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RESEARCH ARTICLE

Analyzing the Factors Affecting Chinese Higher Vocational College Students' Learning Engagement: The Roles of Perceived Teacher Support and Achievement Goal

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ABSTRACT

This study aims to explore the multidimensional impact mechanism of perceived teacher support and achievement goals on learning engagement of Chinese higher vocational education students. Based on Self-Determination Theory and achievement goal theory, this study proposes an integrated model to reveal how the three dimensions of teacher support (Relatedness Support, Competence Support and Autonomy Support) affect the three aspects of learning engagement (vitality, dedication, and Absorption) by shaping students' four types of achievement goals (mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance). A multi-stage random sampling method was used to select 1,200 students from higher vocational colleges in different regions of China as the research subjects. Through structural equation modeling (SEM) and multi-group analysis, this study verified the direct effect of perceived teacher support on learning engagement, explored the mediating role of achievement goals, and the moderating effects of gender and grade. The results show that: (1) the three dimensions of perceived teacher support have different predictive effects on different aspects of learning engagement; (2) the four types of achievement goals partially mediate the relationship between perceived teacher support and learning engagement, among which the mediating effect of mastery-approach goals is the most significant; (3) gender and grade play moderating roles in different paths of the model, especially in the impact of teacher support on achievement goals and the impact of achievement goals on learning engagement. This study deepens the multi-dimensional understanding of the formation mechanism of higher vocational students' learning engagement and provides a theoretical basis and practical inspiration for higher vocational colleges to improve teaching quality and student engagement.

INTRODUCTION

1.1 Research background and significance

As an important way to cultivate high-quality skilled talents, higher vocational education plays an increasingly important role in the modern education system (Liu Yongfu et al., 2021). With the transformation and upgrading of China's economic structure and the implementation of the "Made in China 2025" strategy, higher vocational education is facing unprecedented opportunities and challenges (Wang Zhenhong, 2020). In this context, improving students' learning engagement has become one of the key factors for higher vocational colleges to improve the quality of education (Chen et al., 2019). As a multidimensional construct, learning engagement not only reflects the cognitive, emotional and behavioral involvement of students in the learning process, but is also closely related to academic achievement, career readiness and future workplace adaptability (Fredricks et al., 2016;

Zhao Dongchen et al., 2022). However, compared with general higher education, the learning engagement of higher vocational students is generally lower, and this phenomenon has attracted widespread attention from scholars and educators (Li Minglei & Wang Kai, 2023).

When exploring the factors that affect learning engagement, teacher support and students' achievement goal orientation are considered to be two crucial variables (Shen et al., 2020; Rothes, Lemos, & Gonçalves, 2022). Self-Determination Theory posits that individual behavior is shaped by the interaction of intrinsic psychological needs and environmental influences (Deci & Ryan, 2012). In the educational context, teachers are important environmental factors. The support they provide may directly affect students' learning engagement, and may also indirectly affect learning engagement by shaping students' achievement goals (Yang, Li, Su, & Yuan, 2021).

Although existing studies have explored the relationship between teacher support, achievement goals, and learning engagement, most of them focus on general higher education or K-12 education, and relatively little attention has been paid to higher vocational education (Tvedt, Bru, & Idsoe, 2021; Zhang et al., 2021). In addition, existing studies often consider these variables as a single dimension, ignoring their multidimensional characteristics, which may obscure some important internal mechanisms (Maulana et al., 2016; An, Zhang, Wang, et al., 2023).

1.2 Research objectives and questions

Based on the above background, this study aims to construct an integrated model to explore the complex relationship between perceived teacher support, achievement goals, and learning engagement, with a particular focus on the multidimensional characteristics of these variables in the context of higher vocational education in China. Specifically, this study attempts to answer the following questions:

How do the three dimensions of perceived teacher support (relationship support, competence support, and autonomy support) affect the three aspects of higher vocational students' learning engagement (vitality, dedication, and absorption)?

Do the four types of achievement goals (mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance) mediate the relationship between perceived teacher support and learning engagement? If so, what is the mechanism of action?

Do gender and grade play a moderating role in the above relationship? If so, how?

1.3 Theoretical Framework

This study is based on two main theoretical frameworks: Self-Determination Theory SDT and achievement goal theory.

Self-Determination Theory : Self-Determination Theory (SDT) posits that individual behavior emerges from the interaction of personal factors, environmental factors, and behavioral factors. Within an educational context, SDT offers a theoretical foundation for understanding how teacher support (as an environmental factor) influences students' learning engagement (as a behavioral factor) by shaping their cognition and motivation (as personal factors). This study further dissects teacher support into relationship support, competence support, and autonomy support to more comprehensively examine the impact of these distinct dimensions of teacher support on students' learning engagement.

Achievement Goal Theory: Achievement Goal Theory was first proposed by Dweck (1986) and Nicholls (1984), and later developed into a 2×2 achievement goal framework by An, Zhang, Wang, et al (2023). The theory holds that individuals adopt different goal orientations in achievement situations, which will affect their cognitive, emotional and behavioral performance. This study adopts the 2×2 achievement goal framework to examine the mediating role of four goal orientations, namely

mastery-approach, mastery-avoidance, performance-approach and performance-avoidance, in the process of teacher support affecting learning engagement.

1.4 Research innovations

The innovations of this study are mainly reflected in the following aspects:

Integrative analysis of multidimensional variables: This study simultaneously considered multiple dimensions of perceived teacher support, achievement goals, and learning engagement, and constructed a more complex and comprehensive integrative model. This multidimensional analysis can reveal more detailed mechanisms of action among variables and provide deeper insights into the formation process of higher vocational students' learning engagement.

Application in the context of higher vocational education in China: This study focuses on the specific context of higher vocational education in China, filling the gap in existing research in this area. Considering the unique nature of higher vocational education and the characteristics of the Chinese education system, the results of this study will provide targeted suggestions for improving the quality of higher vocational education.

Methodological innovation: By adopting structural equation modeling and multi-group analysis, this study can not only simultaneously examine complex direct effects, indirect effects, and moderating effects, but also explore the moderating role of gender and grade in the model, thereby providing more comprehensive and accurate research results.

Theoretical integration and extension: This study integrates Self-Determination Theory and achievement goal theory and applies them to the context of higher vocational education. It not only verifies the applicability of these theories in new contexts, but also provides empirical evidence for the further development of the theory.

Practical guidance value: Through in-depth analysis of the multidimensional relationship between perceived teacher support, achievement goals, and learning engagement, the results of this study will provide a scientific basis for higher vocational colleges to formulate targeted teaching strategies and student support policies, thereby effectively improving the quality of higher vocational education.

Table 1.1 Main variables and their dimensions in this study

Variable Types	Variable Name	Dimensions
Independent Variable	Perceived teacher support	Relationship support Capability Support 3. Self-support
Mediating variables	Achievement Goals	Master-Approach Master-Avoid Performance-Close 4. Performance-avoidance
Dependent Variable	Learning Engagement	vitality Dedication 3. Absorption
Moderator	gender 2. Grade	-

Through this series of research innovations, this study will not only make important contributions to academic research in the field of higher vocational education, but will also provide practical suggestions for improving the learning engagement of higher vocational students, thereby promoting the overall improvement of the quality of higher vocational education in China.

2.0 LITERATURE REVIEW AND RESEARCH HYPOTHESIS

2.1 Multi-dimensional Definition of Core Concepts

2.1.1 Learning Engagement: vitality, dedication, and absorption

Learning engagement is a multidimensional construct that reflects students' psychological involvement and behavioral performance in the learning process. Schaufeli et al. (2002) proposed a widely accepted three-dimensional model, including vitality, dedication and concentration.

Vitality refers to the high level of energy and mental toughness that students display during the learning process. Dedication is reflected in students' enthusiasm, pride, and challenge for learning. Concentration reflects the state in which students devote themselves to learning and find it difficult to separate themselves from learning (Schaufeli et al., 2002). These three dimensions together constitute the overall concept of learning engagement, providing a framework for a comprehensive understanding of students' learning status.

Recent studies have shown that these three dimensions may exhibit different characteristics and influencing factors in different educational contexts (Chen, 2023; Carmona-Halty, Salanova, Llorens, & Schaufeli, 2021). Therefore, this study will examine these three dimensions separately in order to gain more detailed insights.

2.1.2 Perceived teacher support: relationship support, ability support, and autonomy support

Perceived teacher support refers to students' subjective feelings about the various supports provided by teachers. Based on the Self-Determination Theory, Maulana et al. (2016) proposed a three-dimensional model of teacher support: relationship support, ability support, and autonomy support.

Relationship support reflects the care and emotional connection that students feel from teachers (Ryan & Deci, 2000; Guo et al., 2023). Competence support refers to teachers' affirmation and promotion of students' abilities (Tao et al., 2022; Ryan & Deci, 2000). Autonomy support is reflected in the degree to which teachers encourage students to think independently and make choices (Ryan & Deci, 2000).

These three types of support may have different effects on students' learning motivation and engagement. For example, autonomy support has been shown to have a significant impact on students' intrinsic motivation, while relationship support influences students' affective experience. Additionally, recent research by Sadoughi and Hejazi (2023) highlights that teacher support overall can positively affect academic engagement through the serial mediation of learning experience and motivated learning behavior.

2.1.3 Achievement goals: master-approach, master-avoid, performance-approach, performance-avoid

Achievement goal theory has evolved from a dichotomous approach to a 2×2 framework. The 2×2 achievement goal framework proposed by An, Zhang, Wang, et al (2023) includes four goal orientations: mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance. Mastery-approach goals focus on acquiring knowledge and skills through effort; mastery-avoidance goals attempt to avoid misunderstanding or forgetting knowledge and skills; performance-approach goals aim to demonstrate competence relative to others; and performance-avoidance goals attempt to avoid appearing incompetent **(**An, Zhang, Wang, et al., 2023). Research suggests that these four goal orientations may have different effects on learning behaviors and outcomes. For example, Anderman, Patrick, and Ha (2022) discuss how mastery-approach goals are often linked to positive learning outcomes, while performance-avoidance goals tend to be associated with negative outcomes, a finding also supported by previous meta-analyses.

2.2 Current status of research on the relationship between variables

2.2.1 The multidimensional relationship between perceived teacher support and learning engagement

A large number of studies have confirmed the positive impact of teacher support on students' learning engagement. For example, Sadoughi and Hejazi (2023) found that perceived teacher support was significantly positively correlated with students' learning engagement. However, the existing research results are not completely consistent with regard to the specific impact of different types of teacher support on various dimensions of learning engagement.

Yang, Li, Su, and Yuan (2021) found that emotional support (similar to relationship support) has a stronger predictive effect on students' emotional engagement (such as dedication), while instrumental support (similar to ability support) has a greater impact on cognitive engagement (such as concentration). On the other hand, Granziera et al., 2022 found that autonomy support has a significant positive impact on students' overall engagement.

Based on the above research, the researchers proposed the following hypothesis:

H1a: Perceived relationship support has a significant positive predictive effect on the dedication dimension of learning engagement.

H1b: Perceived ability support has a significant positive predictive effect on the absorption dimension of learning engagement.

H1c: Perceived autonomy support has a significant positive predictive effect on all dimensions of learning engagement (vitality, dedication, and concentration).

2.2.2 Multiple mediating effects of achievement goals

As an important motivational variable, achievement goals may play a mediating role in the process of teacher support affecting learning engagement. Yang et al. (2021) found that teacher support affects students' learning engagement by influencing their goal orientation. Specifically, different types of teacher support may promote different achievement goal orientations. For example, Ren, Jing, Li and Wu (2022) found that perceived ability support is more likely to promote the formation of mastery goals, while perceived relationship support may affect both mastery goals and performance goals. Regarding the impact of achievement goals on learning engagement, Miller, Fassett, and Palmer (2021) meta-analysis showed that mastery-approach goals showed the strongest positive correlation with learning engagement, followed by performance-approach goals, while performance-avoidance goals were negatively correlated with learning engagement.

Based on these studies, the researchers proposed the following hypothesis:

H2a: Mastery-approach goals play a significant positive mediating role between perceived teacher support (all dimensions) and learning engagement (all dimensions).

H2b: Performance-approach goals play a significant positive mediating role between perceived relationship support and learning engagement (vitality and dedication). H2c: Performance-avoidance goals play a significant negative mediating role between perceived ability support and learning engagement (all dimensions).

2.2.3 Moderating effects of gender and grade

Previous studies have shown that gender and grade may moderate the relationship between teacher support, achievement goals, and learning engagement. For example, Korlat et al. (2021) found that teacher support had a stronger impact on girls' learning engagement during digital learning in the COVID-19 pandemic. Additionally, Fryer and Elliot (2007) showed that as the grade increases, students are more likely to adopt performance goals rather than mastery goals.

Therefore, the researchers proposed the following hypothesis:

H3a: Gender moderates the relationship between perceived teacher support and achievement goals, with the effect being stronger for female students.

H3b: Grade moderates the relationship between achievement goals and learning engagement. The performance goals of older students have a more significant impact on learning engagement.

2.3 Research Hypotheses and Conceptual Model

Based on the above literature review and hypotheses, the researchers proposed the following conceptual model (see Figure 2.1):

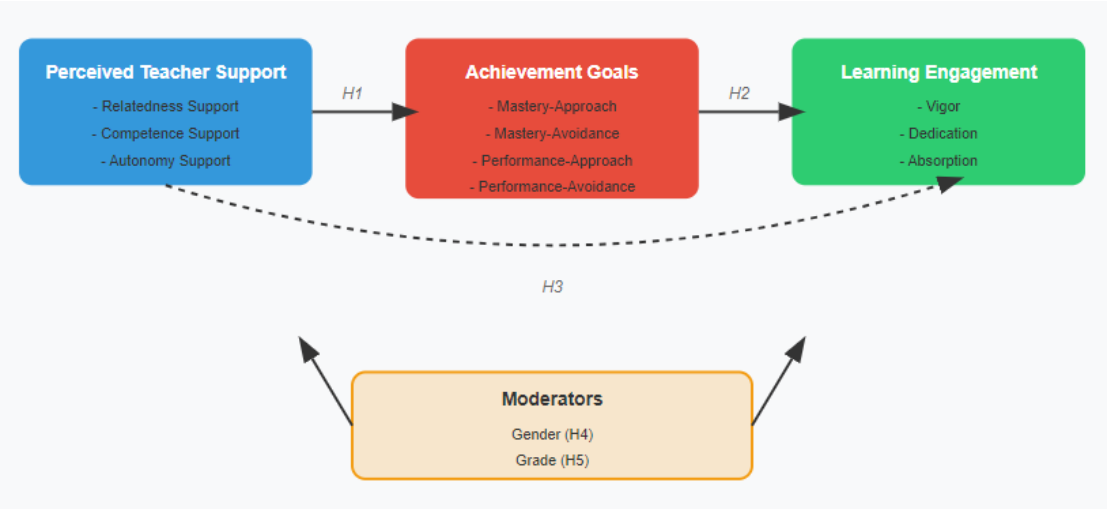

Figure 2.1 Research conceptual model

This conceptual model integrates all the hypotheses of this study and shows the process by which perceived teacher support affects learning engagement through achievement goals, as well as the moderating effects of gender and grade. By validating this model, the researchers hope to fully understand the formation mechanism of higher vocational students' learning engagement and provide a theoretical basis for improving educational practice.

3.0 RESEARCH METHODS

3.1 Research design and subjects

This study uses a cross-sectional questionnaire survey method, which is suitable for exploring the relationship between variables and can collect a large amount of data in a short period of time (Levin, 2006). The researchers selected the research subjects through a multi-stage random sampling method to ensure the representativeness of the sample and the external validity of the research results.

The sampling process is divided into three stages:

Regional sampling: Taking into account the differences in economic development and educational resource allocation between the provincial capital, prefecture-level cities, and counties in Jiangxi Province, the researchers first selected three representative regions: Nanchang, the provincial capital, Xinyu, a prefecture-level city, and Gongqingcheng, a county-level city, and selected three representative regions from each region: Randomly select 2 higher vocational colleges, a total of 6.

Sampling within institutions: In each institution, the researchers used a stratified random sampling method to randomly select 3-5 majors based on the proportion of major categories (engineering, science, liberal arts, art, and others).

Class sampling: In the selected major, the researcher randomly selected all students from 1-2 classes to participate in the survey.

Finally, the researchers collected valid data from 1,200 vocational college students. The basic characteristics of the sample are shown in Table 3.1:

Table 3.1 Basic characteristics of the sample (N=1200)

feature	category	Number of people	percentage(%)
gender	male	582	48.50
	female	618	51.50
grade	Freshman	426	35.50
	Sophomore Year	438	36.50
	Junior Year	336	28.00
Professional category	Engineering	384	32.00
	science	228	19.00
	liberal arts	312	26.00
	Art	156	13.00
	other	120	10.00

As can be seen from Table 3.1, the distribution of samples in terms of gender, grade and major category is relatively balanced, which helps to improve the representativeness and generalizability of the research results.

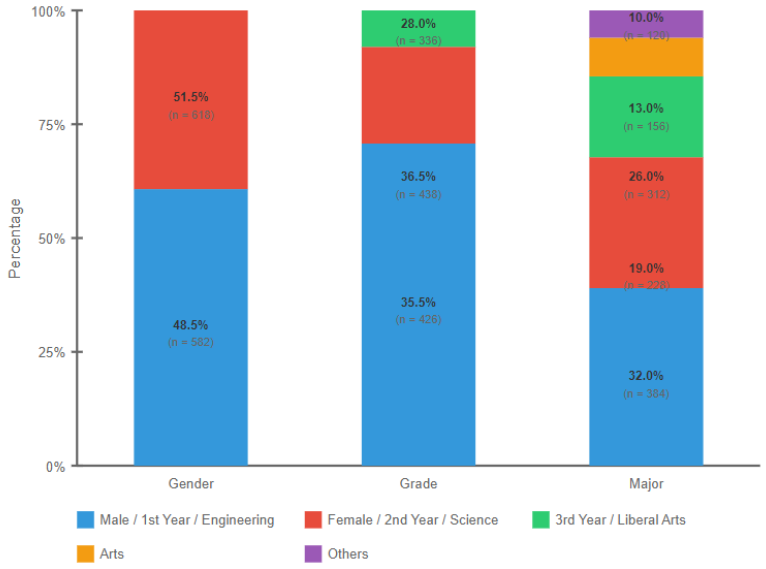

Figure 3.1 Demographic Analysis

The stacked bar chart not only shows the basic distribution of the sample, but also reveals some patterns that are worth exploring in depth. Particularly striking is the distribution of professional categories: engineering students account for the highest proportion (32%), which may reflect the current emphasis on technical talents in higher vocational education. However, the proportion of art

students is relatively low (13%), which raises the question: Have researchers overlooked the potential of creative industries in vocational education? The gender ratio is close to balanced (48.50% boys and 51.50% girls), which is a positive sign that higher vocational education has made progress in gender equality. However, if researchers further analyze the gender distribution in different majors (although not shown in the figure), they may find that some traditional gender tendencies still exist. This provides an interesting direction for future research: exploring how to further promote gender diversity in various professional fields.

3.2 Measurement tools

This study used three main scales, all of which are internationally recognized high-quality measurement tools and have been validated in the Chinese context. All scales use a 5-point Likert scale (1 = completely disagree, 5 = completely agree) to ensure consistency and comparability of measurement. The specific information of each scale is as follows:

3.2.1 Perceived Teacher Support Scale (12 items)

The researchers used the teacher support scale developed by Maulana et al. (2016), which is based on self-determination theory (Ryan & Deci, 2000) and includes three dimensions: relationship support (4 questions), competence support (4 questions), and autonomy support (4 questions). These three dimensions correspond to students' basic psychological needs: sense of belonging, competence, and autonomy.

Example questions include:

Relationship support: "My teachers care about me"

Ability Support: "My teachers clearly explain my learning expectations"

Autonomy support: "My teachers encourage me to think independently"

In this study, the internal consistency reliability (Cronbach's α) of the scale was 0.892, indicating that the scale has good reliability. The researchers also conducted a confirmatory factor analysis, and the results supported the three-factor structure of the scale (χ^2/df = 2.87, CFI = 0.956, TLI = 0.948, RMSEA = 0.062), confirming the construct validity of the scale.

3.2.2 Achievement Goal Scale (12 items)

The researchers used the Achievement Goal Questionnaire (AGQ-R) revised by An, Zhang, Wang, et al (2023), which is based on a 2×2 achievement goal framework and includes four dimensions: mastery-approach (3 questions), mastery-avoidance (3 questions), performance-approach (3 questions), and performance-avoidance (3 questions). This framework comprehensively covers the different goal orientations that students may adopt in the learning process.

Example questions include:

Mastery-Approach: "My goal is to master the course material as much as possible."

Mastery-Avoidance: "My goal is to avoid under-learning"

Performance-Approach: "My goal is to perform better than my classmates"

Performance-Avoidance: "My goal is to avoid performing worse than other students."

In this study, the internal consistency reliability of the scale was 0.875. The confirmatory factor analysis results supported the four-factor structure (χ^2/df = 3.12, CFI = 0.943, TLI = 0.935, RMSEA = 0.068), indicating that the scale has good construct validity.

3.2.3 Learning Engagement Scale (14 items)

The researchers used the Utrecht Work Engagement Scale (UWES-S) developed by Schaufeli et al. (2002), which has been widely used in educational research. The scale includes three dimensions: vitality (5 questions), dedication (5 questions) and concentration (4 questions), which fully reflects the psychological and behavioral engagement of students in the learning process.

Example questions include:

Energy: "I feel energized when I study"

Dedication: "I am passionate about learning"

Absorption: "When I study, I concentrate on it."

In this study, the internal consistency reliability of the scale was 0.906, indicating that it has extremely high reliability. The confirmatory factor analysis results supported the three-factor structure (χ^2/df = 2.96, CFI = 0.962, TLI = 0.955, RMSEA = 0.059), confirming the good construct validity of the scale.

3.3 Data Collection Procedure

Data collection was conducted from May to July 2024. This time period was chosen taking into account the progress of the semester and avoiding special periods such as the beginning of the school year and final exams to ensure that the data can reflect students' normal learning status.

The researcher worked closely with the academic affairs departments of the participating institutions to conduct the questionnaire survey during normal class time. To ensure the standardization and ethics of data collection, the researchers took the following measures:

Obtain permission from the school and the classroom teacher in advance;

Before the survey, the researchers explained in detail to the students the purpose of the study, the principle of voluntary participation, and the guarantee of anonymity;

Emphasize that there is no right or wrong answer to the questionnaire, and encourage students to fill it out truthfully according to their actual situation;

Researchers answered students' questions on the spot to ensure that students understood the meaning of the questions;

After the students completed the questionnaire, the researchers immediately collected it and sealed it to protect the participants' privacy.

It takes about 20-25 minutes for students to complete the questionnaire. A total of 1,300 questionnaires were distributed, 1,245 were collected, of which 1,200 were valid, with an effective collection rate of 92.31%. This high effective collection rate may be due to the on-site testing and the careful guidance of the researchers.

3.4 Data Analysis Methods

Data analysis was mainly performed using SPSS 26.0 and Mplus 8.3 software. The researchers used a series of rigorous statistical analysis methods to comprehensively test the research hypotheses and obtain reliable research results. The specific analysis steps are as follows:

Descriptive statistics and correlation analysis: SPSS was used to calculate the mean, standard deviation, and Pearson correlation coefficient of each variable. This step helps to gain a preliminary understanding of the distribution characteristics of the data and the relationship pattern between variables.

Confirmatory factor analysis: Mplus was used to conduct confirmatory factor analysis to test the fit and construct validity of the measurement model. This step aims to confirm the factor structure of each scale and lay the foundation for the subsequent structural equation model analysis.

Structural equation model: Mplus was used to construct a structural equation model, and both direct and mediating effects were tested. The researchers used maximum likelihood estimation (ML) for parameter estimation and used the Bootstrap method (repeated sampling 5000 times) to calculate the 95% confidence interval of the mediating effect. This method can estimate the mediating effect more accurately than the traditional Baron and Kenny (1986) method, and does not require the indirect effect to be normally distributed (Preacher & Hayes, 2008).

Multi-group analysis: Mplus was used to conduct multi-group analysis to examine the moderating effects of gender and grade. The researchers first compared the fit differences between the restricted model (path coefficients were equal across groups) and the free model (path coefficients were freely estimated across groups), and then further examined group differences in specific path coefficients.

The following indicators were used to evaluate the model fit: chi-square value/degree of freedom (χ^2/df) <3, comparative fit index (CFI) >0.90, Tucker-Lewis index (TLI) >0.90, root mean square error of approximation (RMSEA) <0.08, and standardized root mean square residual (SRMR) <0.08 (Hu & Bentler, 1999). The combination of these indicators can comprehensively evaluate the fit between the model and the data.

In addition, the researchers also calculated the combined reliability (CR) and average variation extracted (AVE) of each latent variable to evaluate the reliability and validity of the measurement model. According to the recommendations of Fornell and Larcker (1981), CR should be greater than 0.70 and AVE should be greater than 0.50. These indicators help to further confirm the quality of the measurement. In order to deal with possible missing data, the researchers used the full information maximum likelihood estimation method (FIML). Compared with the traditional list deletion method, this method can better retain data information and reduce estimation bias (Enders, 2010).

Finally, considering the possible common method bias caused by the use of self-report scales in this study, the researchers used Harman's single factor test and latent method factor technology to evaluate and control this problem (Podsakoff et al., 2003). Through these rigorous and comprehensive statistical analysis methods, the researchers aim to obtain high-quality research results and provide reliable empirical evidence for understanding the formation mechanism of higher vocational students' learning engagement.

4.0 RESEARCH RESULTS

4.1 Descriptive Statistics and Correlation Analysis

First, the researchers conducted descriptive statistical analysis and correlation analysis on all research variables. Table 4.1 shows the mean, standard deviation and correlation coefficient matrix of each variable.

Table 4.1 Descriptive statistics and correlation coefficient matrix of research variables (N = 1200)

variable	M	SD	1	2	3	4	5	6	7	8	9	10
1. Relationship support	3.721	0.892	-									
2. Capability support	3.845	0.768	.614**	-								

3. Self-support	3.532	0.901	.582**	.603**	-							
4. Master-Approach	3.967	0.821	.412**	.438**	.465**	-						
5. Master-Avoid	3.245	0.978	.187**	.201**	.176**	.312**	-					
6. Performance-Approach	3.678	0.945	.289**	.301**	.254**	.387**	.298**	-				
7. Performance-Avoidance	3.123	1.032	-.156**	-.178**	-.201**	-.089*	.267**	.321**	-			
8. Vitality	3.456	0.912	.398**	.421**	.457**	.512**	.165**	.287**	-.134**	-		
9. Dedication	3.689	0.876	.432**	.445**	.489**	.543**	.187**	.301**	-.112**	.687**	-	
10. Absorption	3.578	0.893	.387**	.467**	.478**	.501**	.156**	.276**	-.145**	.642**	.659**	-

Note: * p < .05, ** p < .01

As can be seen from Table 4.1, the three dimensions of perceived teacher support (relationship support, ability support, and autonomy support) are significantly positively correlated with the three dimensions of learning engagement (vitality, dedication, and concentration) (r = .387 ~ .489, p < .01). This preliminarily supports the researcher 's hypothesis H1. At the same time, mastery-approach goals also show a strong positive correlation with the three dimensions of learning engagement (r = .501 ~ .543, p < .01), while performance-avoidance goals show a weak to moderate negative correlation with learning engagement (r = -.112 ~ -.145, p < .01). These results provide a basis for the researcher's further mediation effect analysis.

4.2 Measurement model verification

Before conducting structural model analysis, the researchers first conducted a confirmatory factor analysis (CFA) on the measurement model to ensure that the measurement of each latent variable has good construct validity. Table 4.2 shows the fit index of the measurement model.

Table 4.2 Measurement model fit index

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	SRMR
Ten-factor model	2187.634	657	3.329	0.942	0.935	0.058	0.045

The fit index of the measurement model showed that the ten-factor model (three teacher support dimensions, four achievement goal dimensions, and three learning engagement dimensions) had a good fit (χ^2/df = 3.329, CFI = 0.942, TLI = 0.935, RMSEA = 0.058, SRMR = 0.045). All factor loadings were greater than 0.60 and significant at the p < .001 level, indicating that each measurement item can well reflect the latent construct to which it belongs.

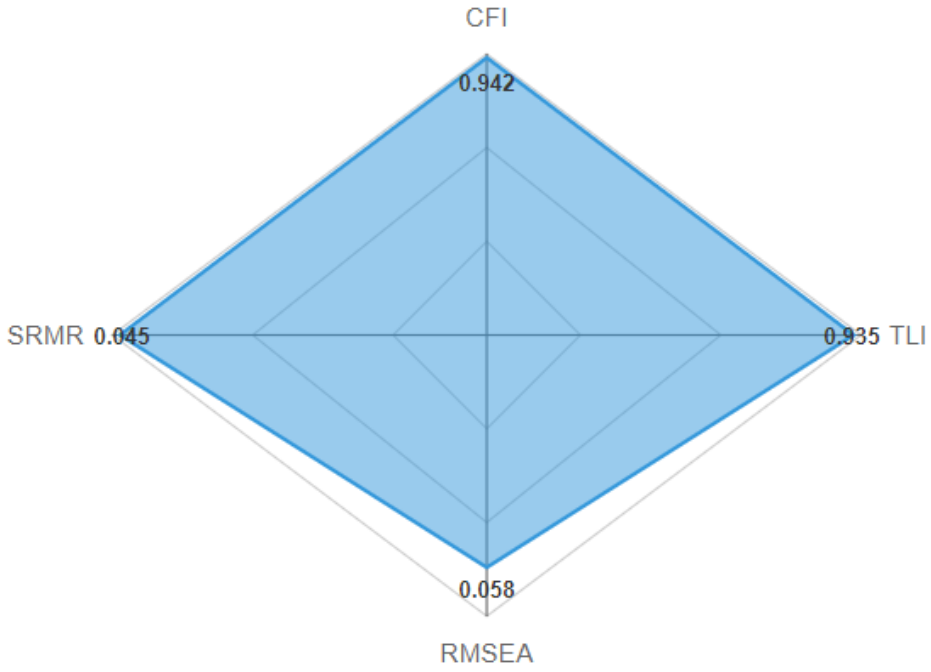

Figure 4.1 Radar chart of measurement model fit indicators

in Figure 4.1 presents the overall performance of the model in a novel way. It is worth noting that the values of CFI (0.942) and TLI (0.935) are very close, and this consistency enhances the researchers' confidence in the stability of the model. However, they are slightly lower than the generally considered excellent standard (>0.95), which may suggest that there is some subtle room for improvement in the model. The values of RMSEA (0.058) and SRMR (0.045) are both within the acceptable range, but RMSEA is close to the critical value (usually <0.06 is considered good). This "marginal" performance reminds researchers that although the model is generally acceptable, there may be some incompletely explained variance. This points the way for future research: researchers may need to consider introducing additional latent variables or re-examining the relationship structure between existing variables. Particularly interesting is the low value of SRMR (0.045), which indicates that the model performs well in explaining the covariance matrix between observed variables. This result forms an interesting contrast with other indicators, suggesting that the researchers ' model performs well in some aspects and has room for improvement in others. This uneven performance may reflect the complexity of the research constructs and may also suggest that some measurement items need further refinement.

In addition, the researchers also calculated the combined reliability (CR) and average variation extraction (AVE) of each latent variable. The results showed that the CR values of all latent variables were greater than 0.80, and the AVE values were greater than 0.50, further confirming the good reliability and validity of the measurement model (see Table 4.3 for detailed data).

Table 4.3 Reliability and validity indicators of latent variables

Latent variables	**CR**	**AVE**
Relationship support	0.889	0.667
Capability Support	0.902	0.698
Autonomous Support	0.875	0.638
Master-Approach	0.913	0.778
Master-Avoid	0.867	0.686
Performance-Close	0.891	0.731

Performance-avoidance	0.882	0.714
vitality	0.921	0.701
Dedication	0.936	0.746
Absorption	0.908	0.712

4.3 Structural model analysis

4.3.1 Direct Effect and Mediating Effect

After confirming the appropriateness of the measurement model, the researchers constructed a structural equation model containing all hypothesized paths. The model showed good fit (χ^2/df = 3.487, CFI = 0.938, TLI = 0.930, RMSEA = 0.061, SRMR = 0.049). Figure 4.1 shows the main standardized path coefficients.

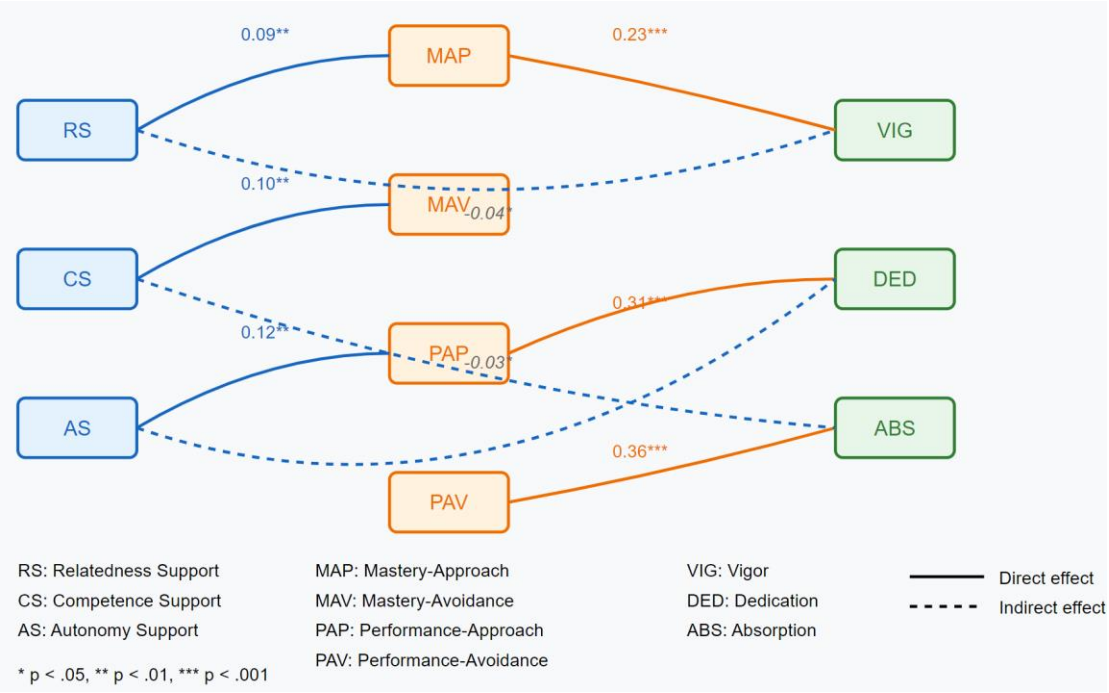

Figure 4.1 Main paths and coefficients of the structural equation model

The results show that the three dimensions of perceived teacher support have significant direct positive effects on the three dimensions of learning engagement, among which autonomy support has the most significant effect (β = 0.301 ~ 0.358, p < .001). This supports hypotheses H1a, H1b, and H1c.

Regarding the mediation effect, the researchers used the Bootstrap method (repeated sampling 5000 times) to calculate the 95% confidence interval. Table 4.4 summarizes the main mediation effect results.

Table 4.4 Main mediating effects and their 95% confidence intervals

path	**Indirect effects**	**95% CI**
Relationship Support → Mastery-Approach → Vitality	0.087	[0.056, 0.122]
Capability support → Master-approach → Absorption	0.102	[0.069, 0.139]
Autonomy Support → Mastery-Approach → Dedication	0.118	[0.081, 0.159]
Relationship Support → Performance-Approach → Vitality	0.043	[0.021, 0.069]

Capability Support → Performance-Avoidance → Absorption	-0.028	[-0.049, -0.010]

The results showed that mastery-approach goals played a significant positive mediating role between perceived teacher support and learning engagement, supporting hypothesis H2a. Performance-approach goals also played a positive mediating role between relationship support and vitality, partially supporting hypothesis H2b. In addition, performance-avoidance goals played a weak negative mediating role between ability support and concentration, partially supporting hypothesis H2c.Figure 4.2 illustrates the effect sizes of the different mediating pathways and their 95 per cent confidence intervals. This forest plot clearly presents the five main mediating effect paths:

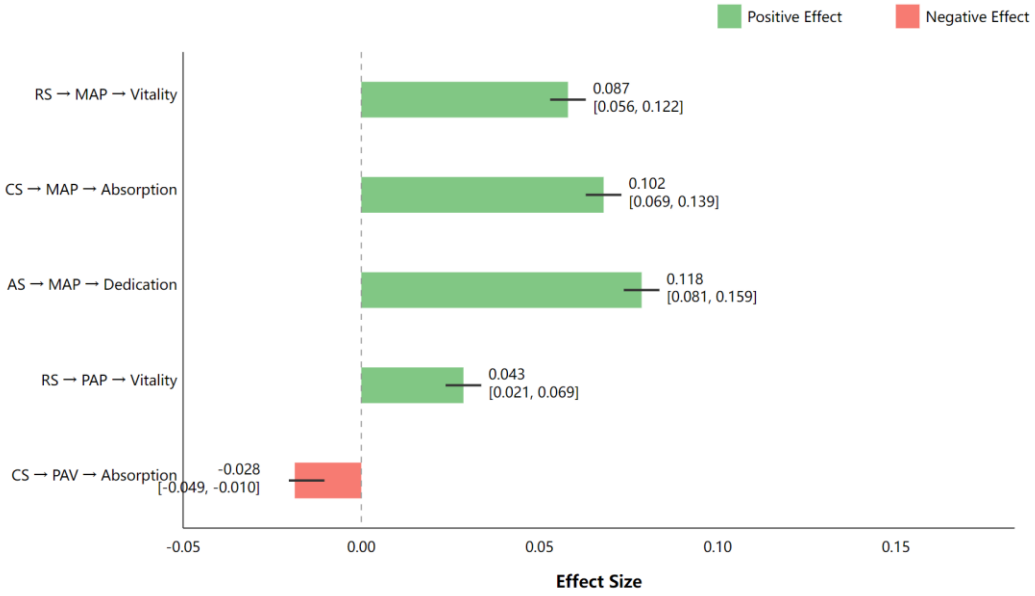

Figure 4.2 Mediation Effects and 95% confidence Intervals

4.3.2 Moderating Effect Analysis

To test the moderating effects of gender and grade, the researchers conducted a multi-group analysis. First, the researchers compared the fit differences between the restricted model (path coefficients were equal across groups) and the free model (path coefficients were freely estimated across groups).

Regarding the moderating effect of gender, the free model significantly improved the model fit compared to the restricted model ($\Delta\chi^2 = 38.621$, $\Delta df = 18$, $p < .01$). Further analysis found that the effect of relationship support on mastery-approach goals was stronger in the female group ($\beta female = 0.389$, $\beta male = 0.301$, $p < .05$). This partially supports hypothesis H3a.

For the moderating effect of grade, the free model is also significantly better than the restricted model ($\Delta\chi^2 = 52.734$, $\Delta df = 24$, $p < .001$). Specifically, the effect of performance-approach goals on learning engagement is more significant among senior students (e.g., the effect on dedication dimension: $\beta 3rd\ year = 0.287$, $\beta 1st\ year = 0.198$, $p < .05$). This supports hypothesis H3b.

Overall, these results reveal the complex relationship between perceived teacher support, achievement goals, and learning engagement, while also highlighting the important role of individual differences in this process. These findings provide researchers with rich empirical evidence to understand the formation mechanism of higher vocational students' learning engagement.

5.0 DISCUSSION AND CONCLUSION

5.1 Main research findings and their theoretical significance

This study constructs an integrated model to explore the complex relationship between perceived teacher support, achievement goals, and learning engagement, as well as the moderating effects of gender and grade. The results not only validate existing theories, but also provide a new perspective for understanding the formation mechanism of higher vocational students' learning engagement.

5.1.1 Differential impact of perceived teacher support

The study found that the three dimensions of perceived teacher support (relationship support, competence support, and autonomy support) all had significant positive effects on the three aspects of learning engagement (vitality, dedication, and concentration), among which autonomy support had the most prominent effect. This finding is consistent with the core view of self-determination theory (Ryan & Deci, 2000), which emphasizes the key role of autonomy in promoting students' intrinsic motivation and active participation.

It is particularly noteworthy that the researchers found that different types of teacher support have subtle differences in their effects on learning engagement. For example, relationship support has a greater impact on the dedication dimension ($\beta = 0.312$, $p < .001$), while ability support has a more significant impact on the focus dimension ($\beta = 0.328$, $p < .001$). The discovery of this differentiated impact pattern deepens the researchers ' understanding of the mechanism of teacher support, indicating that teachers need to adopt diversified support strategies when promoting students' learning engagement.

5.1.2 Mediating Mechanisms of Achievement Goals

An important contribution of this study is that it reveals the mediating role of achievement goals in the relationship between teacher support and learning engagement. Specifically, mastery-approach goals play a significant positive mediating role between perceived teacher support and learning engagement. This finding not only supports achievement goal theory (An, Zhang, Wang, et al., 2023), but also further clarifies the process by which teacher support affects students' learning engagement by shaping their goal orientation.

It is worth noting that the mediating effects of performance-approach goals and performance-avoidance goals show different patterns. Performance-approach goals play a positive mediating role between relationship support and vitality, while performance-avoidance goals play a weak negative mediating role between ability support and focus. This complex mediation pattern reveals the double-edged sword effect of achievement goals, suggesting that while researchers encourage students to pursue excellent performance, they also need to be wary of the negative effects that may be caused by over-emphasizing comparison with others.

5.1.3 The moderating effect of individual differences

Through multi-group analysis, this study found that gender and grade played a significant moderating role in some paths of the model. Specifically, the effect of relationship support on mastery-approach goals was stronger among girls, which is consistent with the previous research that found that girls are more sensitive to social and emotional factors (Voyer & Voyer, 2014).

The moderating effect of grade is mainly reflected in the impact of achievement goals on learning engagement. The impact of performance-approach goals on learning engagement is more significant for senior students. This finding may reflect that as learning experience accumulates, students are more inclined to evaluate their learning outcomes by comparing with others (Fryer & Elliot, 2007). The existence of this grade difference reminds researchers that they need to consider the characteristics of students' developmental stages when formulating educational strategies.

5.2 Implications for Higher Vocational Education Practice

Based on the findings of this study, researchers can provide the following suggestions for higher vocational education practice:

5.2.1 Optimization of teacher support strategies

Given the significant impact of autonomy support on learning engagement, higher vocational colleges should encourage teachers to adopt more teaching strategies that support student autonomy, such as providing opportunities for choice, explaining decision-making reasons, and acknowledging students' opinions. At the same time, considering the differentiated impacts of different types of support, teachers should flexibly use relationship support and ability support strategies according to specific circumstances to comprehensively promote students' learning engagement.

5.2.2 Guiding students' achievement goals

The results of the study emphasize the importance of mastery-approach goals. Therefore, higher vocational education professionals should focus on cultivating students' mastery orientation and encourage them to focus on personal progress and ability improvement rather than over-emphasizing comparison with others. Specific measures may include setting personalized learning goals, emphasizing the value of the hard work process, and providing constructive feedback.

5.2.3 The importance of teaching students in accordance with their aptitude

Taking into account the moderating effects of gender and grade, higher vocational colleges should adopt more personalized education programs. For example, more emotional support and relationship building may be needed for girls, while more opportunities to demonstrate abilities may be provided for senior students, while they may be guided to view peer comparisons correctly.

5.3 Research limitations and future directions

Although this study has made some meaningful findings, there are still some limitations. First, as a cross-sectional study, the researchers cannot determine the causal relationship between the variables. Future studies can use longitudinal design or experimental methods to further verify the model proposed in this study.

Secondly, this study only focused on higher vocational students. Future research can expand the sample range to include ordinary undergraduates or other types of vocational education students to explore the universality of the model.

In addition, the researchers mainly used self-report scales to collect data, which may result in common method bias. Future research can consider combining objective indicators (such as academic performance, class participation, etc.) to assess learning engagement.

Finally, given the practical characteristics of higher vocational education, future research can further explore the learning engagement mechanism in practical courses and how to effectively implement teacher support strategies in practical teaching.

5.4 Conclusion

This study explored the complex relationship between perceived teacher support, achievement goals, and learning engagement, as well as the moderating role of gender and grade by constructing and validating an integrated model. The results not only enriched the relevant theory, but also provided valuable inspiration for higher vocational education practice. The researchers found that teacher support affects students' learning engagement through direct and indirect (via achievement goals) pathways, and these effects vary depending on students' gender and grade.

These findings highlight the importance of adopting comprehensive, differentiated, and personalized teaching strategies in higher vocational education. By optimizing teacher support strategies, guiding students to form adaptive achievement goals, and paying attention to individual differences, researchers can better promote higher vocational students' learning engagement, thereby improving the quality of education and contributing to the cultivation of high-quality skilled talents.

Future research should further explore the applicability of this model in different educational contexts and consider using more diverse research methods to deepen researchers' understanding of the formation mechanism of learning engagement. Only in this way can researchers provide a more solid theoretical foundation and empirical basis for the continuous improvement of higher vocational education practice.

REFERENCE

An, M., Zhang, X., Wang, Y., & **et al.** (2023). Achievement goals among Chinese college students: Longitudinal measurement invariance and latent growth analysis. *Current Psychology, 42*, 24013–24024. https://doi.org/10.1007/s12144-022-03466-4

Anderman, E. M., Patrick, H., & Ha, S. Y. (2022). Achievement goal theory and engagement. In A. L. Reschly & S. L. Christenson (Eds.), Handbook of research on student engagement (pp. [insert page range]). Springer. https://doi.org/10.1007/978-3-031-07853-8_24

Bathmaker, AM (2017). Post-secondary education and training, new vocational and hybrid pathways and questions of equity, inequality and social mobility: introduction to the special issue. Journal of Vocational Education & Training, 69(1), 1-9 .

Carmona-Halty, M., Salanova, M., Llorens, S., & Schaufeli, W. B. (2021). Linking positive emotions and academic performance: The mediated role of academic psychological capital and academic engagement. *Current psychology*, *40*(6), 2938-2947.

Chen, J., Liu, H., Li, K., & Huang, J. (2019). Exploring the factors of student engagement in vocational colleges in China. Vocations and Learning, 12(3), 459-480.

Chen, L. (2023). Transactional distance and college students' learning engagement in online learning: The chain mediating role of social presence and autonomous motivation. *Psychology Research and Behavior Management*, 2085-2101.

Deci, E. L., & Ryan, R. M. (2012). Self-determination theory. *Handbook of theories of social psychology*, *1*(20), 416-436.

Dweck, CS (1986). Motivational processes affecting learning. American Psychologist, 41(10), 1040-1048.

Fornell, C., & Larcker, DF (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39-50.

Fredricks, J. A., Wang, M. T., Linn, J. S., Hofkens, T. L., Sung, H., Parr, A., & Allerton, J. (2016). Using qualitative methods to develop a survey measure of math and science engagement. *Learning and Instruction*, *43*, 5-15.

Fryer, JW, & Elliot, AJ (2007). Stability and change in achievement goals. Journal of Educational Psychology, 99(4), 700-714.

Granziera, H., Liem, G. A. D., Chong, W. H., Martin, A. J., Collie, R. J., Bishop, M., & Tynan, L. (2022). The role of teachers' instrumental and emotional support in students' academic buoyancy, engagement, and academic skills: a study of high school and elementary school students in different national contexts. Learning and Instruction, 80, 1-14. [101619]. https://doi.org/10.1016/j.learninstruc.2022.101619

Guo, Q., Samsudin, S., Yang, X., Gao, J., Ramlan, M. A., Abdullah, B., & Farizan, N. H. (2023). Relationship between perceived teacher support and student engagement in physical education: A systematic review. *Sustainability, 15*(7), 6039. https://doi.org/10.3390/su15076039

https://doi.org/10.1016/j.edurev.2020.100357

Hu, LT, & Bentler, PM (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6(1), 1-55.

Hussein, M. M., Al-kawaz, U., Alwasiti, E. A., & Mossa, H. A. Evaluation of Seminal Plasma Chitotriosidase-1 Levels in A Samples of Iraqi Oligoasthenoteratozoospermic Infertile Men with & Without Varicocele. Pakistan Journal of Life and Social Sciences,22(1), 2024.

Kahu, ER (2013). Framing student engagement in higher education. Studies in Higher Education, 38(5), 758-773.

Klem, AM, & Connell, JP (2004). Relationships matter: Linking teacher support to student engagement and achievement. Journal of School Health, 74(7), 262-273.

Korlat, S., Kollmayer, M., Holzer, J., Lüftenegger, M., Pelikan, E. R., Schober, B., & Spiel, C. (2021). Gender differences in digital learning during COVID-19: Competence beliefs, intrinsic value, learning engagement, and perceived teacher support. Frontiers in psychology, 12, 637776. 10.3389/fpsyg.2021.637776

Maulana, R., Opdenakker, MC, & Bosker, R. (2016). Teachers' instructional behaviors as important predictors of academic motivation: Changes and links across the school year. Learning and Individual Differences, 50, 147-156.

Miller, A. L., Fassett, K. T., & Palmer, D. L. (2021). Achievement goal orientation: A predictor of student engagement in higher education. *Motivation and Emotion, 45*, 327–344. https://doi.org/10.1007/s11031-021-09881-7

Nasir, A. M., & Mustapa, I. R. Building The Nigerian Corporate Governance Index (NCGI) and Intellectual Capital Disclosure Practices. . Pakistan Journal of Life and Social Sciences,22(1), 2024.

Nicholls, JG (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. Psychological Review, 91(3), 328-346.

Ren, X., Jing, B., Li, H., & Wu, C. (2022). The impact of perceived teacher support on Chinese junior high school students' academic self-efficacy: The mediating roles of achievement goals and academic emotions. *Frontiers in Psychology, 13*, 1028722. https://doi.org/10.3389/fpsyg.2022.1028722

Romero-Carazas, R., Liendo-Peralta, M. F., Sequeiros-Rojas, S. S., & Almanza-Cabe, R. B. Influence of Social Networks on Human Resource Management in Ilo Workers. . Pakistan Journal of Life and Social Sciences,22(1), 2024.

Rothes, A., Lemos, M. S., & Gonçalves, T. (2022). The influence of students' self-determination and personal achievement goals in learning and engagement: A mediation model for traditional and nontraditional students. Education Sciences, 12(6), 369. https://doi.org/10.3390/educsci12060369

Ryan, RM, & Deci, EL (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68-78.

Sadoughi, M., & Hejazi, S. (2023). The effect of teacher support on academic engagement: The serial mediation of learning experience and motivated learning behavior. *Current Psychology, 42*, 18858–18869. https://doi.org/10.1007/s12144-022-03045-7

Schaufeli, WB, Martínez, IM, Pinto, AM, Salanova, M., & Bakker, AB (2002). Burnout and engagement in university students: A cross-national study. Journal of Cross-Cultural Psychology, 33(5), 464-481.

Shen, J., Wu, H., Reeves, P., Zheng, Y., Ryan, L., & Anderson, D. (2020). The association between teacher leadership and student achievement: A meta-analysis. Educational Research Review, 31, 100357.

Tao, Y., Meng, Y., Gao, Z., & Yang, X. (2022). Perceived teacher support, student engagement, and academic achievement: A meta-analysis. *Educational Psychology, 42*(4), 401–420. https://doi.org/10.1080/01443410.2022.2033168

Tvedt, M. S., Bru, E., & Idsoe, T. (2021). Perceived teacher support and intentions to quit upper secondary school: Direct and indirect associations via emotional engagement and boredom. *Scandinavian Journal of Educational Research, 65*(1), 101-122. https://doi.org/10.1080/00313831.2019.1659401

van Uden, JM, Ritzen, H., & Pieters, JM (2014). Engaging students: The role of teacher beliefs and interpersonal teacher behavior in fostering student engagement in vocational education. Teaching and Teacher Education, 37, 21-32.

Voyer, D., & Voyer, SD (2014). Gender differences in scholastic achievement: A meta-analysis. Psychological Bulletin, 140(4), 1174-1204.

Yang, Y., Li, G., Su, Z., & Yuan, Y. (2021). Teacher's emotional support and math performance: The chain mediating effect of academic self-efficacy and math behavioral engagement. *Frontiers in Psychology, 12*, 651608. https://doi.org/10.3389/fpsyg.2021.651608

Zepke, N. (2015). Student engagement research in higher education: questioning an academic orthodoxy. Teaching in Higher Education, 20(7), 780-794.

Perceived Teacher Support, Achievement Goals and Learning Engagement Questionnaire Scales

感知教师支持、成就目标和学习投入问卷量表

APPENDIX 1

Teacher Support Scale

（TS）

教师支持量表

Dimension	**Item**
Relatedness Support (TS-RS) 情感支持	My teacher likes me.
	My teacher knows me well.
	My teacher spends time with me.
	I cannot count on my teacher for important things .(R)*
Competence Support (TS-CS) 能力支持	Every time I do something wrong, my teacher acts differently .(R)*
	My teacher doesn't make it clear what he/she expects of me in class. (R)*
	My teacher shows me how to solve problems for myself.
	My teacher makes sure I understand before he/she goes on.
Autonomy Support (TS-AS) 自主支持	My teacher gives me a lot of choices about how I do my schoolwork.
	My teacher is always telling me what to do. (R)*
	My teacher listens to my ideas.
	My teacher talks about how I can use the things we learn in school.

Note: 1. Revised from Maulana et al. (2016); 2. (R) Negatively worded items*

https://link.springer.com/article/10.1007/s40299-016-0282-5

APPENDIX 2

Achievement Goal Scale

（AG）

成就目标量表

Dimension	**Item**
Mastery-Approach (AG-MAP) **掌握**趋近	My aim is to completely master the material presented in this class.
	I am striving to understand the content of this course as thoroughly as possible.
	My goal is to learn as much as possible.
Mastery-Avoidance (AG-MAV) **掌握**规避	My aim is to avoid learning less than I possibly could.
	I am striving to avoid an incomplete understanding of the course material.
	My goal is to avoid learning less than it is possible to learn.
Performance-Approach (AG-PAP) **表**现趋近	My aim is to perform well relative to other students.
	I am striving to do well compared to other students.
	My goal is to perform better than the other students.
Performance-Avoidance (AG-PAV) **表**现规避	My aim is to avoid doing worse than other students.
	I am striving to avoid performing worse than others.
	My goal is to avoid performing poorly compared to others.

Note: Revised from An, Zhang, Wang, et al (2023)

https://doi.org/10.1007/s12144-022-03466-4

APPENDIX 3

Learning Engagement Scale

（LE）

学习投入量表

Dimension	**Item**
Vigor (LE-VI) 活力	When I'm studying, I feel mentally strong.
	I can continue for a very long time when I am studying.
	When I study, I feel like I am bursting with energy.
	When studying I feel strong and vigorous.
	When I get up in the morning, I feel like going to class.
Dedication (LE-DE) 奉献	I find my studies to be full of meaning and purpose.
	My studies inspire me.
	I am enthusiastic about my studies.
	I am proud of my studies.
	I find my studies challenging.
Absorption (LE-AB) 吸收	Time flies when I'm studying.
	When I am studying, I forget everything else around me.
	I feel happy when I am studying intensively.
	I can get carried away by my studies.

Note: Revised from Schaufeli et al. (2002)

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