

Vocational Competence among Students in Vocational Colleges: A PLS-SEM Analysis of Learning Engagement, Vocational value, Career decisions, and Professional commitment in Shanxi Province

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ABSTRACT

The purpose of this study was to develop and validate a causal model of vocational competence among vocational college students in Shanxi Province, China. A mixed-method research design was employed, combining quantitative and qualitative approaches. Quantitative data were collected from 491 vocational college graduates using a structured questionnaire, while qualitative data were obtained through interviews with teachers, graduates, and enterprise representatives. Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied to evaluate the measurement and structural models, whereas content analysis was used to interpret the qualitative findings and explain the underlying mechanisms. The results indicate that learning engagement, vocational value, career decisions, and professional commitment all have significant positive effects on vocational competence. Professional commitment not only directly enhances vocational competence but also mediates the relationships between learning engagement, vocational value, career decisions, and vocational competence. The structural model demonstrates satisfactory explanatory power, accounting for 57.4% of the variance in vocational competence ($R^2 = 0.574$). Qualitative findings further reveal that strengthening behavioral engagement, sustaining learning motivation, fostering vocational value internalization, enhancing career self-awareness, and reinforcing professional identity are essential for improving vocational competence. These findings provide empirical evidence for the development of competency-based vocational education and offer practical implications for curriculum reform, career guidance, and school–enterprise collaboration to enhance vocational competence among vocational college students.

Keywords Learning Engagement, Vocational Value, Career Decisions, Professional Commitment, Vocational Competence.

Introduction

Vocational competence has become a global concern in response to rapid technological advancement, industrial transformation, and increasing economic integration. International organizations and governments have emphasized the importance of equipping students with both technical expertise and transferable skills to meet the evolving demands of the labor market. For instance, the Organisation for Economic Co-operation and Development (OECD) highlights that future employment increasingly requires workers with comprehensive

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competencies, including technical skills, problem-solving abilities, and adaptability [1]. Consequently, the development of vocational competence has become a central objective of vocational education systems worldwide.

In China, the transition from a manufacturing-based economy to an innovation-driven manufacturing power has significantly increased the demand for highly skilled workers. As the primary institutions responsible for cultivating technical talent, vocational colleges have received strong policy support from the Chinese government through a series of national strategies and educational reforms. These initiatives aim to strengthen vocational education, improve workforce quality, and enhance the alignment between education and industrial development.

Despite these efforts, developing vocational competence among vocational college students remains a major challenge. Previous studies indicate that vocational competence is influenced not only by students' professional knowledge and technical skills but also by their career values, motivation, and professional identity. Recent social and economic changes have reshaped students' employment expectations, shifting their focus from idealistic career aspirations toward more pragmatic considerations, thereby affecting their professional values and career decision-making [2]. In addition, students' career planning and vocational development are strongly influenced by their self-perceived abilities, interests, and career goals, which together determine their future employment choices [3].

These challenges are particularly evident in Shanxi Province. According to statistics released by relevant provincial departments in June 2024, Shanxi has 51 vocational education institutions, consisting of two undergraduate vocational universities and 49 higher vocational colleges. However, several structural issues remain unresolved, including the relatively low proportion of graduates possessing comprehensive vocational competence, the limited effectiveness of school-enterprise cooperation, slow curriculum updates compared with rapid industrial development, and the mismatch between educational objectives and workplace requirements. These problems highlight the urgent need to improve the quality of vocational talent cultivation and strengthen the contribution of vocational education to regional economic and social development [4].

Given these international, national, and regional challenges, enhancing vocational competence has become an essential priority for vocational education. Developing highly skilled and adaptable graduates is crucial for narrowing the gap between educational outcomes and labor market demands. Therefore, this study aims to identify and analyze the key psychological and behavioral factors influencing vocational competence among vocational college students in Shanxi Province. Furthermore, it seeks to provide theoretical evidence and practical recommendations for improving vocational competence through curriculum reform, innovative teaching practices, and strengthened school-enterprise collaboration.

Literature Review

Professional Commitment and Vocational Competence

Professional commitment refers to an individual's psychological attachment to

and identification with a chosen profession. Individuals with a high level of professional commitment are more willing to invest time and effort in developing professional knowledge and skills, remain persistent when facing challenges, and continuously improve their competence throughout their careers [5]. For vocational college students, professional commitment encourages active participation in professional learning and facilitates the acquisition of occupational knowledge, technical skills, and professional attitudes required in the workplace.

Vocational competence is generally recognized as a multidimensional construct that encompasses occupational knowledge, practical skills, professional attitudes, teamwork, adaptability, and problem-solving abilities required for effective job performance [6]. Because committed students are more motivated to master these competencies, previous studies consistently suggest that professional commitment positively contributes to vocational competence.

H1: Professional commitment has a positive direct effect on vocational competence.

Professional Commitment, Learning Engagement, and Vocational Competence

Learning engagement refers to students' behavioral, emotional, and cognitive investment in learning activities. Highly engaged students actively participate in classroom activities, devote greater cognitive effort to learning tasks, and demonstrate positive emotional attachment toward their studies [7].

Previous research indicates that professional commitment serves as an important antecedent of learning engagement. Students who strongly identify with their future profession tend to display higher enthusiasm, persistence, and dedication toward learning because they perceive academic activities as meaningful preparation for their future careers [8], [9]. Increased learning engagement subsequently promotes the acquisition of vocational knowledge and practical skills, thereby enhancing vocational competence.

H2: Professional commitment positively influences vocational competence through learning engagement.

H3: Learning engagement has a positive direct effect on vocational competence.

Vocational Values, Professional Commitment, and Vocational Competence

Vocational values represent individuals' beliefs and preferences regarding work, including career goals, professional identity, social responsibility, and self-development. These values influence students' career aspirations and shape their motivation to develop occupational competencies [10].

Studies have shown that students with strong vocational values are more likely to develop stronger professional commitment because they perceive their future profession as personally meaningful and socially valuable [11]. This stronger professional commitment motivates students to invest greater effort in acquiring vocational knowledge and professional skills, ultimately improving vocational competence.

Furthermore, vocational values may also directly influence vocational competence by encouraging students to participate actively in learning activities and continuously improve their professional capabilities [10], [11].

H4: Vocational values positively influence vocational competence indirectly through professional commitment.

H5: Vocational values have a positive direct effect on vocational competence.

Career Decision-Making and Vocational Competence

Career decision-making refers to the process through which individuals evaluate career alternatives, identify occupational goals, and make informed career choices. Effective career decision-making enables students to establish clear professional goals and align their educational activities with future occupational requirements [12].

Previous studies suggest that students who possess greater career decision-making competence demonstrate higher confidence, stronger career adaptability, and better preparation for employment [12], [13]. Consequently, effective career decision-making contributes directly to the development of vocational competence by encouraging students to acquire the knowledge and skills necessary for their chosen careers.

H6: Career decision-making has a positive direct effect on vocational competence.

Career Decision-Making, Professional Commitment, and Vocational Competence

Career decision-making may also strengthen vocational competence indirectly through professional commitment. Students who make clear and informed career decisions generally develop stronger identification with their chosen profession, resulting in higher professional commitment [14]. In turn, stronger professional commitment motivates continuous professional learning, persistence, and competence development throughout vocational education.

Career adaptability theory further suggests that individuals who are capable of making effective career decisions are more resilient when facing career uncertainty and are more willing to invest in developing competencies required by changing labor markets [15]. Therefore, professional commitment is expected to mediate the relationship between career decision-making and vocational competence.

H7: Career decision-making positively influences vocational competence indirectly through professional commitment.

Based on the literature reviewed and the proposed hypotheses, this study develops a conceptual framework to explain the relationships among the key factors influencing vocational competence among vocational college students. As illustrated in [figure 1](#), vocational competence is proposed as the dependent variable, while professional commitment, learning engagement, vocational value, and career decisions serve as the primary independent variables. The model incorporates both direct and indirect relationships to capture the complex mechanisms underlying vocational competence development. Specifically,

professional commitment is hypothesized to directly influence vocational competence (H1), while learning engagement (H2–H3), vocational value (H4–H5), and career decisions (H6–H7) are expected to exert both direct and mediated effects through professional commitment. This conceptual framework provides the theoretical basis for empirical testing and contributes to a better understanding of how psychological and behavioral factors interact to enhance vocational competence in vocational education.

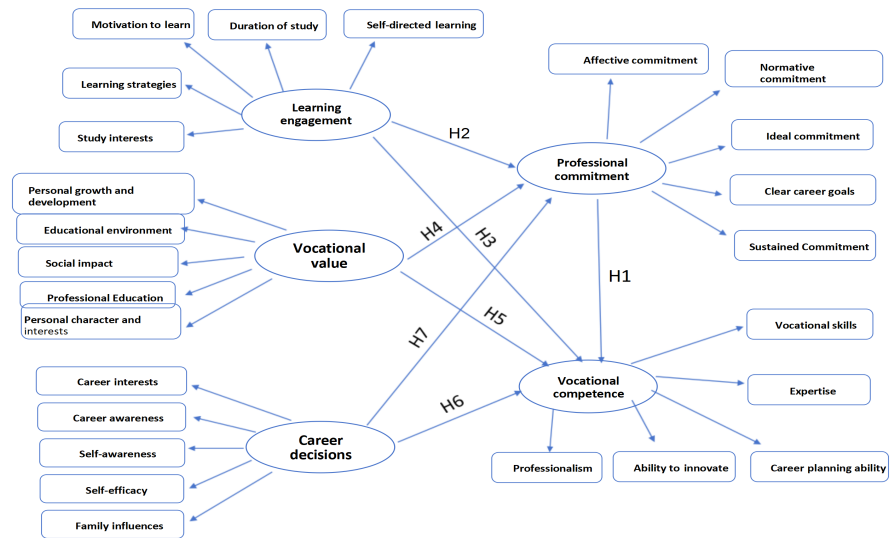


Figure 1 Research Framework

Research Methodology

This study employed a quantitative research approach using a cross-sectional survey design to examine the factors influencing vocational competence among graduates of vocational colleges in Shanxi Province, China. The proposed research model consists of five latent variables, namely learning engagement, vocational value, career decisions, professional commitment, and vocational competence. Structural Equation Modeling (SEM) was employed to test the proposed hypotheses and examine both the direct and indirect relationships among these constructs.

The target population comprised graduates of vocational colleges registered under the Shanxi Provincial Department of Education. According to official statistics, vocational colleges in Shanxi Province enrolled approximately 389,700 students in 2023. The minimum sample size was determined using Yamane's sampling formula [16] with a 95% confidence level and a sampling error of 5%. The formula is expressed as:

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

n = required sample size, N = population size, e = level of precision (sampling error).

Substituting the population size ($N = 389,700$) and a sampling error of $e =$

0.05 into Equation (1) gives:

$$n = \frac{389,700}{1 + 389,700(0.05)^2} = \frac{389,700}{975.25} \approx 399.6 \approx 400 \quad (2)$$

Although the minimum required sample size was approximately 400 respondents, this study targeted 472 respondents to improve statistical reliability and compensate for potential non-response.

A multistage sampling procedure was employed. First, six vocational colleges were selected from vocational education institutions in Shanxi Province. Second, proportional sampling was used to determine the number of respondents recruited from each institution according to its student population. Finally, purposive sampling was applied to identify respondents who met the inclusion criteria. Eligible respondents were graduates who had completed vocational education, had been employed for at least three years, and possessed work experience relevant to their field of study. These criteria ensured that participants had sufficient workplace experience to evaluate their vocational competence accurately.

Data were collected using a structured online questionnaire. The questionnaire consisted of two sections. The first section collected demographic information, including gender, age, educational level, occupation, and years of work experience. The second section measured the five latent constructs included in the conceptual framework. All measurement items were adapted from established literature and modified to suit the context of vocational education in China. Responses were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

To ensure an adequate number of valid responses, 523 questionnaires were distributed to graduates of the six selected vocational colleges. A total of 491 questionnaires were returned, resulting in a response rate of 93.9%. After screening for completeness, consistency, and respondent eligibility, all 491 questionnaires were retained for subsequent analysis.

The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. Following the two-stage analytical procedure, the measurement model was first evaluated by assessing indicator reliability, internal consistency reliability using Cronbach's alpha and Composite Reliability (CR), convergent validity using Average Variance Extracted (AVE), and discriminant validity using the Fornell–Larcker criterion and the Heterotrait–Monotrait ratio (HTMT). Subsequently, the structural model was assessed by examining collinearity, path coefficients, coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and hypothesis testing using the bootstrapping procedure with 5,000 resamples. A hypothesis was considered statistically supported when the t -value exceeded 1.96 and the corresponding p -value was less than 0.05.

Research Result

Reliability and Validity

The measurement instrument used in this study was developed based on an extensive review of the literature on vocational education and subsequently adapted to the context of vocational college graduates in Shanxi Province. The

questionnaire consisted of five latent constructs: Learning Engagement (LE), Vocational Value (VV), Career Decisions (CD), Professional Commitment (PC), and Vocational Competence (VC). All measurement items were assessed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The reliability and validity of the measurement model were evaluated using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach. Following the recommendations of Hair et al. [17], indicator reliability was assessed using standardized factor loadings, while internal consistency reliability was evaluated using Cronbach's alpha (α), Composite Reliability (CR), and Dijkstra–Henseler's rho (ρ_A). Convergent validity was assessed using the Average Variance Extracted (AVE). Indicator loadings greater than 0.70, reliability coefficients exceeding 0.70, and AVE values above 0.50 indicate satisfactory reliability and convergent validity [17], [18].

As presented in table 1, all indicators measuring the Learning Engagement construct exhibit standardized factor loadings above the recommended threshold of 0.70, ranging from 0.7282 to 0.8789, indicating satisfactory indicator reliability. The coefficient of determination (R^2) for individual indicators ranges from 0.5303 to 0.7724, suggesting that each indicator adequately represents the underlying latent construct.

Furthermore, the internal consistency of the Learning Engagement construct is confirmed by Cronbach's alpha ($\alpha = 0.9627$), Composite Reliability ($\rho_C = 0.9665$), and Dijkstra–Henseler's rho ($\rho_A = 0.9640$), all of which exceed the recommended value of 0.70. The Average Variance Extracted ($AVE = 0.6585$) is also greater than the minimum acceptable threshold of 0.50, demonstrating satisfactory convergent validity. These findings indicate that the measurement items for Learning Engagement possess excellent reliability and validity and are appropriate for subsequent structural model analysis.

Table 1 Analysis of measurement model of the latent variable in Learning engagement (LE)

Latent variable	Observed variable	β	R^2	ρ_A	ρ_C	α	AVE
LE	LE1	0.7814	0.6105	0.9640	0.9665	0.9627	0.6585
	LE2	0.7600	0.5776				
	LE3	0.8789	0.7724				
	LE4	0.8083	0.6534				
	LE5	0.8218	0.6754				
	LE6	0.7282	0.5303				
	LE7	0.8412	0.7076				
	LE8	0.8273	0.6845				
	LE9	0.7882	0.6212				
	LE10	0.8714	0.7593				
	LE11	0.8265	0.6831				
	LE12	0.8641	0.7467				
	LE13	0.7436	0.5529				
	LE14	0.7865	0.6186				

LE15	0.8268	0.6836
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Convergent validity

The convergent validity of the Vocational Value (VV) construct was evaluated by examining the standardized factor loadings, internal consistency reliability, and Average Variance Extracted (AVE). As shown in table 2, all indicator loadings are statistically significant and exceed the recommended threshold of 0.70, ranging from 0.7347 to 0.8536, indicating satisfactory indicator reliability. The corresponding coefficient of determination (R²) values range from 0.5398 to 0.7286, suggesting that each indicator adequately explains the variance of the latent construct.

The internal consistency of the Vocational Value construct is also well established. The values of Dijkstra–Henseler's rho ($\rho_A = 0.9604$), Composite Reliability ($\rho_C = 0.9628$), and Cronbach's alpha ($\alpha = 0.9585$) all exceed the recommended threshold of 0.70, demonstrating excellent reliability. Furthermore, the Average Variance Extracted (AVE = 0.6338) is greater than the recommended minimum value of 0.50, confirming satisfactory convergent validity. Overall, these findings indicate that the indicators used to measure Vocational Value are both reliable and valid, supporting their inclusion in the subsequent structural model analysis.

Table 2 Analysis of measurement model of the latent variable in Vocational value (VV).							
Latent variable	Observedvariable	β	R2	ρ_A	ρ_C	α	AVE
VV	VV1	0.7494	0.5594	0.9604	0.9628	0.9585	0.6338
	VV2	0.8434	0.7113				
	VV3	0.8396	0.7049				
	VV4	0.7647	0.5848				
	VV5	0.7662	0.5871				
	VV6	0.7615	0.5799				
	VV7	0.7767	0.6032				
	VV8	0.8173	0.6680				
	VV9	0.7483	0.5599				
	VV10	0.8329	0.6936				
	VV11	0.8536	0.7286				
	VV12	0.7813	0.6104				
	VV13	0.8210	0.6740				
	VV14	0.8377	0.7018				
	VV15	0.7347	0.5398				

The measurement properties of the Career Decisions (CD) construct are presented in table 3. All standardized factor loadings are statistically significant and exceed the recommended threshold of 0.70, ranging from 0.7371 to 0.8887, indicating satisfactory indicator reliability. The corresponding coefficient of determination (R²) values range from 0.5434 to 0.7898, demonstrating that the observed variables adequately explain the variance of the Career Decisions construct.

The internal consistency reliability of the construct is also well established. Dijkstra–Henseler's rho ($\rho_A = 0.9659$), Composite Reliability ($\rho_C = 0.9676$), and Cronbach's alpha ($\alpha = 0.9639$) all exceed the recommended threshold of 0.70, indicating excellent reliability. Furthermore, the Average Variance Extracted ($AVE = 0.6664$) is greater than the recommended minimum value of 0.50, confirming satisfactory convergent validity. Overall, these results demonstrate that the measurement items for the Career Decisions construct are both reliable and valid, supporting their use in the subsequent structural model analysis

Table 3 Analysis of measurement model of the latent variable in Career decisions (CD)

Latent variable	Observedvariable	β	R2	ρ_A	ρ_C	α	AVE
CD	CD1	0.7928	0.6285	0.9659	0.9676	0.9639	0.6664
	CD2	0.8525	0.7268				
	CD3	0.8351	0.6974				
	CD4	0.8497	0.7220				
	CD5	0.7371	0.5434				
	CD6	0.8540	0.7294				
	CD7	0.7490	0.5611				
	CD8	0.8070	0.6512				
	CD9	0.8887	0.7898				
	CD10	0.7674	0.5890				
	CD11	0.8751	0.7659				
	CD12	0.7571	0.5731				
	CD13	0.8168	0.6671				
	CD14	0.7765	0.6030				
	CD15	0.8655	0.7491				

The measurement properties of the Professional Commitment (PC) construct are presented in [table 4](#). All standardized factor loadings are statistically significant and exceed the recommended threshold of 0.70, ranging from 0.7141 to 0.8721, indicating satisfactory indicator reliability. The corresponding coefficient of determination (R^2) values range from 0.5099 to 0.7606, demonstrating that the observed indicators adequately represent the latent construct.

The internal consistency reliability of the Professional Commitment construct is supported by Dijkstra–Henseler's rho ($\rho_A = 0.9630$), Composite Reliability ($\rho_C = 0.9658$), and Cronbach's alpha ($\alpha = 0.9618$), all of which are well above the recommended threshold of 0.70. In addition, the Average Variance Extracted ($AVE = 0.6535$) exceeds the recommended minimum value of 0.50, confirming satisfactory convergent validity. These findings indicate that the Professional Commitment construct demonstrates excellent reliability and validity and is therefore appropriate for inclusion in the subsequent structural model analysis.

Table 4 Analysis of measurement model of the latent variable in Professional commitment (PC).

Latent variable	Observedvariable	β	R2	ρ_A	ρ_C	α	AVE
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PC	PC1	0.7801	0.6086	0.9630	0.9658	0.9618	0.6535
	PC2	0.8437	0.7118				
	PC3	0.7783	0.6058				
	PC4	0.8398	0.7053				
	PC5	0.8721	0.7606				
	PC6	0.7506	0.5634				
	PC7	0.7141	0.5099				
	PC8	0.8467	0.7169				
	PC9	0.8583	0.7366				
	PC10	0.8450	0.7140				
	PC11	0.8148	0.6638				
	PC12	0.8265	0.6832				
	PC13	0.7827	0.6127				
	PC14	0.7718	0.5965				
	PC15	0.7824	0.6149				

The measurement properties of the Vocational Competence (VC) construct are presented in table 5. All standardized factor loadings are statistically significant and exceed the recommended threshold of 0.70, ranging from 0.7234 to 0.8607, indicating satisfactory indicator reliability. The corresponding coefficient of determination (R^2) values range from 0.5222 to 0.7403, demonstrating that the observed indicators adequately explain the variance of the Vocational Competence construct.

The internal consistency reliability of the Vocational Competence construct is supported by Dijkstra–Henseler's rho ($\rho_A = 0.9620$), Composite Reliability ($\rho_C = 0.9648$), and Cronbach's alpha ($\alpha = 0.9608$), all of which exceed the recommended threshold of 0.70, indicating excellent reliability. Furthermore, the Average Variance Extracted ($AVE = 0.6472$) is higher than the recommended minimum value of 0.50, confirming satisfactory convergent validity. These findings demonstrate that the indicators measuring Vocational Competence exhibit strong reliability and validity and are therefore suitable for subsequent structural model evaluation.

Table 5 Analysis of measurement model of the latent variable in Vocational competence (VC)

Latent variable	Observedvariable	β	R^2	ρ_A	ρ_C	α	AVE
VC	VC1	0.7852	0.6149	0.9620	0.9648	0.9608	0.6472
	VC2	0.8552	0.7314				
	VC3	0.8191	0.6720				
	VC4	0.7786	0.6066				
	VC5	0.8179	0.6688				
	VC6	0.7813	0.6112				
	VC7	0.7512	0.5665				
	VC8	0.8607	0.7403				
	VC9	0.8149	0.6640				
	VC10	0.8036	0.6452				
	VC11	0.8532	0.7275				

VC12	0.7234	0.5222
VC13	0.7969	0.6353
VC14	0.7591	0.5757
VC15	0.8519	0.7264

Composite reliability (Dijkstra-Henseler's rho (ρ_A), Jöreskog's rho (ρ_C) and Cronbach α) is equal to 0.9620, 0.9648 and 0.9608, which is greater than 0.70, indicating that the VC measurement model has high reliability.

Discriminate validity

Discriminant validity was assessed using the Heterotrait Monotrait ratio (HTMT), which is widely recognized as a robust criterion for evaluating the distinctiveness of latent constructs in Partial Least Squares Structural Equation Modeling (PLS-SEM) [19]. According to Henseler et al. [19], HTMT values below 0.85 indicate adequate discriminant validity.

As presented in table 6, all HTMT values among the five latent constructs, namely Learning Engagement (LE), Vocational Value (VV), Career Decisions (CD), Professional Commitment (PC), and Vocational Competence (VC), are below the recommended threshold of 0.85. The HTMT coefficients range from 0.1802 to 0.6602, indicating satisfactory discriminant validity. These results confirm that each construct is empirically distinct from the others, demonstrating that the measurement model possesses adequate discriminant validity and is appropriate for subsequent structural model analysis.

Table 6 Classification reasonableness analysis between LE, VV, CD, PC and VC latent

Latent variable	LE	VV	CD	PC	VC
LE	1				
VV	0.2301	1			
CD	0.1802	0.2054	1		
PC	0.5224	0.4562	0.4670	1	
VC	0.5372	0.4960	0.5245	0.6602	1

Analysis of structural equation models

The structural model was evaluated by examining the path coefficients, indirect effects, total effects, effect sizes (f^2), coefficients of determination (R^2), and the significance of each hypothesized relationship. The results are presented in table 7 and illustrated in figure 2. The model demonstrates satisfactory explanatory power. Professional Commitment (PC) explains 46.8% of the variance in the endogenous construct ($R^2 = 0.468$), while Learning Engagement (LE), Vocational Value (VV), Career Decisions (CD), and Professional Commitment (PC) jointly explain 57.4% of the variance in Vocational Competence (VC) ($R^2 = 0.574$).

As shown in table 7, Learning Engagement has a significant positive effect on Professional Commitment ($\beta = 0.3820$, $p < 0.01$) and a significant direct effect on Vocational Competence ($\beta = 0.2845$, $p < 0.01$). In addition, Learning Engagement exerts an indirect effect on Vocational Competence through Professional Commitment ($\beta = 0.0960$), resulting in a total effect of 0.3805.

Table 7 Path coefficient, Indirect effect, and Total effect

Independent	Dependent	β	Indirect effect	total effect	f2	stat	p	R2
LE	PC	0.3820		0.3820	0.2558	12.3663	<0.01	0.468
	VC	0.2845	0.0960	0.3805	0.1410	8.2423	<0.01	
VV	PC	0.2903		0.2903	0.1464	8.7340	<0.01	0.574
	VC	0.2462	0.0730	0.3192	0.1146	6.9052	<0.01	
CD	PC	0.3267		0.3267	0.1891	9.5891	<0.01	
	VC	0.2937	0.0821	0.3758	0.1603	8.5549	<0.01	
PC	VC	0.2513		0.2513	0.0788	6.0544	<0.01	

Vocational Value also has a significant positive effect on Professional Commitment ($\beta = 0.2903$, $p < 0.01$). Furthermore, Vocational Value directly influences Vocational Competence ($\beta = 0.2462$, $p < 0.01$) and indirectly affects Vocational Competence through Professional Commitment ($\beta = 0.0730$), yielding a total effect of 0.3192. Similarly, Career Decisions significantly influence Professional Commitment ($\beta = 0.3267$, $p < 0.01$) and Vocational Competence ($\beta = 0.2937$, $p < 0.01$). The indirect effect of Career Decisions on Vocational Competence through Professional Commitment is 0.0821, resulting in a total effect of 0.3758.

Professional Commitment has a significant positive direct effect on Vocational Competence ($\beta = 0.2513$, $p < 0.01$), confirming its important role as both a direct predictor and a mediating variable in the proposed model. The effect size analysis further indicates that Learning Engagement exerts the largest influence on Professional Commitment ($f^2 = 0.2558$), followed by Career Decisions ($f^2 = 0.1891$) and Vocational Value ($f^2 = 0.1464$). Regarding Vocational Competence, Career Decisions demonstrate the largest direct effect ($f^2 = 0.1603$), followed by Learning Engagement ($f^2 = 0.1410$), Vocational Value ($f^2 = 0.1146$), and Professional Commitment ($f^2 = 0.0788$). According to Cohen's guidelines, these results indicate small to moderate effect sizes, suggesting that all proposed predictors make meaningful contributions to explaining vocational competence.

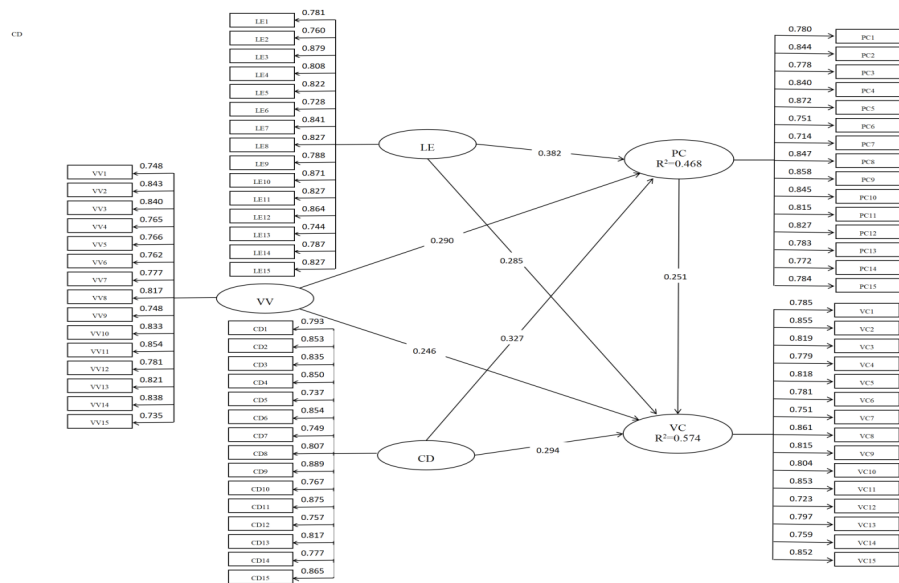


Figure 2 Structural model showing the relationships among Learning Engagement,

Vocational Value, Career Decisions, Professional Commitment, and Vocational Competence

Hypothesis Testing

The results of hypothesis testing are summarized in [table 8](#). All proposed hypotheses are supported at the 0.01 significance level. Specifically, Professional Commitment has a significant positive direct effect on Vocational Competence (H1). Learning Engagement positively influences Vocational Competence both directly (H3) and indirectly through Professional Commitment (H2). Similarly, Vocational Value has significant direct (H5) and indirect effects (H4) on Vocational Competence through Professional Commitment. Career Decisions also demonstrate significant direct (H6) and indirect (H7) effects on Vocational Competence, with Professional Commitment serving as a mediating variable. These findings provide empirical support for the proposed conceptual framework and highlight the critical roles of learning engagement, vocational value, career decisions, and professional commitment in enhancing vocational competence among vocational college graduates in Shanxi Province.

Table 8 Causal Factors Model the university vocational competence of college students in Shanxi Province.

Hypothesis	Research hypotheses	Result
1	Professional commitment has a direct impact on college students' vocational competence.	support
2	Learning engagement indirectly affects college students' vocational competence through professional commitment.	support
3	Learning engagement has a direct impact on college students' vocational competence.	support
4	Vocational value indirectly affect college students' vocational competence through professional commitment.	support
5	Vocational value have a direct impact on college students' vocational competence.	support
6	Career decisions have a direct impact on college students' vocational competences.	support
7	Career decisions indirectly affect college students' vocational competences through professional commitment.	support

This study develops a multidimensional theoretical model of vocational college students' professional competence, grounded in frameworks such as competency-based education, competency theory, and constructivist learning theory. Moreover, it identifies the critical mediating role of professional commitment, thereby enriching and refining the theoretical framework linking professional competence development to students' learning engagement, Vocational values, and career decision, while also providing empirical support for these relationships.

Discussion

This study examined the direct and indirect relationships among learning engagement, vocational value, career decisions, professional commitment, and vocational competence among vocational college graduates in Shanxi Province, China. The findings indicate that all proposed hypotheses are supported, confirming that professional commitment plays a central role in enhancing vocational competence while also mediating the effects of learning engagement, vocational value, and career decisions. These findings are consistent with previous studies emphasizing that vocational competence is shaped by both psychological and behavioral factors rather than technical skills alone [\[5\]](#), [\[6\]](#), [\[8\]](#).

The results demonstrate that professional commitment has a significant positive effect on vocational competence, supporting Hypothesis 1. Graduates who possess stronger emotional attachment, identification with their profession, and long-term career commitment tend to exhibit higher levels of vocational competence. This finding is consistent with previous research suggesting that professional commitment encourages continuous learning, persistence, and professional development, ultimately leading to improved occupational performance [5], [8], [14]. Students who are committed to their chosen profession are more likely to invest time and effort in acquiring vocational knowledge and practical skills that support long-term career success.

The findings also reveal that learning engagement directly and indirectly influences vocational competence through professional commitment, supporting Hypotheses 2 and 3. Students who actively participate in learning activities, demonstrate greater cognitive investment, and maintain positive attitudes toward learning are more likely to develop stronger professional commitment, which subsequently enhances their vocational competence. These findings support previous studies indicating that learning engagement contributes not only to knowledge and skill acquisition but also to the development of professional identity and commitment [7], [8], [9]. Therefore, vocational colleges should promote active learning environments that encourage students to participate in meaningful academic and practical learning experiences [16], [17].

Similarly, vocational value exerts both direct and indirect effects on vocational competence through professional commitment, providing support for Hypotheses 4 and 5. Students who perceive their future profession as meaningful and aligned with their personal values are more likely to develop stronger professional commitment and invest greater effort in improving their professional capabilities. This finding is consistent with previous studies demonstrating that vocational values influence motivation, career identity, and lifelong learning, all of which contribute to vocational competence [10], [11]. Consequently, strengthening vocational values should become an integral component of vocational education through career guidance, professional ethics education, and authentic workplace experiences.

The results further indicate that career decisions significantly influence vocational competence both directly and indirectly through professional commitment, supporting Hypotheses 6 and 7. Students who make clear and informed career decisions are better able to align their educational experiences with future occupational requirements, resulting in stronger professional commitment and higher vocational competence. This finding is consistent with career development theories suggesting that effective career decision-making improves career adaptability, self-efficacy, and professional preparedness [12], [18], [19]. Accordingly, vocational institutions should provide comprehensive career counseling and career planning services to assist students in making informed career decisions and preparing for labor market demands.

Among the predictors examined, learning engagement exhibits the strongest influence on professional commitment, while career decisions demonstrate the largest direct effect on vocational competence. These findings suggest that vocational competence is influenced not only by students' technical knowledge but also by psychological and behavioral factors that shape their motivation,

professional identity, and career development [6], [7], [12]. Therefore, vocational education institutions should adopt comprehensive educational strategies that simultaneously strengthen learning engagement, cultivate positive vocational values, support informed career decision-making, and enhance professional commitment. Such integrated approaches are expected to improve graduates' employability and better prepare them for rapidly changing industrial environments [1], [4], [6].

Overall, the findings contribute to the literature on vocational education by providing empirical evidence that professional commitment serves as a key mechanism linking learning engagement, vocational value, and career decisions to vocational competence. The proposed model offers a comprehensive framework for understanding vocational competence development and provides practical implications for curriculum design, career guidance, and school-enterprise collaboration in vocational colleges, particularly within the context of vocational education in Shanxi Province, China [20].

Conclusion

This study examined the relationships among learning engagement, vocational value, career decisions, professional commitment, and vocational competence among vocational college graduates in Shanxi Province, China. The findings confirm that all proposed hypotheses are supported. Professional commitment has a significant positive direct effect on vocational competence and also serves as a mediating variable linking learning engagement, vocational value, and career decisions to vocational competence. In addition, learning engagement, vocational value, and career decisions each exert significant direct effects on vocational competence, demonstrating that both psychological and behavioral factors play important roles in developing graduates' professional capabilities.

The findings contribute to the literature on vocational education by providing empirical evidence that vocational competence is a multidimensional construct influenced by learning engagement, vocational value, career decisions, and professional commitment. The proposed structural model extends previous research by demonstrating that professional commitment functions not only as an independent predictor but also as an important mediating mechanism through which students' learning experiences, vocational values, and career planning translate into higher vocational competence. These findings enrich the theoretical understanding of vocational competence development and provide empirical support for competency-based vocational education.

From a practical perspective, the results suggest that vocational colleges should adopt comprehensive strategies to strengthen vocational competence. Learning engagement can be enhanced through student-centered learning approaches, experiential learning, and continuous formative assessment. Vocational values should be cultivated by integrating professional ethics, craftsmanship, and industry-oriented values into the curriculum. Career decision-making should be supported through systematic career guidance, mentoring programs, and collaboration with industry partners. Furthermore, vocational colleges should strengthen professional commitment by creating learning environments that encourage professional identity, responsibility, and lifelong learning. Close collaboration between vocational institutions and enterprises is also essential to

ensure that curricula, practical training, and competency standards remain aligned with evolving labor market demands.

This study is subject to several limitations. The data were collected only from vocational college graduates in Shanxi Province, which may limit the generalizability of the findings to other regions or educational contexts. In addition, the cross-sectional research design does not allow causal relationships to be examined over time. Future studies are therefore encouraged to employ longitudinal research designs, include participants from different provinces or countries, and incorporate additional variables such as career adaptability, employability, digital competence, or organizational support to further explain vocational competence development. Such research would provide a more comprehensive understanding of the factors that contribute to the development of vocational competence in vocational education.

Declarations

Author Contributions

Conceptualization: Q.B. and X.Z.; Methodology: X.Z.; Software: Q.B.; Validation: Q.B. and X.Z.; Formal Analysis: Q.B. and X.Z.; Investigation: Q.B.; Resources: X.Z.; Data Curation: X.Z.; Writing Original Draft Preparation: Q.B. and X.Z.; Writing Review and Editing: X.Z. and Q.B.; Visualization: Q.B.; All authors have read and agreed to the published version of the manuscript.

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The data presented in this study are available on request from the corresponding author.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- [1] OECD, *Building Future-Ready Vocational Education and Training Systems*. Paris, France: OECD Publishing, 2023. doi:10.1787/28551a79-en.
- [2] A. Amrosafitri and D. Nastiti, "Self Concept and Career Planning Among Vocational Students," *Psikologia: Jurnal Psikologi*, vol. 10, no. 2, 2025, doi:10.21070/psikologia.v10i2.2143.

- [3] S. Agustina, M. Supriatna, and E. S. Yudha, "Career Planning Profile of Vocational School Students in Bogor Regency: Comprehensive Perspective and Strategic Role of Career Guidance," *G-Couns: Jurnal Bimbingan dan Konseling*, vol. 10, no. 1, 2024, doi:10.31316/g-couns.v10i01.8132.
- [4] Ministry of Education of the People's Republic of China, *Number of Higher Education Institutions*, 2024.
- [5] S. Zhou and W. Wu, "A study on the relationship between higher vocational students' perceived teacher support and learning engagement: The chain mediation of academic self-efficacy and professional commitment," *Nurture*, vol. 17, no. 4, pp. 595–606, 2023, doi:10.55951/nurture.v17i4.435.
- [6] M. Hiim, "How does the learning environment support vocational student learning of domain-general competencies?," *Vocations and Learning*, vol. 16, no. 3, pp. 343–369, 2023, doi:10.1007/s12186-023-09318-x.
- [7] J. Chen and X. Zhang, "The impact of career calling on higher vocational nursing students' learning engagement: The mediating roles of career adaptability and career commitment," *Frontiers in Psychology*, vol. 14, Art. no. 1111842, 2023, doi:10.3389/fpsyg.2023.1111842.
- [8] K. Ning and Y. Peng, "Status Quo and Influencing Factors of Freshmen's Professional Commitment in Local Universities," *Frontiers in Artificial Intelligence and Applications*, vol. 372, pp. 561–568, 2023, doi:10.3233/FAIA230746.
- [9] X. Guo and N. Wang, "Study on the Relationship between Professional Commitment, Self-Efficacy and Learning Burnout of Vocational Students," *International Journal of Education and Humanities*, vol. 7, no. 2, pp. 72–77, 2023, doi:10.54097/ijeh.v7i2.5624.
- [10] S. M. Mutlu, B. Ziegler, and M. Granato, "Logics of Career Choice—Concept and Results of an Approval-Sensitive Career Guidance Workshop," *Frontiers in Psychology*, vol. 14, Art. no. 1235221, 2023, doi:10.3389/fpsyg.2023.1235221.
- [11] M. F. Pratama and D. Muttaqin, "Career Decision-Making Self-Efficacy as Mediator of Parental Career Support and Vocational Identity," *Journal of Educational, Health and Community Psychology*, vol. 13, no. 4, 2024, doi:10.12928/jehcp.v13i4.29077.
- [12] B. Chang, Y. Xu, J. Wang, *et al.*, "Longitudinal Associations Between Vocational Identity Processes and Career Decision-Making Self-Efficacy," *International Journal for Educational and Vocational Guidance*, vol. 25, pp. 585–606, 2025, doi:10.1007/s10775-024-09715-1.
- [13] Z. Wang, C. Fan, and J. Niu, "Predicting Effects of Career Adaptability and Educational Identity on the Career Decision-Making of Chinese Higher Vocational Students," *International Journal for Educational and Vocational Guidance*, 2023, doi:10.1007/s10775-023-09591-1.
- [14] M. F. Pratama and D. Muttaqin, "Career Decision-Making Self-Efficacy as Mediator of Parental Career Support and Vocational Identity," *Journal of Educational, Health and Community Psychology*, vol. 13, no. 4, 2024, doi:10.12928/jehcp.v13i4.29077.
- [15] M. Hiim, "How does the Learning Environment Support Vocational Student Learning of Domain-General Competencies?," *Vocations and Learning*, vol. 16, no. 3, pp. 343–369, 2023, doi:10.1007/s12186-023-09318-x.

- [16] Y. Li, H. Zhang, and X. Liu, "Student engagement and competency development in vocational education: The mediating role of active learning," *Education + Training*, vol. 66, no. 2, pp. 245–262, 2024, doi:10.1108/ET-07-2023-0288.
- [17] S. Virtanen and P. Tynjälä, "Factors explaining vocational students' learning and competence development in workplace learning environments," *Vocations and Learning*, vol. 17, no. 1, pp. 1–23, 2024, doi:10.1007/s12186-023-09325-y.
- [18] H. Guan, Y. Guo, M. Bond, S. Cai, Y. Zhou, and Y. Xu, "New job market entrants' future work self, career adaptability and career decision-making self-efficacy: A longitudinal study," *Journal of Vocational Behavior*, vol. 149, Art. no. 103973, 2024, doi:10.1016/j.jvb.2024.103973.
- [19] A. Hirschi and A. Koen, "Contemporary career adaptability research: A systematic review and future agenda," *Career Development International*, vol. 29, no. 2, pp. 187–209, 2024, doi:10.1108/CDI-09-2023-0271.
- [20] X. Zhao, J. Wang, and L. Chen, "Industry–education integration and vocational competence development: Evidence from Chinese higher vocational colleges," *Education + Training*, vol. 66, no. 5, pp. 694–712, 2024, doi:10.1108/ET-11-2023-0465.