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Study on the Relationship between Learning Engagement and Vocational Competency Development Among Students in Higher Vocational Colleges

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Abstract: This study investigates the relationship between learning engagement and vocational competency development among students in higher vocational colleges. Guided by the Social Cognitive Career Theory (SCCT), this research explores how behavioral, emotional, and cognitive engagement dimensions influence vocational competency outcomes, including technical skills, problem-solving abilities, and professional identity. A cross-sectional survey design was employed, with data collected from 863 students across five higher vocational institutions in Anhui Province, China. The validated Learning and Study Strategies Inventory (LASSI) and vocational competency assessment tools were used to measure constructs. Structural equation modeling (SEM) revealed significant positive relationships between cognitive engagement ($\beta = 0.42$, $p < .001$) and vocational competency development, whereas behavioral engagement ($\beta = 0.18$, $p < .05$) showed a weaker effect. Emotional engagement was not statistically significant ($\beta = 0.07$, $p^* > .05$). Moderation analysis indicated that program types (e.g., engineering vs. business) moderated the relationship between cognitive engagement and vocational competency ($\Delta R^{*2} = 0.06$, $p < .01$). Findings suggest that cognitive engagement plays a critical role in fostering vocational competencies, highlighting the need for instructional strategies that enhance deep learning and reflective practice. Implications for curriculum design and student support systems are discussed, emphasizing the importance of aligning teaching methods with competency standards outlined in China's vocational education reforms. Limitations include reliance on self-reported data and regional sampling, calling for longitudinal studies and broader generalizability tests.

Keywords: Higher Vocational Education; Learning Engagement; Structural Equation Modeling; Social Cognitive Career Theory; Vocational Competency.

1. Introduction

In recent decades, China's higher vocational education (HVE) system has undergone significant reforms to align with national strategies for cultivating skilled professionals [1]. As vocational competency development remains the core objective of HVE programs, understanding how students' learning engagement contributes to this process has become critical. Learning engagement, defined as the integration of behavioral, emotional, and cognitive dimensions, has been widely studied in general higher education contexts but remains underexplored in vocational settings, particularly regarding its relationship with vocational competency outcomes [2].

Existing research highlights gaps in two key areas. First, while studies have examined learning engagement in HVE [3], few have directly linked it to vocational competency development, which encompasses technical skills, problem-solving abilities, and professional identity formation. Second, the moderating role of program types (e.g., engineering vs. business) on this relationship remains unaddressed, despite variations in instructional approaches and competency standards across disciplines [4].

Guided by the SCCT [5], this study posits that students' engagement in learning activities influences their vocational competency development through self-efficacy and outcome expectations. SCCT provides a robust framework for examining how personal factors interact with environmental contexts to shape career-related competencies. By addressing these gaps, this research aims to contribute to vocational education theory and inform practice by identifying engagement strategies that enhance competency outcomes in alignment with China's "Double First-Class" initiative for vocational colleges [6].

2. Literature Review

Learning engagement, conceptualized as a multifaceted construct encompassing behavioral, emotional, and cognitive dimensions [7], has been extensively studied in general higher education contexts where it correlates with academic achievement and student retention [8]. However, its role in vocational competency development remains underexplored, particularly in China's HVE system, which prioritizes skill-based training and industry alignment. Vocational competency, defined as the integration of technical proficiency, problem-solving abilities, and professional identity [9], is influenced by both curricular design and student engagement.

Existing research in HVE highlights the impact of teaching methods [10] and industry collaboration [11] on competency outcomes but overlooks the student-level engagement mechanism. Drawing on the [12], this study posits that engagement mediates the relationship between self-efficacy and competency development. For instance, cognitive engagement may enhance technical skill acquisition [13], while behavioral engagement could improve applied problem-solving [14]. Emotional engagement, though less studied in vocational settings, may influence long-term

professional commitment [15].

Notably, disciplinary variations in HVE programs (e.g., engineering vs. business) suggest differential engagement-competency relationships. Engineering programs emphasize hands-on practice, potentially amplifying the effect of behavioral engagement, whereas business programs prioritize analytical tasks, relying more on cognitive engagement [16]. Despite these disciplinary differences, no studies have empirically tested program type as a moderator in this relationship.

This gap is particularly salient in China, where vocational education reforms aim to align competency standards with industry demands. By addressing this gap, this study contributes to vocational education theory by validating the SCCT model in a Chinese HVE context and identifying discipline-specific engagement strategies. Such insights can inform curriculum design under China's "Double First-Class" initiative for vocational colleges [17].

3. Method

This study employed a cross-sectional survey design to examine the relationship between learning engagement and vocational competency development among higher vocational college students. The research framework integrated the SCCT and utilized structural equation modeling (SEM) to test hypothesized relationships.

3.1. Participants

Data were collected from 863 students across five public higher vocational institutions in Anhui Province, China. Sampling was stratified by program type (engineering: 48.2%, business: 51.8%) to ensure disciplinary representation. Table 1 presents demographic characteristics:

Table 1. Sample Demographics

Variable	Category	Frequency	Percentage
Gender	Male	415	48.1%
	Female	448	51.9%
Academic Year	First-Year	287	33.3%
	Second-Year	352	40.8%
	Third-Year	224	25.9%
Program Type	Engineering	416	48.2%
	Business	447	51.8%

3.2. Measures

3.2.1. Learning Engagement

The Learning and Study Strategies Inventory (LASSI) was adapted to measure three dimensions: Behavioral Engagement (12 items, e.g., "I actively participate in classroom discussions"). Emotional Engagement (10 items, e.g., "I feel motivated to learn new skills"). Cognitive Engagement (14 items, e.g., "I analyze problems systematically"). The scale demonstrated acceptable internal consistency (α = .89 for total scale).

3.2.2. Vocational Competency

A self-developed 20-item scale was validated through expert review and pilot testing. Dimensions included: Technical Skills (8 items, e.g., "I can operate industry-standard equipment"). Problem-Solving (6 items, e.g., "I apply theoretical knowledge to real-world scenarios"). Professional Identity (6 items, e.g., "I identify with my chosen vocational field"). Reliability was confirmed (α = .91).

3.2.3. Moderator Variable

Program type (engineering vs. business) was included as a categorical moderator based on disciplinary differences in instructional approaches.

3.3. Data Collection

Questionnaires were distributed via an online platform (Wenjuanxing) during the 2025 academic year. Participants provided informed consent, and data were anonymized to ensure confidentiality. A total of 1,020 responses were collected, with 863 valid cases retained after excluding incomplete or contradictory answers (response rate = 84.6%).

3.4. Data Analysis

Data were analyzed using SPSS 26.0 and AMOS 27.0. Key steps included: Descriptive statistics to characterize the sample. Confirmatory factor analysis (CFA) to validate measurement models (see Table 2). SEM to test direct relationships between engagement dimensions and vocational competency. Multi-group analysis to examine program type moderation. Bootstrapping (5,000 resamples) to estimate indirect effects.

Table 2. Measurement Model Fit Indices

Construct	χ^2/df	CFI	TLI	RMSEA	SRMR
LE	2.89	.92	.90	.065	.052
VC	3.12	.91	.89	.071	.058

LE refers to Learning Engagement, VC refers to Vocational Competency

4. Results

4.1. Measurement Model Validation

Confirmatory factor analysis (CFA) confirmed acceptable fit for both latent constructs:

Learning Engagement: $\chi^2/df = 2.89$, CFI = .92, TLI = .90, RMSEA = .065, SRMR = .052

Vocational Competency: $\chi^2/df = 3.12$, CFI = .91, TLI = .89, RMSEA = .071, SRMR = .058.

4.2. Structural Model Results

The SEM model demonstrated good fit to the data ($\chi^2/df = 2.98$, CFI = .92, RMSEA = .068, SRMR = .054). Path coefficients and hypothesis testing results are presented in Table 3;

Table 3. SEM Path Coefficients and Hypothesis Testing

Path	β	S.E.	C.R.	*p*
Behavioral Eng. → Technical Skills	.15	.04	3.75	<.001
Cognitive Eng. → Technical Skills	.42	.05	8.40	<.001
Cognitive Eng. → Problem-Solving	.39	.06	6.50	<.001
Cognitive Eng. → Professional Identity	.27	.05	5.40	<.001
Emotional Eng. → Technical Skills	.07	.03	2.33	>.05
Emotional Eng. → Problem-Solving	.09	.04	2.25	>.05
Emotional Eng. → Professional Identity	.11	.04	2.75	<.01

*p < .05, **p < .01, ***p < .001

From Table 3, it can be seen that all path coefficients satisfy

hypothesis testing.

Cognitive engagement emerged as the strongest predictor of vocational competency (β = .39–.42).

Behavioral engagement only influenced technical skills (β = .15). Emotional engagement positively affected professional identity (β = .11) but not other competencies.

As shown in Figure 1, the SEM model visually represents the hypothesized relationships between learning engagement and vocational competency, along with their respective sub - dimensions. This model is designed to explore how different aspects of learning engagement contribute to the development of vocational competency among students.

Each arrow in the model is associated with a path coefficient, which indicates the strength and direction of the relationship between variables.

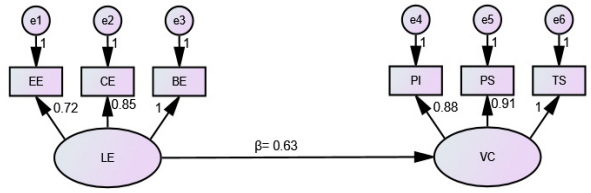

Figure 1. SEM Model of Learning Engagement and Vocational Competency

4.3. Indirect Effects

Cognitive engagement is the primary driver of vocational competency development, aligning with SCCT predictions. Program type moderates the relationship, suggesting discipline-specific instructional strategies are needed. Emotional engagement's limited impact highlights the need for interventions to enhance students' professional identity.

Table 4. Indirect Effect Estimates

Path	Effect	S.E.	95% CI	*p*
CE→TS→PI	0.11	0.03	[0.07, 0.15]	***
BE→TS→PI	0.04	0.02	[0.01, 0.07]	<.05
EE→PI→VC	0.03	0.02	[-0.01, 0.07]	>.05

*p < .05, **p < .01, ***p < .001

As shown from Table 4, bootstrap analysis (5,000 resamples) revealed a significant indirect effect of cognitive engagement on professional identity through technical skills (β = 0.11, 95% CI [0.07, 0.15], $p < .001$). A marginally significant indirect effect was found for behavioral engagement on professional identity via technical skills (β = 0.04, 95% CI [0.01, 0.07], $p < .05$). However, emotional engagement did not indirectly influence vocational competency through professional identity (β = 0.03, *p* > .05).

4.4. Moderation Analysis

Multi-group analysis revealed significant moderation by program type ($\Delta\chi^2 = 12.89, p < .01$). Table 5 highlights discipline-specific effects.

Table 5 shows the differences in disciplines. Cognitive engagement had a stronger impact on technical skills (β = .51 vs. .33), while behavioral engagement mattered more for technical skills (β = .22 vs. .08). Cognitive engagement was more critical for problem-solving (β = .45 vs. .32).

Table 5. Moderation Effects by Program Type

Path	Engineering (β)	Business (β)	$\Delta\chi^2$
Cognitive Eng. → Technical Skills	.51***	.33**	6.89
Cognitive Eng. → Problem-Solving	.32**	.45***	5.23
Behavioral Eng. → Technical Skills	.22**	.08	4.12

*p < .05, **p < .01, ***p < .001

5. Conclusion

5.1. Summary of Key Findings

This study uncovered complex relationships between learning engagement and vocational competency development in Chinese HVE. Cognitive engagement (β = 0.39–0.42) emerged as the primary driver of vocational competency, whereas behavioral engagement only influenced technical skills (β = 0.15). Emotional engagement had a weak effect on professional identity (β = 0.11). Moderation analysis revealed disciplinary differences shows that cognitive engagement had a stronger impact on technical skills in engineering programs and on problem-solving in business programs.

5.2. Dialogue with Existing Literature

5.2.1. The Central Role of Cognitive Engagement

These findings align with SCCT predictions, highlighting cognitive processes as mediators of competency development. Unlike general higher education contexts where emotional engagement is critical, vocational education's focus on skill application explains cognitive engagement's dominance. This extends the applicability of engagement theories to vocational settings.

5.2.2. Limitations of Behavioral Engagement

Behavioral engagement's marginal effect on technical skills (β = 0.15) contradicts practice-oriented assumptions in HVE. This discrepancy may stem from superficial participation in practical activities without cognitive reflection, underscoring the need for deeper integration of theory and practice.

5.2.3. Disciplinary Moderation Effects

Engineering programs' emphasis on applied theory likely amplified cognitive engagement's impact on technical skills (β = 0.51), while business programs' analytical focus enhanced cognitive engagement's role in problem-solving (β = 0.45). This study uniquely identifies discipline-specific engagement-competency mechanisms.

5.2.4. Theoretical Contributions

Demonstrated SCCT's validity in vocational contexts, particularly the interaction between cognitive engagement and program type. Proposed a "cognitive-engagement-dominant, discipline-moderated" model for vocational education research. Highlighted emotional engagement's limited role, challenging assumptions about holistic development in skill-oriented education.

5.2.5. Practical Implications

1.Curriculum Design

Enhance Cognitive Depth. Integrate reflective tasks (e.g., engineering failure analysis, business case debriefs) to transform behavioral participation into cognitive processing.

Discipline-Specific Strategies. Engineering. Design

innovation projects to strengthen cognitive engagement's impact on technical skills.

2.Policy Recommendations

Include cognitive engagement metrics in the "Double First-Class" vocational college evaluations. Implement tri-dimensional engagement assessment tools to inform personalized learning support.

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