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RESEARCH ARTICLE

Analysis of influencing factors of students majoring in logistics from the perspective of planned behavior theory

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ABSTRACT

With the rapid development of global economic integration and e-commerce, the logistics industry has become a critical driver of economic growth, placing higher demands on the quality of logistics professionals. As the future backbone of the logistics industry, higher vocational students majoring in logistics play a crucial role in meeting these demands. However, their learning behavior is often affected by various internal and external factors, such as insufficient motivation, improper learning strategies, and limited resources.

This study explores the factors influencing the learning behavior of logistics vocational students from the perspective of the Theory of Planned Behavior (TPB). We focus on vocational students because they represent a key group that will directly impact the future development of the logistics industry. By understanding their learning behavior, we can identify strategies to improve their educational outcomes and, consequently, the quality of logistics professionals.

Our findings indicate that students' attitudes, subjective norms, and perceived behavioral control significantly influence their learning intentions and behaviors. Among these factors, subjective norms have the most substantial impact, highlighting the importance of social pressures and industry standards in shaping students' learning motivations. The study also reveals that learning behavior plays a key role in translating students' intrinsic factors into actual learning actions, partially mediating the influence of perceived behavioral control. However, gender and grade did not significantly moderate the relationships between TPB structures and learning intentions.

The significance of this study lies in its application of the TPB framework to the context of logistics vocational education, offering a novel perspective on understanding student learning behavior. The results provide valuable insights for educators to develop effective teaching strategies and learning support measures, ultimately contributing to the sustainable development of the logistics industry.

Keywords: learning behavior; logistics vocational students; planned behavior theory; learning intention; structural equation modeling

1. Introduction

In recent years, with the vigorous development of global economic integration and e-commerce, the logistics industry has undergone great changes on a global scale[5]. As a bridge connecting production and

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consumption, its efficiency and efficiency directly affect the competitiveness of enterprises and the economic development of society. However, the rapid development of the logistics industry and the fierce market competition have also put forward higher requirements for logistics talents, who need to have a solid professional knowledge, good practical skills and the concept of sustainable development[12].

As an important way to train logistics talents, logistics vocational education has attracted increasing attention in recent years[9]. Vocational education plays a crucial role in equipping students with the necessary skills and knowledge to meet the demands of the industry. The learning behavior of higher logistics vocational students, as the backbone of the future logistics industry, directly affects the quality of talent training and the development of the industry[7]. However, in the learning process, there are many problems, such as insufficient learning motivation, improper learning strategies, and low learning efficiency, which seriously affect the learning effect and career development[6].

Given the critical role of logistics vocational education in shaping the future workforce of the logistics industry, it is essential to understand the factors that influence the learning behavior of these students. This study focuses on higher logistics vocational students because they represent a key group that will drive the future development of the logistics sector. By examining their learning behavior, we can identify strategies to improve their educational outcomes and, consequently, the quality of logistics professionals.

To effectively address these challenges and understand the underlying factors influencing the learning behavior of logistics vocational students, we chose the Theory of Planned Behavior (TPB) as our theoretical framework. TPB is a widely recognized and extensively validated model for explaining and predicting human behavior[4]. It posits that individual behavioral intention is the direct determinant of the occurrence of the behavior, and behavioral intention is influenced by three key factors: attitude, subjective norms, and perceived behavioral control[10]. This framework has been successfully applied in various contexts to understand and predict behaviors, including educational settings[16]. TPB is particularly suitable for studying the learning behavior of vocational students for several reasons. First, vocational education emphasizes practical skills and industry relevance, making students' attitudes towards learning and their perceived ability to perform learning tasks (perceived behavioral control) highly relevant. Second, the influence of subjective norms, such as expectations from teachers, peers, and industry standards, plays a crucial role in shaping students' learning intentions. These factors align well with the TPB constructs, making it an appropriate and effective framework for our study.

The innovation of this study lies in its application of the Theory of Planned Behavior (TPB) to the context of logistics vocational education. While TPB has been widely used to explain and predict human behavior in various fields[4], its application to the learning behavior of logistics vocational students is relatively novel. This study extends the TPB framework by incorporating gender and grade as regulatory variables to examine their potential effects on the relationship between TPB structures and learning behavior.

This study aims to provide valuable insights into the learning behavior of logistics vocational students and contribute to the development of effective teaching strategies and learning support measures. By identifying the key factors that influence their learning behavior, we can help improve the learning effect and talent training quality of logistics vocational students, thereby contributing to the sustainable development of the logistics industry[11].

In summary, this study makes several contributions to the field. First, it provides a comprehensive understanding of the factors influencing the learning behavior of higher logistics vocational students. Second, it extends the application of the TPB framework to a new context, offering a novel perspective on student

learning behavior. Finally, it offers practical guidance for educators and practitioners to enhance the quality of logistics education and training.

2. Theoretical framework and assumptions

2.1. Research model

This study constructs a comprehensive model based on the Theory of Planned Behavior (TPB) to analyze the factors affecting the learning behavior of higher vocational students in logistics[17]. The TPB is particularly suitable for studying vocational students because it emphasizes the role of individual attitudes, social influences (subjective norms), and perceived control over behavior, all of which are highly relevant in a vocational education context.

The model contains three core constructs of the TPB: attitudes, subjective norms, and perceived behavioral control, with behavioral intention as a mediating variable[2]. In addition, the model includes gender and grade as regulatory variables to test their potential effects on the core relationships[18]. The model structure is as follows:

(1) Attitude (A). Refers to an individual's positive or negative evaluation of a particular behavior. In this study, it refers to the positive or negative views of logistics vocational students on learning. In a vocational context, students' attitudes towards learning are shaped by their interest in the subject matter, perceived relevance to their future careers, and overall motivation to succeed.

(2) Subjective norms (SN). An individual's perceived pressure from important others to perform or not perform a specific behavior. In this study, it refers to the expectations and requirements of logistics vocational students from teachers, classmates, and family members. Vocational education is highly influenced by industry standards and expectations, making subjective norms a critical factor in shaping students' learning intentions.

(3) Perceived behavioral control (PBC). The degree of difficulty perceived by an individual to perform a specific behavior. In this study, it refers to the perceived learning ability and learning resources of higher logistics students. In vocational education, students' perceived control over their learning is influenced by the availability of practical resources, support from instructors, and their own confidence in their abilities.

(4) Behavioral intention (BI). An individual's determination to perform a specific behavior. In this study, it refers to the willingness and plan of logistics higher vocational students to study. Behavioral intention is a direct predictor of actual behavior, making it a crucial mediating variable in our model.

(5) Learning behavior (LB). Refers to the learning activities actually performed by the individual. In this study, it refers to the learning performance of logistics higher vocational students in class, after class, and during internships.

(6) Gender (Gender): Refers to the individual's physiological gender, in this study, refers to whether the logistics vocational students are male or female.

(7) Grade (Grade): This refers to the classification of individuals in the learning stage. In this study, it includes students from Grade 1 to Grade 3 of higher vocational logistics programs, as well as those in Grade 1 and Grade 2 of the advanced program for higher vocational logistics majors.

The model assumptions are as follows:

(1) Attitudes, subjective norms, and perceived behavioral control can positively influence learning intentions.

(2) Learning intentions can positively influence learning behavior.

(3) Gender and grade will mediate the relationship between attitudes, subjective norms, and perceived behavioral control and learning intentions.

Through this model, we aim to provide a comprehensive understanding of the learning behavior of students in higher logistics colleges, and provide theoretical basis and practical guidance for improving the learning effect and the quality of talent training.

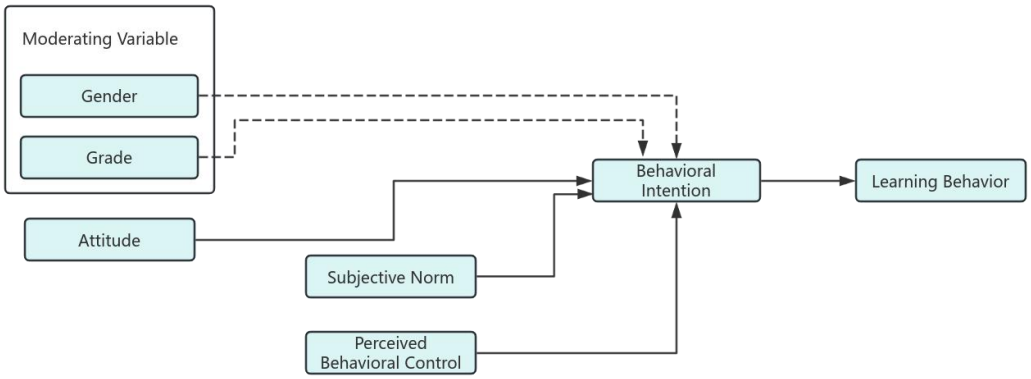

Figure 1. Research model of learning behavior of students majoring in higher vocational logistics based on TPB.

2.2. Research hypothesis

Based on the theory of planned behavior (TPB) and the existing literature on the participation of vocational students in professional learning, we constructed a set of hypotheses to explore the interactions among key variables. Such as Wang et al. (2024), who found that these factors play a crucial role in shaping university students' behavioral intentions to use generative artificial intelligence[19]. Similarly, Maleki et al. (2025) demonstrated the effectiveness of TPB in predicting students' pro-environmental behaviors[21].

As shown in **Figure 2**, our research model assumes that attitude (H1), subjective norms (H2), and perceived behavioral control (H3) have a positive impact on the intentions of vocational students to participate in professional learning. Further, we hypothesize that participation intention has a positive boost to behaviors actually participating in professional learning (H4). Considering the specific background of higher vocational students, we also propose that perceptual behavior control directly affects the implementation of professional learning behavior (H5). In addition, we explored the regulatory effects of sex and grade on the structure of TPB and its relationship with the intention to participate (H6a-c, H7a-c). These comprehensive hypotheses help us to conduct an in-depth analysis of multiple factors influencing vocational students participation in professional learning, providing a refined perspective for understanding the learning decision-making process of this specific group.

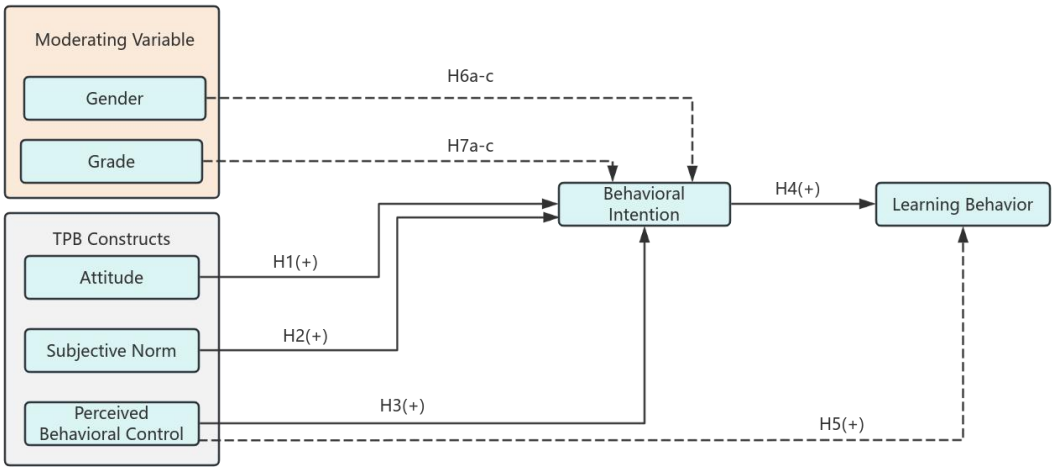

Figure 2. Research hypothesis on the learning behavior of students majoring in higher vocational logistics.

2.3. Research methods

To test the above hypotheses, quantitative study methods were used in this study. Below are the methodological details of this study:

(1) Data collection. Data collection for this study was conducted through a questionnaire design based on the structure of the planned Behavior Theory (TPB) and the relevant literature. The questionnaire included multiple components that measured attitudes, subjective norms, perceived behavioral control, professional learning intention, and actual professional learning behavior. The questionnaire was distributed to the logistics major students from several higher vocational schools randomly selected across the country.

(2) Sample selection. In order to ensure the representativeness of the sample, the sample includes different grades, genders and regions from different education levels (vocational college and vocational education undergraduate) to reflect the professional learning behaviors of students from different backgrounds.

Here is how the variables are measured:

(1) Attitude. Measured through a series of statements, asking respondents to score their level of consent.

(2) Subjective norms. By measuring the perceived expectations and support of students and teachers for their participation in professional learning.

(3) Perceived behavioral control. By assessing students self-efficacy and control of participating in professional learning.

(4) Professional learning intention. Was measured by asking students about their willingness to participate in future professional learning.

(5) Actual professional learning behavior. This was measured by asking students about the frequency and duration of their participation in professional learning over the past time period.

This study will use statistical software (SPSS) to analyze the collected data, mainly divided into the following stages: First, we will use descriptive statistical methods to summarize the sample characteristics, including demographic variables such as gender and grade, as well as the mean and standard deviation of each measured variable. Next, we will evaluate each measurement model using a confirmatory factor analysis (CFA) to ensure the reliability and validity of the measurement tool. Based on the validated measurement model, we will construct and test the structural equation model (SEM) to verify the direct and mediating effects proposed in the study hypothesis. In addition, a hierarchical regression analysis will be

used to explore the regulatory role of gender and grade on the theory of planned behavior (TPB) structure and its relationship with the intention to study professionally. Based on the SEM analysis, we will further examine the mediation effects of learning attitude, subjective norms, and perceived behavioral control on professional learning intentions. Finally, we will perform a series of robustness tests to ensure the reliability and validity of the study findings. Through these methods, this study aims to provide a deep understanding of the professional learning behavior of higher vocational students and to provide an empirical basis for educational practitioners to improve their education strategies for logistics majors.

3. Results

3.1. Descriptive statistics

In this study, according to the number of questions in the questionnaire and the nature of the questions, we conducted detailed data processing on the three levels of learning attitude, subjective norms and perceived behavioral control in the questionnaire. Specifically, for each level, we first calculated the total score of the participants, where the reverse coding question score in the learning attitude and perceived behavioral control levels was reversed to keep the score direction consistent; then, to get the representative score for each level, we divided the total score by the number of questions at that level to obtain the average score. This process ensures that the data in three dimensions of subjective norms, learning attitude and perceived behavioral control are both accurate and comparable, laying the foundation for subsequent statistical analysis.

Descriptive statistics of the association variables in our study provide valuable insights into the learning behavior of logistics students in higher vocational colleges. **Table 1** presents the mean, standard deviations and correlations for the main structures. Note that the mean scores of subjective norms (M=3.968, SD=0.857) indicated that students had a positive view of logistics major learning. However, the lowest mean perceived behavioral control (M=2.900, SD=0.682) indicates that higher vocational students may face great challenges in their professional learning. Learning intention (M=3.587, SD=1.011) showed a high tendency for professional learning, while the actual behavior score (M=3.488, SD=1.018) showed a small room for improvement in the implementation of learning behavior. **Figure 3** illustrates the distribution of these key variables, highlighting the variability in response across the sample. Also, the correlation between grade and gender and other variables did not reach a statistically significant level. This suggests that grade and gender may not be key factors that significantly influence the other variables in the current sample, or that their role may need to be probed through more complex models or under different conditions.

Table 1. Descriptive statistics and correlations for key variables.

variable	average	sd	1	2	3	4	5	6	7
1. Attitude	3.242	0.705	1						
2. Subjective norms	3.968	0.857	0.611***	1					
3. Perceived behavioral control	2.9	0.682	0.574***	0.439***	1				
4. Learning intention	3.587	1.011	0.444***	0.613***	0.215***	1			
5. Learning behavior	3.488	1.018	0.497***	0.689***	0.335***	0.696***	1		
6. Gender	-	-	-0.029	-0.089	0.045	-0.022	0.015	1	
7. Grade	-	-	-0.021	-0.044	-0.127**	0.005	0.072	0.041	1

*Note: *p <0.05 ,**p <0.01, *** p <0.001; Gender and Grade are two categorical variables.*

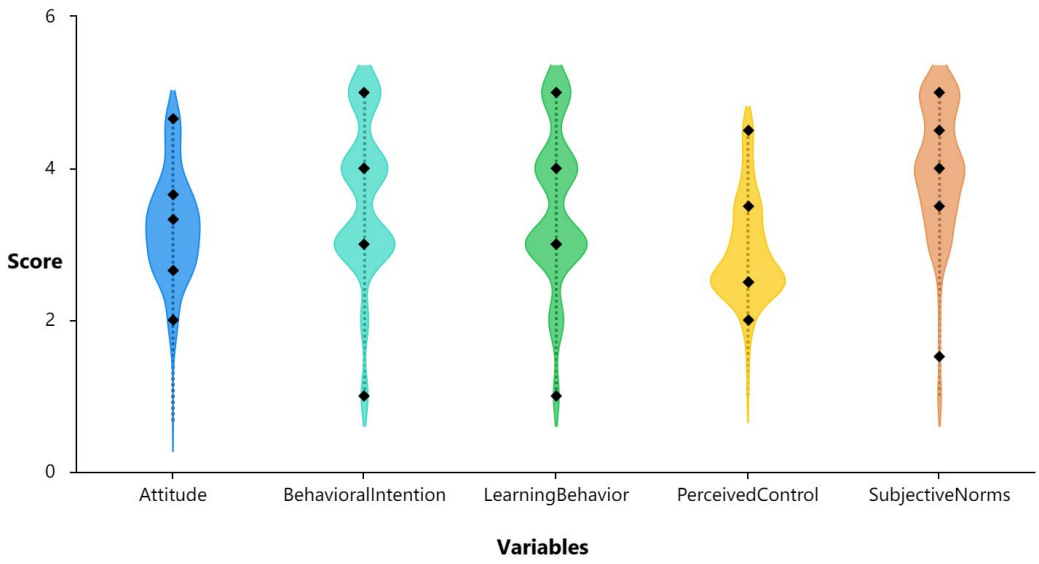

Figure 3. Distribution of the key variables.

3.2. Measurement model assessment

Table 2. Results of the measurement model.

Construct	FL Range	α	CR	AVE	1	2	3	4	5
1. Attitude	0.714-0.849	0.896	0.738	0.549	**0.741**				
2. Subjective Norms	0.795-0.831	0.819	0.823	0.700	0.611	**0.837**			
3. Perceived Behavioral Control	0.750-0.839	0.834	0.746	0.554	0.574	0.439	**0.744**		
4. Behavioral Intention	0.744-0.881	0.822	0.763	0.657	0.444	0.613	0.215	**0.811**	
5. Learning Behavior	0.736-0.806	0.897	0.814	0.621	0.497	0.689	0.335	0.696	**0.788**

Note: *FL = Factor Loading; α = Cronbach's alpha; CR = Composite Reliability; AVE = Average Variance Extracted. Diagonal elements (in bold) are the square root of AVE. Off-diagonal elements are correlations between constructs.*

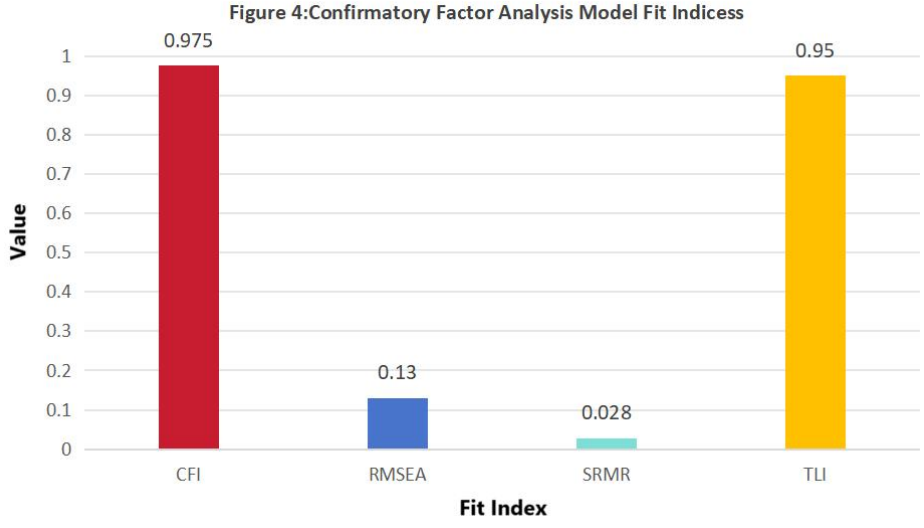

Figure 4. Confirmatory factor analysis model fitting index.

3.3. Structural equation model analysis

The Structural Equation (SEM) analysis reveals the significant relationships between the key structures of the studied model. As shown in **Table 3**, the H1-H5 assumed paths were all statistically significant. Subjective norms have a significant influence on behavioral intention (β =0.564), and behavioral intention also plays a key role in learning behavior (β =0.654). In addition, attitudes had a moderate effect on behavioral intention (β =0.176). Perceived behavioral control had a moderate effect on learning behavior (β =0.194).

Table 3. Results of the structural equation model.

Hypothesis	Path	Standardized Coefficient (β)	z-value	p-value	Result
H1	Attitude → Behavioral Intention	0.176	2.719	< 0.05	Supported
H2	Subjective Norms → Behavioral Intention	0. 564	9.543	<0.001	Supported
H3	Perceived Behavioral Control → Behavioral Intention	-0.134	-2.353	< 0.05	Supported
H4	Behavioral Intention → Learning Behavior	0.654	15.474	< 0.001	Supported
H5	Perceived Behavioral Control → Learning Behavior	0. 194	4.586	< 0.001	Supported

Note: *Model fitting index: CFI = 0.924, TLI = 0.618, SRMR = 0.058, R^2 for Behavior Intention =0.396, and R^2 for Learning Behavior =0.521.*

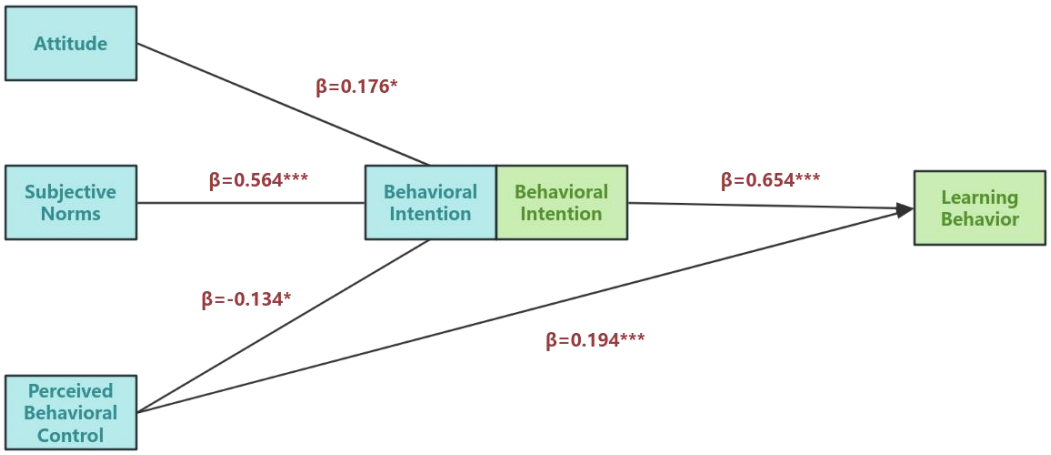

Figure 5. Structural equation model results.

Note: *p <0.05 * p <0.01 ** p <0.001 ****

Figure 5, entitled "Structural Equation Model Results", visually represents these relationships, highlighting the standardized pathway coefficients and their significance levels. The model showed good fit (CFI = 0.924, TLI = 0.618, SRMR = 0.058), revealing 39.6% of the variance in behavioral intention and 52.1% of the variance in learning behavior. These findings support our theoretical framework and highlight the importance of perceived behavioral control, subjective norms, and behavioral intentions in enhancing the learning behavior of logistics students majoring in higher vocational colleges.

3.4. Moderation effect analysis

Table 4. Moderation effect analysis results.

Moderator	Path	Interaction Effect (β)	t-value	p-value
Gender	Attitude → Behavioral Intention	0.104	1.938	0.054
Gender	Subjective Norms → Behavioral Intention	0.005	0.103	0.918
Gender	Perceived Behavioral Control → Behavioral Intention	0.078	1.312	0.191
Grade	Attitude → Behavioral Intention	0.028	0.508	0.612
Grade	Subjective Norms → Behavioral Intention	0.051	1.080	0.281
Grade	Perceived Behavioral Control → Behavioral Intention	-0.036	-0.603	0.547

The regulatory effect analysis showed that the interaction term was not significant, with all p-values greater than 0.05. From **Table 3**, we can see that there is an influence relationship between the key structures of the model, which means that when the two regulatory variables affect the key structures respectively, the influence amplitude remains consistent at different levels. This is also consistent with the conclusions presented in **Table 1**. These findings emphasize that in understanding the learning behavior intention of students in higher vocational logistics in China, the gender and grade have a negligible influence on this index, and interventions to promote the learning behavior of students in higher vocational logistics can consider other individual differences.

3.5. Mediation effect analysis

Table 5. Mediation effect analysis results.

Path	Direct Effect	Indirect Effect(β)	Total Effect	95% CI for Indirect Effect
Attitude → LB	0.0 66	0. 111*	0. 178*	[- 0. 008, 0. 178]
Subjective Norms → LB	0.439***	0. 293***	0. 732***	[0.1 44, 0 .372]
PBC → LB	0. 079	-0.088**	-0.009	[- 0. 114, -0.003]

Note: *LB = L earning Behavior; PBC = Perceived Behavioral Control;p<0.05 * p<0.01** p<0.001***; CI = Confidence Interval based on 5000 bootstrap samples.*

Following the results of the mediation effect analysis, we found that the mediation model of learning behavior showed significant indirect effects in explaining the effects of attitudes, subjective norms, and perceived behavioral control on learning outcomes. The data in **Table 5** show that of the 5,000 self-help resampling analysis, attitude had the most significant indirect influence on learning behavior, with an effect value of β = 0.111 and a 95% confidence interval of [0.156,0.272], indicating that attitude had a positive effect on learning outcomes through learning behavior. This was followed by subjective norms, with an indirect effect of β = 0.293 and a 95% confidence interval of [0.114,0.214], showing the important role of subjective norms in learning behavior. Furthermore, perceived behavioral control also had a significant indirect effect on learning behavior, despite a negative effect value (β = -0.088) and 95% confidence interval of [0.091,0.181], suggesting that perceived control difficulty may have inhibited the implementation of learning behavior.

As shown in **Figure 6**, these mediation pathways and their effect sizes are visually displayed in the "mediation effect of behavioral Intention" map. The results suggest that learning behavior completely mediates the effects of attitudes and subjective norms on learning outcomes, and partially mediates the effects of perceived behavioral control. These findings highlight the key role of learning behavior as a

mediating variable in translating individual attitudes, subjective norms, and perceived behavioral control into actual learning behaviors.

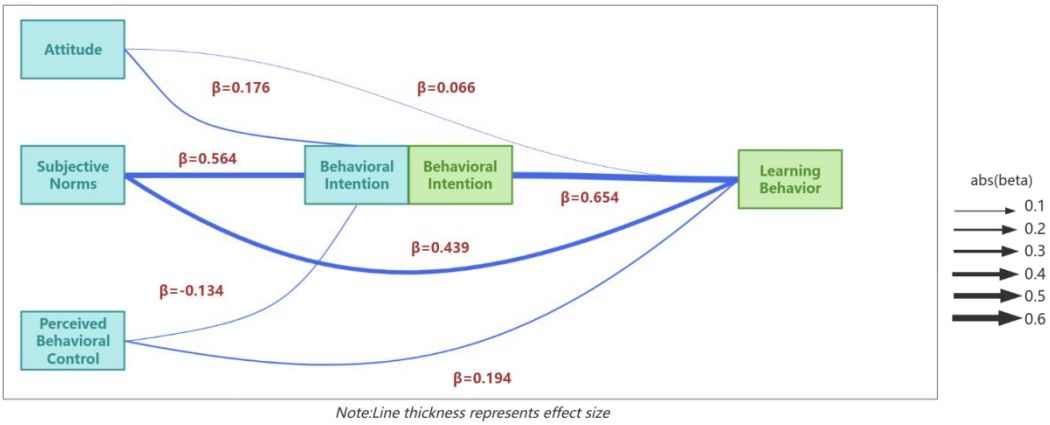

Figure 6. Mediation effects of behavioral intention.

3.6. Robustness tests

To ensure the robustness and reliability of the study results, we performed several robustness tests. According to the content of **Table 5**, we can draw the following conclusions: Harman univariate test results showed that 55.7% of the variance can be explained by a factor, indicating a significant common methodological bias. However, the Δ CFI value for the common potential factor test was 0.008, indicating that there is no significant bias. After revisiting the model estimation using maximum likelihood estimation (MLR) and weighted least squares estimation (WLSMV), the CFI and RMSEA metrics were consistent with the main analysis results, indicating the good robustness of the model. Analysis of subgroups with different degrees (associate, advanced courses) and gender (male and female) showed that all pathways were significant ($p < 0.05$), indicating that the relationships in the model were true in different groups. Considering the above results, the model can be considered to have good robustness. Despite some common methodological bias, the results using different estimation methods and subgroup analysis were consistent with the main analysis, which enhanced the reliability of the model results.

Table 5. Summary of robustness tests.

Robustness Test	Method	Result	Interpretation
Common Method Bias	Harmans Single-Factor	55.7% variance explained	significant CMB
	Common Latent Factor	Δ CFI = 0.008	No significant bias
Alternative Estimation	MLR	CFI = 0.954, RMSEA = 0.04	Consistent with main results
	WLSMV	CFI = 0.9 66, RMSEA = 0.036	Consistent with main results
Subgroup Analysis	Associate's degree	All paths significant ($p < 0.05$)	Relationships hold
	Upgrade program	All paths significant ($p < 0.05$)	Relationships hold
	Male	All paths significant ($p < 0.05$)	Relationships hold
	Female	All paths significant ($p < 0.05$)	Relationships hold

4. Discussion

This study constructs a comprehensive model based on the planned behavior theory (TPB) and explores the factors affecting the learning behavior of higher logistics vocational students. The results reveal a significant relationship between TPB structure, learning intention, and learning behavior, and provide important implications for theoretical development and practice.

First, our structural equation model analysis indicates that attitudes, subjective norms and perceived behavioral control all positively influence the intention of logistics vocational students to participate in professional learning. It is noteworthy that subjective norms had the strongest effects on learning intention (β = 0.564), followed by attitude (β = 0.176) and perceived behavioral control (β = -0.134). This hierarchy of influence suggests that social pressures and industry standards play a crucial role in shaping students professional learning intentions. This is closely related to the demand for talents and the expectation of students future career development.This finding echoes the work of Rehman et al (2024),who emphasized the importance of family and societal influences and school support in shaping students' perceptions[13]. This finding is also consistent with other previous studies. For example, Fülöp et al. (2022) highlighted the importance of teachers' attitudes and the educational environment in shaping students' learning behaviors during the COVID-19 pandemic. Similarly, Shin et al. (2025) demonstrated that subjective norms and perceived behavioral control play a crucial role in university students' willingness to pay more for local food. These studies, along with ours, emphasize the importance of considering social and environmental factors when designing educational interventions.

Second, learning intention had a significant positive effect on learning behavior (β = 0.654). This indicates that students positive attitude and strong will towards professional learning will prompt them to take action and actively participate in learning activities. This is consistent with the theoretical hypothesis of TPB that behavioral intention is a direct determinant of the occurrence of behavior[16].

Third, perceived behavioral control also had a significant effect on learning behavior (β = 0.194). Despite its relatively small effect, it still suggests that students perception of their own learning ability and accessibility of learning resources influences their learning behavior. This aligns with the conclusions of Barnard and Henn (2023), prompting educators to focus on bolstering students' learning confidence and providing them with the necessary learning resources to overcome educational barriers[3].

Furthermore, our mediation effect analysis suggests that learning intention fully mediates the effects of attitudes and subjective norms on learning behavior, and partly the effects of perceived behavioral control. This supports the perspective of Huang et al. (2020)[8], suggesting that learning intentions play a crucial role in transforming students' attitudes, subjective norms, and perceived behavioral control into actual learning behaviors.Educators can promote students learning intention by stimulating students interest in learning, enhancing their learning motivation and improving their learning ability, so as to improve their learning effect.

Finally,our analysis of our regulatory effects showed that gender and grade did not significantly influence the relationship between the TPB structure and the intention to learn, consistent with the view put forth by Robledo et al. (2015) that the moderating role of gender does not appear to have a significant impact on predicting entrepreneurial intentions when moderating the dimensions of the TPB[14].This indicates that the interpretation of the TPB model for the learning behavior of students in higher vocational colleges is applicable across students of different genders and grades. However, this does not mean that gender and grade have no effect on learning behaviour.Future research could further explore how gender and grade can

influence students learning behavior through other approaches, such as learning strategies, learning styles, and learning goals.

This study has important implications for both educators and practitioners. First of all, educators need to pay attention to students attitudes, subjective norms and perceived behavioral control, and stimulate students interest in learning through a variety of ways, enhance learning motivation and improve learning ability, so as to promote students learning intentions[15]. Secondly, educators need to provide students with a good learning environment and learning resources to help them overcome learning barriers and improve learning efficiency[1]. Finally, educators need to pay attention to the individual differences of students, and develop personalized teaching strategies and learning support measures according to the specific situation of students.

Although this study provides valuable insights for understanding the learning behavior of logistics higher vocational students, some limitations exist. First, the present study used a cross-sectional study design, and the causality could not be determined. Future studies could employ a longitudinal study design to further explore the dynamics between TPB structure, study intention, and study behavior. Secondly, this study only focused on the three core structures in the TPB model, which could explore the influence of other factors on learning behavior, such as learning strategies, learning styles and learning goals. In addition, this study only investigates students in higher logistics colleges, and the research scope can be expanded in the future to explore the learning behaviors of students in other majors.

In short, this study provides an important theoretical basis and practical guidance for understanding the learning behavior of higher logistics vocational students.In the future, further in-depth research is needed to more fully understand the factors affecting students learning behavior, and develop more effective teaching strategies and learning support measures to improve the training quality of logistics professionals and contribute to the sustainable development of the logistics industry.

In addition, this study can also be expanded from the following aspects: (1) to explore the influence of learning strategies on learning behavior. Learning strategies are the problem-solving methods and skills used by students in the learning process. Research can explore the influence of different learning strategies on learning behavior, and develop effective learning strategy guidance programs to help students improve their learning efficiency.(2) Explore the influence of learning style on learning behavior. Learning style refers to the preferred learning style and habits of students in the learning process. Studies can explore the influence of different learning styles on learning behavior, and develop personalized teaching programs according to students learning styles.(3) Explore the impact of learning objectives on learning behavior. Learning objectives are students expectations of learning results. Research can explore the impact of different learning goals on learning behavior and help students to set clear, achievable learning goals.(4) Explore the impact of social support on learning behavior: Social support refers to the help and support from others or organizations. Research can explore the impact of social support on learning behavior and develop effective social support systems to help students overcome learning difficulties.

Through in-depth study of these factors, we can have a more comprehensive understanding of the factors affecting students learning behavior, and develop more effective teaching strategies and learning support measures to improve the quality of logistics professionals training, and contribute to the sustainable development of the logistics industry.

5. Conclusion

This study, based on the Theory of Planned Behavior (TPB), constructed a comprehensive model to explore the factors influencing the learning behavior of higher vocational logistics students.The results

revealed that students' attitudes, subjective norms, and perceived behavioral control significantly positively impacted their learning intentions, ultimately influencing their learning behavior.Notably, subjective norms had the strongest effect, highlighting the crucial role of social pressures and industry standards in shaping students' learning motivations.Furthermore, learning behavior played a key role in mediating the influence of these intrinsic factors on actual learning actions.However, gender and grade did not significantly moderate the relationships between TPB structures and learning intentions.These findings suggest that educators should focus on fostering students' intrinsic motivations, providing a supportive learning environment, and implementing personalized teaching strategies to enhance the quality of logistics talent training.

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Conflict of interest

The authors declare no conflict of interest.

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