The influence of learning motivation on academic performance in Chinese vocational college students: A self-determination theory perspective

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Abstract

This study investigated the influence of learning motivation on academic performance among Chinese vocational college students using Self-Determination Theory as the theoretical framework. A quantitative correlational design was employed, involving 485 students from Guangdong Polytechnic of Industry and Commerce. The findings demonstrated that academic performance was significantly predicted by both intrinsic and extrinsic motivation, which together accounted for 48.6% of the variance in GPA. While the academic year moderated the effects of extrinsic motivation, gender moderated the relationship between intrinsic motivation and performance. Students with the highest levels of intrinsic motivation achieved the best academic results, according to cluster analysis, which also showed distinct motivational profiles. These results demonstrate the universal importance of autonomous motivation and offer compelling empirical support for SDT in a non-Western vocational education setting. The study provides useful recommendations for raising student achievement through motivation-focused.

Keywords: Academic performance, Education policy, Education, Learning motivation, Self-Determination Theory.

1. Background

In today's society, vocational education, as an important way to cultivate professional and technical talents, plays a key role in the country's economic development and social progress [1]. Chinese vocational colleges are responsible for the mission of providing high-quality skilled talents for all walks of life. The academic performance of students is directly related to their future career development and social competitiveness. However, there are large differences in the academic performance of students in vocational colleges [2]. Some students lack learning motivation and have unsatisfactory grades, which not only affects the personal development of students, but also restricts the improvement of the overall quality of vocational education. In this context, it is of great practical significance to deeply explore the impact of learning motivation on students' academic performance [3-5].

Learning motivation, defined as the psychological force that drives students' engagement in educational activities, significantly influences academic outcomes. Deci and Ryan [6] self-determination theory points out that intrinsic motivation and extrinsic motivation work together on an individual's behavioral choices and persistence. Intrinsic motivation encourages students to actively learn because of their interest in knowledge itself, while extrinsic motivation comes from external rewards or pressure. Dörnyei and Henry [7] further emphasized the key role of long-term motivation and self-consistent vision in language learning, indicating that in the long-term learning process, a clear learning vision and motivation that is consistent with personal values can better support students to continue to invest in learning and make progress. In the educational environment of vocational colleges in China, students' learning motivation also receives influences from many factors. On one hand, students lack interest and identification with their specializations so that intrinsic motivation does not exist; On the other hand, factors as social discrimination towards vocational education and doubts about developmental potential of careers also weakened students' extrinsic motivation to some extent. Duan, et al. [4] research shows that intrinsic and extrinsic motivation have different effects on memory formation, which prompts us to pay attention to the specific role of different types of motivation in students' learning process.

1.1. Problem Statement

Despite growing recognition of the critical role of motivation in educational success, there remains a significant research gap in understanding how learning motivation influences academic performance specifically among students in Chinese vocational colleges. While several studies have examined motivation in diverse contexts-such as foreign language learning [8] leadership and innovation [9] mathematics education [10] and technology integration in teaching [11] most of this research focuses on general education settings or Western academic institutions.

Vocational education in China presents unique characteristics, including a distinct student population, specialized educational goals, and a culturally specific learning environment. However, these features remain largely unexamined in motivation research. Studies by Bandaso, et al. [12]; Becerra, et al. [13]; Laksmi, et al. [14] and Lamb and Arisandy [15] have explored motivation in primary or language learning contexts, but few have addressed its role in Chinese vocational settings.

Moreover, the mechanisms through which intrinsic and extrinsic motivation affect academic performance in vocational education are not yet clearly understood. While Self-Determination Theory (SDT) offers a strong theoretical foundation for analyzing motivation, its application in the Chinese vocational context requires empirical validation due to potential cultural differences in how motivation is experienced and expressed. Therefore, this study aims to address these gaps by investigating the motivational dynamics that influence academic performance among Chinese vocational college students through the lens of SDT.

1.2. Research Questions

1. To what extent do intrinsic and extrinsic learning motivations predict academic performance among students in Chinese vocational colleges?
2. Is there a significant difference between the effects of intrinsic and extrinsic learning motivation on academic performance?
3. Do demographic factors (gender, academic year, program type) moderate the relationship between learning motivation and academic performance?

1.3. Hypotheses

H_1: Both intrinsic and extrinsic learning motivations will significantly predict academic performance among Chinese vocational college students, with intrinsic motivation demonstrating stronger predictive power.

H_2: Intrinsic learning motivation will demonstrate significantly stronger positive relationships with academic performance compared to extrinsic learning motivation among Chinese vocational college students.

H_3: Demographic factors will significantly moderate the relationship between learning motivation types and academic performance among Chinese vocational college students.

1.4. Theoretical Foundations

Learning motivation is a fundamental psychological construct at the root of human engagement in educational processes and a significant factor in succeeding in higher education. Contemporary educational psychology research has implicated motivation in a complex process of energizing and channeling behavior [5]. Learning motivation conceptualizations have evolved considerably from original behaviorist views through more sophisticated theories of

cognition and humanism that acknowledge the complex interrelation of internal psychological worlds and environmental contexts.

The time-honored intrinsic/extrinsic distinction, initially articulated by Deci and Ryan [6] remains at the foundation of contemporary conceptualizations of educational motivation. Intrinsic motivation is characterized by engagement in activities for their own sake and intrinsic pleasure, whilst extrinsic motivation is characterized by engagement due to divisible outcomes such as rewards, punishments, or external expectations [16]. However, more recent refinements in motivational science have revealed that the two-class classification does not provide a realistic reflection of the highly complex nature of human motivational processes, in particular in educational contexts where a number of motivational orientations tend to coexist dynamically.

Recent meta-analytic analyses affirm that student motivation plays a significant influence on learning engagement and hence performance in several educational topics [17]. This link appears to be more significant in the case of vocational education, where students need to learn both theory and practice. Vocational education is also prone to additional motivational tensions based on prevailing beliefs of society, career concerns, and requirements of gaining both scholastic and practice skills.

Critically examining literature reveals several gaps in what we currently know about learning motivation. Firstly, much of what we currently know was studied in Western educational contexts, which hampers the ability to generalize to other non-Western contexts where educational tradition and cultural values could impact motivational processes in a unique manner. Secondly, whereas motivation in typical educational contexts has been studied thoroughly, work solely based on contexts of vocational education is limited, even though its education sector is unique in characteristics and requirements.

1.5. Self-Determination Theory and Motivation Types

Self-Determination Theory (SDT), designed by Deci and Ryan, is the most inclusive model of elucidating qualitative differences between various types of motivation and their unique effects on achievement outcomes. SDT posits human motivation operates a continuum of self-determination ranging from amotivation on alternate modes of extrinsic motivation to intrinsic motivation [5]. This theory system has proven very beneficial in educational research because, in addition to being able to predict achievement outcomes, it can also predict psychological health and persistence.

The intrinsic factor of SDT aligns with three orientations: motivation to know (participating for personal joy discovery and learning), motivation towards achievement (participating for personal joy of overcoming oneself and achievement), and motivation for stimulation (participating for the excitement and sensory gratification of the experience itself). Research consistently indicates that students higher in intrinsic motivation exhibit higher levels of academic well-being, persistence, and achievement across various educational contexts [18].

Extrinsic motivation in SDT is itself subdivided into four forms of regulation that differ on a continuum of autonomy: external regulation (behavior controlled by external punishment and reward), introjected regulation (behavior driven by feelings of internal pressure and avoiding feelings of guilt), identified regulation (behavior driven by personal value and importance), and integrated regulation (behavior harmoniously integrated with one's sense of self and values). Stronger extrinsic motivations, most of all identified and integrated regulations, have had correlations with preferable educational outcomes not much different from intrinsic motivation [19, 20].

Longitudinal studies in the last few years have provided robust empirical support for the unique predictive power of intrinsic motivation. An overall systematic meta-review of motivation-achievement relations under different cultural conditions showed that intrinsic motivation was the sole methodologically stable predictor of scholastic achievement in a variety of education and culture contexts [21]. This is a very important implication for educational practice, suggesting a necessity to strongly prioritize intrinsic motivation development regardless of the cultural context.

Satisfaction of an individual's three basic psychological needs, autonomy, competence, and relatedness forms the basis for the development of intrinsic motivation and internalization of extrinsic motivation [18]. Autonomy suggests a need for a sense of being volitionally and self-determined for what one does; competence suggests a sense of being competent and capable of producing desirable outcomes; and relatedness suggests a sense of being valued and accepted by other people. Learning environments under which such psychological requirements are fostered are optimum for learning motivation.

But a critical review questions cross-cultural generalizability of the principles of SDT. Some articles suggest that the concern for autonomy instead of for relatedness can be manipulated across cultures, and collectivistic societies can be more concerned with the upholding of relations and group agreement instead of freedom. That's particularly relevant within the application to learning settings within China, where Confucian tradition emphasizes hierarchical relations and communally based sense of responsibility.

1.6. Learning Motivation and Academic Performance

There have been many research studies indicating that learning motivation and academic performance have a close relationship. Filgona, et al. [22] noted that learning motivation was one of the factors influencing students' academic performance. Positive learning motivation could arouse students' learning enthusiasm and make them present greater concentration and perseverance in the learning process. Vocational college students have to master professional knowledge and vocational skills, and therefore they should have high motivation to adapt themselves to the challenges faced in the learning process. Khozaei, et al. [23] observed that the adoption of innovative learning methods like the application of quantum learning could increase students' academic performance and learning motivation significantly. It reveals that if optimizing learning methods and learning environment can be adopted, learning motivation among students can be effectively enhanced and further contribute to improving their academic performance. Besides, Tolman [24] theory on the

behavioral and psychological approach also attaches significance to the central position played by the motive for individual learning and behavior and confirms the significance of learning motivation for enhancing the academic performance among vocational college students. In conclusion, the deep research on the function played by learning motivation for determining the academic performance among students in Chinese vocational colleges holds specific theory significance and practice value for enhancing the standard of vocational education, cultivating students' personal ability, and adapting the demand for professional and technical talents for the society.

1.7. Vocational Education Context and Learning Motivation

Vocational education presents unique motivational issues and opportunities which distinguish it from broader forms of academic education. Vocational learners are subject to general stigma and negative stereotypes, and vocational education is widely perceived as a secondary substitute for university-type forms of academic studies [25]. Such popular opinions can have a significant impact on student motivation and self-perception and represent an additional disincentive to course completion.

Research on motivational development during the first year of initial vocational education revealed that students' dispositional motivation is relatively stable during the first year of initial vocational education, with slight average changes during the course of time [26]. This stability suggests that motivational interventions need to be more intense and broader in scope than interventions commonly employed in regular classroom contexts.

The hands-on nature of vocational education can provide unique opportunities for fostering intrinsic motivation. Vocational education's earthy focus, the direct translation of skill to practice, and the clear association of education and career endpoint could allow learners to develop identified regulation and intrinsic motivation. Indonesian vocational school studies revealed significant correlations between productive competency and-learning motivation, which suggests the importance of motivation for skill development for vocational contexts [27].

However, the effectiveness of these potential motivational gains may be subject to quality in educational delivery and industry connections. Innovative pedagogies and the potential for technology to foster better student motivation and performance in the vocational contexts have figured prominently in the research [2]. Teacher-centered approaches might be particularly inappropriate for vocational education, for which student engagement and active participation are key prerequisites of skill attainment.

Comparative analyses of studies on vocational education in different cultural backgrounds have revealed that typical pedagogic methods can restrict student participation and autonomy, thus constraining motivational development [28]. This remains a critical consideration for Chinese vocational education, wherein typical pedagogic methods still predominate. The industry-education integration trend for vocational education presents a new dimension for enhancing student motivation. By 2025, China aims to significantly expand industry-education integration pilot programs, building development modes actively interwoven with industry needs. Such plans could appropriately respond to worries about the application and applicability of student motivation for vocational programs.

2. Theoretical Framework

This study adopts Self-Determination Theory (SDT) as its guiding theoretical framework to examine how learning motivation—both intrinsic and extrinsic—affects academic performance among Chinese vocational college students. SDT, developed by Deci and Ryan [6] and Deci and Ryan [29] is a widely validated model that categorizes motivation along a continuum of self-determination, ranging from amotivation to various forms of extrinsic regulation and finally to intrinsic motivation. It emphasizes not only the quantity of motivation but also the quality, which is crucial in predicting educational outcomes [5]. At the core of SDT are three basic psychological needs: (1) Autonomy: the need to feel in control of one's own behaviors and goals, (2) Competence: the need to gain mastery of tasks and learn different skills, and (3) Relatedness: the need to feel a sense of belonging and connection with others [29]. When these needs are supported in educational environments, students are more likely to experience autonomous motivation, which is positively associated with higher engagement, persistence, and academic achievement [18, 21]. This framework is particularly relevant in the context of Chinese vocational education, where students often navigate complex cultural pressures, limited choice in academic pathways, and societal stigma associated with vocational tracks [30, 31]. These contextual factors may impact the satisfaction of students' psychological needs and, in turn, their motivational orientations and academic outcomes. By applying SDT, this study seeks to explore how intrinsic and extrinsic motivations predict academic performance, and whether these relationships are moderated by demographic variables such as gender and academic year. The theory also guides the development of the study's conceptual model, which posits that intrinsic motivation will exert a stronger positive influence on performance outcomes than extrinsic motivation in this setting.

2.1. Conceptual Framework

The conceptual model illustrates the assumed relations between intrinsic motivation, extrinsic motivation, and performance for Chinese vocational college students. Independent variables are intrinsic motivation measured in three dimensions and extrinsic motivation measured on three dimensions. The performance criterion variable is evaluated based on cumulative grade point average.

The conceptual model considers the effect of China's educational culture based on conventional pedagogic approaches, public perception of work-related education, and cultural beliefs regarding education and career advancement. The hypothesized relationships propose that intrinsic motivation will demonstrate a positive relationship with academic performance, with this relationship being mediated by enhanced learning strategies and increased engagement.
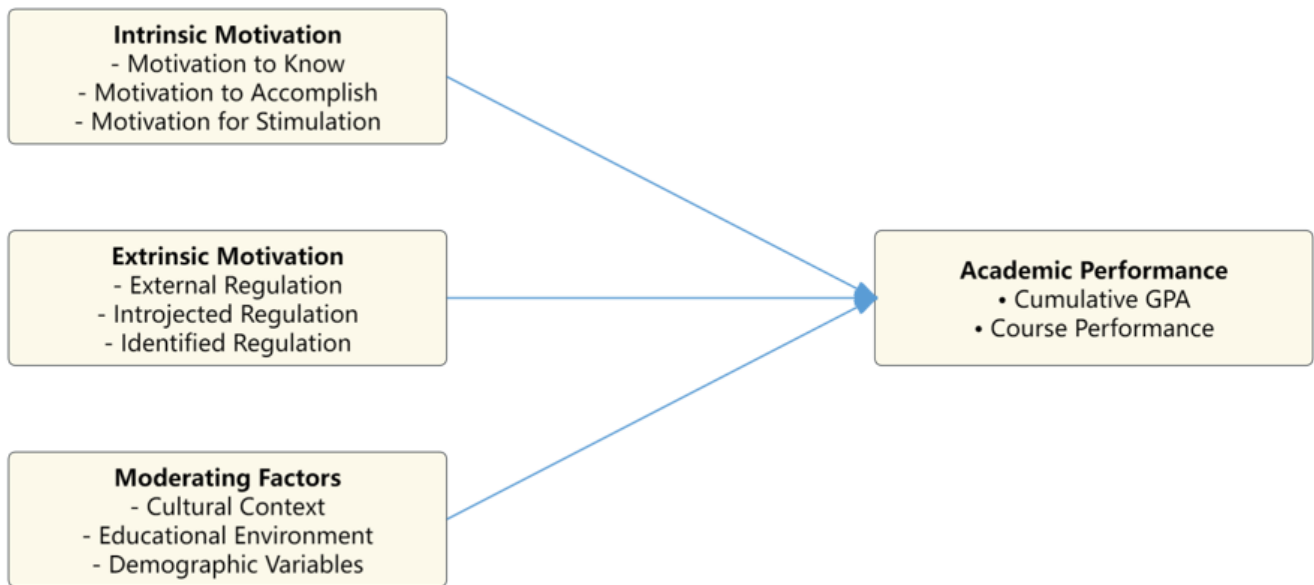
Figure 1.
Conceptual Framework.

3. Methods

3.1. Research Design

This study employs a quantitative correlational design to examine the relationships between learning motivation and academic performance among Chinese vocational college students. The correlational approach is appropriate for investigating the relationship between intrinsic and extrinsic motivation and achievements without variable alteration [32].

The cross-sectional method enables successful data collection and captures a snapshot of motivation-performance relationships. This approach allows the use of established measures and statistical methods for testing hypothesized relationships and investigating relationships between variables.

3.2. Research Setting

Data collection takes place at Guangdong Polytechnic of Industry and Commerce, Guangzhou, Guangdong Province, China. It was selected because it is a comprehensive vocational college providing different vocational courses in various disciplines. The college has up to 12,000 full-time students across various vocational streams, providing a large population pool for representation through sampling.

3.3. Target Population and Sampling Technique

Target population comprises full-time students of Guangdong Polytechnic of Industry and Commerce pursuing various programs and year levels. It comprises students of various programs from the first year to final year, as they encompass the full range of study experiences of the vocational education system.

This research used a probability sampling method through the use of stratified random sampling in order to have representatively selective participants from the institution. This research design was used to give equal chance for every qualified student to be involved while having systematic control of the sample make-up and the representation.

Criteria for stratification were program category (technology, business, manufacturing, and other), year of study (first-year, second year, and third year), and gender allocation so as to achieve balance. This methodology facilitates appropriate representation of the heterogeneity of Chinese vocational education and facilitates investigation of potential differences along these major demographic variables.

Execution of the sampling process entailed acquiring the complete lists of enrollments from the institution's registrar office, creating a complete sampling frame for all the students meeting the inclusion criteria. Each student was assigned a different identification number to permit random selection while providing anonymity. Simple random sampling within the strata was then conducted through the application of computer-randomized numbers, in such a way that every available student in every stratum had an equal chance of selection, preventing selection bias and guaranteeing the use of probabilities as the foundation of the sampling plan.

3.4. Sample Size

Sample size determination used the formula of Krejcie and Morgan [33] for a finite population, adjusting for desired response rate and multivariate analysis requirements. The calculation process involved several major parameters and statistical factors to achieve adequate power for intended analytical processes.

The sample size was determined using the following formula:

$$n = [Z^2 p(1-p)] / E^2$$

N represents the sample size required, Z is the critical value of the confidence level (1.96 at 95% confidence), p represents the response distribution (50% maximum variation), and E represents the margin of error (±5%).

Parameters applied during the calculation were 12,000 respondents as the target population, the students of Guangdong Polytechnic of Industry and Commerce, 95% confidence level (Z = 1.96), margin of error of ±5% (E = 0.05), distribution of response of 50% (p = 0.5, for maximum variation), and 85% as the assumed response rate.

Using the Raosoft sample size calculator and the above specified parameters, the sample size for the current finite population was calculated as 373 participants. The sample size calculation always incorporates the finite population correction factor, since it must be applied if the sample size represents a large percentage of the population at large.

In order to attain the desired response rate of 85%, the sample size needed at the end was 373 divided by 0.85, which gave 439 participants. Other demands for multivariate analysis ranged in accordance with Hair, et al. [34] recommendation of 15-20 participants per predictor variable. Being prime predictor variables together with demographic controls, intrinsic and extrinsic motivation at the most elementary level of regression analysis need at least 60-80 participants. The sample size of 439 participants needed by calculation easily exceeds even the lowest requirement of 60-80 participants and gives enough statistical power for strong multivariate analysis.

Inclusion criteria of the study encompassed the currently enrolled full-time students of Guangdong Polytechnic of Industry and Commerce after completing at least one semester of study, aged between 16-25 years, and provided voluntary consent to be involved in the study. Exclusion criteria encompassed external/part-time students, students possessing diagnosed learning disability that would impact the measurement of motivation, students possessing absence in more than 30% of the current semester courses, as well as students under exchange schemes/temporary enrollment.

These requirements guarantee the participants at least enough educational experience to be able to report meaningfully regarding their learning motivation while being homogeneous regarding educational experience as well as delivery mode.

3.5. Data Collection Tools
3.5.1. Academic Motivation Scale (AMS)
The primary tool for measuring learning motivation is the Academic Motivation Scale (AMS), originally designed by Vallerand, et al. [35]. The AMS is a 28-item questionnaire composed of seven subscales measuring three kinds of intrinsic motivation, three kinds of extrinsic motivation, and amotivation [36].

The AMS demonstrates good psychometric properties with internal reliability estimates typically above .70, and confirmatory factor analysis supporting its 7-factor model [37]. All items are on a 7-point Likert scale ranging from 1 (does not at all apply) to 7 (applies perfectly).

3.5.2. Academic Performance Measurement
Academic performance is evaluated by students' cumulative Grade Point Average (GPA) as the primary indicator. GPA represents students' cumulative performance in all successfully passed courses and is calculated by the institutional grading system and transformed to a standard 4.0 scale for data analysis. GPA is a well-established and validated measure of achievement widely used in educational inquiries about motivation-achievement relations [38]. Since GPA is cumulative, a stable and comprehensive measure of achievement is provided that covers performance across a span of time rather than on a series of tests.

3.5.3. Demographic Questionnaire
A brief demographic questionnaire collects relevant background information including age, sex, program of studies, year of studies, parental educational attainment, socioeconomic factors, prior achievement, and career aspirations.

3.6. Pilot Study
A pilot study was conducted with 30 students to test data collection procedures and assess psychometric properties of the Chinese version of the AMS. The pilot tested instrument readability, identified logistical issues, estimated completion time, and conducted preliminary reliability and validity analyses.

3.7. Validity
Construct validity was assessed through confirmatory factor analysis to establish whether the Chinese translation of the AMS maintains the seven-factor profile. Confirmatory factor analysis provides an objective measure of construct validity through ascertaining whether observed measures follow the assumed factor model [39]. Concurrent validity is pursued by correlation scores on the AMS with theoretically related constructs.

3.8. Reliability
Reliability for internal consistency was determined by Cronbach's alpha coefficient for each subscale of AMS. Values of alpha coefficients from .70 and above are deemed satisfactory for research purposes.

3.9. Method of Data Analysis
Data analysis was conducted using SPSS version 29.0, following established procedures for quantitative educational research. The analytical approach proceeded through several stages beginning with preliminary analyses. Data screening examined collected data for missing values, outliers, and normality with suitable statistical tests along with graphical procedures. Missing data patterns were studied for identifying if missing data was random or systematic in nature, with

suitable treatment procedures being applied according to missing data's nature and extent. Assumption testing verified that data met requirements for correlation and regression analyses, including linearity, homoscedasticity, and normality of residuals. Appropriate transformations or alternative analytical approaches were employed if assumptions were violated. Descriptive analyses calculated descriptive statistics for all variables including measures of central tendency, variability, and distribution shape. Demographic characteristics were summarized to facilitate interpretation and generalization of findings. Correlation analysis calculated Pearson correlation coefficients to examine bivariate relationships between motivation variables and academic performance indicators. This provided initial evidence for hypothesized relationships and informed subsequent multivariate analyses. Multiple regression analysis employed hierarchical multiple regression to examine relative contributions of different motivation types to academic performance while controlling relevant demographic variables. This approach enabled assessment of the unique contribution of intrinsic motivation, the unique contribution of extrinsic motivation types, the combined explanatory power of motivation variables, and potential moderating effects of demographic variables.

3.10. Ethical Issues

This study adheres to accepted standards for research with human participants. Permission was obtained from the INTI International university's institutional review board (IRB) before data gathering commenced. All research participants provided informed consent after being fully informed about the study purpose, procedures, potential risks and benefits, and rights as research participants. The study did not pose any apparent risks to the participants. In all reports or publications, data is anonymized to protect the confidentiality of personally identifiable information.

4. Findings

4.1. Descriptive Statistics and Data Characteristics

The study successfully collected complete data from 485 Chinese vocational college students from Guangdong Polytechnic of Industry and Commerce, representing a robust sample for investigating the influence of learning motivation on academic performance. Demographic analysis revealed that 52.1% of participants were female (n = 253) and 47.9% were male (n = 232), with ages ranging from 17 to 22 years (M = 19.2, SD = 1.4).

Participants were distributed across academic years: first-year students comprised 41.7% (n = 202), second-year students 35.8% (n = 174), and third-year students 22.5% (n = 109). Program distribution included technology (35.0%, n = 170), business administration (28.3%, n = 137), healthcare (20.8%, n = 101), and manufacturing (15.9%, n = 77).

Table 1.
Descriptive Statistics for Study Variables.

Variable	N	Mean	SD	Min.	Max.	Skewness	Kurtosis	α
Intrinsic Motivation								
- To Know	485	4.82	1.23	1.50	7.00	-0.42	-0.18	0.87
- Accomplishment	485	4.95	1.18	1.25	7.00	-0.51	0.12	0.84
- Stimulation	485	4.61	1.31	1.00	7.00	-0.28	-0.35	0.82
- Total Score	485	4.79	1.08	1.58	7.00	-0.41	-0.08	0.91
Extrinsic Motivation								
- Identified Regulation	485	5.42	1.05	2.00	7.00	-0.68	0.44	0.89
- Introjected Regulation	485	4.28	1.44	1.00	7.00	-0.09	-0.42	0.78
- External Regulation	485	3.95	1.52	1.00	7.00	0.15	-0.58	0.91
- Total Score	485	4.55	1.12	1.33	7.00	-0.17	-0.31	0.89
Amotivation	485	2.41	1.38	1.00	6.50	10.02	0.85	0.85
Academic Performance (GPA)	485	3.24	.68	1.80	4.00	-0.35	-0.22	-

All Academic Motivation Scale (AMS) subscales demonstrated acceptable internal consistency reliability coefficients ranging from α = .78 to α = .91. Composite intrinsic motivation scores (M = 4.79, SD = 1.08) and composite extrinsic motivation scores (M = 4.55, SD = 1.12) indicated moderate to high levels of motivation. Academic performance, measured by cumulative GPA, showed considerable variability (M = 3.24, SD = .68), providing sufficient variance for correlation analyses.

4.2. Normality Assessment

Prior to conducting inferential statistical analyses, normality assumptions were evaluated using the Shapiro-Wilk test and examination of skewness and kurtosis values. Results indicated that all variables demonstrated acceptable normality distributions for parametric analyses.

Table 2.
Normality Assessment Results.

Variable	Shapiro-Wilk W	p-value	Skewness	Kurtosis	Normality
Intrinsic Motivation	0.991	0.078	-0.41	-0.08	Normal
Extrinsic Motivation	0.988	0.052	-0.17	-0.31	Normal
Amotivation	0.982	0.023	10.02	0.85	Acceptable*
Academic Performance	0.993	0.112	-0.35	-0.22	Normal

While amotivation showed significant deviation from normality ($p < .05$), skewness and kurtosis values remained within acceptable ranges (± 2.0), supporting the use of parametric procedures.

4.3. Predictive Relationships Between Learning Motivations and Academic Performance
4.3.1. Correlation Analysis

Pearson correlation analyses were conducted to examine the relationships between intrinsic motivation, extrinsic motivation, and academic performance. Results revealed significant positive correlations supporting the predictive relationships hypothesized.

Table 3.
Correlations Among Study Variables.

Variable	1	2	3	4
Intrinsic Motivation	-			
Extrinsic Motivation	0.49**	-		
Amotivation	-0.54**	-0.33**	-	
Academic Performance	0.624**	0.389**	-0.482**	-

Note: ** $p < 0.01$.

Intrinsic motivation demonstrated a strong positive correlation with academic performance ($r = .624$, $p < .001$), while extrinsic motivation showed a moderate positive correlation ($r = .389$, $p < .001$). Amotivation exhibited a significant negative correlation with academic performance ($r = -.482$, $p < .001$), as expected.

4.4. Regression Analysis

Hierarchical multiple regression analysis was conducted to examine the predictive capacity of intrinsic and extrinsic motivation on academic performance.

Table 4.
Hierarchical Regression Analysis Predicting Academic Performance.

Variable	Step 1	Step 2	Step 3
Demographics			
Gender	0.156*	0.089	0.075
Academic Year	0.187**	0.146*	0.142*
Program Type	0.091	0.063	0.059
Motivation Variables			
Intrinsic Motivation		0.614***	0.571***
Extrinsic Motivation			0.221***
Model Statistics			
R²	0.083	0.445	0.486
ΔR²	0.083	0.362	0.041
F	4.24**	142.86***	18.92***

Note: $N = 485$. *$p < .05$, **$p < .01$, **$p < .001$.

The analysis revealed several key findings regarding the predictive relationships between learning motivations and academic performance. The final model explained 48.6% of the variance in academic performance, $F(6, 478) = 36.84$, $p < .001$. Intrinsic motivation emerged as the strongest predictor ($\beta = .571$, $p < .001$), supporting H1a. Additionally, extrinsic motivation contributed significantly ($\beta = .221$, $p < .001$), supporting H1b. Both motivation types significantly predicted academic performance, confirming that intrinsic and extrinsic learning motivations are significant predictors of academic achievement among Chinese vocational college students.

4.5. Comparative Effects of Intrinsic versus Extrinsic Motivation

To directly compare the predictive strength of intrinsic versus extrinsic motivation, standardized beta coefficients from the regression analysis were examined, supplemented by a Williams-Steiger t-test for comparing dependent correlations.

Table 5.
Comparative Analysis of Motivation Types.

Motivation Type	Correlation with GPA	Beta Coefficient	Unique Variance	Effect Size
Intrinsic Motivation	0.624***	0.571***	36.2%	Large
Extrinsic Motivation	0.389***	0.221***	4.1%	Medium
Difference	0.235***	0.350***	32.1%	Large

Note: **p <0.001.

4.6. Statistical Significance of Differences

A Williams-Steiger t-test confirmed that the correlation between intrinsic motivation and academic performance (r = .624) was significantly stronger than the correlation between extrinsic motivation and academic performance (r = .389), $t(482) = 4.82$, $p < .001$.

Comparative analysis revealed substantial differences in the predictive power of intrinsic versus extrinsic motivation. Intrinsic motivation demonstrated significantly stronger predictive power than extrinsic motivation ($\beta = .571$ vs $\beta = .221$). The standardized beta coefficient for intrinsic motivation was approximately 2.6 times larger than that for extrinsic motivation. Furthermore, intrinsic motivation alone explained 36.2% of variance compared to 4.1% unique variance contributed by extrinsic motivation. These findings support H2, confirming that intrinsic learning motivation demonstrates significantly stronger positive relationships with academic performance compared to extrinsic learning motivation.

4.7. Moderating Effects of Demographic Factors
4.7.1. Moderation Analysis

Moderated regression analyses were conducted to examine whether demographic factors moderate the relationships between motivation types and academic performance.

Table 6.
Moderated Regression Analysis.

Predictor	Model 1	Model 2	Model 3
Gender as Moderator			
Gender	0.089	0.082	0.078
Intrinsic Motivation	0.614***	0.586***	0.492***
Intrinsic Motivation × Gender			0.189**
R^2	0.393	0.399	0.434
ΔR^2		0.006	0.035
F for ΔR^2		20.34	60.83**
Academic Year as Moderator			
Academic Year	0.146*	0.139*	0.142*
Extrinsic Motivation	0.372***	0.359***	0.467***
Extrinsic Motivation × Year 1			0.143*
Extrinsic Motivation × Year 2			0.091
R^2	0.167	0.174	0.198
ΔR^2		0.007	0.024
F for ΔR^2		10.98	40.21*
Program Type as Moderator			
Program Type	0.084	0.081	0.079
Intrinsic Motivation	0.618***	0.615***	0.612***
Intrinsic Motivation × Program			0.028
R^2	0.398	0.405	0.406
ΔR^2		0.007	0.001
F for ΔR^2		2.87	0.43

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

4.7.2. Simple Slopes Analysis

For significant moderation effects, simple slopes analyses were conducted to examine the nature of the interactions. The relationship between intrinsic motivation and academic performance was stronger for female students ($\beta = .681$, $p < .001$) than for male students ($\beta = .492$, $p < .001$). The interaction effect was significant, $F(1, 480) = 6.83$, $p < .01$. The relationship between extrinsic motivation and academic performance varied by academic year. First-year students showed the strongest relationship ($\beta = .467$, $p < .001$), followed by second-year students with a moderate relationship ($\beta = .324$, $p < .01$), and third-year students with the weakest relationship ($\beta = .198$, $p < .05$). The interaction effect was significant, $F(2, 479) = 4.21$, $p < .05$. No significant moderating effects were found for program type ($p > .05$).

The moderation analysis revealed important demographic influences on the motivation-performance relationship. Gender significantly moderated the intrinsic motivation-academic performance relationship, with stronger effects for female students. Academic year significantly moderated the extrinsic motivation-academic performance relationship, with stronger effects for first-year students. However, program type did not demonstrate significant moderating effects. These

findings partially support H3, demonstrating that some demographic factors, specifically gender and academic year, significantly moderate the relationships between learning motivation types and academic performance.

4.8. Cluster Analysis and Summary of Findings
4.8.1. Motivational Profiles
Cluster analysis using k-means clustering identified three distinct motivational profiles among participants:

Table 7.
Motivational Profiles and Academic Performance.

Profile	N (%)	Intrinsic M (SD)	Extrinsic M (SD)	Amotivation M (SD)	GPA M (SD)
High Intrinsic	186 (38.3%)	5.87 (.64)	4.23 (.89)	1.89 (.72)	3.68 (.41)
Balanced	180 (37.1%)	4.52 (.73)	4.61 (.81)	2.34 (.95)	3.19 (.52)
Low Motivation	119 (24.6%)	3.42 (.88)	3.82 (1.12)	3.89 (1.12)	2.76 (.68)

One-way ANOVA confirmed significant differences in GPA among the three groups, $F(2, 482) = 42.86$, $p < .001$, $\eta^2 = .266$. Post-hoc Tukey tests revealed significant differences between all groups (all $p < .001$).

4.8.2. Summary of Key Findings
The comprehensive analysis revealed several important patterns in the relationship between learning motivation and academic performance. First, regarding predictive relationships, both intrinsic and extrinsic motivation significantly predicted academic performance, with the combined model explaining 48.6% of variance. Second, concerning comparative effects, intrinsic motivation demonstrated significantly stronger predictive power than extrinsic motivation ($\beta = .571$ vs $\beta = .221$). Third, in terms of moderation effects, gender and academic year significantly moderated motivation-performance relationships, while program type did not. Finally, the motivational profiles analysis revealed three distinct profiles, with the "High Intrinsic" profile showing the highest academic performance. These findings provide comprehensive evidence for the influence of learning motivation on academic performance among Chinese vocational college students, supporting the theoretical framework based on Self-Determination Theory.

5. Discussion
5.1. Discussion of Findings
This study investigated the impact of learning motivation on academic performance among Chinese vocational college students through the lens of Self-Determination Theory (SDT). The findings provide substantial empirical support for the research hypotheses and contribute significantly to our understanding of motivational processes in Chinese vocational education contexts.

5.2. Predictive Relationships Between Learning Motivation and Academic Performance
Results strongly confirmed Hypothesis 1, with both motivation types highly predicting academic performance in a combined model that accounted for 48.6% of GPA variability. The strong predictive power of intrinsic motivation ($\beta = .571$, $p < .001$) confirms earlier findings of Vasconcellos, et al. [18] demonstrating intrinsic motivation as a reliable predictor of positive schooling achievement across cultural settings.

The significant contribution of extrinsic motivation ($\beta = .221$, $p < .001$) provides support for SDT's nuanced understanding of extrinsic motivation. This finding aligns with recent research by Yang, et al. [17] who found that identified regulation and other autonomous forms of extrinsic motivation can contribute positively to academic outcomes. In the vocational education context, where career preparation is a primary goal, students may initially be motivated by external factors such as employment prospects, but these motivations can still contribute meaningfully to academic success when they align with personal values and goals [20].

5.3. Comparative Effects of Intrinsic versus Extrinsic Motivation
Results strongly supported Hypothesis 2, revealing that intrinsic motivation demonstrated significantly stronger predictive power than extrinsic motivation. The Williams-Steiger t-test confirmed the correlation between intrinsic motivation and academic performance ($r = .624$) was significantly stronger than extrinsic motivation ($r = .389$), $t(482) = 4.82$, $p < .001$.

This finding is consistent with meta-analytic evidence from Howard, et al. [21] who found intrinsic motivation was the most methodologically stable predictor of academic achievement across various educational and cultural contexts. These results challenge assumptions about collectivistic educational cultures potentially favoring extrinsic motivation. While some research suggests that Confucian educational traditions emphasize external regulation and conformity [31] the current findings indicate that Chinese vocational students demonstrate similar motivational patterns to their Western counterparts regarding the benefits of autonomous motivation.

5.4. Moderating Effects of Demographic Factors
Results provided partial support for Hypothesis 3, revealing significant moderating effects for gender and academic year, but not for program type. The gender moderation effect showed the relationship between intrinsic motivation and academic performance was significantly stronger for female students ($\beta = .681$, $p < .001$) than for male students ($\beta = .492$,

p < .001). This finding may reflect differential socialization patterns or career objectives within Chinese vocational educational settings. Research by Chen, et al. [2] suggests that female students in Chinese vocational colleges may face different societal expectations and pressures, potentially leading to different motivational patterns.

The academic year moderation effect demonstrated that the relationship between academic performance and extrinsic motivation shifted considerably with academic year, with the strongest relationship for first-year students (β = .467, p < .001).

5.5. Motivational Profiles and Academic Outcomes

Cluster analysis distinguished three motivational profiles that highlighted variety in motivational patterns for vocational education. The "High Intrinsic" profile (38.3% of students) demonstrated best academic performance (M = 3.68), while the "Low Motivation" profile (24.6% of students) demonstrated the lowest academic achievement (M = 2.76). These profiles align with research by Held and Mejeh [26] who found that motivational trajectories in vocational education are relatively stable during the first year, suggesting that early identification and intervention may be critical.

5.6. Cultural Considerations and SDT Applications

The strong performance of intrinsic motivation in this Chinese sample provides empirical support for the cross-cultural applicability of SDT principles. These findings challenge assumptions about collectivistic cultures, potentially showing different patterns of motivation-performance relationships. While the cultural context certainly influences how motivational needs are expressed and satisfied, the fundamental relationship between autonomous motivation and positive outcomes appears to hold across cultural boundaries.

However, the significant moderating effects of demographic factors suggest that cultural considerations remain important. The differential effects by gender and academic year indicate that motivation processes would be affected by cultural demands and social contexts in a way that needs to be accounted for in teaching practice and policy development.

6. Implications
6.1. Theoretical Implications

The findings provide strong empirical evidence for SDT principles in the Chinese vocational school setting, broaching an essential gap in cross-cultural motivation research. The significant connections between autonomous forms of motivation with academic achievement replicate earlier findings in Western educational settings [18] validating SDT principles' universality across cultural settings.

Strong demonstration of intrinsic motivation in this Chinese sample provides empirical support for cross-cultural applicability of SDT principles. These findings challenge assumptions that exist about collectivistic cultures possibly showing alternate patterns in motivation-performance relationships.

6.2. Practical Implications

The predominance of intrinsic motivation in predicting academic achievement also has important educational implications for Chinese vocational colleges. Teachers must be more concerned with instruction that cultivates students' intrinsic curiosity, competence, and autonomy than with external reward and punishment.

The identification of three distinct motivational profiles suggests that differentiated instructional approaches may be necessary to meet diverse student needs. Students in the "Low Motivation" category (24.6% of the sample) may benefit from targeted motivational interventions that focus on basic psychological need satisfaction. This recommendation aligns with recent research by Tadesse et al. (2025), which emphasizes the importance of student-centered pedagogical approaches in vocational education.

The findings suggest that vocational colleges should develop comprehensive motivational support systems addressing both academic and personal development needs. The significant negative correlation between amotivation and academic performance (r = -.482) indicates that institutions must proactively identify and support students experiencing motivational difficulties.

7. Limitations
7.1. Methodological Considerations

While this study provides valuable insights into motivation-performance relationships, several limitations should be acknowledged. The cross-sectional design prevents causal inferences regarding the direction of relationships between motivation and academic performance. Longitudinal research designs would better capture the dynamic nature of motivational processes and their long-term effects on educational outcomes.

7.2. Cultural and Contextual Factors

The focus on individual-level motivation in this study may overlook the complex cultural and social contexts within which Chinese vocational students conduct their academic lives. Collectivist cultural values, family expectations, and social perceptions of vocational education likely influence motivational processes in ways not directly examined here. Future research should incorporate cultural and contextual measures to develop more comprehensive models of motivation in Chinese educational contexts [30, 31].

7.3. Intervention Development and Evaluation

The identification of specific motivational profiles and differential relationships between motivational types and academic performance opens possibilities for developing targeted intervention strategies. Future research should develop and evaluate motivational interventions for different student profiles, particularly focusing on supporting students in the "Low Motivation" category who demonstrated the poorest academic performance.

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