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Types and Influencing Factors of University Students' Learning Engagement: A Latent Profile Analysis

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Abstract: ***This study explores the heterogeneous learning engagement among college students, identifies its types and analyzes influencing factors. A total of 995 students from six universities in Shaanxi Province were surveyed using relevant scales. Latent profile analysis via Mplus8.3 revealed three engagement types: maintenance-oriented, target-oriented and exploration-oriented. Hierarchical regression analysis in SPSS26.0 showed future work self-clarity and career exploration significantly predict learning engagement, with the model explaining 33.1% of variance. The findings offer insights for universities to optimize talent cultivation strategies and highlight the synergy between academic and career development.***

Keywords: Learning engagement, Future work self, Career exploration, Latent profile analysis, University students.

1. Introduction

With the popularization of higher education and the rising number of university students, the Ministry of Education emphasizes enhancing learning engagement to meet the talent development needs of the new era. Learning engagement relates to students' learning status and career development and has attracted widespread attention [1]. Scholars have explored learning engagement from multiple perspectives, finding that it encompasses behavioral, cognitive, and emotional dimensions and is influenced by both internal and external factors [2]. However, existing research is mostly variable-centered and lacks an individual-centered perspective. This study uses Latent Profile Analysis (LPA) to identify typical types of learning engagement among Chinese university students, reveal group differences, and provide a basis for precise educational interventions in higher education institutions.

2. Participants and Methodology

2.1 Participants

From April to July 2023, a cluster sampling method was employed to select university students from six higher education institutions in Shaanxi Province as survey participants. A total of 995 valid questionnaires were collected, yielding a questionnaire recovery rate of 35.75%. The participants, aged between 18 and 25 years, comprised 187 males (18.88%) and 808 females (81.12%). The distribution by academic year was as follows: 389 freshmen (39.06%), 213 sophomores (21.39%), 182 juniors (18.27%), 104 seniors (10.44%), and 52 fifth-year students (5.22%). In terms of disciplinary majors, 344 students were enrolled in Education (34.54%), 375 in Medical Sciences (37.65%), and 277 in other fields including Science, Management, and Engineering (27.81%).

2.2 Measurement Instruments

2.2.1 Demographic Questionnaire

A self-designed questionnaire was utilized to collect demographic information, including academic year, gender, major, and major selection process.

2.2.2 Future Work Self Salience Scale (FWSS)

The Future Work Self Salience Scale, revised by Guan in 2014 to align with the Chinese cultural context and population characteristics, was administered [3]. This unidimensional scale employs a 7-point Likert scoring system, ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Higher scores indicate greater clarity in an individual's cognitive schema regarding their future work. In this study, the scale demonstrated a Cronbach's α coefficient of 0.883.

2.2.3 Career Exploration Scale (CES)

The Career Exploration Scale, originally developed by Stumpf et al. and subsequently revised by Wendao Li in 2007 for the Chinese context, was used [5]. It employs a 5-point Likert'scale, ranging from 1 ("almost never") to 5 ("very often"). Higher scores reflect a greater proactiveness in exploring career-related information. The scale's Cronbach's α coefficient was 0.919 in the present study.

2.2.4 Learning Engagement Scale

The Utrecht Work Engagement Scale–Student (UWES–S), originally developed by Schaufeli and later revised by Xiying Li in 2010 for the Chinese cultural context, was adopted [6]. This 17-item scale comprises three dimensions: Motivation (6 items), Vigor (6 items), and Absorption (5 items). Responses are recorded on a 7-point Likert'scale, from 1 ("never") to 7 ("always"), with higher scores indicating a greater degree of learning engagement. The scale exhibited a Cronbach's αcoefficient of 0.960 in this study.

2.3 Statistical Methods

Latent Profile Analysis (LPA) was further conducted on the data using Mplus 8.3. Using future work self-salience and career exploration as manifest indicators, models comprising 1 to 4 latent classes were estimated and fitted. The model fit and classification effectiveness for learning engagement profiles were evaluated comprehensively using indices including the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), sample-size adjusted BIC (aBIC), Entropy, the Lo-Mendell-Rubin Likelihood Ratio Test (LMR-LRT), and the Bootstrap Likelihood Ratio Test (BLRT). Lower values for the information criteria (AIC, BIC, aBIC) indicate better model fit [9]. An Entropy value greater than 0.80, and closer to 1, signifies higher classification accuracy. Significant p-values for the LMR-LRT and BLRT suggest that the model with k classes provides a better fit than a model with k-1 classes.

3. Results

3.1 Common Method Bias Test

Common method bias was assessed for the collected data. Utilizing Harman's single-factor test, all items measuring future work self-salience, career exploration, learning engagement, career calling, and career adaptability were subjected to exploratory factor analysis. The analysis extracted four factors with eigenvalues greater than 1. The first common factor accounted for 33.32% of the variance, which is below the 40% threshold, indicating the absence of severe common method bias in this study.

3.2 Descriptive Statistics and Correlation Analysis

Pearson correlation analysis was employed to examine the relationships between the key variables. The detailed results are presented in Table 1. The findings revealed significant positive correlations among future work self-salience, career exploration, learning engagement, and its constituent dimensions.

3.3 Latent Profile Identification

A latent variable model was established using the three dimensions of learning engagement as manifest indicators. Models containing 1 to 4 latent classes were fitted and analyzed. As the number of classes progressively increased, the values of AIC, BIC, and aBIC consistently decreased, and the entropy values for the 4-class solution all exceeded 0.8. When a 2-class model was retained, the AIC, BIC, and aBIC values were relatively high, and the entropy was comparatively lower. The 3-class model demonstrated the highest entropy value, relatively lower information criteria, and the Lo-Mendell-Rubin Likelihood Ratio Test (LMR-LRT) reached statistical significance ($p < 0.001$). For the 4-class model, the information criteria were relatively low; however, the significance level of the LMR-LRT was not as strong ($0.001 < p < 0.05$). Consequently, after comprehensively considering the model fit indices and the practical interpretability of the classifications, the 3-class model (C1, C2, C3) was ultimately determined to be the optimal solution. The analysis results are presented in Table 2.

Table 1: The detailed results of Pearson correlation analysis

Items	$\bar{x}\pm s$	1	2	3	4	5	6
1.Future Work Self	18.92±4.64	1.000					
2.Learning Engagement	74.90±16.67	0.503b	1.000				
3.Career Exploration	43.10±8.27	0.373b	0.433b	1.000			
4.Motivation	28.61±6.03	0.491b	0.931b	0.406b	1.000		
5.Energy	24.79±6.45	0.485b	0.956b	0.407b	0.815b	1.000	
6.Focus	21.50±5.15	0.444b	0.949b	0.415b	0.822b	0.886b	1.000

Note: aP < 0.05, bP < 0.01; the same applies hereinafter.

Table 2: The analysis results of latent variable model

Type	AIC	BIC	aBIC	Entropy	BLRT(P)	MLR-LRT(P)	Grouping Ratio
1	8701.783	8731.206	8712.149	—	—	—	1
2	7488.989	7538.026	7506.266	0.879	<0.001	<0.001	0.764/0.236
3	6815.165	6883.817	6839.353	0.888	<0.001	<0.001	0.671/0.145/0.185
4	6384.436	6472.704	6415.535	0.881	<0.05	<0.05	0.122/0.088/0.563/0.226

Based on the above analysis, the average probabilities of participants being classified into the three latent categories were calculated, and the results are presented in Table 3. For each individual, the probability of being assigned to the corresponding group was above 0.9, while the probability of being assigned to other groups was below 0.1, indicating that the grouping was relatively accurate.

Table 3: The results of average probability of three potential categories

Type	Type Number of individuals	Proportion of Types	Belonging Probability		
			C1	C2	C3
Class1	667	67.1	0.956	0.026	0.019
Class2	144	14.5	0.084	0.916	<0.001
Class3	184	18.5	0.045	<0.001	0.955

3.4 Characteristics and Designation of Latent Profiles of Learning Engagement

The characteristic patterns of the three identified latent profiles of university students' learning engagement are illustrated in Figure 1. The profiles were designated based on their distinct dimensional score profiles. The results indicated that Profile C1 comprised 67.1% (n = 667) of the students. This profile demonstrated moderate scores across all dimensions, with relatively similar scores between them, suggesting a systematic pattern. Notably, the motivation dimension score was significantly higher than those for vigor and absorption. This pattern may indicate goal-oriented self-regulation among these students; hence, this group was designated as the Target-Oriented Profile. Profile C2 accounted for 14.5% (n = 144) of the sample. This profile was characterized by low scores across all dimensions, reflecting a baseline level of academic participation. These students likely engage in task-completion oriented learning or are primarily driven by extrinsic factors; consequently, this group was named the Maintenance-Oriented Profile. Profile C3 constituted 18.5% (n = 184) of the participants. It exhibited

high scores across all dimensions, demonstrating a state of deep intrinsic immersion in the learning process. The motivation dimension score was the highest and particularly prominent within this profile. Thus, this group was designated as the Exploration-Oriented Profile.

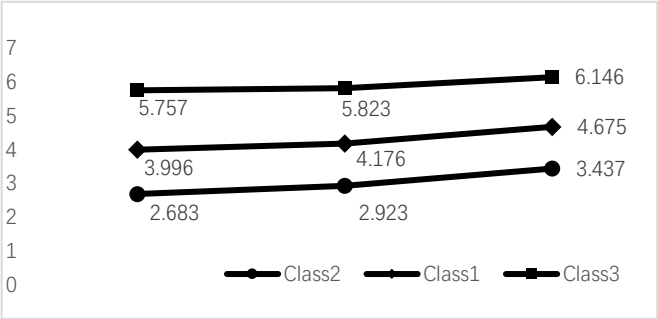

Figure 1: The characteristic patterns of the three identified latent profiles of university students' learning engagement

3.5 Demographic Characteristics across Latent Profiles of University Students' Learning Engagement

Table 4: The results of Chi-square tests

Variable	Target-Oriented (n=667)	Maintenance-Oriented (n=144)	Exploration-Oriented (n=184)	x^2	P
Gender				7.100	<0.05
man	121	20	46		
female	546	124	138		
Grade				24.104	<0.05
First-year	273	65	51		
Sophomore year	135	27	51		
Junior year	125	26	31		
....	....	....	....		
singleton				7.606	<0.05
Yes	174	40	67		
no	493	104	117		
Place				0.268	0.875
Rural areas	270	55	73		
Urban areas	397	89	111		
specialty				52.056	<0.001
Education	245	51	48		
Medicine	263	49	62		
....	....	....	....		
Major Selection				6.803	0.339
Self-selection	452	94	117		
Parental Choice	149	31	43		
....	....	....	....		

Chi-square tests were conducted to examine the distribution of learning engagement profiles across various demographic variables, with detailed results presented in Table 4. The findings indicated that gender, academic year, status as an only child, and academic discipline served as significant influencing factors on the distribution of learning engagement types. Analysis based on gender revealed that, compared to their representation in the Maintenance-Oriented profile, male students constituted a significantly higher proportion within both the Target-Oriented and Exploration-Oriented profiles. Concerning academic year, the distribution of learning engagement profiles varied significantly. First-year students showed a higher prevalence in the Maintenance-Oriented profile, whereas fourth-year students demonstrated a relatively higher representation in the Exploration-Oriented profile. Regarding the variable of only-child status, post-hoc analysis indicated that students with siblings were over-represented in the Exploration-Oriented profile. Conversely, only children showed a higher proportional membership in the Maintenance-Oriented profile. Pertaining to academic discipline, the distribution of learning engagement profiles differed significantly among students from different majors, suggesting that students from different disciplines tended to exhibit distinct patterns of learning engagement.

3.6 The Relationship between Latent Profiles of College Students' Learning Engagement and Future Work Self and Career Exploration

Regression analysis was performed using the mean score of the Learning Engagement Scale as the dependent variable, with detailed results presented in Table 5. In the first step, demographic variables that demonstrated statistical significance in the chi-square tests were entered as independent variables. Subsequently, in the second step, career exploration and future work self-salience, which showed statistical significance in the correlation analysis, were incorporated as additional independent variables. The results demonstrated that in the first step of the regression analysis, the demographic variables explained merely 3.6% of the variance in learning engagement ($P < 0.001$). In the second step, following the inclusion of career exploration and future work self-salience, the explanatory power of the model significantly increased to 33.1%. The change in the coefficient of determination (ΔR^2) was 0.295, reaching a highly significant level ($P < 0.001$).

Table 5: The results of Regression analysis

Variable	Regression coefficient	β	t	P
First layer				
Gender	-0.149	-0.059	-1.865	0.062
Grade	0.050	0.083	2.620	<0.01
singleton	-0.257	-0.118	-3.749	<0.001
Major Selection	0.027	0.064	-2.006	<0.05
Second layer				
Career Exploration	0.388	0.273	9.641	<0.001
Future Work Self	0.330	0.390	13.695	<0.001

Note: First layer R2=0.036, adjusted R2=0.032, F=9.189, P<0.001; Second layer R2=0.331, adjustedR2=0.327, F=81.730, P<0.001.

4. Discussion

4.1 Characteristics of LPA Profiles

This study, grounded in a person-centered perspective, utilized Latent Profile Analysis (LPA) to categorize university students into three distinct latent classes based on their score patterns across the motivation, absorption, and vigor dimensions of learning engagement: the Maintenance - Oriented, Target-Oriented, and Exploration-Oriented profiles. The analytical results indicated that the overall learning engagement level of the participating university students was moderate. The study revealed that the Target-Oriented profile constituted the largest proportion within the sample, suggesting that the majority of students exhibited moderate levels of investment across motivation, absorption, and vigor. The proportions of the Maintenance-Oriented and Exploration-Oriented profiles were relatively close, with the latter slightly higher than the former. Individuals in the Maintenance-Oriented profile demonstrated low scores across

all dimensions, reflecting a level of engagement that merely meets basic requirements, with limited additional cognitive and behavioral investment in learning tasks. In contrast, individuals in the Exploration-Oriented profile scored above average on all dimensions, indicating clearer and stronger learning motivation, higher levels of concentration, and more (vigorous energy investment). The observed individual differences in university students' learning engagement and the formation of distinct profiles may be attributed to individual variability, as well as macro- and micro-level influences stemming from factors such as the learning atmosphere, institutional environment, academic major difficulty, and broader socio-temporal context.

4.2 Hierarchical Regression Analysis

The findings of this study indicate that career psychological factors are key predictors of university students' learning engagement. After controlling for the effects of demographic variables and incorporating future work self-salience and career exploration, the model's explanatory power for learning engagement increased substantially. This result strongly suggests that individual differences in university students' learning engagement are not primarily derived from basic demographic backgrounds, but are closely linked to their cognitive and preparatory processes concerning future careers. This provides a novel and highly explanatory perspective for understanding students' academic motivation mechanisms - namely, that career development can drive academic investment, underscoring the robust empirical foundation and necessity for integrating career education with academic development. Furthermore, upon deeper comparison of the two predictor variables, this study found that the predictive effect of future work self on learning engagement was significantly stronger than that of career exploration. This may indicate that, compared to specific exploratory behaviors, a clear, vivid, and positive future professional self-image possesses a more powerful driving force for motivating students' current learning behaviors. According to Markus and Nurius's possible selves theory [11], a positive and attainable future work self can serve as a mental representation of a potential professional self that the individual can achieve, providing not only a goal to strive for but also imbuing current learning activities with a profound sense of meaning and direction. When students can connect their future career aspirations with their present coursework, learning is transformed from a passive task into an essential pathway towards realizing their ideal self. Career exploration behavior itself might primarily constitute a process of information gathering and environmental assessment [12]; its facilitative effect on learning engagement may, to some extent, be more effectively realized through the reinforcement or clarification of the future work self. This suggests that, within the psychological pathway of motivation generation, internal vision may exert a more direct and potent influence than external behavioral exploration. Based on these findings, this study also yields clear implications for educational practice.

4.3 Implications for Education

The empirical results of this study demonstrate that the "Target-Oriented" profile predominates among the current university student population, with its overall level of engagement across dimensions being moderate. This state may stem from an ineffective balance between extrinsic and intrinsic motivation and could be influenced by various external factors. To enhance students' learning engagement, multi-level, differentiated intervention strategies are recommended:

For Maintenance-Oriented profile students, the focus should be on stimulating motivation and building confidence. This involves developing detailed, personalized learning plans with clear goals broken down into actionable steps and timelines. Activate their intrinsic motivation through interest guidance and appropriate goal setting, and provide timely positive feedback and encouragement upon achieving milestones. Concurrently, concerted efforts are needed to cultivate a positive and mutually supportive collective learning atmosphere. For Exploration-Oriented profile students, the key lies in expanding depth and challenging potential. Provide more challenging learning opportunities (e.g., participation in professional projects, academic conferences), guide them to delve into cutting-edge disciplinary issues, encourage independent learning and research, and support involvement in academic competitions and innovation/entrepreneurship activities to broaden their horizons. Particular attention should be paid to their career development aspirations, assisting them in effectively aligning their specialized knowledge and skills with future career directions, thereby enhancing their professional competitiveness and achieving a smooth transition from academia to profession.

In summary, enhancing university students' learning engagement requires the construction of a multi-dimensional, coordinated intervention system. The core lies in implementing precise and differentiated educational strategies tailored to students exhibiting different learning engagement profiles (e.g., Maintenance-Oriented, Exploration-Oriented). While ensuring the effective implementation of educational programs for the majority of students, it is essential to provide ample guidance and support for Maintenance-Oriented students to stabilize their engagement levels, and to create expansive developmental opportunities for Exploration - Oriented students to foster deep learning and holistic development.

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