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The Role of Learning Passion in Student Performance in Probability and Statistics at Thai Nguyen University of Economics and Business Administration

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ABSTRACT
This study aims to identify the factors affecting students' academic performance in the Probability Theory and Statistics course at Thai Nguyen University of Economics and Business Administration. The data used in the study were collected from a survey of 120 students from various majors. The data were processed using SPSS 20.0 software, including scale reliability testing with Cronbach's Alpha, exploratory factor analysis (EFA), and multiple linear regression analysis. The findings indicate that students' learning outcomes in the Probability Theory and Statistics course are influenced by three main factors: "students' learning passion", "lecturers' teaching competence", and "learning conditions". Among them, "students' learning passion" exerts the strongest influence on academic performance in this course.

Keywords: Influencing factors, academic performance, Probability Theory and Statistics, University of Economics and Business Administration

I. INTRODUCTION

Probability Theory and Statistics is a subject taught by the Mathematics Department at Thai Nguyen University of Economics and Business Administration and other institutions. It equips students with fundamental knowledge and skills in linear algebra and calculus, which serve as a basis for understanding models in probability and statistics. Additionally, the course contributes to the development of students' self-direction, adaptability to different work environments, lifelong learning, and the ability to draw conclusions, plan, coordinate, and enhance professional practice on a medium scale.

In recent years, the university has continuously improved its curriculum, enhanced faculty qualifications, innovated teaching methods, and upgraded facilities. To further improve learning quality—especially from students' perspectives—the university has collected data from teaching evaluation forms. However, such data are often general and do not delve into the specific factors influencing learning outcomes. Thus, the authors conducted this study to scientifically support the Mathematics Department and the university in enhancing teaching quality in alignment with training objectives.

II. RESEARCH METHODOLOGY

The research was conducted in two steps:

- Step 1: Qualitative research to develop and refine the system of concepts/scales and observational variables to fit real-world conditions.
- Step 2: Quantitative research using Cronbach's Alpha to test scale reliability, Exploratory Factor Analysis (EFA) to identify and confirm influential factors, and multiple linear regression analysis to determine the level of impact of each factor on academic performance in the Probability Theory and Statistics course.

The theoretical model consists of three groups of factors:

- Lecturer competence: Measured by four observed variables.
- Facilities: Measured by two observed variables.
- Student characteristics: Measured by six observed variables.

A 5-point Likert scale was used to measure the observed variables

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Table 1: Variables in the Model

Variable	Description
x_1	Appropriate teaching content
x_2	Suitable teaching methods
x_3	Enthusiastic and dedicated teaching by lecturers
x_4	Appropriate testing and examination methods
x_5	Availability of learning materials
x_6	Availability of school facilities and equipment
x_7	Students' interest in the TKT course
x_8	Students' self-awareness in learning the TKT course
x_9	Students' learning methods
x_{10}	Students' expenses for the TKT course
x_{11}	Pressure from various sources on students
x_{12}	Students' choice of major

From that basis, the learning outcome model for the TKT course of students at the University of Economics and Business Administration is established as follows:

Learning outcome (Y) = f(Y_1, Y_2, Y_3)

Where: Y is the dependent variable and Y_1, Y_2, Y_3 are the independent variables

III. RESULTS AND DISCUSSION

The research employed primary data collected via direct surveys of 120 randomly selected students who had taken the Probability Theory and Statistics course. The data were analyzed using SPSS 20.0.

- Cronbach's Alpha test showed a value of 0.798, indicating good reliability. However, three variables were excluded due to low item-total correlation (< 0.3): students' course fee burden, external pressures, and students' choice of major.
- Exploratory Factor Analysis (EFA) was performed on the remaining 9 variables, yielding the following:

+ Factor loadings > 0.5
+ KMO = 0.773 (satisfactory)
+ Bartlett's test: Sig. < 0.05
+ Cumulative variance explained = 69.452%

Table 2: Rotated Component Matrix

	Yếu tố		
	1	2	3
x_8	,872		
x_7	,773		
x_9	,785		
x_2		,853	
x_1		,832	
x_3		,675	
x_5			,819
x_6			,770
x_4			,545

Source: Results of exploratory factor analysis from survey data

According to the rotated component matrix, all factor loadings of the variables in Table 2 are greater than 0.5. Three factors were extracted:

- **Factor 1** includes the observed variables x_8, x_7, x_9, and is labeled **"Students' Learning Passion."**
- **Factor 2** includes the observed variables x_2, x_1, x_3, and is labeled **"Lecturers' Professional Competence."**
- **Factor 3** includes the observed variables x_5, x_6, x_4, and is labeled **"Learning Conditions."**

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Based on the results with high factor score coefficients from the rotated component matrix, the following factor equations are established:

Factor 1, "Students' Learning Passion", is mainly influenced by three observed variables:

- x_8 (Students' self-discipline in learning the TKT course),
- x_7 (Students' interest in the TKT course), and
- x_9 (Students' learning methods).

All these variables have a positive impact on Factor 1, with self-discipline (x_8) being the most influential.

$$\mathbf{F_1 = 0.411x_7 + 0.423x_8 + 0.351x_9}$$

Factor 2, "Lecturers' Professional Competence", is mainly influenced by:

- x_1 (Appropriate teaching content),
- x_2 (Appropriate teaching methods), and
- x_3 (Lecturers' enthusiasm and dedication).

These variables positively contribute to Factor 2, with appropriate teaching methods (x_2) being the strongest contributor.

$$\mathbf{F_2 = 0.422x_1 + 0.432x_2 + 0.268x_3}$$

Factor 3, "Learning Conditions", is primarily affected by:

- x_4 (Appropriate forms of testing and assessment),
- x_5 (Availability of learning materials), and
- x_6 (Availability of school facilities and equipment).

These also contribute positively to Factor 3, with availability of learning materials (x_5) having the greatest influence.

$$\mathbf{F_3 = 0.329x_4 + 0.498x_5 + 0.478x_6}$$

Table 3: Factor Score Coefficient Matrix

	Yếu tố		
	1	2	3
x_1	,073	,422	-,206
x_2	-,049	,432	-,128
x_3	-,082	,268	,182
x_4	-,222	-,198	,329
x_5	-,035	-,097	,498
x_6	-,078	-,150	,478
x_7	,411	-,034	-,121
x_8	,423	-,067	-,100
x_9	,351	-,039	-,030

Source: Results of exploratory factor analysis from survey data

Table 4: Results of Linear Regression Analysis

Tên biến	**Hệ số B**	**Hệ số Beta**	**Sig.**	**VIF**
Hằng số	1,323	-	,000	
F_1	,244	,388	,000	1,369
F_2	,178	,249	,000	1,44
F_3	,294	,384	,000	1,389
Significance coefficient (Sig.) of the model			0,000	
Adjusted R-squared coefficient			0,679	

Source: Results of exploratory factor analysis from survey data

The results of the regression analysis in **Table 4** show that the **adjusted R^2 coefficient is 67.9%**, which means that 67.9% of the variation in learning outcomes is explained by the factors included in the model, while the remaining variation is due to other unexamined factors. The **Sig. F value = 0.00**, which is much smaller than the significance level α = 5%, indicating that the regression model is statistically significant—i.e., the independent variables have an impact on the dependent variable Y.

Moreover, the **Variance Inflation Factor (VIF)** values of the variables in the model are all well below 10, which confirms that

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multicollinearity is not present among the independent variables.

The analysis results also show that all three variables included in the model are statistically significant (**Sig. < 5%**). Based on these findings, the estimated regression equation for the factors affecting students' learning outcomes in the course Probability and Statistics Theory at the University of Economics and Business Administration is as follows: $\mathbf{Y = 1.323 + 0.244F_1 + 0.178F_2 + 0.294F_3}$

According to the regression equation, all three factors are positively correlated with students' learning outcomes. Among them, the factor "Students' Learning Passion" has the strongest influence (standardized Beta coefficient = 0.388), followed by "Lecturers' Professional Competence" (with an unstandardized coefficient of 0.178), and finally "Learning Conditions" (with an unstandardized coefficient of 0.294).

IV. CONCLUSION

The study identifies three major factors influencing students' performance in the Probability Theory and Statistics course in order of importance: students' learning passion, learning conditions, and lecturer competence. These findings provide valuable empirical evidence for improving teaching quality. It is essential to further encourage students' independent learning and curiosity, while also creating a conducive learning environment supported by faculty and the institution.

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