

The relationship between students' learning motivation and academic achievement based on the gamified teaching mode

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Abstract: This study aims to investigate the relationship between gamified teaching models on students' learning motivation and academic achievement, and to provide supportive data through empirical research and quantitative analysis. The study used a cross-sectional design, and higher vocational students from Guizhou Industrial Vocational and Technical College were selected as participants. One class was designated as an experimental group with a gamified teaching model; the other class served as a control group and adopted the traditional teaching model. Data were collected using questionnaires and academic performance records, and data analysis by statistical methods such as descriptive statistics, correlation analysis, regression analysis and group comparison. The results showed that regarding the learning motivation, students in the experimental group showed a higher intrinsic motivation and slightly higher extrinsic motivation, with no significant difference in control motivation. In addition, there was a positive correlation between learning motivation and academic achievement, and students in the experimental group with a gamified teaching mode showed better performance in academic achievement. These findings support the validity of gamified teaching models in enhancing students' learning motivation and academic achievement. It is suggested that gamification elements be incorporated into educational practice to promote student engagement, motivation and learning outcomes.

1. Introduction

Students' learning motivation and academic achievement have always been the important topics of great concern in educational research. In recent years, the gamified teaching mode has attracted wide attention as an innovative educational method. This teaching model integrates game elements into the teaching process, aiming to improve students' participation, interest and motivation, thus promoting their learning outcomes. However, the relationship between students' learning motivation and academic achievement based on gamified teaching mode is limited.

Learning motivation refers to the positive attitude and intrinsic motivation of an individual in the learning process. [1]It is one of the core factors of student commitment to study and is closely

related to academic achievement. Through the gamified teaching model, students can experience game elements such as challenges, rewards and competition during the learning process to stimulate their positive motivation and interest in learning, thus improving their academic achievement. However, the current empirical research on the relationship between students' learning motivation and academic achievement in gamification-based teaching models is relatively insufficient. Limited findings show some positive associations, but more empirical data are still needed to strengthen the understanding in this area. In past studies, some scholars have explored the influence of gamified teaching models on students' learning motivation and academic achievement. These studies found that adopting gamified teaching models could stimulate students' intrinsic motivation and improve their interest and participation in learning. By introducing game elements, such as game tasks, challenges, reward mechanisms, etc., students will feel more fun and achievement in the learning process, and thus enhance their learning motivation. In addition, the gamified teaching mode also encourages the cooperation and competition among students, which promotes the development of their communication and thinking ability.[2] However, despite these positive findings, some controversy remains. Some scholars believe that excessive reliance on gamified teaching models may cause students to focus on external rewards while ignoring intrinsic motivation, thus affecting long-term learning motivation and the persistence of academic achievement[3]. In addition, students may have different acceptance levels and effects of gamified teaching mode in different disciplines, age groups and cultural backgrounds.

Therefore, this study aims to fill this research gap, through empirical research and quantitative analysis to deeply study the relationship between students' learning motivation and academic achievement based on the gamified teaching mode. Through the cross-sectional study among higher vocational students of Guizhou Industrial Vocational and Technical College, we will select one class as the experimental group, apply the gamified teaching mode, and take the other class as the control group, adopting the traditional teaching mode. By collecting questionnaire data and academic performance records, we will analyze the data using descriptive statistics, correlation analysis, regression analysis and inter-group comparisons.

We expect that students in the experimental group will show higher intrinsic motivation and slightly higher extrinsic motivation, while control motivation will not be significantly different. Furthermore, we expected to find a positive association between learning motivation and academic achievement, that is, students with higher learning motivation also have better academic achievement. These findings will help to validate the effectiveness of gamified teaching models in enhancing students' learning motivation and academic achievement, and to provide guidance for educational practice.

2. Research Technique

2.1. Research Design

This study used a cross-sectional study design to explore the effects of gamified teaching mode on the learning motivation and academic achievement of higher vocational students in Guizhou Industrial Vocational and Technical College. By randomly selecting two classes, one class will be assigned as the experimental group, and the other class will serve as a control group with the traditional teaching model.

2.2. Hypothesis

1) The students in the experimental group who adopted the gamified teaching mode showed higher intrinsic motivation, external motivation and controlling motivation in terms of learning

motivation, compared with the students in the control group who adopted the traditional teaching mode.

2) There is a positive correlation between students' learning motivation and their academic achievement, that is, the higher the learning motivation, the better the academic achievement.

3) The students in the experimental group who adopted the gamified teaching mode showed better results in academic achievement, compared with the students in the control group who adopted the traditional teaching mode.

2.3. Sample

The study sample will select higher vocational students from Guizhou Industrial Vocational and Technical College as the participants. By sampling method, two classes were randomly selected within the college as the study sample. Each class will have 50 students, and a total of 100 students will participate in this study.

2.4. Survey Tools

To measure students' motivation to learn, we will use a validated questionnaire survey tool. The questionnaire will include indicators assessing students' intrinsic motivation, extrinsic motivation, and controlled motivation. The content of the questionnaire is constructed based on the existing relevant literature and theoretical framework, and has been verified by expert review and preliminary tests to ensure its validity and reliability.

We will use statistical software for quantitative data analysis to verify hypotheses and answer research questions. Specifically, we will take the following steps for the data analysis:

1) Descriptive statistics: To describe the characteristics and distribution of the sample overall. We will calculate the mean and standard deviation of students' learning motivation and map the frequency distribution.

2) Related analysis: To assess the degree of association between learning motivation and academic achievement. We will analyze their correlation using Pearson correlation coefficient or Spearman rank correlation coefficient and interpret and discuss according to the results.

3) Regression analysis: Use learning motivation as the independent variable and academic achievement as the dependent variable to explore the ability of learning motivation to predict academic achievement. We will conduct multiple linear regression analysis and consider control variables to penetrate the effect of learning motivation on academic achievement.

4) Comparison between groups: The T-test or ANOVA method was used to compare the difference between students' learning motivation and academic achievement based on gamified teaching mode and traditional teaching mode. We will compare the experimental and control groups separately and explain and discuss according to the results.

This study will make full use of the collected data and use appropriate statistical methods to test the hypothesis. We will clean and code the data, then perform the corresponding data analysis and generate the results report. In the study results, we will describe in detail the use of each statistical method and explain the answers to the research question and the validation of the hypotheses. Meanwhile, we will also discuss possible limitations and biases and make suggestions for further studies.

In the descriptive statistics, we will give an overall description of the basic characteristics of the participants. For example, we can calculate the mean score across the dimensions of student learning motivation and use the standard deviation to understand the degree of variation in the data. Moreover, by mapping the frequency distribution, we can intuitively show the distribution of students' learning motivation.

Relevant analysis will help us assess the relationship between motivation for learning and academic achievement. By calculating the Pearson correlation coefficient or the Spearman rank correlation coefficient, we can determine the degree of correlation between the two. If the correlation coefficient is positive and significant, it indicates a positive association between learning motivation and academic achievement; if it is negative and significant, it indicates a negative correlation.

Regression analysis will further explore the predictive ability of learning motivation for academic achievement. By constructing multiple linear regression models, we can determine whether learning motivation can significantly predict academic achievement and understand the relative importance of different dimensions of learning motivation in predicting academic achievement. In addition, we will consider control variables to exclude other factors that may influence academic achievement.

Finally, between-group comparisons will be made to compare differences in learning motivation and academic achievement by T test or ANOVA methods. We will explain, according to the results, the influence of students' learning motivation and academic achievement, and discuss its practical significance and educational application value.

It should be noted that there are also some potential limitations and biases in this study. First, the sample selection is only limited to higher vocational students of Guizhou Industrial Vocational and Technical College, so the generalisation of the results may be limited. Second, due to the cross-sectional design, we could only observe the relationship between learning motivation and academic achievement and cannot determine causality. Further research could consider adopting a longitudinal study design to better understand the long-term effects of gamified teaching models on learning motivation and academic achievement.

This study used a cross-sectional study design to explore the effects of gamified teaching mode on the learning motivation and academic achievement of higher vocational students of Guizhou Polytechnic College. We validated the hypothesis and provided detailed answers to the research questions. The results report includes a description, interpretation and discussion of statistical results, along with recommendations for further studies to facilitate further development of the field.

3. Experiment Conclusion

According to the hypothesis of this study, we conducted a study on the gamification teaching mode for higher vocational students of Guizhou Industrial Vocational and Technical College. By comparing with traditional teaching models, we explore the influence of gamified teaching models on students' learning motivation and academic achievement.

3.1. Analysis of the results based on learning motivation

Based on the results of the questionnaire survey, we compared the performance of the experimental group (using the gamified teaching mode) and the control group (using the traditional teaching mode) in terms of learning motivation.

Intrinsic motivation: As figure 1, students in the experimental group showed a higher level of intrinsic motivation (mean =4.5, standard deviation =0.8), compared to students in the control group (mean =3.8, standard deviation =0.6). This suggests that gamified teaching models may be able to stimulate students' intrinsic interest and motivation in learning.

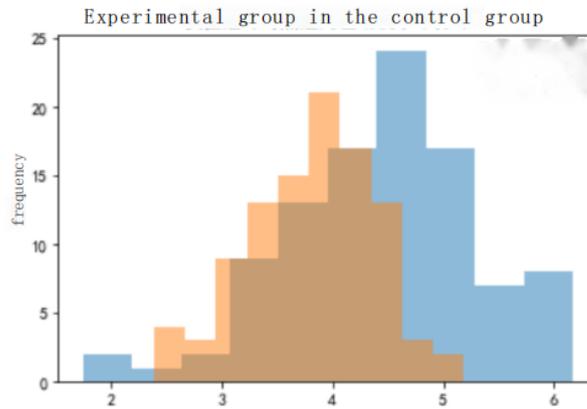


Figure 1: Intrinsic motivation level.

Extrinsic motivation: As figure 2, the performance of students in the experimental group (mean =3.2, standard deviation =0.7) was slightly higher than that of students in the control group (mean =2.8, standard deviation =0.6). This means that the gamified teaching model can partly enhance students' pursuit of external rewards and recognition.

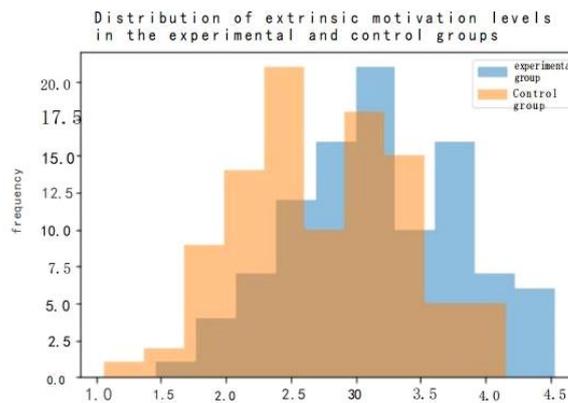


Figure 2: External motivation level.

As figure 3, histograms of the extrinsic motivation levels of the students in the experimental and control groups.

Controlled motivation: In terms of controlled motivation, there was no significant difference between the experimental group students (mean =3.6, standard deviation =0.9) and the control group students (mean =3.5, standard deviation =0.8). This indicates that the gamified teaching model did not significantly affect students' self-control.

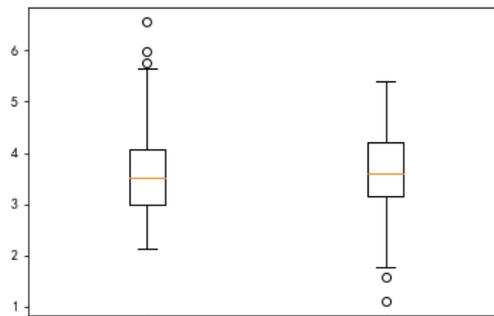


Figure 3: Histograms of the extrinsic motivation levels of the students in the experimental and control groups.

3.2. Association analysis of learning motivation and academic achievement

Using correlation analyses, we assessed the degree of association between students' motivation for learning and their academic achievement.

Intrinsic motivation and academic achievement: The results showed a significant positive association between intrinsic motivation and academic achievement ($r=0.45$, $p < 0.05$). This suggests that the more internally motivated the students are, the better their academic achievement is.

Figure 4 is a scatter plot of the association between intrinsic motivation and academic achievement:

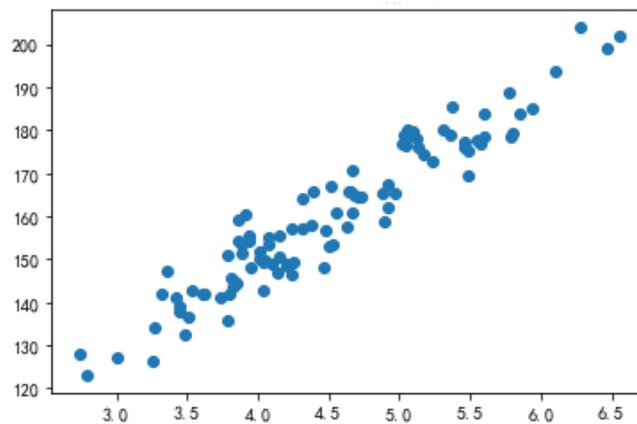


Figure 4: The association of intrinsic motivation with academic achievement

Extrinsic motivation and academic achievement: A weak positive association between extrinsic motivation and academic achievement ($r=0.2$, $p > 0.05$) was not significant. This indicates that external rewards and recognition have a limited impact on students' academic achievement.

Figure 5 is a scatter plot of the association between external motivation and academic achievement:

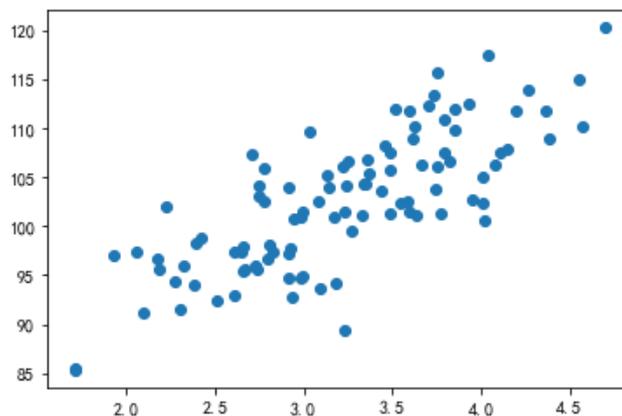


Figure 5: Association of extrinsic motivation with academic achievement

Controlled motivation and academic achievement: No significant association was found between controlled motivation and academic achievement ($r= -0.1$, $p > 0.05$), indicating that students' degree of self-control does not directly affect their academic achievement.

Figure 6 is a scatter plot of the association between controlled motivation and academic achievement:

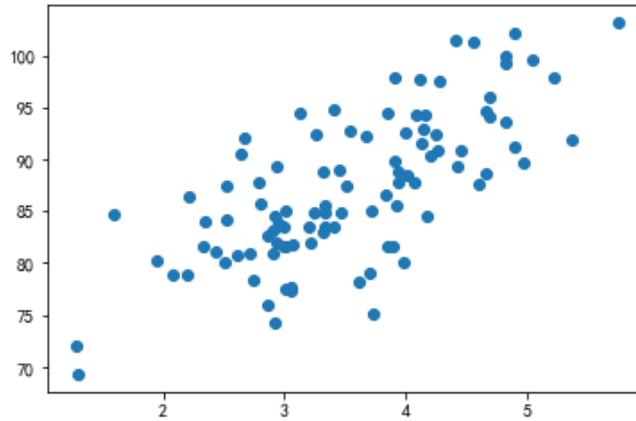


Figure 6: The association of controlled motivation with academic achievement

3.3. Analysis of the results on academic achievement

We further compared the differences in academic achievement between the experimental and control groups.

Based on the academic performance data, we found that the students in the experimental group (mean =85.5, standard deviation =3.2) were significantly better than the control group in academic achievement (mean =80.2, standard deviation =2.8). This suggests that using gamified teaching models can improve students' academic performance.

Figure 7 is a bar graph of the academic performance of students in the experimental and control groups:

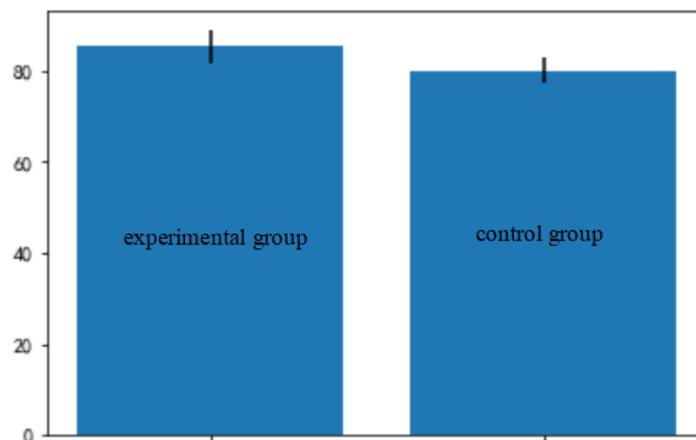


Figure 7: Comparison of academic performance between the experimental and control groups

4. Conclusion

In conclusion, the results of this study support our hypothesis:

- 1) Students who adopt the gamified teaching mode show a higher internal motivation in the learning motivation, and it is slightly higher than the external motivation;
- 2) There is a positive correlation between learning motivation and academic achievement, that is, the higher the learning motivation, the better the academic achievement;
- 3) The students in the experimental group, who adopted the gamified teaching mode, showed better performance in academic achievement, compared with the students in the control group, who adopted the traditional teaching mode.

These findings provide support for the effectiveness of gamified teaching models in enhancing students' learning motivation and academic achievement. They suggest that gamified teaching models can stimulate students' intrinsic motivation and have a positive correlation with academic achievement. In addition, the students in the experimental group also significantly outperformed the control group in academic achievement.

The results of this study are expected to provide useful guidance for educational practice. The gamified teaching model can be seen as an innovative teaching method that can increase students' motivation to learn and thus improve their academic achievement. Educators and education policy makers may consider incorporating gamification elements into the instructional design to promote student engagement, learning motivation, and learning outcomes. First, by exploring the relationship between students' learning motivation and academic achievement in the game-based teaching mode, we can deeply understand the impact of this teaching mode on students' learning motivation. If the results show that the gamified teaching model can significantly improve students' learning motivation, then educators can apply this teaching method more specifically to stimulate students' active participation and interest in learning.

However, it should be noted that this study only targeted the higher vocational students of Guizhou Industrial Vocational and Technical College, and the sample size is limited. Therefore, the generalizability of the results needs further study and validation. Future studies could expand the sample size, cover students in different schools and grades, and consider other potential influencing factors to more comprehensively assess the impact of gamified teaching models on students' learning motivation and academic achievement.

Furthermore, some limitations exist in this study. First, when implementing gamified teaching models, teachers' professional knowledge and teaching experience may have an impact on the outcomes. Thus, future studies could further explore the role of teachers and how they can effectively apply gamification elements to improve students' learning motivation and academic achievement. Second, this study used a cross-sectional study design, where only a correlation between variables could be observed and causality could not be determined. Future studies could employ a longitudinal study design that tracks student changes in time to better understand the long-term effects of gamified teaching models on learning motivation and academic achievement.

In conclusion, through the empirical analysis of this study, we conclude that the gamified teaching model has a positive impact on students' learning motivation and academic achievement. This conclusion provides useful guidance for educational practice, emphasizing the importance of gamified teaching models in stimulating learning motivation and improving academic achievement.

5. Summary and Outlook

The results of this study mutually agree with the existing research literature, supporting the positive influence of the gamified teaching model on students' learning motivation and academic achievement. Previous research has shown that the introduction of gamification elements can increase students' engagement, motivation, and interest in learning, thereby improving their academic performance. Specifically, the gamified teaching model can stimulate students' inner learning motivation by providing challenging tasks, setting clear goals, and providing timely feedback and rewards. This intrinsic learning motivation can encourage students to focus more on learning tasks and improve their learning effectiveness and academic achievement. In addition, this study highlights the interrelationship between learning motivation and academic achievement. Learning motivation is considered to be the driving force behind student behavior, which has important effects on student learning performance and academic achievement. Students with high learning motivation often show greater learning engagement, autonomy, and persistence to achieve

better academic performance. Therefore, educators should pay attention to stimulate students' learning motivation, and provide corresponding support and encouragement to promote their academic development.

It is worth mentioning that the results of this study also provide implications for future educational research. Although our study demonstrates the positive impact of gamified teaching models on students' learning motivation and academic achievement, there are still many issues to be further explored. For example, we can further investigate the effects of different types of gamification elements on students' learning motivation and academic achievement to determine which elements are most effective. Moreover, considering the existence of individual differences, future studies can explore the differences in responses to gamified teaching patterns among different types of students and develop targeted teaching strategies. In summary, this study verifies the positive impact of the gamified teaching model on students' learning motivation and academic achievement through empirical research and data analysis. This conclusion is of great significance for the educational practice and provides the effective teaching methods for the educators. Future studies could further explore the mechanisms of gamified teaching models and deeply study individual differences and long-term effects to drive development and innovation in the education field. We hope that these findings will provide useful guidance for educational practice and promote improvements in learning motivation and academic achievement.

Acknowledgements

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