A Study of Gamified Teaching Activities for Enhancing Motivation in Grade 6 Primary School Students—an Example of Instructional Design Model on a Field Course

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Abstract. In recent years, people have attached increasing importance to primary education. They have realized that primary education not only requires students to passively acquire knowledge but also needs to stimulate their intrinsic learning motivation. Learning motivation has a significant impact on the learning behavior and outcomes of primary school students. Gamified teaching is a type of instructional activity that incorporates the fun of games into the teaching activity, allowing students to learn while enjoying themselves and stimulating their motivation for learning. This study researches the influence of gamified teaching methods on the learning motivation of primary school students. In the experiment, 80 sixth-grade primary school students were collected as samples, and they were taught under gamified teaching method for two months, and Zhou Bucheng’s MAAT scale was distributed to measure their learning motivation. The experiment collected the scores of students’ two math tests and two MAAT scales by pre-test and post-test, and analyzed the changes of scores and learning motivation. The research found that attractive teaching methods and content of course can better stimulate students' interest in learning, promoting them to develop active learning motivations, and lay a foundation for their comprehensive development in the future.

1 Introduction

1.1 Research background

Motivation is one of the most important factors influencing learning behaviour and learning outcomes. Motivation plays a great role in facilitating students' learning abilities. The study of learning motivation has a long history and many theories, including American psychologist Maslow’s hierarchy of needs theory, American psychologist Bandura's self-efficacy theory, and American psychologist Weiner's attribution theory, etc. These theories have been applied to the practice of education and teaching in a large number of ways, and have given rise to an abundant of practical and successful teaching activities. Among them, gamified teaching is a type of teaching activity that closely combines teaching factors and game factors, so that students can naturally learn more in a relaxed and pleasant mood. The use of Gamified teaching is conducive to teaching for fun, stimulating primary school students' interest in learning and enhancing their motivation to learn. At present, there are still a large number of parents responding to the lack of motivation of primary school students, and a large number of gamified teaching on learning motivation of the study is mostly focused on the undergraduate university students', high vocational secondary school students' point of view.

In contrast, less research has been done on primary school children. Therefore, this study will design teaching activities modelled on the Pastoral course which is based on the theory of Gamified teaching, and use questionnaire method for further investigating the enhancement of learning motivation of primary school students by Gamified teaching.

1.2 Literature review

The authors conducted a literature search in the China Knowledge Network (CNKI) database with the theme of "Gamified teaching", and learnt that the number of publications on the theme of Gamified teaching showed a rapid upward trend from 2013 to 2019 and reached a peak of 1,135 in 2019, and then declined between 2019 and 2022, but rebounded after 2022. Overall, the number of domestic publications on Gamified teaching and learning has been on an upward trend in the past ten years, and the academic attention to the topic has increased substantially compared to the past.

Haidong Ding and Yunlong Han believe that Gamified teaching is in line with the characteristics of children's cognitive development. The passive learning style of "receptive learning" is not suitable for children's age, but games allow children to learn actively while playing, which is a suitable learning style for children [1].
Regarding the learning motivation of primary school students, the results of Binghuang Li's research showed that girls scored higher than boys in cognitive drive, ego-enhancement Drive and affiliated Drive; urban primary and secondary school students scored higher than rural students in learning motivation; and parental literacy was positively correlated with their children's learning motivation. The development of willfulness is unstable, decreasing in the third year of primary school and increasing in the fourth and fifth years [2].

The statistical results of Zhang Min, Lei Kaichun and Wang Zhenyong indicate that there are gender differences in the motivation of male and female students to interact for profit, survival and practical motivation. Boys' intensity is higher than girls', which is due to the differences in gender evaluation and treatment of men and women in society, and different gender identity roles. Students in the fourth grade show stronger altruistic motives, and students in the sixth grade are more self-conscious, so self-actualisation motives appear. And external motivation for learning predominates among pupils compared to internal motivation, which is always developing [3].

Plato, the famous scholar of ancient Greece, pioneered children's education, and focused on the all-round development of children. He was the first to put forward the concept of "Gamified teaching" and emphasised the role of games in children's education, believing that the use of games in teaching is in line with children's active nature, and at the same time, correct and appropriate games can shape children's character and morality [4]. Fröbel, the "father of early childhood education", recognised the educational value of games, believing that games were very important to the development of children's personality and intelligence, and that parent-child and group games could help children form their personalities and integrate into the groups. He imitated the characteristics of nature and designed children's toys called "Spielgäbe" to enable young children to learn about nature through games [5]. Waweru W. B., Ng S. Joseph P. and Eaw C. H. developed a gamified learning application, had the respondents use it and conducted surveys and interviews with the respondents. The results showed that the use of gamification could enhance students' intrinsic motivation to learn, but the effectiveness of this enhancement is also limited by the students' own willingness to do so [6]. Nand, K., Baghaei, N., Casey, J., Barmada, B., Mehdi, F., Liang, H. N. A feature-rich version and a feature-poor version of a game were given to primary school children, and the result was that the feature-rich version was better able to engage children's interests and facilitate their learning [7].

Chinese and foreign scholars agreed that Gamified teaching was in line with children’s qualities and was a suitable learning method for children. Gamified teaching can improve students' motivation to a certain extent, and the degree of improvement depends on students' willingness and the richness of games. In China, there are few studies linking Gamified teaching and learning motivation, and fewer studies using video games in teaching, but in foreign countries, there are more studies on the effects of video games on teaching.

1.3 Research topics

Gamified teaching is gradually becoming an important direction in the field of education. In primary school, students' motivation has a key impact on their learning outcomes and future learning development. Therefore, exploring how to enhance the learning motivation of primary school students through the Gamified teaching is of great significance in helping educators to better design and carry out gamified learning activities, stimulating the learning interests of primary school students, enhancing their learning motivation and active participation, improving their learning motivation and academic performance, and making a solid foundation for promoting the all-round development of students.

This study will take Gamified teaching as the theoretical basis, simulate and analyse the impact of gamified teaching activities on primary school students' motivation with the teaching activity model of the Pastoral course. The present study will explore the impact of gamified teaching activities on primary school students' interest in learning, participate in learning and already learning achievement, study the impact of gamified teaching activities on primary school students' attitude towards learning and self-confidence in learning, the impact of gamified teaching activities on the persistence of primary school students' motivation in learning.

2 Research methods

2.1 Research design

2.1.1 Research object

Students in the sixth grade took part in the "Pastoral Course". The authors analyzed students' perceptions of the Pastoral Course through observation and interviews conducted before and after the activity. The study included 80 students, 42 males and 38 females, with 76 being 11 years old and four being 12 years old.

Teachers participated in the "Pastoral Course". With interviewing the teachers who participated in the "Pastoral Course" activity, the research gained a deeper understanding of the activity's development and student cooperation.

The "Pastoral Course" activity was designed based on Ji Haiyan's mathematics pastoral course. During teaching, the teacher utilized the school flower bed to teach area knowledge and let students measure the data of the flower bed themselves to calculate the area. The teacher used nearby farmland to teach about different area units such as hectares, acres, and square meters.

The students highly evaluated the "Pastoral Course" activity, finding it more interesting and more serious were they than sitting in a classroom for math class.
They expressed a desire for more outdoor learning opportunities in the future. Teachers believed that students participating in the "Pastoral Course" activity were more active than usual in class, quickly grasped knowledge, and showed increased enthusiasm for learning.

2.2.2 Selection of research methods

Questionnaires is a method that researchers use controlled measurements to measure variables related to their study topic, so as to collect reliable data. Questionnaire method is detailed, complete and maintaining control over variables. The survey is conducted with a well-designed questionnaire tool and the design requirements of the questionnaire meets standardized requirements.

The research of this paper conducts a lateral investigation from the perspective of educatee-students. As recipients of education, the cognitive and classroom experience of students can objectively reflect the effectiveness of gamified activities in terms of teaching outcomes, changes in learning motivation, and comprehensive skill acquisition. These are essential aspects for researchers to consider before delving into students' motivation.

MAAT learning motivation scale was adopted in this questionnaire. Team members followed up the progress in time, the questionnaire recovery rate was 100%, and subsequent data analysis was carried out to facilitate the smooth progress of the research.

2.2 Description of samples

The attention of primary school students is relatively easy to be distracted and greatly affected by emotional factors, so educators need to design attractive teaching content and methods to maintain their focus, pay attention to their emotional state, and foster a positive and pleasant learning atmosphere. Gamified teaching effectively meets both student and teacher needs while addressing primary school teaching challenges. This study takes the application of "pastoral course" in mathematics teaching in grade 6 of primary school as an example to analyze students' feedback in the form of interviews and questionnaires.

This study is based on the background of M school. M School is a Chinese excellent culture and art inheritance school in primary and secondary schools in China. The school emphasizes integrating cultural knowledge with practical skills to foster the all-round development encompassing morality, intelligence, physical fitness, aesthetics, labor skills while insisting on carrying out subject comprehensive practice course. This school has the educational philosophy of educating people for science, facing the future and facing the world.

The participants involved in this study were students in grade 6 from M School. The consent of the school authorities was obtained before the study began.

2.3 Research process

In order to gain an in-depth understanding of the impact of gamified teaching on primary school students' learning motivation, this study adopts a pre-test and post-test design to compare changes in students' learning motivation before and after receiving gamified teaching by assessing their learning scores prior to and following the intervention.

For the experimental group, this study selected a primary school teacher as a collaborator to jointly design a gamified teaching activity specifically tailored for the "pastoral curriculum" subject, integrating knowledge points with pastoral game elements.

Quantitative data analysis:
The study collected scores from two monthly math tests of similar difficulty before and after the intervention, conducting T-tests for comparison. Additionally, the MAAT learning motivation scale was utilized to investigate students' learning motivation, with paired sample test analysis employed to examine differences in learning motivation.

2.4 Analysis method

Statistical software was used to analyze sample data in order to answer research questions and test hypotheses.

2.4.1 Descriptive statistics:

Initially, descriptive statistics were conducted on basic characteristics of the sample including age distribution and gender ratio, which aids in obtaining an overall understanding of the sample.

<table>
<thead>
<tr>
<th>Name</th>
<th>Paired (mean ± standard deviation)</th>
<th>Difference (Pairing 1 - Pairing 2)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-gamification learning activity performance Pairing</td>
<td>81.85±5.69</td>
<td>82.90±5.80</td>
<td>-1.05</td>
<td>-2.993</td>
</tr>
<tr>
<td>Post-gamification learning activity performance Pairing 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p<0.05 ** p<0.01
2.4.2 Changes in performance

As can be seen from Table 2, the paired data of the group shows a difference (p<0.05). Significance at the 0.01 level (t=-2.993, p=0.004) was presented between the pre-gamification learning activity scores and the post-gamification learning activity scores, and a specific comparison of the differences shows that the mean of the pre-gamification learning activity scores (81.85) was significantly lower than the mean of the post-gamification learning activity scores (82.90).

2.4.3 Quantifying participation in activities

Table 2. Results of pre- and post-analysis of gamified teaching activities

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Standard Error Mean</th>
<th>Difference 95% Confidence Interval</th>
<th>t</th>
<th>Degree of Freedom</th>
<th>Significance (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation for Success</td>
<td>-1.02188</td>
<td>1.19671</td>
<td>0.0669</td>
<td>-1.15349 -0.89026 -15.275</td>
<td>319</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Test Anxiety</td>
<td>-0.6875</td>
<td>0.8701</td>
<td>0.06879</td>
<td>-0.82336 -0.55164 -9.995</td>
<td>159</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Self-responsibility</td>
<td>-0.8625</td>
<td>0.82283</td>
<td>0.092</td>
<td>-1.04561 -0.67939 -9.375</td>
<td>79</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Level of Demand</td>
<td>-0.5</td>
<td>0.87149</td>
<td>0.09744</td>
<td>-0.69394 -0.30606 -5.132</td>
<td>79</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

In this study, the MAAT Learning Motivation Scale, which was distributed before and after gamified teaching, was quantified to analyze the data changes in a total of four dimensions, namely, Motivation for Success, Test Anxiety, Self-responsibility, and Level of Demands.

As can be seen from Table 2, the results of the scale analysis between pre-gamification teaching and post-gamification teaching show significance at the 0.001 level. The four dimensions of pre-gamification instruction (Motivation for Success, Test Anxiety, Self-responsibility, Level of Demand) had significantly lower mean values than the mean values after gamified instruction. Gamification teaching is effective in enhancing learning motivation.

3 Discussion

This paper takes sixth-grade primary school students as the research object and discusses the impact of gamified teaching activities on their learning motivation. This study is a powerful supplement to the existing teaching methods of primary school mathematics. To a certain extent, it makes up for the shortcomings of the existing teaching methods. The results of the study show that the impact of gamified teaching activities on the improvement of learning motivation of sixth grade primary school students is significant (t-test p=0.004 for the change of students' performance in two exams). Therefore, primary school teachers should not only pay attention to the changes in primary school students' learning motivation, but also update teaching methods and introduce gamification elements in teaching to ensure that learning motivation is on an upward trend. The difficulty of this study is how to accurately assess the dynamic learning motivation of primary school students.

Compared to the previous research findings (that gamified lessons are more motivating than traditional lessons), the findings of this paper have some commonalities and some differences. From the common points, it is clear that gamification can increase the level of motivation and improve the learning outcomes of students. Moreover, the use of gamification in teaching mathematics in primary schools meets the needs of students' interest in learning at primary school level and helps students to improve their performance in mathematics in a more innovative way [9]. From the point of view of variance factors, a number of studies have specifically examined whether the effect of gamification on students' participation is intrinsic or extrinsic motivation. This paper does not study from that perspective and focuses only on generalised motivation.
to learn, without refinement. In addition, the experimental design of this study was relatively simple and not replicated, and the results of the study were not comprehensive enough as it did not compare different types of knowledge in teaching and learning [10].

There are some limitations of this paper, which are mainly manifested in the following: firstly, sample selection limitations. The sample used for the study was drawn from a group of grade 6 primary school students in a specific school and therefore cannot represent the characteristics and backgrounds of all grade 6 primary school students. This may place some limitations on the ability to generalise the results. Secondly, the artificiality of the experimental setting. Studies conducted under controlled conditions may not be able to fully simulate real learning environments. Elementary school students may be influenced by other factors in the actual school environment, such as peer interactions and teachers’ guidance, which may potentially affect learning motivation. Third, limitations of the measurement tool. There may be some limitations of the learning motivation assessment tools used in the study. Different measures may consider different dimensions and expressions of learning motivation, so this study may not be able to fully capture the full view of students' learning motivation. Fourth, the limitation of research time. Due to the researcher's time constraints, this study was conducted only for short-term effects (two months) and has not yet been evaluated for the long-term. Learning motivation is a dynamic concept that is subject to change over time. Therefore, further research is needed on the long-term effects of gamification activities on learning motivation.

Based on the limitations of the current study, future research can further expand the sample capacity and enhance the randomness of the sample, such as selecting sixth-grade primary school students from different types of schools in different regions to randomly form a new class, and conducting the study in a learning environment that is closer to the real one. Moreover, the influence of other irrelevant factors should be minimised as much as possible, and the research methodology should be further improved to refine the research methodology on the learning motivation of grade 6 primary school students to make up for the shortcomings of the current study.

4 Conclusion

This study conducted an experiment on the influence of gamified teaching on learning motivation among 80 sixth grade students in M school.

The research adopted literature research, experimental method and quantitative analysis, and the research results show that gamified teaching method was effective in improving the learning motivation and learning performance of sixth grade students.

This teaching method is in line with the curious and active characteristics of primary school students. Teachers can use gamified teaching method when teaching.

However, primary school students' learning motivation is affected by many factors, so teachers need to observe the changes of students' learning motivation in teaching, and flexibly use different types of games for teaching.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

References