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Quizizz-Based Gamification to Improve Fractions to Percentages Converting Ability among 5th Grade Students in SJKC Chong Cheng

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Abstract

It has been generally recognized that students face difficulties in solving daily problems involving percentages. This study was conducted to test the effect of the use of Quizizz-based gamification in improving the skills of students, especially in problems involving converting mixed numbers to percentages and vice versa. A total number of 40 Year 5 Ken students were selected as the treatment group while 37 students from 5 Qin were used as the control group. Both classes are from Sekolah Jenis Kebangsaan Cina Chong Cheng, which is the largest primary school in Penang. Preliminary tests for both classes were conducted. An intervention involving a gamification approach through the Quizizz-based gamification was conducted. Final tests for the same topic were conducted after the gamification approach and the conventional approach were conducted for both classes. Through this study, it was found that students from the treatment group who used the Quizizz-based gamification approach have shown significant improvement in the skills of converting fractions to percentages and vice versa.

Keywords: Gamification Approach, Conventional Approach, Quizizz, Percent, Improve Skills

Introduction

The use of electronic applications in the 21st century is a common thing nowadays. The COVID-19 pandemic that hit the whole world has endangered human health all over the world. In the education sector, the pandemic had a very far-reaching impact as most schools in the world were closed to stop the spread of COVID-19. Several countries have closed schools and caused at least 2905 million students worldwide to experience disruption of learning activities as schools were closed by the government .

The Malaysian Movement Control Order 2020-21, also known as MCO, refers to the preventive measures implemented by the federal government Malaysia against coronavirus outbreak (COVID-19) from 18 March 2020. Closure of all kindergartens, government and private schools including day schools, full boarding schools, international schools and other primary, secondary and pre-university educational institutions. As a result, education has changed dramatically, this move has had a huge impact in terms of both good and bad effects on the education sector.

The effect of the COVID-19 pandemic was that many students had begun online learning. According to the government, online learning is considered to be the most effective and efficient way to do learning in the midst of the current pandemic.

Ideally, virtual learning should be continued using various approaches, either face-to-face online learning (synchronous learning) or non-face-to-face (asynchronous learning). Learning tools used can be customized according to learning needs; those with internet access can attend classes using *Microsoft Teams, Facebook live or Google Meet and other applications*. Interaction can also be implemented through various chat applications, which allow students and teachers to discuss learning at any time.

The way students learn has changed from offline to online learning as a result of the COVID-19 pandemic. This pandemic is seen as a transformation agent from offline to online learning. The conventional approach of face-to-face learning in the classroom has been replaced by online learning. One approach that fits the characteristics of learning in the 21st century is through gamification (Deterding et al., 2011).
One of the important roles played by a teacher is to identify teaching methods that can improve student achievement to a more excellent level even if learning is implemented online and remotely. Teachers play a fundamental role in engaging and supporting students to develop crucial attitudes towards these teaching and learning sessions.
One of the ways to make the teaching and learning process more effective, interactive and engaging is through a gamification approach. It not only ensures the presence of students during the teaching and learning process, but it can also help to improve their skills or achieve certain learning outcomes. Gamification has given a positive impact on learning outcomes in various forms including enjoyment, involvement, motivation i.e. intrinsic and extrinsic, outcomes and achievements, satisfaction and attitudes (Basha, 2020).
The Quizizz application was chosen to be the application of this study because it is very interesting. Quizizz has an attractive and interactive display (Wiwin et al., 2020). It is thought to be able to replace the old way of quizzes that only involved paper and pen, which was seen as boring. Quizizz is free and does not require any payment. Teachers can choose whether the quiz will be implemented, made live or as homework.

Problem Statement

In Malaysia's education system, the most controversial issue debated is the availability of quality students and schools. In terms of teachers, teachers have the habit of giving priority to completing the learning syllabus in order to prepare the students for public examinations. This causes the teaching and learning process to be carried out with the aim of completing the syllabus but not to help the students to understand the mathematics concept. Many drills are given to students to train them to answer exam questions even if students have not mastered the basics of the concept.

Other than that, students are also not given the opportunity to construct knowledge or concepts through the understanding of their own efforts. They are just waiting for knowledge to be fed into their minds through conventional types of teaching methods. Pupils are not active in the classroom because the teacher will provide all the necessary information. Moreover, students will be considered a disciplinary problematic student if they actively

communicate with peers. They do not have the opportunity to share opinions even if they do not agree or there are doubts in the teaching and learning process.

The conventional approach of "*chalk and talk*" that has been practiced so far is no longer appropriate in the 21st century because it is not able to produce workers who meet the needs of the industry. Pupils who can think critically and creatively, and are able to use computers are a basic requirement for workers in the 4.0 revolution industry. One of the new approaches that has the potential to motivate students to learn with interest is through the gamification approach (Alhuwaydi, 2020).

In an effort to increase students' interest in problem solving involving percentages, a Quizizz-based gamification approach has been introduced. For students who are passive during the teaching and learning process, gamification is said to be able to be used as an option of teaching methods to achieve teaching goals (Cankaya & Karamate, 2009). The integration of gamification in mathematics teaching is able to enhance the learning experience (Al-Azawi et al., 2016).

Research Aim

The objective of the study is to determine the use of Quizizz-based gamification in improving fractions to percentages converting ability among 5th grade students SJKC Chong Cheng, Penang.

Research Questions

Can Quizizz-based gamification improve the students' ability in improving fractions to percentages converting among 5th grade students SJKC Chong Cheng, Penang?

Methodological Framework

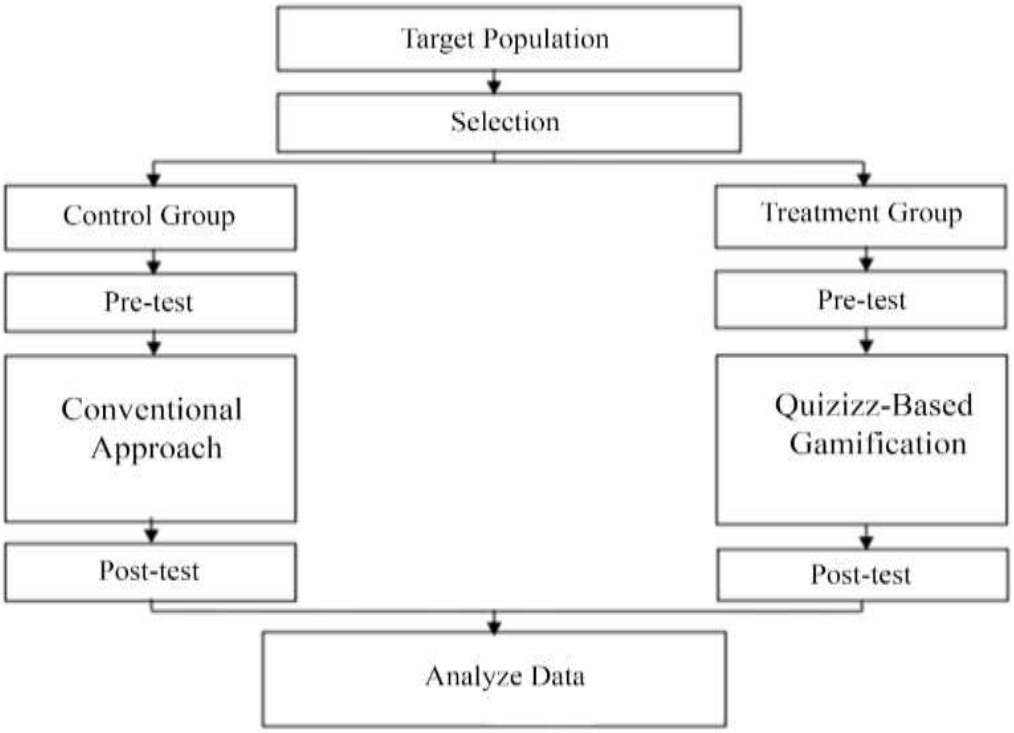

Figure 1: Methodological Framework for the Gamification Approach

Literature Review

Quizizz is a game-based educational application that can be played by many people working on
problems with an interactive and fun display (Zhao, 2019). Quizizz allows students to compete with their classmates to motivate them to learn because they can see their immediate result on the leaderboard. Teachers can evaluate their performance and download the report (Zhao, 2021).

Besides, the students are also able to use game elements in non-game environments (Durin et al., 2019) to solve problems (Su & Cheng, 2015) and induce good behaviors in learning (Khaleel et al., 2020). Gamification can be defined as a concept that introduces game elements to non-game activities (Faiqah et al., 2019). Gamification methods help in the development of students' potential in terms of cognitive, psychomotor and affective (Wahid, 2019). The purpose of the use of gamification is to make the learning process more interesting (Bicen & Kocakoyun, 2018).

Students who are able to learn in an active and collaborative environment and can help students who face challenges in learning at an early stage (Vlachopoulos & Makri, 2017). The integration of gamification approach can increase students' understanding of mathematical concepts as well as stimulate students to be more motivated to be actively involved during the mathematics teaching process (Muhammad, 2021).

Recently, gamification is often applied in education for various pupil points, learning activities, levels of education and has various designs (Bovermann & Bastiaens, 2020). This is because gamification can transform passive learning into active learning (Ardiana & Loekito, 2020). Gamification learning methods provide a positive mathematics' learning experience as well as can help improve student achievement in mathematics (Riley et al., 2017). According to Celik (2018) activity -based learning can improve students 'academic achievement compared to conventional education in mathematics teaching. This is because students often face problems in understanding sentence -shaped problem -solving questions to mathematical equations correctly (Muhammad, 2021). Thus, increasing students' enjoyment of mathematics is a key strategy to address the problem of boredom among students (Muhammad, 2021).

Gamification can provide opportunities for fun and effective learning in mathematics subjects compared to conventional learning which often fails to arouse interest in what they learn while in class (Alamri, 2016). Interest in learning is an important aspect in encouraging students to learn mathematics happily. In addition, the gamification approach can also encourage the active involvement of students in the PDP process as this learning method is more focused on students who can attract students to actively engage in learning and can directly improve the skills and knowledge of a student (Tangkui & Keong, 2020). Indirectly, the level of student achievement will also increase if students' interest in learning mathematics can be nurtured.

Among the frequently used online gamification applications for the PdP process are *Kahoot* (Bicen & Kocakoyun, 2018; Faiqah et al., 2019) and Quizizz (Sanchez et al., 2020; Yan mei et al., 2019).

Research Methodology

Research Design

This research is a quantitative research using a quasi-experiment design of pre-test and post-test types of control group and treatment group. The independent variable was the teaching approach while the dependent variable was the level of student achievement in the percentage topic. The treatment group used a gamification approach while the control group used only the conventional approach as an intervention measure for converting mixed numbers to percentages and vice versa.

Table 1
Quasi-Experimental Study Design Pre-Test and Post-Test Control Group and Treatment Group

Group	Pre-Test	Teaching methods	Post-Test
Treatment	O1	X1	O2
Control	O1	X2	O2

Guidance:
O1: Score achievement measure (Pre-test)
O2: Score achievement measure (Post-test)
X1: Teaching and learning using Quizizz-based gamification approach
X2: Teaching and learning using conventional approachTeacher provides

Pupils answer the quiz on their own but seem to play together because in *Quizizz* there are interesting elements such as the use of avatars, leaderboards and memes that are funny. Pupils find out their weaknesses through game scores. At the same time, the teacher analyzes the student's progress report through the data obtained and takes the next step to help his student in the weak part.

Quizizz application as a gamification approach is based on the following factors:

- learning is interactive and interesting with *avatars*, *leaderboards*, themes, music ;and so on
- quizzes can be made quickly and easily without taking a long time
- allows teachers to provide data and reports on students 'mastery levels in detail
- can be played using a computer, tablet or smartphone
- students do not need to register an account to answer the quiz.

Study Sample

This study involved 77 students from two Year 5 classes of SJKC Chong Cheng, namely 40 students from class 5 Ken, were used as the treatment group while 37 students from class 5 Qin were selected as the control group. SJKC Chong Cheng, Penang was chosen to run the research because it is the largest school in Penang; in terms of number of students, which is 2010 students as of 1/5/2022. The treatment group was exposed to the Quizizz-based gamification approach while the control group was exposed to the conventional approach.

The teaching and learning sessions for both groups were conducted by an experienced primary school mathematics teacher.

Research Instruments

The research instruments for this study consisted of pre-test and post-test. The construction of the item is based on reference to the syllabus of the Primary School Revision Course (2017) Mathematics Year Five and the textbook Mathematics Year Five which covers the topic of percentages. Both study instruments contained 10 items of which 9 items were objective and 1 item was subjective. The items were constructed based on the Mathematics Curriculum and Assessment Standard Document (DSKP).

Pre-tests were administered before any approach was given. This aims to assess the existing knowledge of the study sample. Post-tests were administered to track the effectiveness of the use of the gamification approach in terms of student achievement levels.

Findings

H_o1: There was no significant difference between the mean achievement scores for the control group in Pre-test and Post-test

A sample t-test was conducted to identify the difference of the mean score of the pre-test achievement score with the mean score of the post-test achievement score in the control group. Based on findings of the study in table 4, there was no significant difference between the mean achievement scores of pre-test achievement scores (mean = 77.02) with the mean score of post-test achievement scores (mean = 80.68) with t = -1.43, p> .05. This means that the null hypothesis fails to be rejected.

Table 4
Level of Achievement of Pre-Test and Post -Test for the Control Group

The test	Group	Min	Standard deviation	The t-value	The p-value
Pre Post	Control	77.02 80.68	13.92 17.41	-1.43	0.08

*Significance level 0.05

H_o2: There was no significant difference between the mean achievement scores for the treatment group in Pre-test and Post-test.

Based on table 5, the mean achievement scores in the post-test (mean = 87.00) for the treatment group was much higher compared to the pre-test which showed a mean achievement score of 65.25 with t = -7.05, p <0.001. This means that the null hypothesis is rejected. There was a significant difference between the mean achievement scores between pre-test achievement scores and post-test achievement scores in the treatment group.

Table 5
Level of Achievement of Pre-Test and Post-Test for the Treatment Group

The test	Group	Min	Standard deviation	The t-value	The p-value
Pre Post	Treatment	65.25 87.00	13.20 14.35	-7.05	<0.001

*Significance level 0.05

H_o 3: There was no significant difference between the mean achievement scores between the control group and treatment group in Post-test.

Table 6 shows the mean score results of post-test achievement scores between the control group and the treatment group.

Based on table 6, the mean achievement scores for the post-test (mean = 87.00) in the treatment group was much higher compared to the pre-test which showed a mean achievement score of 80.68 with t = -1.73, p <0.005. This means that the null hypothesis is rejected, i.e. there is a significant difference between the mean score of the pre-test achievement score and the mean score of the post -test achievement score in the treatment group.

Table 6
Post-Test Achievement Level Between Control Group and Treatment Group

The test	Group	Min	Standard deviation	The t-value	The p-value
Post	Control Treatment	80.68 87.00	17.41 14.35	-1.73	0.043

*Significance level 0.05

Since the probability value obtained (.043) is less than the specified level of significance (.05), then the null hypothesis is rejected. There was a significant difference in the mean score of the post-test achievement score for the control group n (mean=80.68) with the mean score of the post-test achievement score of the treatment group (mean= 87.00) for the percentage topic with t = -1.73, p <.05. The treatment group obtained a higher mean score of post-test achievement than the control group.

Discussion

The results revealed that the Quizizz-based gamification approach for Mathematics students' in the topic of percentage has had a positive effect on the level of student achievement. Significantly improved students' achievement levels through the Quizizz-based gamification approach compared to the conventional approach. This was evidenced from the post-test mean scores which showed significant differences for the control group (mean=80.68, SP=17.41) and the treatment group (mean=87.00, SP=14.35), with t = -1.73 and p <.05. The

mean test score of the treatment group increased significantly from 65.25 (pre-test) to 87.00 (post-test).

The findings of this study are in line with the findings of Khasanah's study which proved that the gamification approach through Quizizz is effective in teaching mathematics. Similarly, the findings of Suwarto's study stated that the Quizizz approach was successful in improving students' Indonesian language learning performance.

Through the advancement of technology, students are able to visualize the concept of abstract theory of percentages into a clearly visible picture. The picture not only appears in 2D but can also appear in 3D, this can attract the attention of students and increase their understanding. The conceptual understanding of percentages topics among students which can then be applied in answering the percentages questions can improve the level of achievement of weak students. Explanations through pictures or symbols can also be included in the Quizizz to help students understand concepts in more depth. The problem of cognitive maturity has been addressed.

The Quizizz-based gamification approach can also encourage active involvement among students. Besides that, the students realized what was needed in learning. They could identify their weakness and mistakes after doing the test. That gamification creature provided the students incorrect answer to some questions (Muhammad et al., 2020).

Conclusion

Based on the results of research that was conducted using the T-test, there is a significant difference for the mean achievement scores in post-test between the control group (mean=80.68, SD=17.41) and treatment group (mean=87.00, SD=14.35). It is clear that the students' ability had shown significant improvement throughout the usage of Quizizz-based gamification.

Therefore, the need for support from principals, teachers, and the role of parents in increasing the use of Quizizz-based gamification during the teaching and learning process, especially in mathematics subjects should be encouraged. More research should be conducted for other grade students in bigger areas for this gamification approach.

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