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EFFECT OF GAMIFICATION METHODOLOGY ON THE STUDENT'S ACHIEVEMENT IN MATHEMATICS

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Abstract

Knowledge of Gamification is an educational method to encourage students by using the game method and game components in an academic setting. Gamification methodology is the use of game essentials within the learning environment, and its significance is to improve student interest and engagement. This main aim was to investigate the "Effect of Gamification Methodology on the Students' Achievement in Mathematics". The main objective of the study was: To examine the improvement of students' academic achievement in mathematics through the use of the Gamification methodology. For this purpose, an experimental study was equipped on the topic of fractions of mathematics grade three. An experimental pattern with the same pre-test and post-test was used to check the achievement of students. In this experimental research study, Students were divided into two groups experimental groups (taught with gamified activities) and control groups (taught by traditional method). The population of the study included students at primary school of class three (n=30). The findings of the research indicated that students treated with gasified methodology achieved higher scores than the students treated with non-gamified methodology further demonstrating that students showed positive motivation towards gamified activities in the classroom. According to the findings, it is suggested that the curriculum should be revised according to gamified activities that would influence the achievement of students.

Keywords: Gamification, Methodology, Student, Achievement, Mathematics

INTRODUCTION

Although in the teaching of mathematics, teachers put much effort to improve the attitudes and motivation of students towards this course. Revolution of course not only needs new teaching methodology but also involves policies. Mathematics is a very comprehensive subject, and the creativity that is an important part of mathematical study is poorly taught by the traditional method of teaching. Students frequently complain that the typical approach to teaching problem-solving principles is uninspiring, dry, and boring; many students find it challenging to understand how unrestricted and explorative mathematics learning is at the elementary level. So, the practice of gamified activities allows mathematics education to get some of the interesting qualities of the games that the students aim to play during their breaks.

An educational approach, which motivates students to gain knowledge using activity patterns and essentials in learning environments, is the gamification of learning. The aim is to exploit delight plus commitment in the course of recording the attentiveness of learners and stirring them to maintain learning. This is useful as it allows the recognition of weaknesses, which in turn lets teachers adapt to the individual needs of different students. What games can create is the goal equal to levels of involvement (Smiderle et al., 2020). The learning process towards students' needs and requirements is the main issue for today's teachers, which they have to solve. The teachers should use different methods and techniques through which students become energetic participants with Ong powerful inspiration and commitment to their learning. The primary goal of the current work is to research the environment and benefits of Gamification to provide several ideas on how to apply it in teaching.

An educational approach, which motivates students to gain knowledge through activity patterns and essentials in learning environments, is the gamification of learning. The aim is to exploit delight plus commitment in the course of recording the attentiveness of learners and stirring them to maintain learning. Gamification can give immediate feedback to students because it is a unique teaching technique. This is useful as it allows the recognition of weaknesses, which in turn lets teachers adapt to the individual needs of different students. What games can create is the goal equal to levels of involvement (Smiderle et al., 2020). Boost definite potentials, establishing objectives to provide knowledge with a rationale, connecting students, upgrading learning, maintaining behaviour alteration, and hanging out are the particular goals of Gamification.

However, it is true that in today's society, computers and other game consoles have provided for human needs that the outside world cannot (McGonigal, 2011). This is because incentives are possible in the game world whereas they are typically not available in the actual world. Technology integration can be positive or detrimental, depending on the reader's perspective (Adimabua, 2015). We currently live in a rapidly changing environment where change is accelerating in unfathomable ways. Also, because there is a constant need for new and better ways to learn, research on the subject of education is not static (Schaaf & Mohan, 2014).

The activity method or gasification method is capable of the best teaching instrument to teach young people all their needs. In the form of a video game, Scientists considered the usefulness of Gamification to educate students. Gamification learning can be used in inside as well as outside the classroom. If you divided your math work of your child into different sections. Gamification methodology at home is also becoming very vital in your child's teaching (Cani et al., 2017).

Objective

To examine the improvement of student's academic achievement in mathematics by the use of Gamification methodology.

Research Question

What are the students' achievements in mathematics before and after the implementation of a Gamification methodology as measured by a math test based on the fraction among Third-grade students?

Significance

The study is significant as it contributes to knowledge about the "Effect of Gamification methodology on the students, achievement in mathematics. This research provides valuable information about the effects of gamification methodology on the student's academic achievement in mathematics at the school level for further research related to other groups of researchers in Pakistan. The study revealed the opportunities for researchers to conduct more comprehensive studies on the Effect of gamification methodology on the student's academic achievement in Mathematics. This study helped the students to increase their motivational level by using gasified activities in the teaching space. Gamified activities also add to the student's engagement and interest towards mathematics which is a beneficial factor in mathematics course achievement. This study contributed positive assistance to teachers in higher achievements of students towards mathematics.

REVIEW OF LITERATURE

The intention of this work is in the direction of identifying the effect of gamification methodology on the students' accomplishment in mathematics. This chapter examines the literature to determine the effects of gamification methodology among primary school students in Rawalpindi. Many of the researchers put their focus on the achievements of primary school students and explored several gamification methods in mathematics that are the most influential factors in the achievements of primary school students. Gamification has been used in diverse areas such as business, medicine, and fieldwork but particularly in education, from the time when it became widespread (Deterding, Dixon, Khaled, and Nacke, 2011). The immense quantity of studies in this work, when amended literature reviews, manifest how vital Gamification has to turn into for educators in the provision of measuring its outcome on students' learning (Faiella & Ricciardi, 2015).

Relationship between the Gamification and Mathematics

Behaviourist theory has also been used to justify the importance of gamification in education. The behaviour premiseof the study is Bandura's (1992) theory of self-regulation and Skinner's (1938) theory of operant conditioning. Human minds, according to Skinner (1938), can be viewed as a black box. As a result, through conditioning and reinforcement, students can be coerced to learn. Students are forced to succeed (and so learn) to be rewarded in a Gamified atmosphere. In a Gamified setting, pupils might depend too much on the incentives.

To build a relationship through the atmosphere state reactions, achieve experiences, have a good time, calm down and stumble on solutions to the troubles could be achieved by games that enable a child. According to Muntean (2011), learners have a good attitude toward Gamification, which encourages pupil inspiration and helps learners obtain an affirmative response for the period of the teaching process. It is claimed that tricks that incorporate games help with statement and motor coordination (Jones, 2001). Prensky (2002) places a strong emphasis on the value of reducing obstacles to learning in the classroom and fostering a positive learning environment. In this regard, teaching pupils through instructive games or amusement is probable to be beneficial for their learning. Educational sports event encourages students to participate actively, particularly timid students, and this has a direct impact on a student's concentration and thoughts toward a course (Bayat, Klcarslan, & Enturk, 2014). Other research (Aycan et al.,

2002; Karamustafaoglu & Kaya, 2013) have backed up the positive influence of game-heightened surroundings.

Impact of Gamification Methodology on Students'Achievement

According to Callaghan, Long, van Es, Reich, and Rutherford (2018), some games can adjust to students' varying skills and offer teachers progress reports to assess their grasp of the subject. This allows teachers to provide students with feedback onareas where they need more help. Effective combination of computer games and classroom education by teachers can improve student engagement and content learning even though most educational computer games are supplements rather than substitutes (Wouters & Van Oostendrop, 2013). According to Elshemy, "the role of gamification approach is floating inspiration amid students about education, which favourably affects the accomplishment level; thus, this research applied to fix the effect of a gamification approach on rising motivation as well as academic achievement among students of the second stage in the governorate of Muscat." Researchers observed the impact of low enthusiasm on academic achievement between students through evaluation tools and, most prominently, examination results; to certify this, researchers developed a questionnaire to investigate learners' needs, which discovered that students mostly use resources and can't absorb large amounts of knowledge & information during an educational class, so they prefer learning through activities that are generally considered by collaboration. These results from questionnaire analysis led researchers to the conclusion that when teaching methods are enjoyable and entertaining, pupils are more motivated because they are more engaged in the lesson, paying attention, and feeling more confident.

Gamification Methodology Enhance Educational Engagement

Breaking the concept of fun down into categories can help you understand itbetter. The Keys to amusing loom developed by XEO Design, a consulting and game design firm, is one attempt at such classification (XEO Design, 2004). This method distinguishes vital types of entertainment that are allied with various emotions. Trouble-free enjoyment is related to a laid-back mood, a sense of wonder, and a sense of surprise; it piques players' imaginations and encourages them to see the sights and be creative. Hard fun, on the other hand, is about conquering obstacles, learning, achieving goals, and solving problems; it is related to feelings of accomplishment, pride, and dissatisfaction. Fun encompasses a wide range of social activities, from rivalry to communication and collaboration. The ultimate class is the seemingly contradictory grim fun: the enjoyment of doing things for oneself or others that have purpose and meaning outside of the context ofthe game (e.g., environmental action, community service, etc.). Hunicke, LeBlanc, and Zubek (2004) created eight-category taxonomy of enjoyment, for example, phenomenon, imagination, history, challenge, fellowship, discovery, representation, and submission. The crucial thing is to recognize that diverse kinds of enjoyment exist, with some being more acceptable and beneficial in an educational setting than others.

The differences in the independent variable cause or result from changes in the dependent variable. Any variable whose values should be affected by manipulations of changes in the values of one or more independent variables is a dependent variable, according to Burney & White (2010). Student math achievement served as the dependent variable for this study. Best & Kahn (2003) state that an independent variable in educational research can be a specific teaching strategy, kind of teaching materials, incentive, length of exposure to a specific situation, or characteristic like intelligence level. During the experiment or research study, the researcher isolates and controls independent variables.

The cause is the independent variable. Its value is unaffected by the other study variables. The use of the gamification methodology in mathematics is the study's independent variable.

Research Methodology

The research study is experimental in nature as it aims to find out the effect of gamification methodology on the student's achievement in mathematics.

Sample

The sample for this study was 3rd-grade students of Minhaj model school situated in Khayaban e SiKhayabanawalpindi. A sample size of 30 primary students was selected for this experimental research from the whole population which includes 16 boys and 14 girls. The sample size was selected accordingly by using the simple random sampling technique. In simple random sampling, the members of the public were selected aimlessly. Each member from the total has an equal possibility of being selected.

Research Design

An experimental type of study that follows a scientific research pattern. In this research, the students were distributed into two groupings to be treated, on one side the control group proceeds with the traditional teaching technique and on the second side, an experimental group proceeds with a Gamification as a technique for practising the mathematics course. An experimental pattern with my pre-test and post-test was used on the topic of "fractions" in mathematics. The result was gathered before and after the experimental treatment and it was compared to the control group result. Students in third-grade mathematics were divided into experimental and control groups, and the same teacher provided instruction to both groups. In contrast to the control group, the experimental group's therapy was reinforced through elements of gamification. In this fashion, over the course of the experiment's two weeks, gamification components were implemented in the experimental group. The treatment of the control group did not include any gamification-related features or objects. Experimental and control groups are assessed on basis of dependent and independent variables. It included a variable that could be manipulated by the researcher (gamification methodology) known as the Indian dependent variable, and variables that could be measured, calculated, and compared like this research (achievement in mathematics) is led as the dependent variable.

FINDINGS / RESULTS

The findings of the study were analyzed based on the data given below:

Table 1: Comparison between the pretest of both experimental and control group

Group	No. of students	Mean score of Pretest	SD of Pretest
Experimental	15	14.6	2.1483844
Control	15	14.13	2.015495

According to these measurements, the pre-test mean scores of the experimental and control groups were 14.6 and 14.13 respectively found very close to each other. The findings of the analysis revealed that the mean scores of achievements in the experimental group and control of Mathematics in Grade 3 in the pretest did not increase due to the traditional method of teaching which showed that the traditional method of mathematics does not enhance the achievement of students.

Table 2: Evaluation of the post-test of the experimental group and control group

Group	No. of students	Mean score of Post-test	SD of Post-test
Experimental	15	18.4	1.030641
Control	15	15.6	1.8184141

Corresponding to these indicators, the post-test mean scores of the experimental and control groups were 18.4 and 15.6 respectively. The findings show that Mathematics in Grade 3 in posttest increase

due to games and activities which shows that gamification enhances the achievement of students.

Table 3: Achievement of the pretest and posttest of the experimental group

Test	No. of students	Mean Score	SD of test
Pre-test	15	14.6	2.1483844
Post-test	15	18.4	1.030641

Permitting these measurements, the pre-test mean scores and the post-test mean score of the experimental groups were 14.6 and 18.4 respectively. About the results, the mean scores of Gamification on achievement in the experimental group of Mathematics in Grade 3 in the posttest increased due to games and activities which shows that gamification enhances the achievement of students.

Table 4: Pre-test and Post-test achievement of the control group

Test	No. of students	Mean score	SD of test
Pre-test	15	14.13	2.015495
Post-test	15	15.6	1.8184141

According to these measurements, the pre-test mean scores and the post-test mean score of the control groups were 14.13 and 15.6. So, the results revealed that the mean scores of achievements in a control-treated group of Mathematics in Grade 3 in the post-test did not increase so much as compared to the pre-test due to the traditional method of teaching which showed that the traditional method of mathematics does not enhance the higher achievement of students.

Table 5: Significance of difference between means score of both groups.

GROUP	PRE-TEST			POST-TEST		
	No. of students	Mean X	Standard deviation	No. of students	Mean X	standard deviation
Experimental	15	14.6	2.1483844	15	18.4	1.030641
Control	15	14.13	2.015495	15	15.6	1.02415

According to the findings, the mean scores of the experimental and control groups were very close to each other. On the other hand, the means of the two groups of posttests show the difference in their mean value due to which Table revealed that the mean scores of Gamification on achievement in the experimental group of Mathematics in Grade 3 in the posttest increase as compared to pre-test results due to games and activities which shows that gamification enhances the achievement of students.

DISCUSSION

This represents the discussion of the findings and provides explanations for results gathered from the research on gamification. Games, as defined in this research, are a method whereby games and game-like elements and activities related to mathematics were used in the classroom to solve math problems. This research study regulates even if the use of Gamification methodology could assist in the improvement of third-grade students' mathematical achievement. Teachers are in search of apparatuses to boost the student's achievements in class three within an academic school year. Gamification is a new movement that aims to improve student engagement in learning by including game-like elements such as charts models, badges and shapes in non-game contexts (Looyestyn et al., 2017). When compared to pupils who did not use gamification, the anticipated results would show that gamification enhanced student engagement by showing greater accomplishment scores. The curriculum's successful adoption of the gamification framework to raise students' motivation, academic performance, and attitudes toward lessons is referred to as the gamification of educational processes (Yildirim, 2017).

Class 3	Test 1	Test 2	Total	Group	T 2 - T1	
Sr. No	Student	Pretest result	Post-test result	Total mark	Experiment Rental Group	Achieve-Mint	Mean (x-
1	A	20	20	20	E	0	14.44
2	B	14	18.5	20	E	4.5	0.49
3	C	13	19	20	E	5	1.44
4	D	13	17.5	20	E	4.5	0.49
5	E	13.5	18	20	E	4.5	0.49
6	F	13	18	20	E	5	1.44
7	G	11	16	20	E	5	1.44
8	H	14	17	20	E	3	0.64
9	I	12	18	20	E	6	4.48
10	J	17	19	20	E	2	3.24
11	K	15	19	20	E	4	0.04
12	L	16	18.5	20	E	2.5	1
13	M	15	20	20	E	5	1.44
14	N	16	19	20	E	3	0.64
15	O	15.5	19	20	E	3.5	0.09

Pre-test and post-test results of the same test of mathematics topic fraction of the experimental group. According to these statistics, based on pre-test and post-test scores the achievement test of the experimental group was found.

This research evaluated two groups of students one who used gamification in some way and the second one who did not use the gamification method. Gamification had a considerable impact on student achievement in mathematics test evaluation. Gamified teaching can aid to improve a student's skill, increasing their motivation in learning a subject. Turgut and Temur (2017) concluded in their study that using game-like elements to teach mathematics can improve students' academic achievement. When the education goals are undecided and the concentration is on the gamification itself rather than the curriculum, using any type of activity to learn can be less effective or ineffective.

Achievement of pre-test and post-test of the control group

Class 3	Test 1	Test 2	Total	Group	T2 -T1	
Roll.no	Name of students	Pretest result	Posttest result	Total marks	control group	Achievement *X*	Mean (x-
1.	A	13	16	20	C	3	2.16
2.	B	15	18	20	C	3	2.16
3.	C	20	20	20	C	0	2.34
4.	D	16	17	20	C	1	0.289
5.	E	13	15	20	C	2	0.22
6.	F	14	16	20	C	2	0.22
7.	G	14	14	20	C	0	2.34
8.	H	14	15	20	C	1	2.34
9.	I	13	15	20	C	2	0.22
10.	J	12	15	20	C	3	2.16
11.	K	13	14	20	C	1	0.289
12.	L	15	17	20	C	2	0.22
13.	M	13	13	20	C	0	2.34
14.	N	15	16	20	C	1	0.289
15.	O	11	13	20	C	2	0.22

RECOMMENDATIONS

On the bases of the findings following recommendations were drawn:

- It is recommended that the curriculum may be revised to gamified activities that influence the achievement of students.
- It is recommended that a compulsory unit of gamification methodology may be introduced in the teacher's training program. It will assist the teachers for the guidance of students towards their learning.
- It is recommended that a study conducted on the impact of gamification on achievement in mathematics may be directed at other subjects like English, Sciences, Social Science, Commerce, Economics etc.
- It is recommended that government may provide activity-based subjects to both boys and girls students.

CONCLUSION

The findings of the study indicated that the students using the gamification methodology scored higher than the students not using the gamification methodology. The test area was the topic of fractions from the mathematics of grade three. However, students were divided into two groups treatment one in the experimental group and the second in the control group. The experimental group used gamified activities while learning and the other hand control group did not use gamification. There is evidence in this study to indicate that students using gamification achieved higher scores as compared to students not using gamification.

It is also concluded that the unique contributions made by these study's findings show if gamification might assist pupils in achieving higher achievement. The stated statistics camefrom student evaluations taken before and after tests. In today's global culture, content learning units have a fresh appearance. To assess the student's progress in their learning, official and informal assessments are conducted all year long. This quantitative study was done to determine how well gamification worked in third-grade math lessons.

It also concluded that groups taught via gamification and traditional education had significantly different math achievement levels. It is also possible to draw the conclusion that students who are taught utilizing a gamification platform are more motivated, engaged, and successful on math exams than those who are taught using conventional methods.

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