# A PRACTICAL STUDY OF MATHEMATICS EDUCATION USING GAMIFICATION

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**ABSTRACT**

This paper explores the use of gamification in math lessons for children in order to highlight the relationship between math education and its application to society. In school education, there is an existing problem about how to relate concepts learned in math to everyday life. One of the reasons for this problem is that it is difficult for teachers to set appropriate questions for students.
We investigated a classroom using gamification intended for elementary school sixth grade students (34 people). As a result, it is argued that gamification is effective in math education.

**KEYWORDS**

Gamification, Elementary school students, Math class

## 1. INTRODUCTION

In school education, there is an existing problem about how to relate concepts learned in math to situations in everyday life. One of the reasons is that it is difficult for teachers to set appropriate questions to students learning math. For example, when the teacher asks a math question, students do not think about it in relation to society. Therefore, this study considers the use of gamification to solve this problem. Gamification is the application of aspects such as “scenarios” and “competition” from a technological game-playing context to a non-gaming situation (in this case, the context of a classroom). A performance evaluation was conducted using gamification. First, teachers made a realistic scenario using videos and photos related to the math lesson.; second, children competed with each other in the same scenario. This study highlights and verifies the effectiveness of the gamification method that was used for children learning math.

## 2. METHOD

We think that there are two advantages in using Gamification. One is the ability of children to feel the need to question. With a mathematical problem integrated into a scenario, children enact on this need. The second point is that scenarios considered “fun” improves children’s motivation and interest for learning. We developed the lesson with these two points in mind.

The research was conducted in a classroom using gamification intended for an elementary school sixth grade class (34 students). The class was given a scenario in which children had to simulate staff members of the local football team (the team’s name is “SHIMIZU S-Puls”) were asked to develop goods related to a football game for the children. The children were set the task of not only designing the goods but also consider their material costs and sale prices. When we set this task, we added the illusion of reality by relaying it through a video message.

After the class, the children were evaluated based on their design and ideas using a rubric (See table 1).

Table 1. Rubric evaluation (The method for evaluation)

| Evaluation item | A Group | B Group | C Group |
|---|---|---|---|
| Interest<br>(Ingenuity of goods design) | A well designed devise | A fairly well designed devise | A not so well designed devise |
| Knowledge<br>(using a proportional calculation) | Calculated correctly and carefully completed, possible to determine profit | It is possible to give an answer to the calculation | Has not been calculated until the end |
| Calculation<br>(Appropriateness of the calculation) | Possible to be used efficiently, proportionally well calculated | Can be a reasonably efficient calculation | Calculation is not proportional |
| Representation or graph<br>(Correctness of graph) | Expressed in an easy-to-understand proportionality graph | It is possible to write a graph of the proportionality | Unable to write a graph determining proportionality |

## 3. RESULT

The results were evaluated using the above rubric. The number of Interest in column "A" was 30 people, while "B" stood at four. In the "Knowledge" criteria, "A" consisted of 21 students, while the number evaluated to level "B" was 12. Only one student was assessed at level C. In the evaluation of "Calculation," five students achieved grade "A," while 18 were assessed at "B," with again only one at "C." In the "Representation or graph" evaluation, level "A" was given to 10 students, "B" was awarded to 18, while "C" given to six people.

After the exercise was completed, a survey was distributed to the students which included two questions (See Table 2). As shown in Table 1, a significant difference was observed for each of the items before and after the lesson was conducted. As a result, it may be concluded that gamification is effective in math education.

Table 2. Questionnaire results (average value)

| Question | Before class | After class | Significant difference |
|---|---|---|---|
| Do you think that "arithmetic" concepts are related to society? | 2.91 | 3.49 | ** |
| Do you think "proportionality" is related to society? | 2.52 | 3.21 | ** |

## 4. CONCLUSIONS

From the results of this study, the gate for teaching and evaluation methods that incorporate the application of gamification concepts is open as children are more likely to feel the connection between the subject and society. It will also increase student motivation and interest.

On the other hand, If children have a difference of academic ability, Gamification might have no effect. Therefore, challenges remain in terms of measuring a child's academic ability.

## REFERENCES

Fujimoto Toru, 2015. Development and Practice of Gamified Coursework Design Framework. EducationalTechnology Research, Vol. 38(4),Japan, pp 351–361