Chapter One

Introduction

Hasemann, 1981a points out that there have always been difficulties with the introduction of fractions in primary schools. This is because fractions is a difficult topic for primary school students and due to this it is mostly taught through repetitive drilling, rather than teaching a proper understanding of the concepts of the topic (Alston et al., 1994). A possible solution to this is the gamification of the topic. Gamification is the application of game design elements to non-game activities. Mason and Rennie, n.d. shows us how children prefer to learn from videos, pictures, and sounds rather than texts. This means that should a difficult maths topic like fractions be gamified using established gamification techniques, the rate of engagement for students with the topic may significantly improve.

1.1 Motivation

The motivation for this paper was to find an alternative teaching method, which may benefit students by making the learning experience easier and more enjoyable to them. Hasemann, 1981b discusses how fractions are recognised to be a difficult topic in most schools. He points out how fractions are difficult for students to grasp as they are not used often in everyday life, the written form of fractions are comparatively more complicated than regular numbers. In addition to this students find it difficult to understand the concept and result in repetitive

drilling to learn the topic. This causes children to find it difficult to put fractions in order of size on a number line further showing that they did not understand the concept of the topic. The findings in the study conducted by Gafoor and Kurukkan, 2015 indicate that 75% of students reported that they believed mathematics to be difficult, the main reasons being that their teachers provided them with poor instructions. They tend to think of it as a boring subject that will not affect them in their every day lives, as described by Forman, 2002.

This proves that there is a problem in the way mathematics is being taught, and the gamification of topics may be a solution to this that is worth investigating.

1.2 Research Questions

The hypothesis of this paper is to investigate if the gamification of difficult mathematics topics will keep children engaged with the game, enhancing the educational experience and could be used as a tool to help them learn about fractions more efficiently than using only the traditional method of studying with a book.

1. How can a simple game increase the rate of engagement of students with a specific mathematics topic?

2. How can computer game technologies be leveraged in a grade 4 classroom to enhance the educational experience?

3. How can computers be used in the classroom environment to help teachers more easily teach difficult subjects to children?

1.3 Outline of the Research

1.3.1 Literature Review

In this chapter literature was researched and reviewed to understand the issues primary school students have with the fractions topic, and the potential there is for the gamification of the topic to solve these issues.

The chapter begins by describing how people have been hooked to electronics since their inception, and goes on to explain how the use of such electronics in education if implemented well could significantly improve the teaching of difficult mathematics topics such as fractions.

Following this are sections where research papers that go into detail on determining the extent at which children understand fractions with the use of practical tasks assigned to the children. The children who take part in these tasks have completed the fractions topic in class through the traditional methods of learning with textbooks and repetitive drilling.

These research papers discuss the issues there are with this repetitive drilling method of teaching fractions and show how this method does not result in the students truly understating the topic.

The final sections of this chapter discuss the research papers that review the effectiveness of gamification of topics and how this could improve the learning experience of students.

1.3.2 Methodology

In this chapter the methods used to collect data using the game created are described and explained. The chapter starts off by explaining how the game is played and the different levels that it is made up of.

The next section describes how the users are to interact with the game, and explains that since the game is intended for young children its U.I. was created to be as simple to use as possible.

The final section of this chapter goes into detail about how the sessions were organised and what kind of data was to be collected during them.

1.3.3 Results and Discussion

In this chapter the results obtained through the sessions that took place at De La Salle primary school Malta, are discussed and elaborated on. Firstly the quantitative data obtained is discussed and each class that took part in these sessions was compared against one another. Secondly the qualitative data was discussed where the students behaviours during the sessions was examined, and the teacher in charge provided her feedback.

Finally the research questions were discussed and answers provided were backed up by research papers.

Chapter Five

Conclusion

Hasemann, 1981a tells us how there have always been difficulties with the introduction of fractions, new methods to introduce the topic are regularly being looked for. This paper aimed to explore the effectiveness of using gamification of fractions in the classroom. Johnson et al., 2017 describes how in almost all studies, applied games leads to improvements of the users involved and this was mirrored in the classroom sessions that were carried out testing the game. It was concluded that the game managed to provide a positive user experience for the students and teacher involved. With this type of alternative learning tool, educators would be able to meaningfully assess student understanding and retention of difficult topics through means other than traditional classroom methods.

Feedback received from the teacher indicates that the game was successful in keeping the children engaged. This being the case some improvements that could be done to the game were pointed out as there was a handful of children that seemed uninterested in playing. The results obtained mirror this feedback as to whether a child achieved a high or low score, they all took their time in reading the questions and trying to work them out.

The results obtained mirror the findings made by Baldeon et al., 2015 where both indicate that the difficulties children have with fractions are conceptual. This suggests that it would be beneficial if maths educators were to shift from emphasizing on the learning of rules and equations to focusing on the students gaining a conceptual understanding of fractions.

5.1 Implications

The implication here is that gamified educational games that follow established gamification guide lines can significantly improve the educational experience of students. During the sessions the students were in some cases collaborating with one another and in other cases they were competing. Throughout all the sessions that took place there was a significantly higher rate of engagement with the game than when the topic is worked on in the classroom. This shows the children were highly motivated to keep playing the game. The teacher who was in charge of the sessions noted how the children don't behave that way when they're working on the same topic but in the normal classroom environment. This can result in those students having a better understanding of difficult topics resulting in them achieving higher grades.

5.2 Future Work

Gamification needs to be researched further, it could provide a way to change how material is taught in classrooms. Future work applying gamification techniques to the learning of other elementary mathematics concepts could help to better understand the benefits gamification could possess. Additionally assessing the engagement and retention rates of children in class both with and without gamification could provide a more concrete understanding of the effects of gamification in education. Another beneficial addition would be to provide the teachers and parents with tools to monitor the progress of children within the gamified educational activities.