# Fun math's game for kids to learn basic mathematics of addition and subtraction operation: usability findings

Raidah Yazid[1], Faaizah Shahbodin[2,*], Nur Syazwani Sukormo[1]

[1)] Faculty of Information and Communication Technology, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia
[2)] Centre for Academics Excellence and Scholarship, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

[*]Corresponding e-mail: faaizah@utem.edu.my

**Keywords**: Instructional design; ADDIE model; usability

**ABSTRACT** – Technology has the potential to improve many aspects of our daily lives, including learning. It has been proven to increase student engagement and learning outcomes. The application of mobile learning and the use of game-based instructional strategies have been demonstrated as promoting students' learning performances and motivation. In the game apps, there are two modules provided, which are learning and game module. These game apps encourage kids to learn math in an easy way. The objective of this paper is to determine the usability of the mobile educational game in learning basic mathematics. In the end of these research, the Fun Math apps have accomplished the usability such the effectiveness, efficiency, learnability and satisfaction.

## 1. INTRODUCTION

Nowadays, children are getting less attention and interest in learning. In addition, they are also slow to learn and remember new things. Finding a new way to attract students and engage them in the learning process is one of the key issues. Fun Math apps is an initiative that will be developed to help children in recognizing the number and the basic operation of mathematics while it will interest them to learn mathematics. This game apps name as "Fun Math's", the focused on the basic of mathematics, for instance, addition and subtraction. The application is built on a mobile platform, for children aged around 7 to 9 years old to enhance their understand and mathematics skills. Figure 1 below show the example of existing maths game application from google play.

The genre of the game is puzzle game meanwhile the mode of the game is the endless game. Based on instructional design theory, this application has applied the cognitivism theory to practice factor in learner characteristics that promote or interfere the cognitive process of information and analyze which task is appropriate for effectively and efficiently processing information [1].

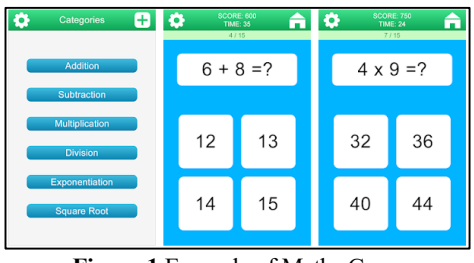


**Figure 1** Example of Maths Game

## 2. METHODOLOGY

Mobile ADDIE model is a generic instructional design model that use to develop instructional materials. In the development of Fun Math's game, the ADDIE model will be used as the instructional development process. This method has applied as it provides simpler yet clear steps in developing the application [2]. Based on the ADDIE model, it has employed five steps which is analysis, design, development, implementation, and evaluation [3], [4].

In the analysis step, there are few tasks need to accomplish such as find learning problems in math, especially for children. In the initial, this task is made from the observation and the literature review. Besides, the analysis also provides what goals and goals for this project and identify the audience needs. The needs of contents, the interface takes into the accounts and identify the constraints. Then, find a suitable delivery option for this game apps and start to schedule the project timeline.


**Figure 2** Design Level of Fun Math's game

Figure 2 above show the design level interface of Fun Math game. Design level will be a systematic process to determine learning objectives. In the design step, it consists of several tasks, which is creating the

storyboard and designs the graphics user interface (GUI). A storyboard is shown the flow of the game apps from start until the end. Besides, the GUI is the interface of game apps and it consists of the main menu, type of module, learns module, game module, addition game, subtraction game, game over, learns number, learns addition and learns subtraction.

In the development, step comprises coding program, design the asset, level scene and the content of the game. This game apps have used the Unity 3D engine for the development and edit the asset by using Adobe Photoshop. In the Unity 3D engine, the graphics user interface (GUI) is set to make it functionally.

Summative evaluation is the end of the project evaluation and targeted at the end-users. The basis of summation evaluation applied in this project is short-term. The short-term based on the observations and get the feedback from the user. To get the feedback, the usability testing is conducted to identify usability applied in the game apps, the shortage and review the objective is achieved or not.

## 3. RESULTS AND DISCUSSION

This game is developed based on instructional design and the usability testing was to measure the usability of these game apps. Thus, Fun Math's game apps encourage children's in learning mathematics while playing the game. Besides, from the findings above, this game apps have fulfilled the usability. The usability has mentioned in this game apps are:

Table 1 Usability

| Usability | Evidence |
|---|---|
| Effectiveness | • Fun math's is easy for kids to use |
| Efficient | • Fun math's game apps easy for kids to control |
| Learnability | • Fun math's game app is easy for kids to learn basic mathematics<br>• The interactive graphics user interface used in Fun Math's game apps for learning numbers help kids to memorize |
| Satisfaction | • Fun math's game apps give clear feedbacks and visual<br>• Fun math's stimulate curiosity and gain the attention of kids on learning mathematics<br>• The audio used in fun math's game apps is suitable<br>• Fun math's is engaging and fun for kids |

## 4. CONCLUSIONS

In conclusion, game-based learning is one of the effective mediums in the classroom that can affect motivation can provide greater learning opportunities compared to the traditional approach of teaching, so that effective learning can take place. Besides, instructional design is the systematic process of translating principles of learning and instruction into specifications for instructional materials and activities. Hence, the instructional design and ADDIE model that was applied in this project is very helpful to develop the game apps based on the element. This game apps have applied the instructional design, based on Gagne's nine events, for instance, gain attention, present information, gamification to motivate and engage learners, elicit performance (practice), provide feedback, assess performance, enhance retention and transfer. In addition, from the finding and result, this game apps have accomplished the usability such the effectiveness, efficiency, learnability and satisfaction. Thus, from the summative evaluation result and findings, this game apps it will help children in learning the basics of mathematics.

## 5. ACKNOWLEDGEMENT

We would like to thank to the Universiti Teknikal Malaysia Melaka for research facilities and laboratories and expert guidance for our self-funded research project.

## REFERENCES

[1] Ferriman, J. (2017). 3 Instructional Design Theories | LearnDash. LearnDash.

[2] Setyaningrum, W. & Waryanto, N.H. (2018). Developing mathematics edutainment media for Android based on students' understanding and interest: *A teachers' review," J. Phys. Conf. Ser. 983 (1).*

[3] Huang, R., Spector, J.M., & Yang, J. (2019). Designing Learning Activities and Instructional Systems. *Educational Technology* 125–147.

[4] Samur, Y. (2010). Kes Sesi: A mobile game designed to improve kindergarteners' recognition of letter sounds. *J. Comput. Assist. Learn.* 35(2), 294–304.