Assessing the Impact of Mobile Educational Games on Student’s Success within Mathematics Subject in Primary Schools

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Abstract - The research focus is set in investigating the impact of educational games as instructional strategy in student’s success within the course of Mathematics in High School. In order to assess the impact we have developed a mathematical mobile Game for Android Devices, to be used as a case study, and assessed the students’ achievements. We have used quantitative research methodology and as research method used a questionnaire to collect the data. We collected the data before and after playing the game, so we can assess the difference of the time spent on educational games and the level of transferred knowledge. The system is expected to help high school students to easily orient and engage during lecture classes and easily find and use the learning content. The system has been evaluated on its functionalities and the usability, on two groups of users, one group with computer science background and the second group of users as novices with different field background. Afterwards we used regression analyses to determine the impact. The research study tries to contribute with identified impacting factors for such systems, analyses of the improvement in user friendliness, and usability. Insights and recommendations are provided.

Keywords - mobile devices, mobile learning, mathematics, game based learning, evaluation

I. INTRODUCTION

Mobile devices nowadays have made a huge impact in the society, especially in areas that include social life, business, health and education, industry etc [3]. According to [2] the adoption and use of IT in teacher Education have a positive impact on teaching, learning, and research. It will increase flexibility so that teacher educators and teachers can access the information regardless of time and geographical barriers. According to [4] educators today are using technology to engage pupils and encourage them to learn by putting the education in educational apps. Pupils find traditional way of learning hard and boring. Numerous studies [2],[3],[6] have shown evidence of increased interest to learn when mobile devices are incorporated into the learning environment. Over 80,000 apps are classified as education and learning based [4]. The purpose of this research is to find out how mobile game applications will impact the process of learning and assess the results in the subject of Mathematics. Following the guidelines from [5] we expect that learning subject of Mathematics by a mobile game application to be developed will be more interactive and will have positive effect by increasing pupil’s interest in learning.

II. RESEARCH METHODOLOGY

We have used quantitative research methodology and as research method used a questionnaire to collect the data. This research had as target the fifth grade pupils in primary school of Mitrovica, Shaban Idrizi. In the research two classes have been involved, a control and experimental group. The study used the an experimental approach. Participants consisted of (50) students who were registered in a course called "Strategies of Teaching and Learning" offered by the Department of Curriculum and Instruction at the College of Education to students majoring in English at the Department of English Language at the College of Science and Arts. As usual participant students were divided into experimental and control groups of (25) students in each. The course content was uploaded to the University Google Classroom System for students in the experimental group. Another hardcopy of the course content was delivered to students in the control group by hand in the first meeting. Data collection tools included an academic achievement test and conversational skills rating scale. We collected the data before and after playing the game, so we can assess the difference of the time spent on educational games and the level of transferred knowledge. Another purpose of this research is to find out how pupils and teachers will adopt the mobile learning methodology in learning process. Since children nowadays have access to various entrainments and games, we expect this app not to be difficult for them to use. By using a new and entertaining learning method, we have find out whether there will be a significant increase in the success and the results of achievement in the process of learning. Another aim of the research is to increase the motivation and interest of learning by not wasting their time playing but learning and playing in the same time. Our study is built on numerous studies involving teaching novice programming using mobile technology in Mathematic subject. This study is an action research. Participants of this research will be divided in two groups. One of the classes will be assigned as a control group, and the other one will be assigned as the experimental groups. A preliminary survey from all groups will be conducted.
This survey questions will aim to realize the student's background knowledge of the topics, usage of the internet and other technological devices. One class will use the mobile application Play and learn that we have created and the other will use the traditional method of learning. The application contains a lot of options for pupils to learn. The basic option is the Mash mole game, in five categories with five different Mathematical subjects whom pupils have already learned. The other option is quizzes with the same subjects and also the learning materials option. Pupils have the option to see their height score for each category so they can track their progress. They have also the help option, and about application option. This action research was 5 weeks long. First of all, the two groups take tests for the first two subjects. They had two weeks to learn and prepare, one of them with the application and the other group in the traditional way. After two weeks they took another test for the same subjects. The same procedure was practiced for the 3 other subjects. The tests and observations were collected and recorded. Furthermore, questionnaires have been recorded and transcribed for analysis. After action research we have done students’ needs analysis, experimental and empirical research where we measure parameters and comparative research. After action research we will do experimental and empirical research where we measure parameters and comparative research.

III. HYPOTHESIS AND RESEARCH OBJECTIVES

This research study objective is to investigate some important research questions as follows:

- What is the impact of Mobile Educational Games on increasing the attention and interest in the learning process?
- What is the impact of Mobile Educational Games on improving student’s success?
- What is the aspect of adaption of the game to the pupils and teachers?
- How Mobile Educational Games affects students, their motivation and will to learn?
- Mobile Games have improved my thorough understanding of the course content?
- Does Mobile Educational Games encourage competition among pupils?

The research study has these hypothesis:

H1: “Educational games have a positive impact on improving student success and achievement”

H2: “Educational games have an impact on increasing students' attention and interest in learning”.

IV. BACKGROUND RESEARCH

According to [6], [7] nowadays pupils use mobiles to play different games. The subject of the research in this paper is the educational application of mobile games for teaching and learning using mobile devices or smartphones, specifically applying it in teaching the subject of Mathematics with an interface in Albanian language; by the application of mobile educational games, in order for pupils to gain knowledge in easy and entertaining way. According to [4] mobile learning in Saudi Arabia, for instance it has been encouraged to be used in higher education institutions because of a set of factors such as the availability of mobile phones, their ability to motivate students, and the freedom and privacy they provide to share information. According to [2] Mobile Learning is defined as E-learning that uses mobile devices or learning connected to a mobile device. It is mainly based on mobility of technology, mobility of learners and mobility of learning [3]. According to [1] incorporating interactive tools one methodology will positively influence to make their class more interesting and motivate the pupils to learn more. There are a few educational applications in Albanian language, so a mobile game application will make a small contribution to the educational system in Albanian language. It will be an example of a new method for teachers to teach and pupils to learn.

V. RESULTS AND DATA ANALYSIS

In order to find out how the educational game responds to the user requirements a questionnaire has been given to in total 64 pupils one before they used the game, and afterwards they used the game. The questionnaire in total had 9 question three to capture the general data about gender, academic achievement and the others to capture the research questions input. It has questions about the system and one before they used the game and one after they used the game.

![Gender Analyses of respondents](image)

**Figure 1. Gender Analyses of respondents**

Elementary school that has been used as Case Study has more male respondents 63.2% then female 38.8%

Q2: Do you have access to digital educational resources?

As shown in the figure below, 25% of pupils have excellent access to educational resources while 10% have very good access and 25% have good access. Overall we can see that they have good access to digital educational resources.
Q3: Can Educational Games help you learn better?

From the feedback from the respondents we can see that they initially were neutral or disagree that educational games can help them learn better, but after they tried the educational game and experience it practically they changed their mind and consider that they can learn better.

Q4: The impact of Mobile Educational Games on increasing the attention and interest in the learning process is high?

As shown in the figure above, we can see that pupils initially were skeptical about the use of digital educational games but after they have used it most of them agree that their interest and attention has been increased.

Q5: The impact of Mobile Educational Games on improving student’s success is high?

From the answers of the respondents we can see that large number of pupils initially disagreed that educational games can improve their success, but after they used it they consider it can improve their success.

Q6: Mobile Games have improved my thorough understanding of the course content?

The results from these questionnaires showed a positive relationship between the post-test and pre-test, $T (1,62) = 79.989$, $p < 0.001$, and there were no significant differences between genders $T (1,62) = 3.076$, $p = 0.079$. 


TABLE I. ANOVA RESULTS FOR CONDITION FROM POST- TEST

<table>
<thead>
<tr>
<th>Variation</th>
<th>The sum of squares</th>
<th>df</th>
<th>Mean Square</th>
<th>T Value</th>
<th>S</th>
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</thead>
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<tr>
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<td>48.538</td>
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<td>16.847</td>
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<tr>
<td>gender</td>
<td>460.588</td>
<td>4</td>
<td>115.145</td>
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<tr>
<td>all * gender</td>
<td>51.587</td>
<td>7</td>
<td>7.369</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>errors</td>
<td>2686.247</td>
<td>27</td>
<td>99.126</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5228.472</td>
<td>41</td>
<td>126.662</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>

*P<0.05, **P<0.001 (THESE ARE STANDARD VALUES FOR THRESHOLD LEVELS)

VI. CONCLUSION

In this research study, the impacts of game based learning instruction method has been examined. We particularly aimed at investigating the opinion and attitude of pupils and therefore used two questionnaires, one before they used the game in learning mathematics used the game. Results showed that mobile learning had quite significant effect on both students’ academic achievement and conversational skills. In light of these findings faculty members were recommended to adapt the use of Mobile Learning in their classes. Within the research study concluded that there is quite increase in positive attitude and interest after the game has been used from pupils and it increased their attention and level of transfer of knowledge.

Educational games can be viable help in providing learners with additional learning resources and increasing their knowledge. The most important issues identified are: lack of exposure to new teaching methodologies, non-existing educational games in local languages, especially in Albanian language in the school used as case study, lack of internet access in school, and have been the most important ones identified. Addressing this issues will increase substantially the positive usage of educational games in increasing the level of knowledge by including the game in study curricula.

This research study aimed to contribute with investigating the impact at pupils in gaining knowledge involving educational games in their curricula’s. From the pupils feedback we can see that they have increased knowledge of the subject matter and the anova analysis confirmed this. We expect this insights to help other researchers to further investigate and use game based learning in liaison with fleeped learning and analyses the advantages of this approach.

REFERENCES