Analysis of Factors Affecting the Learning Enhancement of Primary School Children Using Smart Devices

Manzar Bashir[1,*], Asghar A. Chandio[1], Akhatar H. Jalbani[1], Muzaffar B. Arain[2]

[1]Department of Information Technology, QUEST Nawabshah, Pakistan.
[2]Department of Mathematics & Statistics, QUEST Nawabshah, Pakistan.
[*]Corresponding author: manzararain@yahoo.com

Abstract

The traditional learning styles are driven towards digital learning paradigms, such as e-learning and mobile learning (M-learning). The innovative trends in the technology have focused on finding new approaches for improved learning techniques and M-learning is one of them. The M-learning is a new and dynamic field of research which is constantly evolving in developed and developing countries. The use of mobile devices has recently increased in educational institutions for online learning and information gathering at any time. With the new era of information technology, learning trend is rapidly changing throughout the world with the aid of different learning platforms to the children. However, it is very important for Pakistan to promote M-learning and generate the new pattern of learning that will facilitate children to enhance their learning skills by using smart devices such as Tablet PCs and smartphones. In this paper, the role of M-learning and the factors which affect it are analyzed. An education based interactive application for primary school students on smart devices for M-learning has been developed in order to analyze the learning skills of the students. Our results show that M-learning, especially learning through interactive applications on smart devices, plays a vital role in enhancing the learning skills, learning interests and knowledge spectrum of the students.

Keywords—M-learning, E-learning, interactive learning, learning through games, mobile learning.

1 Introduction

Mobile Learning (M-learning) is one of the rapidly growing fields in educational institutes all over the world. M-learning is a revolution in e-learning that uses the electronic educational technology in learning (i.e., M-learning). It provides the learners with improved access to data, learner-centered approach, enrichment, high quality and new ways of interaction to enhance their level of knowledge and interest towards the education using smart devices (such as Tablet PCs, PDAs, iPads, mobile phones). The M-learning plays significant role in the formation of universal knowledge based society. In modern era, M-learning approach is one of the powerful tools for standard education in most educational institutes all over the world.

The important consideration from the educational point of view is that by incorporating modern technology oriented tools in education, such as learning through the mobile games or other interactive applications, can produce the positive feedback from the children. The authors in [1] suggest that the game-based learning can achieve better learning results than the traditional classroom learning. The tremendous success of M-learning in developed countries shows that M-learning contributes significantly in improving the educational outcomes. Hence, Pakistan should also take immediate measures to introduce this mode of learning at each educational level to make future of Pakistani education bright in universal knowledge based society.

The UNESCO project [2], launched in collaboration with Nokia in Pakistan, shows that the quality of the teaching in remote areas of Pakistan can be improved using mobile technology. UNESCO and Nokia together have introduced a Mobilink learning project for teachers' professional development for public schools in remote areas of Pakistan in order to deliver learning resources using Nokia's education delivery application. Smart device technology has enabled people from almost every walk of life to carry their own mobile

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assistant with them all the time. These mobile devices include Personal Digital Assistants (PDAs), tablet PCs, e-readers and smart phones. These devices have tremendous potential for both traditional classroom learning and out-of-classroom informal learning [19].
The rest of the paper is organized as follows. Section 2 outlines related work in this domain. Section 3 describes the factors affecting the learning behavior. Section 4 discusses the proposed framework. Section 5 describes the results and discussions and section 6 concludes the paper.

2 Related Work

Mobile learning (M-learning) is derived from e-learning which is a portable technology composed with wireless and mobile phone networks which facilitates the learners to enhance their level of understanding towards the particular topic anywhere and anytime. The educational results of students are affected by the usage of interactive learning applications using smart mobile devices [5]. The adoption of the e-learning implementation at a private university in Indonesia has isolated the behavior of the students towards the ICT [4].
M-learning also has positive influence for the behavior, attitude and interest in students of colleges at American higher education institutes [8]. An M-learning process for pre-school children also affects the educational period of children and teachers [3]. Mobile learning also has a positive effect on educational achievement and self-regulation [6]. In M-learning, cultural factors have also significant impacts for culturally diverse country such as Pakistan [7], as mobile culture is an integral part of our daily life and young people bring mobile phones with them all the time and continue to use them for playing games and internet surfing [9].
According to students' perception, the role of the teacher is very important in M-learning at developed countries [10]. Most of the teachers favor the use of technology-oriented tools during their lectures in the classrooms for facilitating the students to understand the lecture topics more easily [11]. The distance learning via SMS facility of Open University Malaysia is an initiative which enables the university students from remote areas to learn through mobile devices [12]. One of the significant uses of mobile phones for playing games indicates that the learning interest of students is enhanced through mobile games [14]. M-learning impacts the learning outcomes by improving the access to the education with alternative learning process [13]. The mobile game development is rapidly growing due to the increased use of mobile devices which may also have positive influence in the educational institutes [14]. The game based learning features also contributes to the engagement of participants in a topic and they feel fun by learning through the mobile games [15].

3 Factors Affecting Learning Outcomes

There are a number of factors that affect the leaning outcome and behavior of children using smart devices. The M-learning technique facilitates the children from different aspects which are discussed in the following sections.

3.1 Activity Based Learning

This type of learning enhances the learning interest of children using smart devices and has shown significant impact on the children outcome in education. The activity-based learning provides a variety of educational material in different aspects and children may be engaged through different activities according to their level of interest.

3.2 Ownership

Ownership is also perceived as a powerful motivational force for individual learners. Ownership includes using own device, privacy, availability and mobility which allow the learners to access information all the time and staying connected with friends, family and the rest of the world.

3.3 Collaboration

Collaboration is one of the greatest experiences for mobile learners which provides them a chance to work together from remote locations. Learners can interact with their trainers and colleagues anytime and from anywhere. M-learning allows the learners to share their ideas within a group and get a quick feedback. Mobile learning facilitates the learners with various online apps such as Google Apps that allow the learners to work collaboratively. The M-learning context is more than on-demand and the mobile learning extends learning from the classroom to the real-world practice. There are a number of opportunities for the learners in M-learning such as they can choose a course on their own demand. M-learning also enhances the learning experience of the learners for both formal and informal learning practices. Leaning is everywhere and anytime such as waiting for the train at station and the context of M-learning is more than the time and space [17]. By this way, learners can learn more effectively and efficiently in flexible and comfortable environments [18].

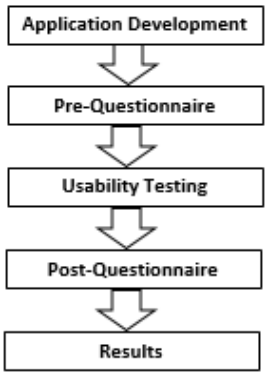

Fig. 1: The proposed framework

3.4 Learning as a Fun

Learning as a fun also has a positive effect on educational outcomes of the children, because when children have fun, they are more creative and innovative and are able to engage with whatever they are learning through coming up with new ideas. Learning as a fun looks for providing free learning activities to children according to their interest such as children learn through mobile games according to their choice (math, English, etc). These additional benefits of mobile application facilitate the learners to learn with fun [20].

3.5 Feeling Happy

Feeling happy is also one of the motivational factors for the children leaning through mobile games. M-learning provides the learners with entertainment at their fingertips. Starting to learn with the help of games on their own smart devices has a positive experience for improving the learning skills of the students [16].

4 Proposed Framework

Our proposed framework is depicted in Figure 1. The following sections explain the various steps of our proposed framework.

4.1 Application Development

In the first step, we develop an Android-based alphabet learning application, namely "English Alphabets Learning Application" for children. The idea behind the development of the android application is to use it for analyzing and measuring the interest of the children for learning through mobile devices with the help of usability tests.

4.2 Pre-Questionnaire

A number of the questions are asked from the children before testing the developed application which are helpful for understanding the level of the interest of the children towards M-learning.

4.3 Usability Testing

The developed application is tested in real environment on the children of class nursery, kindergarten and one. During this phase, 5 primary schools are visited for conducting application tests. These schools include both private and public sector. A total of 155 students participated for usability testing. The application contains multiple activities for children's understanding. The students were able to learn through different aspects as per their interest. This helped to analyze the user experience of the children.

4.4 Post-Questionnaire

At the end of the usability testing phase, a post-questionnaire are distributed among the students which contains a number of questions for the children about the user interface and the use of the application.

5 Results and Discussions

We adopt a collaborative classroom setting by making the students sit together around the tables in the classrooms. Before the usability testing of the application, some pre-questionnaires are distributed among the students for collecting the basic information about the use of smart devices. Subsequently, we give a demo to the students about the use of the application. Some of the basic questions asked from the students and their respective answers given by the students are shown in the Table 1. At the end, the post-questionnaire are distributed among the students for knowing the understanding and interest of the students using the smart devices.Table 2 shows the usability test questionnaires asked from the students after the pre-questionnaire.

After the usability testing, post-questionnaire are distributed among the students. Table 2 shows the post-questionnaire questions asked from the students. Furthermore, the feedback of the students about each questionnaire is shown in the following Figure 2-6. Figure 2 shows the feedback of the students on the usability experience of the developed application. 89 students strongly agree, 31 agree, 21 are uncertain, 9 disagree and 5 strongly disagree, respectively.

Figure 3 shows the feedback of the students on the understanding of the alphabets using the developed application. 81 students strongly agree, 47 agree, 15

TABLE 1: Questions asked before the usability testing

Age in Year	3 to 4 5 to 6 6 to 7	60 65 30
Gender ratio	Boys 53.55%	Girls 46.45%
Class-wise students	Play Group KG Nursery One Class	44 24 55 32
Familiarity About Smart devices	YES 76%	NO 24%
Learning through Interactive Tools	YES 73%	NO 27%
Availability of Smart devices	YES 82%	NO 18%

TABLE 2: The questionnaire of the usability test

S.No	Question
1	Is this application interesting and easy to use?
2	Did you understand easily through this application?
3	Will you use this application at your home?

are uncertain, 9 disagree and 3 strongly disagree, respectively.

Figure 4 shows the feedback of the students regarding the use of the developed application at their homes in order to learn English alphabets using this application. The results show that 83% of the students are willing to use this application at their homes for learning English alphabets and 17% are not interested to use this application.

The application developed is based on five basic activities for learning English alphabets. Each activity is defined by different ways of learning for the students to learn through different techniques and interests. Figure 5 shows the feedback from the students regarding activity wise interest of the students. 73 students are interested in ABC-Chart activity, 61 in Finger-Swipe activity, 9 in Click-to-Next activity, 8 in Auto-play and 4 are interested in Alphabets activity.

The traditional learning and M-learning methodologies are compared and the feedback from the students regarding the traditional learning system and M-learning system is obtained. The results of the feedback as given in Figure 6 show that 51% students are interested in the interactive learning, 41 in traditional learning and 8% are interested in both traditional and interactive learning.

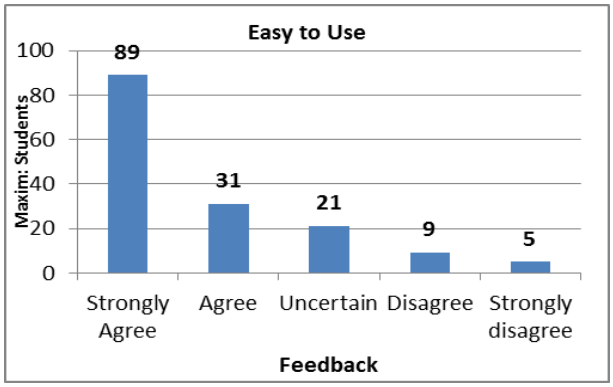

Fig. 2: Usability of the developed application (easiness to use)

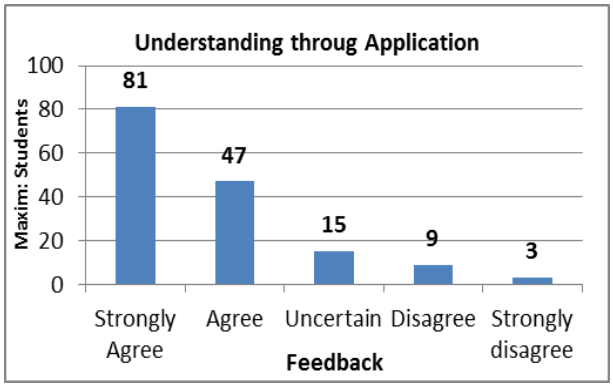

Fig. 3: Usability of the developed application (understanding through the application)

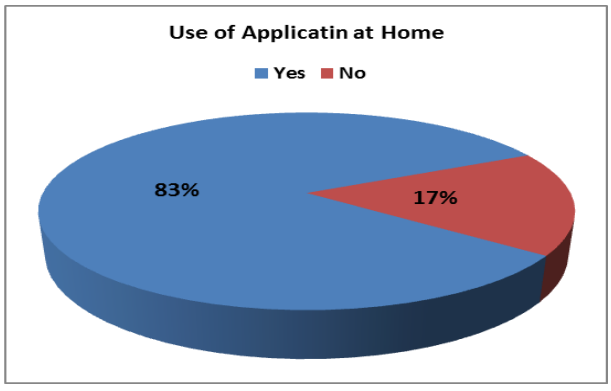

Fig. 4: Usability of the developed application (use of the application at home)

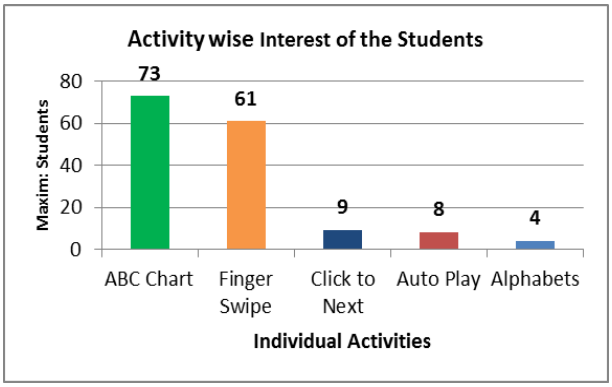

Fig. 5: Activity-wise interest of the students

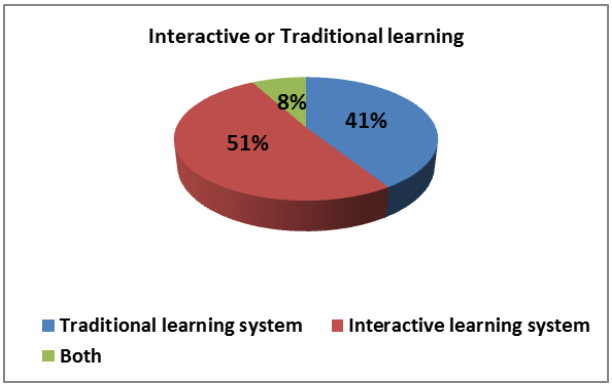

Fig. 6: Interactive vs. traditional learning

6 Conclusion

The mobile learning enables the education delivery everywhere/anytime. Mobile learning facilitates the students with verity of integrated learning activities, especially the use of the smart devices as interactive learning tool. Mobile learning has potential to produce innovative pattern of learning that may facilitate the students to enhance their learning skills. This research study concludes that interactive learning (M-learning) has significant impact on the leaning outcomes of the students. In addition, five factors are analyzed as activity based learning, ownership, collaboration, feeling happy, and leaning as a fun that can enhance the learning interest of the students. Moreover, an educational learning application was developed for analyzing the learning interest of the students. The results of this research study show that 72% of the students are interested in interactive learning methodology, such as M-learning, through mobile games and other interactive learning tools. During the visit of the schools for usability testing of the application, it was found that most of the private sector schools are already using interactive learning tools such as FlexiMaster, but they are not using these tools on regular basis. However, in the government sector schools, there is no existence of interactive learning practices. Therefore, it is important for education department of government of Pakistan to take vigorous steps for promoting the interactive learning (M-learning) in order to be a part of the global society.

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References

[1] Mehdipour, Yousef, and Hamideh Zerehkafi. “Mobile learning for education: Benefits and challenges.”. International Journal of Computational Engineering Research, vol. 3, no. 6, pp.93–101, 2013.

[2] Teacher Development with Mobile Technologies Projects in Mexico, Nigeria, Pakistan and Senegal United Nations Educational, Scientific and Cultural Organization.(n.d). Available at http://www.unesco.org/new/en/unesco/themes/icts /m4ed/teacher-development/teacher-development-with-mobile-technologies-projects-in-mexico-nigeria-pakistan-and-senegal. Retreived on Feb 23, 2016,

[3] Tarim, Mustafa, Celal O., and G. Yuklu. “An M-Learning Tool for Pre-School Kids”. pp.192–197, 2015.

[4] Indrati, Aviarini, Edi Munaji Pribadi, and Silvia Harlena. “E-Learning Acceptance by University Students in Indonesia Using Unified Theory of Acceptance and Use of Technology”. pp.180–186, 2012.

[5] Ashiq, Huma, Malik Tariq Mahmood, and Syed Abdul Siraj. “Use of mobile communication and its affect on social capital of college going teenager”. International Journal of Research in Humanities, Arts and Literature, vol. 1, no. 3, pp.45–60, 2013.

[6] Zare Bidaki, Majid, Fatemeh Naderi, and Mohsen Ayati. “Effects of mobile learning on paramedical students academic achievement and self-regulation”. Future of medical education journal, vol. 3, no. 3, pp.24–28, 2013.

[7] Hameed, Nazia, and Fozia Hameed. “Effect of Cultural Factors on Students of Pakistan”. ArXiv preprint arXiv:1605.01580. pp.310–318, 2012.

[8] Cheon, Jongpil, Sangno Lee, Steven M. Crooks, and Jaeki Song. “An investigation of mobile learning readiness in higher education based on the theory of planned behavior”. Computers & Education, vol. 59, no. 3, pp.1054–1064, 2012.

[9] Kurkovsky, Stan. “Integrating mobile culture into computing education”. IEEE Integrated STEM Education Conference (ISEC), pp.1–4. 2012.

[10] Imtinan, Umera. “The Teacher’s Role in Mobile Learning Perceptions of University Students in Pakistan”. Transactions on Mobile Learning, vol. 2, pp.20–23, 2013.

[11] Khan, Md, Shahadat Hossain, Mahbub Hasan, and Che Kum Clement. “Barriers to the introduction of ICT into education in developing countries: The example of Bangladesh”. Online Submission vol. 5, no. 2, pp61–80,2012.

[12] Valk, John-Harmen, Ahmed T. Rashid, and Laurent Elder. "Using mobile phones to improve educational outcomes: An analysis of evidence from Asia". The International Review of Research in Open and Distributed Learning, vol. 11, no. 1, pp.117–140, 2010.

[13] Schwabe, Gerhard, and Christoph Goth. "Mobile learning with a mobile game: design and motivational effects". Journal of computer assisted learning, vol. 21, no. 3, pp.204–216, 2005.

[14] Dabney, Matthew H., Brian C. Dean, and Tom Rogers. "No sensor left behind: enriching computing education with mobile devices". In Proceeding of the 44th ACM technical symposium on Computer science education, pp.627–632, 2013.

[15] Jacob, Seibu Mary, and Biju Issac. "The mobile devices and its mobile learning usage analysis". arXiv preprint arXiv:1410.4375, 2014.

[16] Lim, Tina, Mansor Fadzil, and Norziati Mansor. "Mobile learning via SMS at Open University Malaysia: Equitable, effective, and sustainable". The International Review of Research in Open and Distributed Learning, vol. 12, no. 2, pp.122–137, 2011.

[17] Jones, A., K. Issroff, E. Scanlon, P. McAndrew, and G. Clough. "Affective factors in learning with mobile devices". Big issues in mobile learning, pp.17–22, 2007.

[18] Gros, Begona. "The design of smart educational environments". Smart Learning Environments, vol. 3, no. 1, p.15, 2016.

[19] Sung, Yao-Ting, Kuo-En Chang, and Tzu-Chien Liu. "The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis". Computers & Education, vol. 94, pp.252–275, 2016.

[20] Crawford, Maxine R., Mark D. Holder, and Brian P. O'Connor. "Using mobile technology to engage children with nature". Environment and Behavior, vol. 49, no. 9, pp.959–984, 2017.