A REVIEW OF MOBILE TECHNOLOGY FOR TEACHING AND LEARNING MATHEMATICS

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Abstract - Today, the claim of Mathematics is more critical than ever. Almost everything in the world is relying on mathematics. The subjects like mathematics can be known as a requisite subject of the school curriculum which is compulsory for students and cannot be ignored. Because, as it is mentioned earlier mathematics can be known as a crucial subject. There is a general opinion that most students do not like mathematics due to many reasons. However, students' dislike for mathematics may damage the collaborative other professions as well. This paper examines the reasons for students' dislike for this subject and will provide the most convenient SMART solution. The methodology used to conduct this research is qualitative and quantitative based survey. The online survey was circulated through Email, Social Media and desk research. The survey was successfully completed by 160 persons securing their secrecy. The shared questionnaire brought strength to the research when identifying the issues. According to the previous work, the technological assistance was the main empirical result that they have suggested in order to minimize this situation. According to the online survey results more than 90% raised their flag on the difficulties that they face during calculations and other algebra by their life time experiences. With the rapid growth of technology and the interest of people towards mobile-based applications, it has been shown that mobile devices can be used as a tool to improve students' academic skills. Therefore, this paper suggests a new approach to the user, through which the user can build up an interest towards mathematics. Also, these can identify the aspects that are involved in teaching and learning of mathematics as well as the possible solutions.

Keywords- Mathematics, Mobile application, SMART technologies

I. INTRODUCTION

Over a decade, the mobile technology, such as smartphones, tablets, different applications, etc. has become a requisite part of the human life in all over the world. With the time to time development of the mobile technology the uses or the services of the mobile device has increased. The mobile technology went beyond the traditional telecommunication. It changed the way of communicating, sharing information and how their works done. Likewise, with the combination of mobile technology and the generation's new cognitive new solutions for the current concept of learning has invented. One prospective solution is Mobile Learning (m-learning).

Mobile educational applications motivate and influence students while they focus on problem solving, memory improvement, reading and writing skills. In addition to traditional classroom contexts, the use of innovative technology in the learning progression and evaluation with m-learning tests improves the time of use according to the needs of the student, by personalizing the experience. M-learning seems gratifying to be able to host features and departments in a wide range of environments that provide a more collaborating learning experience for students. It provides a stress-free environment powered by a particularly designed, user-friendly interface. While it removes the design and layout of the text, hindrance and misperception, information makes it easy to think carefully about certain subject areas like Mathematics (Taleb et al., 2015).

Over many centuries, Mathematics is extended to solve problems. It helps to think logically, to identify a problem clearly and to solve the problem with the appropriate method. Now, much more than arithmetic and geometry, Mathematics has become a necessary discipline which is a powerful tool in the world in order to enhance the perspective of every individual in the world. Rather, mathematics is a study of quality, quantity, structure and the space. Since most of the computational concepts works throughout the mathematical base. With the rapid changes in technology, there will be mathematical changes and logical changes as well. Because of these rapid changes, it would be difficult to anticipate the future skill requirements of people. But, if someone has a proficient base of mathematics, would keep him/her agile enough to face for the rapid changes in technology. Therefore, it would be better to be expertise in mathematics. This review leads to a new approach in leaning mathematics with mobile technology.

II. LITERATURE REVIEW

Mobile learning is one of the emerged solutions to the challenges facing in education sector. Even though the various resources are always available for learning, mobile learning tools offer more options for personalized learning. Mobile learning also can be defined to the use of wireless or mobile devices in order to learn on the move. Mobile learning characteristics in the distance learning contextually has described in a better understandable manner by Park, (2011). Mobile learning in the classroom generally allows students to work on projects, solve problems individually or in groups. There are many formal and informal learning opportunities when you can reach so much of content all the time and anywhere.

After the technological evolution, many technological tools have been presented in tend to increase learning. A study has shown that laptops, mobile tablets, iPod touch and iPads are very widespread devices and announced as the latest technological devices to facilitate mobile learning due to the costs and availability of applications. They are used to collect student feedbacks, refer e-books and websites, record their thoughts, document trips, collect and analyze data, and much more(Mehdipour and Zerehkafi, 2013).

But these devices will be substituted to many other different technological devices in the future with the new emerging technologies. Mobile devices can be used by collaborative teams to switch between relative experience and physical abstraction and high-level ideas and abstraction to switch between relational and sensational events. Because of that the work load is not too high among the teams (Rogers et al., 2010).

Over a decade, ML did not produce a single application for learning technologies, but projected promising circumstances, such as the use of graphing calculators and portable response systems in the classroom, use of PDAs to configure small group work, portable tools for arithmetic skills, portable travel guides and portable tools for basic learning (Balacheff et al., 2009). As it is mentioned, it is a great opportunity to provide a support to a person throughout the technology to their lives, to capture and organize their daily education and lives in order to create and share their wide views to explore surroundings (Sharples et al., 2005)

At most of the higher education institutions which are followed by the elementary schools, mobile learning (ML) is widespread. ML is frequently used to support in the professional industry and the students who follows applied science and formal sciences (Wu et al., 2012). The progression of mobile learning in the widest possible framework and explores the importance of ideas on the current development of mobile learning. The challenge for the mobile learning community is the balance between beholding inner, improving your work, and observing and understanding the framework and importance of this work (Traxler, 2009). The difficulties encountered in assessing mobile learning, defined as a direct consequence of the complex nature of socially perceived mobile learning rather than as a technical phenomenon of people who moves to the advance in daily life by creating a context of self-learning and negotiation through parameters, contacts and technological interactions (Vavoula and Sharples, 2009).

In the modern world of information technology, application of mathematics has become more critical. In that case it is important to improve the overall performance of mathematics among students and undergraduates. Even though it is important, most of the school students and undergraduates are not successful in their mathematical education. The main reason for this situation can be ranged from pedagogically, socially, economically, administrative and the attitude aspect of students and teachers and the strategies used by teachers.

But today, it is in an unsatisfactory level. Because, due to the facility impoverishment, lack of study materials, the

quality of teaching has become bad and low. It is shown below in Figure:1. This issue causes a huge breakdown towards the educational development of the whole world (GEZAHEGN, 2007) . Among the factors, mainly, the low performance in mathematics may causes because of the poor attitudes of both teachers and students towards the subject modules. Both parties cannot underestimate the importance of a good attitude towards mathematics in the learning and the teaching processes. Hence, this is important to commence to study all the factors individually which are influencing the performance in mathematics. Mostly, the scope of higher education is rely on the performance of this subject module(Adino, 2015).

According to the Strengthening of Mathematics and Science in Secondary Education (SMASSE), mathematics and science are the modules that students persistently perform lowly today. Other main reason for low performance in Mathematics is lack of confidence. The students who are not really sure about themselves are feel more likely threatened. Most of the time they avoid seeking help from others as well. Because of that most of them fails in their studies and examinations. The students who got high confidence are more likely to seek help when they need it (MUTAI, 2010).

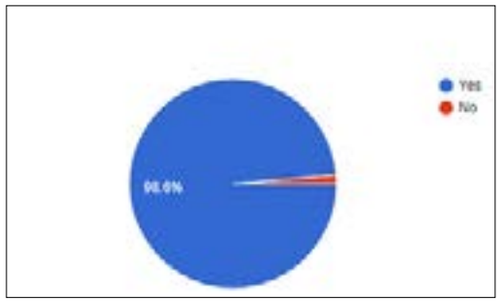
According to more research findings, there are some more reasons why students get slow passing score in their mathematics examinations. They are mainly. Lack of prior knowledge of students, lack of student labor and their parents' support(Acharya, 2017). When it says prior knowledge, it is the knowledge that the students gained in previous grades. Simply, it can be called as basic foundation in mathematics. If a student erases the knowledge of previous grades, it won't help him to do the present grade. In that case the students' failure rate may increase. Generally, a student's mathematics achievements are depending on the student's laborism. That means a student need to manage some extra time to practice mathematics. Today, most of them are not laborious. Consequently, their failure rate increases. Role of parents is also a main aspect that influences in students' achievements.

(Al-Zoubi and Younes, 2015) also have researched about the low achievements in academics. According to them, the most challengeable situation of both teacher and student, is the low academic achievements in the examinations. In that sense, this problem may derive not only in educational problems but also in social, cultural and psychological dimensions. Guidance or the support is much needed for students to achieve their study goads. It clearly can be seen in the Vygotsky's zone of proximal development.

III. METHODOLOGY

The methodology used to conduct this research is qualitative and quantitative based and the online survey circulated through Email, Social Media and desk research. When it comes to the Mathematical knowledge success factor there are several kinds of questions and problems to be considered. For instance, why people have lacked knowledge of mathematics, why it is so complex to learn and high time consumption of learning due to the complexity.

Today, there is a huge breakdown of learning mathematics among the students. Since they don't see the general requirement of mathematics, they have got a less power of critical thinking and quantitative analytical skills. Not only that, they are lacking with computational skills, problem solving, data analyzing, pattern recognition and learning how to approach and solve complex problems.



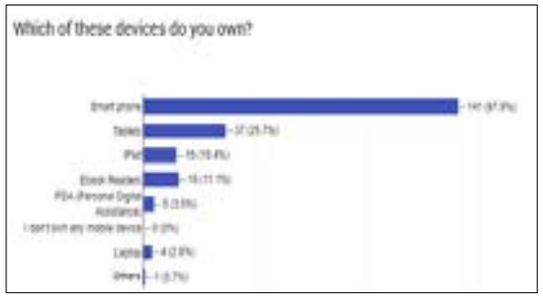
Figer 1. Do you use a mobile device?

Over 160 people participated for this survey via emails, chat rooms and social medias. This research was conducted through an online survey, which included some questions regarding the impact of technology towards the learning factor. This questionnaire was distributed via emails, chatrooms and different social medias. The investigation was successfully completed by over 160 people insuring their privacy. The shared questionnaire brought more strength to the investigation by identifying problems.

IV. RESULTS

Today, mobile device has become an essential thing in life. Out of 161 respondents there were 91 males (56.5%) and 70 females (43.5%). As it is shown in the Figure 1, among those who have submitted their point of view in this survey, there were 46% undergraduates, 22.4% students, 10.6% teachers/lecturers and some other professionals. According to them 98.6% of people owns a mobile device in their day-to-day lives.

As the questionnaires were responded, people use not only the smart phone but they use many other mobile devices in order to ease their basic works. Anyhow the majority with 97.9% are using smart phone. Also, the percentage of people who do not use a mobile device have indicated as 0%. It can be clearly seen in the Figure 2.



Figer 2. The device ownership

As it is questioned in this survey, people have responded that they use their mobile phone or the smart phone almost always (48.6%) and most of them have their phones always with them (60.3%). As well, some people do not hold their phones with them at night and compared to the percentage of having phone always, it is less than 50% (Figure 3).

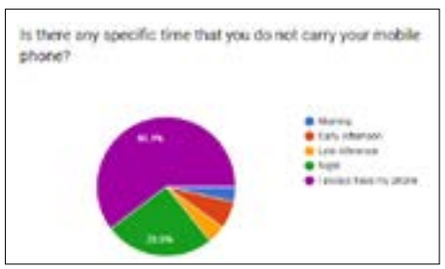


Figure 3. Specific times that people do not carry their mobile phones

Normally, people use their phones in order to communication with others via a phone call. But, today people use their phone most frequently to check out their social media. Some of them use their mobile as a calculator in order to their calculations as well.

When consider about the subject mathematics, it was being a compulsory module that cannot be ignored. Most of the people have completed this module. But their view of this subject is different from one to another. In that case, this investigation has gone through few facts and it was compared to each (Figure 4).

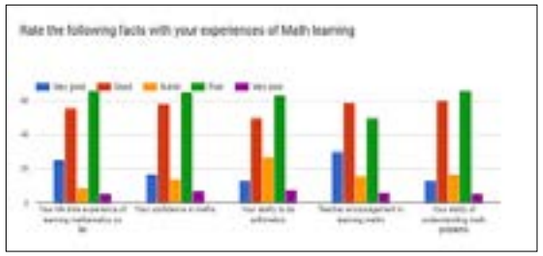


Figure 4. Comparison of peoples' view on Math

Such as;

- The life time experience of learning mathematics so far
- The confidence in Math
- The ability if doing arithmetic
- The encouragement of the teacher
- The ability of understanding math problems

According to the above chart, majority have indicated their knowledge and the attitude towards mathematics as "Poor" while some have indicated as "Good". Also, peoples' the experience of learning mathematics and the understanding the math problem is quite way behind. As for them, they have got a good guidance and a well encouragement when studying mathematics. When considering Figure 3, the overall interest and the attitudes towards this subject is can be seen low.

Not only because the attitude and the interest, but because the indolence of students to refer books have made them to score low mark in examinations. Sometime students have to refer so many books just only to solve one

calculation. As a solution for this issue people have elected to use digital media for referencing over the textbook in referencing. As the Figure 5 shows 87% of respondents have chosen digital media.

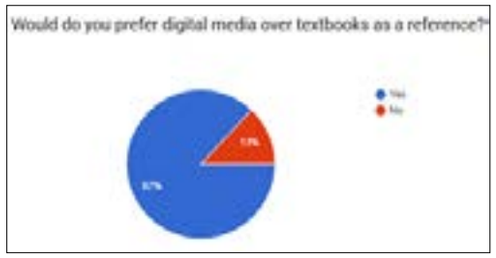


Figure 5. Media Preference

With the development of technology, most of the industries, different sectors have changed. But, the classroom education in Sri Lanka, still in the same level of over a decade. As for the general public who represented the students, teachers and other professional, it is better to use the mobile phone inside the classroom for the learning process as well as for the teaching process. It can be clearly shown in below figure 6.

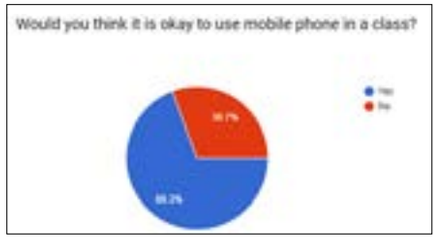


Figure 6. Using Mobile phone in the classroom

In agreement with the previous research authors and as respondence to the survey, the empirical solution that can be seen for the above situation is a technological approach. Because, there are certain amount of people who have been using mobile devices for their learnings and teaching. Correspondingly, it is stated as 92.5 percentage. Also, there were people who suggested that mobile learning should play an important role in Mathematics learning as it is shown in Figure 7.

V. DISCUSSION

Mobile technology is the key point for next generation and let the learning occurs in anytime, anywhere and to

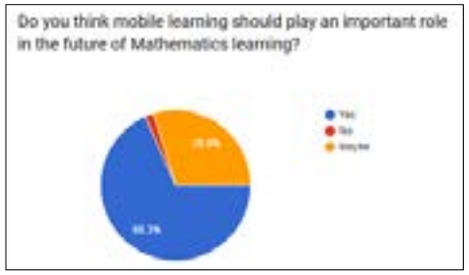


Figure 7. Interest towards mobile learning with mathematics

be an inspiration in a variety of learning circumstances. Mobile learning applications are becoming better known year after year and today they are used by millions of students and educators around the world. Strategies for implementing mobile learning are very important for each nation because of the benefits that this brings. For example, easy access to education and expanded better interaction between instructors and students.

Mobile devices, such as smartphones, personal digital assistants and tablets, could be used to assist students' learning modules, such as mathematics inside of a classroom or beyond the classroom. Inclusion of mobile learning in the educational process, presents some important factors that will examine the implications of using mobile tools and applications in mathematics education at all the levels of education. Mobile learning and related technologies are extensively considered to be increasing ubiquitous in society, especially among young people.

When it comes to be the Mathematical knowledge factor there are several kinds of questions and problems to be considered. For instance, why people have lacked knowledge of mathematics, why it is so complex to learn and high time consumption of learning due to the complexity.

According to the respondents of the survey most of the public individuals have not experienced well while in mathematics education. Most of them are failing in mathematics due to the disability of understanding math problems or the situations. Because of that, students have lost their confidence in learning mathematics. Due to these reasons, there is a huge breakdown of learning mathematics among the students. Since they don't see the general requirement of mathematics, they have got a less power of critical thinking and quantitative analytical skills.

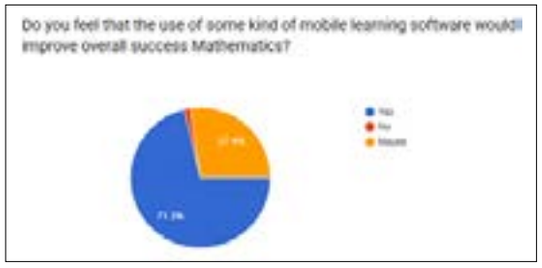
Not only that, they are lacking with computational skills, problem solving, data analyzing, pattern recognition and learning how to approach and solve complex problems.

As a solution for this breakdown in learning mathematics, it can suggest moving forward with the technology. According respondents of the survey which has been taken place on "The usage of mobile devices for learning Mathematics" have marked that having a software tool would be better for math learning. Out of 161 respondents, 112 have marked positive, 43 have marked as may be while only 2 made it negative.

VI. CONCLUSION AND FURTHUR WORKS

With the development of technological change, processes in education, it necessities to be acknowledged that mobile learning should be regarded as a new part of the landscape. Mobile learning offers many opportunities for personal, informal and self-learning. Using mobile devices, students from all ages and backgrounds can work together, interact and learn in different ways.

In addition, the introduction of mobile learning and subsequent technological innovations in schools offers significant opportunities for change and study in teaching practice (Figure 8). Student involvement of trainers will improve learning and teaching opportunities tailored to new trends.



Figer 8. Acceptance of Mobile Learning Software

For a young research area, there is a lot of potential for discrete fields such as mathematics, as well as transforming classes into mobile devices. The result of this study shows that the ability of understanding a problem should be increased as well as the confidence of students. This study was mainly focused on the solution for the breakdown in math learning. According to the previous work done by other research authors and the results of the survey done on this matter shows that adding up mobile technology as a new approach to mathematics learning would be best solution.

The survey results will help to develop the SMART mobile app which can help to solve the mathematical problems such as equation and formulas to be developed in the future as a partial solution to improve the knowledge, confidence and the attitude towards math learning. This concept of mobile learning for mathematics can be expanded further by carrying out this survey for the different schools and the universities. By analyzing results via SPSS statics software can have the best results.

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