M-Learning withSelf-Regulation Strategies for-Mathematics Learning

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Abstract - Most of the students face difficulties in learning of mathematics, students need help for solving mathematics problems. The self-regulated model can help learners to regulate their own learning. This Mobile application of self-regulated learning model to improve the performance of students through the use of hints for solving problems.Total of 60 children were selected from three different schools. Students were divided into two groups control group and the experimental group. The classroom environment was followed by the control group and SRL mobile application used by the experimental group. A post-testmethodwas applied at the end to validate the result.The calculated value of T-test was greater than the value of the T .distribution table at level of 0.05 with confidence level of 95%

Keywords:Self-regulatedlearning, Mobile Technology, Experimental Group distribution, M-learning,Mathematics .Learning

INTRODUCTION

Self-regulation is the self-directive process in which learner alters their mental abilities into academic knowledge. Self-regulated learners control their behavior toward goals of getting information, enhancing their expertise, and self-improvement of their knowledge, such learners set their learning goals or monitor their learning progress.Self-regulation defined as it is a framework for the students to become active and directed towards learning and achieving goals. Today's students need of mixing of different ways of learning like self-regulatory learning strategies into their curricula which is also recommended by researchers. Self-regulated learners as individuals who are cognitively, motivationally, and behaviourally play the active role who participating in their learning process. During the last few years, learning through self-regulation skills has acquired a crucial role in all areas of learning including sport and academic learning; medical and mathematics, sciences, and technological disciplines [1].

Expert learners manage their learning goals at each stage of life. In self-regulated learning tutorials, students can make self-assessments to improve their performance. Smartphone applications provide a facility to the learners to assessments their expertise regardless of specific time or location. These smart devices allow users in remote areas, where there is a lack of infrastructure and suitably of Self-regulation is the self-directive process in which learner alters their mental abilities into academic knowledge. Self-regulated learners control their behavior toward goals of getting information, enhancing their expertise, and self-improvement of their knowledge, such learners set their learning goals or monitor their learning progress.

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material and content. The challenge is to present educational resources in such a way so can learn independently and smoothly. Many ways self-regulation skills can be implemented in intelligent tutoring systems, some are implemented as self-explanation models in which related examples of the problems are explained in detail, some are based on hint base approach. students see hints when solving problems, or they can follow tips to improve their knowledge, monitor and control themselves to educational contentto present educational resources in such a way so can learn independently and smoothly. Many ways self-regulation skills can be implemented in intelligent tutoring systems, some are implemented as self-explanation models in which related examples of the problems are explained in detail,

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BACKGROUND OF SELF-REGULATED LEARNING

Self-Regulated learning seems to have been a long exercise in German education. Johann Amos Comenius (1592 to 1679) is counted as the pioneer of the pedagogy of Europe, the principal goal of this learning is to discover teaching ways that enable teachers to teach less and students to learn more in a short time, that leads to a peaceful environment of learning. The idea of self Regulatedlearning comeback in Germany in the era of1970s the early 1980s [2],[3]. In 1982, the German journal "Instructional Science" printed a distinctive issue on self-regulated learning which was introduced by Weinert, a well-known researcher of that time in the field of psychology of educational thinNeberking, with an article on self-regulated learning as a requirement, method, and objective of education [4],[5] book on policies of learning and working includes chapters on inspiring own, time managing, excogitating, identifying the crucial, processing information, self-regulation, writing an essay and presenting individual. Most current textbooks on learning and instruction [6]. Learning within different situations and locations needs the support of appropriate technology [7]. Mobile learners should have access to laptops, tablets, or mobile phones that will allow learners for the learning content. A variety of learning devices currently exist, all of the deviceshave different limitationsand advancements that force mobile learners to upgrade their learning devices according to demands.

Self-Regulated Learning in Mathematics

Self-regulated learning occurs when students feel like the masters of their learning processes in theirplace[8]. Research has been carried out at the beginning of the school year, students came from various schools and students were familiar with mathematics education experiences. The classroom teacher took the classes of 12 lessons to teach children about the mathematics topic of the area of proportional reasoning over 4 weeks. Self-regulated learning is vast relevant to proportional reasoning. Activities were designed at the level of the whole class, group level, pair level, and individual levels, and time was also provided to students to write about their learning outcomes.An interview was conducted with about six students at the initial level and the final level of the study. All the students participated in the test at the initial level and the final level of the unit. The majority of the questions in the test belonged to assess components of proportional reasoning and some of the problems in the test belonged to those questions that were not covered in the classrooms. The majority of the students who were interviewed could draw pictures to comprehend the knowledge that successfully has been transferred to problem situations. Throughoutthis teaching experiment, students were introduced to various types of modeling proportional situations. Topics included were double number lines, geometrical shapes, Cuisenaire rods, and decimal pipes. One of the most successful models was the double number line. Students understood the difference between 50 and 25 percentage points on the scale and in the subsequent discussions, many of the students realized that how many milliliters resembled other percentage amounts. Self-regulated learning in mathematics involves developing awareness among students to provide problem-solving options and strategies.

Introduction to M-Learning

The quick growth of mobiletechnology has created a new zone that is known as mobile learning technology. This technology can be a powerful tool for strengthening children's home connection with the school connection [9].Mobile phone is being used as an e-School bag system at Aletheia University in Taiwan [8].These devices become a part of our daily routine and culture of about every student and teacher.M-Learning can be assumed as a suitable platform for everyone at any age of life to continue learning. Courses of distance learning programs can use mobile Learning as the tool for transferring the knowledge and provide a valuable source for the learners ubiquitously at any time.

According to research conducted by the Learning and Skills Development Agency (LSDA) from the UK, young people might soon be using mobile phones as a learning tool to help for improving their English and Mathematics skills. Mobile learning can support students in building their confidence with technology-based learning [10].

Mobile learning provides the digital learning environment and support tools they need, organized for access at any time. Even whether learners are traveling, working away from their normal office location, in the field or at home, using such a mobile learning environment, students can access their learning materials wherever they are located and whenever they want to access them. Students can access their desired courses, can view a lot of other types of digital information, such as videos, PDF files and Office documents. Another advantage of some types of mobile learning apps is that it doesn't need of internet package. Students can learn free of cost, students just need of internet connection for installing the app.

SELF-REGULATEDLEARNING STRATEGIES FOR STUDENTS

These strategies include Goal setting [11],planning[8],self-inspiration[12], attention control [13], learning policies [14], Help-Seeking [11].

Goal Setting: you should decide your goals according to the needs students learning matter for getting a worthy score in an exam.
Planning: Planning supports learners to design well-thought goals and strategies to become successful [43].

Self-Inspiration: It is an important method ofself-regulation because through this strategy learners can control their learning [12].

Attention Control: Attention control is a cognitive process that accomplishes the requirement of self-monitoring [13].

Self-instruction, paying attention or focusing on a task to complete on time, and task strategies, help learners and performers to focus on the physical task and optimize their solution effort.

LearningPolicies: Successful learners implement multiple learning plans to complete tasks and regulate those plans as needed to ease their growth to acquire theirdesired objectives [14].

Help-Seeking: Self-regulated learners should not try to achieve every task on their own at any cost, but somehow, they should look for help from others when they see the difficulty to understand. [12].

Mobile Phone as a Learning Tool

The development of Mobile Learning Technology enhanced the learning process, enabled the students to learn in such a way that learner is free from designated locations and time with supports from mobile learning systems [15].Wireless technologies just like IEEE 802.11, Bluetooth, and GPRS are being used in projects for the development of mobile classrooms, and the Learning which is accepted by using mobile or any other handheld device is called mobile learning. Mobile learning is short-termed as M-Learning. A Learning technique that shrinks the condition of learning locality and time with the mobility of portable devices.one definition of mobile learning is an educational facility where leading technologies are handheld or palm devices.

Many students consume most of their time away from their home and most of the students spend just a few hours with pc each week. Now with the existence of mobile devices students are not comfortable with computers because most of the students use web/learning stuff on mobile devices more comfortably than computers or laptops due to the ubiquitous computing nature of the devices, in which learner is not bound to the specific location or time.

Mobile Learning for Education and Teachers Training

Mobile phone technology has modernized numerous sides of life in the evolving economy of the world and inspires its use to enhance the quality of education for students. Mobile learning plays an active role in providing the latest educational resources in the current educational atmosphere, particularly relative to teacher's training, worth of education, literacy and education for adults. Mobile technologies can be used to improve the standards of education, teaching traditions, teaching faculty development, and for improving inquiry-based learning. The community of research standards has endorsed that it can enrich, spread, and develop the concept and activity of getting knowledge itself, beyond the previous ideas of learning. The learning which is customized for the abilities of individual learners or groups of learners is termed Personalised learning. M-learning can be interactive by combining mobile technology within one package of audio, web, and mobile. The challenges for the implementation of m-Learning described by Krull and Mallinson (2006), are device limitations, education material which is to be followed, teacher's training, safety on learning, security of mobile devices, and time to time maintenance of such devices, and the cost of implementing of such educational apps. A learning model is Pedagogical that emphasizes 111111on teachers who are the controlling part of the learning model. According to Keough (2005), a new philosophical learning term is known as mobigogy which assimilates pedagogy (teacher-controlled learning). Everyone wants to be connected with their cell phones at any time, at any stage, and the place to ease their work. The busiest schedule of day-to-day activities faced by students and teachers can demoralize them to participate in the learning process. The benefits of mobile learning,as described by Kyun and Baek are theimplementation ubiquitous learning environment. Ubiquitous, according to Oxford advanced dictionary for learners, explains that learning that seems to be everywhere or at several places at the same times or at different times. Users of Mobile learning can be more self-confident while dealing and working with IT technology such as mobile phones, PDA's, and Tablets.

IMPLEMENTATION OF SELF-REGULATIONIN MOBILE SYSTEMS

The skills of learning through self-regulation define the achievement of students with computer/Mobile assisted learning. A technology-enriched process which in turn enhanced self-regulation and inspiration of students [20]. It allows students to see tips while solving questions to complete a task. Studies demonstrated that by using mobile apps we can engage students in the cycles of learning through self-regulation [12]. One way of self-regulation strategy is that students may lose their score for seeing tips, relating to the number of questions a student skips while appearing in a quiz. The average time students consume to solve each question in a quiz is the degree of the skills of students. This research

plans a method of achievement of the award or penalizes to the students consequently. Levels of the students or questions during a quiz determine how well the student performed in the quiz. Achievements that can be implemented in self-regulated systems can be upgrading the marks on the quiz, implementation of awarding points can also be in favor of students so they can acquire more features of the particular mobile app and virtual trophies should be awarded according to their performance they achieve. Feedback strategy in the last for asking the students what are their views about performing in their tasks and consult with tips to increase their performance. Students should also be allowed to access more difficult quizzes when needed, after completing the level student gets a noticeable performance on what they got ata particular level and students can access a more difficult quiz level on condition.

EXISTING MOBILE LEARNING APPLICATIONS FOR SELF-REGULATION.

In the following section, some of the mobile applications are given which are based on self-regulated learning ways.

Practi

Practi[20],This is a commercial mobile application that permits students to accomplish math and science practice[20], created and provided by teachers of a particular school. This application Practi is capable of granting points to students so that students should be allowed to unlock more features and get virtual trophies according to the score level they achieve. The students may also obtain feedback when they are busy with a task and get consult with tips to improve student's performance. Students can have more difficult quizzes when needed, trophies are awarded as feedback on their performance.

Mod Math

Mod Math designed by Danikipfin 2016 this is an iPad application for primary to middle school-aged students to create basic mathematics problems. Mod Math is developed for individual children who learn basic math problems. There are many mathematics apps available which deal with the use of a division sign, align fractions and keep alignment with key input. Mod Math app, as compared to other apps provides a worksheet format of questions to provide addition, subtraction, multiplication and division problems along with tools through which we create fractions, equations and division symbols with the use of a remainder sign or without using a remainder sign. This app also provides hints material for solving problems with editing or entering numbers and we can also enter numbers in a left to right alignment.

Math Tutor: Addition and Subtraction Application.

Math Tutor [18], This is an android platform-based app designed to help children to learn necessary addition and subtraction. This also helps teachers to monitor and review children's progress. Part of this app help students to learn and practice single-digit addition and subtraction by using number and images as shown in Fig.II-2 addition and subtraction. This app is designed as GUI based so that children become attracted to make learning progress in an easy and fun style. Students earn medals after doing exercises when they learned a particular level.

The second part of this app is designed for teachers, this includes functionalities such as language section, exercise mode, teacher mode. Teacher login to perform an administrative task, users of this application in between the age of 5 to 6 years. A student can do the practice addition of numbers in a single digit.

Using visual concepts of taking things with no. of objects like fruits to count and find the answers. On completion, students obtain different color star medals. The result is received on the number of correct and incorrect responses with percentage and medals. When the child moves to the scoreboard result of the exercise can be viewed and the child can see the medals, he/she earned on the total percentage child achieved.

Mobile Mathematics Tutoring (MoMT)

Mobile Mathematics Tutoring (MoMT)[19], permits the learners to make participate in dialogue or create ideas in a textual way, in image format, audio or in the video, which is conveyed by the way of using the email client of the mobile device. When students confront with questions or difficulties which they are solving, it makes some difficult for them to find someone to help them. They go to review the textbook again and again for solving difficulties, or ask classmates or their teacher on the next days and even in some conditions they become unable to submit their assignments. Mobile Mathematics Tutoring (MoMT) system support for primary level of students. It supports mathematics learning with the help of mobile devices for young students. MoMT offers tutors facilities for four basic arithmetic operations (+, -, *, /) for which MoMT can provide the solution. MoMT tutor can help learners at any time and in any place.MoMT can combine a learner's tutoring and practice history to deliver personalized on what he/she has already learned or improve in what he/she has not mastered.

Algebra

Roberts, et al., (2011) presented the Nokia Mobile Learning for Math Learners. It starts works from theory sections and quick answer questions belonging to the database of 10000 questions (MCQs, true or false, spot the error and open-ended questions), topics are placed in categorical order of difficulty and type. Results disclosed that it makes conceivable to use a networking platform for teenagers to work mathematics problems at home. One year later Kalloo and Mohan designed Mobile Math. To support secondary level school children to improve their performance in algebra.

AnimalWatch

AnimalWatch[20], is based on word problem-solving In AnimalWatch, students whose target is to solve word problems with reliable information about various domains of the math field. This practice solving of errors of the problems to make the approximation of the student's skill with each mathematics topic, and it makes the selection of problems that the student be able to solve by using integrated help resources. When students solve difficult problems in one topic successfully, the system will interchange its state with the new mathematics topic. Students do not solve all problems, in the same way, students do not see all problems to work with the same way as they see in the help section, or move at the same pace through the mathematics topics.

Sketch2Go

sketch2go[24] application teaches students about how to draw graphs. It empowers students to draw graphs, using icons on the behalf of constant, increasing, and decreasing functions that change at constant, increasing, or decreasing rates. The regulation feature of this app provides instantaneous feedback on the drawn graph by presenting a graph on the rate of change.

MathWars

MathWars[20] It is a Mxit application that provides mathematics and science content and support assessment. The MathWars application is composed of different modules. One module is a quiz. All users of this application start at level one and continue to the higher level after finishing the minimum number of tests at the particular level and achieve an average score beyond a quantified score. Collection of test questions are adapted by merging questions from the previous level if the user average is low, and merging questions from the next level if the user score average achieved is higher. The questions were designed from the previous national Mathematics Olympiad competition questions and those questions are problem-solving type questions. The MathWars application also delivers support for learners who are involved in the Govan Mbeki Mathematics Development Unit (GMMDU) based on the Science faculty of the Nelson Mandela Metropolitan University (NMMU) in the South African program by providing entree to mathematics and science tests used for summative assessment.

Droidmatics:Droidmatics[21] application explains the process of solving math problems step by step also notifies tricks for solving the problem. At the end the lesson assessment exam is taken to examine the student's proficiency, the student has to pass. A rank is proposed at the end of each lesson for the students being encouraged and challenged in answering the questions.

BubbleMath: This is a game-based learning application that was designed to learn the multiplication of numbers. Therefore, it is best for children between the age of 6-9. There are two different modes of this app first is in a training mode and the second is in a contest mode. This is just like learning with gaming, story-based learning is that you are into the sea and you have different surroundings; when the game is over you are converted into a specific character of the sea. This inspires the children to play it again with more effort.

T-TEST METHOD

The T-Test is a type of systematic statistical measurement, this is used to find out if there is a significant difference between the means of two groups and there maybe a relation in groups in certain features[4]. It is widely used when the data sets are recorded as the result of flipping a coin even 100 times but there would be no difference in the result of both groups. We can call this T-Test a hypothesis tool that can be applied to the assumptions or expectations applicable to a population.

One of the most generally used statistical tests is to measure the significance of small data sets (<=30) is the collection of Student's tests. Collection of these tests are used for comparing of two means. The result of such tests is the acceptance or rejection of our hypothesis. Smaller the T-score means there is more similarity between the groups and larger the T value means there is a difference in the groups.

Formula for Performing
T-test

To find out the T-test requires three types of data values. These include the difference between the mean values of both groups this is called the mean difference, the standard deviation of each group, and the number of data values of each group that are used to make a comparison[22].The result of the T-test is called a T value. This calculated T-value is compared with the value obtained from a critical value table this table is called a T distribution table. This assessment helps to determine how much the difference between the means occurred by chance, or whether the data sets havean actual difference. The T-test result may answer whether the difference between the groups represents a true difference of the study or if it is just a worthless statistical difference [23].\

There are three types of t-testing methods:

Independent sample T-Test: An independent sample T-Test was used to compare the means of two groups. For example, comparison the mean of two groups of students.

Paired sample T-Test: Paired sample T-Test used to compare the means of the same group at different times. For example, compare the means of a group at different intervals like at the interval of one month or one-year interval.

One sample T-Test: It is the mean of a single group against the specified known number, says for example, what is the mean of students who secured A1 Grade in the examination.

Variables involved in T-Test When calculating the T-Test of result, one should know about p-value, confidence level, Degree of freedom. Every T value has a P-value related to it. This p-value is also called statistical significance level; P-value is the probability that specifies that sample data or result came out by chance. Lower P-values are decent they indicate that result did not come by chance, for example,the p-value of .05.

Likewise, all significant test results are provided in the form of confidence level (CL). Mostly Confidence levels that are used are 90%, 95% and 99%, but normally 95% of the confidence level is standard level.

A confidence level of 95% means that if suppose our null hypothesis is rejected, we have 95% or more confidence that we did the right thing.

Directional and Non-Directional T-Test: When doing analysis on data or working with results, you will have to decide about a statistical test. Our statistical test may be one-tailed (Directional test) or two-tailed (Non-directional).

One-Tailed Hypothesis: A directional hypothesis predicts the actual direction in which findings of the observation will go, this type of test is usually carried out when the actual research has been carried out earlier. For example, students did not achieve the A1 grade on the test.

Two-Tailed Hypothesis: This is a non-directional hypothesis, results of this type of test can go in both directions, and either may go in positive level or may go on a negative level. For example, what strategy of learning is better either through books or through mobiles.

CHALLENGES IN UTILIZING TECHNOLOGY FORMATHEMATICS LEARNING

Mathematics educational research is highlighted by using the apps and associated pedagogies. U.S. National Council of Teachers of Mathematics (NCTM) described that "Help of technological tool is crucial for learning Mathematics to compete with the 21st-century educational environment, and all educational institutes must ensure nearly all their students they must have access to technological learning". Due to the mobile device's increased pervasiveness and instructional features, mobile learning is becoming one of the key current inclinations of educational apps for the new technologies.

There are numerous challenges for introducing and utilizing mobile technologies in our learning atmosphere such as the teacher's faith about the worth of technology in the learning environment is important in their pedagogical reasoning, one most important of the prime challenges in mobile learning is the needs of various learner types who stress one tool among different Media. Permitting educators to familiarize their pedagogical thoughts and practices in response to learning prospects provided by technology, is expected that can be a very difficult and complex process. Deficiency of expertise among teachers' knowledge and interest to learn among children is reported as a bundle of obstacles. This is additionally reinforced by the researcher who cited several matters with teachers' use of the technological tools. Another challenge for the implementation of mobile technology as practical learning refers to educational institutes' difficulties. It is noted that this wall of blockage includes the absence of technologically supported professionals, deficiency in getting funds, and lack of adequate professional development. However, the main barrier that has been noted about implementing and using mobile devices was understood to be teachers'hesitancy for initiating efforts for using mobile devices as a teaching tool.

METHODOLOGY

This research is based on the goal to develop an android app that provides strategies of self-regulation to help the learning of mathematics for class v for our primary schools of rural areas with the support of native language instructions.

Problem with the children learning mathematics is due to the lack of interaction with the subject whenever students face difficulty while solving the problems of the subject. This research study is based on the self-regulation learning strategies through which students empower their learning progress. Students overcome their weaknesses by interacting with our designed SRL application which is based on hints based approach of self-regulation.Our SRL application is an effort to grasp the knowledge of mathematics learning among children and to decrease the hindrances of mathematics learning.Students of class v level are fully dependent on the classroom environment, they will have to appear in classes regularly, they don't have such mechanism that supersedes their hindrances of learning progress if they miss the class, they lost their opportunity to learn that class material, only they have books material for increase their interest and competency.

Participants

Students who participated in this study are selected from three different schools of Shahadpur, participation is based on random order.

Procedure

Questions of the tutorial are taken from the exercises of the class V mathematics book of Sindh textbook board Jamshoro and oxford university press book

For the evaluation of this research study, a Posttest method is designed to measure the performance of students. In the posttest method students are divided into two groups. Three topics are chosen to learn including percentages, averages and ratios, these three chapters teachertaught one group of students in a classroom environment, and the same chapter was included in the SRL application of mobile another group of students learned through SRL application only. Students are asked to appear in the test. Mcq type test is conducted from the students on traditional pattern who learn through classroom environment and on a smartphone from the students who learn through mobile.

For the students who learn through mobile, a class is organized to teach children about how to use this Self-regulated mathematics tutorial on a smartphone or tablet, how to get hints on the specific question so that they can solve problems easily. After completing the test student will get their score.
The result of Both post-test scores is statistically analyzed with t- Testing method to compare the performance of students.

result Collection Method

Data is randomly selected, sixty children of 5th class from three different schools of Shahadpur. All of the students belong to the age group of 10 to 12. All students are much familiar with mobiles but they are unaware about using mathematics applications on mobile phones.
The Control group learn three chapters of 5th class i-e percentage, average and ratio in the traditional way of the lecture through a classroom environment. The experimental group learn the same chapters but through smartphone application of mathematics. Both groups were given the time of one weak to learn 03 topics and they positively completed training in specified time.

ANALYSIS OF GROUPS

When comparing the mean of each topic of the experimental group with the mean of the control group,the variance of the control group is more than the experimental group, which indicates that result of the control group is dispersed but experimental group students marks are not dispersed their marks have little difference.

Table 1. Mean, Variance, S.D and C.V Result of Experimental Group.

TOPIC NAME	EXPERIMENTAL GROUP			
	Mean	Vari-ance	Standard Devia-tion	Coefficient of Variance
Percentage	14.27	5.13	2.2665	15.48%
Average	13.37	15.3	3.082	23.4%
Ratios	14.1	11.27	3.36	23.8%
Overall Result	13.91	10.57	2.90	20.89%

Table 2.Mean, Variance, S.D and C.V Result of Control Group.

TOPIC NAME	CONTROL GROUP			
	Mean	Variance	Standard Deviation	Coeffi-cient of Variance
Percentage	12.07	10.83	3.2914	24.97%
Average	11.10	9.5	4.0	35.8%
Ratios	11.43	17.56	4.19	36.7%
Overall Result	11.53	12.63	3.82	32.49%

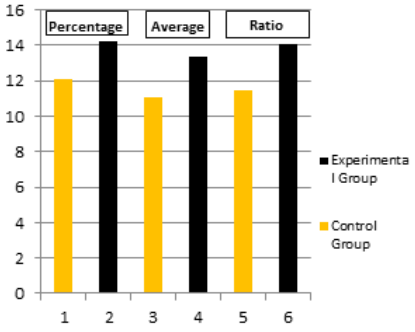

Fig 1. Group Comparison of all Topics

T-test Result calculated, our hypothesis is measured at 95% confidence level, results calculated are given below,

Table 3.Mean, Variance, S.D and C.V Result of Control Group.

TOPIC NAME	Proba- 5% bility Result	95% Confidence Level Result ((C.L
Percentage	0.049	2.78
Average	0.017	2.45
Ratios	0.0085	2.72

Our calculated t value in all topics is higher than the T-Distribution value given in appendix-A, which is 2.045 thus our result is significant at $p<0.05$.

Analysis of the result of the test conducted at the end of both groups, it was explored that learning outcome of the experimental group was higher than the control group students, this determines that mean result of the experimental group was more than the mean result of control group mean result. In the overall mean score,the experimental group got 2.38 more mean than the control group. Control group students got more variations in their score as compared to experimental group students' variation. In overall performance, the control group got 2.06 more variation than the variation of the experimental group. After calculating the results in mean and by viewing variations of both group students, these calculated values are applied in the T-Test standard formula to validate our calculated result through T Distribution Table.

CONCLUSION AND FUTURE RECOMMENDATION

The focus of this research was to use self-regulation learning skills among children to enhance their skills with a better approach, to accomplish this task a SRL application was designed and deployed in a group of 5th class students along with another group of students who followed traditional classroom environment of the same class but students were different.

Results showed that after the learning session, the result of the experimental group was higher than the control group. Variation in the score of the experimental group was also closed as compared to the students of control group students, this depicts that the control group score is more scattered in our studied topics of the research study.

Based onthe above mean score results t-value is calculated for all three results. Data is analyzed that students who work with self-regulated learning approach of tutorial got t-value higher at 95% confidence level and 5% probability.

These three topics learning with mobile and test on the mobile device showed that the result of our SRL application is confident; the result did not come by chance. Evaluation of results showed that developedsolution was so much beneficial for the students for learning purpose, it is too much recommended that why don't to create other learning sources for the students just as this one tutorial designed in the native language. Other subjects tutorials should be designed and these types of SRL applications should be included in the curriculum so that students can take benefit from such sources, as we see there is a lot of online learning resourcesare available for learning. It is suggested like syllabus books, such SRL applications are advised to be followed among children of primary education for improving their skills of mathematics and also necessary for another subject too with more interactive learning strategies like game-based learning so that students get to compete with the increasing burden of knowledge and they can capture thing quickly with these techniques.

REFERENCES:

[1] ACEVEDO, R., GREENE, J. A., AND MOOS, D. C, (2007), "The effect of a human agent's external regulation upon college students' hypermedia learning. Metacognition and Learning", vol.2(2/3), 67–87.

[2] NAEYC, & FRED ROGERS CENTER, (2012), " Technology and Interactive Media as Tools in Early ChildhoodPrograms Serving Children from Birth through Age 8".

[3] Weinert,F.E.(1982).SelbstgesteuertesLernenalsVoraussetzung, Methode und Ziel des Unterrichts [Self-regulated learning as prerequisite, method and objective of in-struction]. Unterrichtswissenschaft, 2, 99-110.

[4] WAGENAAR.R., (2008), "Learning Out-comes a Fair Way to Measure Performance in Higher Education the tuning Approach", Organization for Economic Co-operation and Development, Vol.2, No.4.

[5] MASOOD, Z. and HODA, R., (2014), "Math Tutor: An Interactive Android-Based Numeracy Application for Primary Education", Fifteenth Australasian User Interface Conference (AUIC2014), Auckland, New Zealand, Vol.5, No.2, pp.3-10.

[6] KACHEPA.A(2014), "Implementation of Mobile Games for Mathematics Learning": A case of Namibian Schools, Vol. 1, No.1.

[7] MAHAMAD, S.,IBRAHIM, M.N and TAIB, S.M.,

(2010), ”M-Learning: A New Paradigm of Learning Mathematics in Malaysia”, International Journal of computer science and information Technology (IJCSIT), Vol.2, No.4, pp.76-86.

[8]. SALTER, P., (2012), “Developing Self-Regulated Learners in secondary schools”, Joint AARE APERA International Conference, Sydney, pp.1-11.

[9]. NATALIA HOFFERBER.N(2008), “Effects of Autonomy Supportive vs. Controlling Teachers’ Behavioron Students’ Achievements”, European Educational Research Journal, October 2014.

[10] JOHNSON, G.M. and DAVIES, S.M., (2014), “Self-Regulated Learning in Digital Environments: Theory, Research, Praxis”, British Journal of Research, Vol.1, No.2, pp.7-1.

[11] BRUCE, F., ANTONY, U.(1995), “The T-Test An Introduction”, Comsig Review, Vol.4, No.2, pp.37-40.

[12] Chang, C., &Sheu, J. (2002). Design and Implementation of Ad Hoc Classroom and eSchoolbag Systems for Ubiquitous Learning. IEEE International Workshop on Wireless and Mobile Technologies in Education, 2002, Växjö, Sweden. 8-14.

[13] Gutman, L. M. (2006). How student and parent goal orientation and classroom goal structures influence the math achievement of African Americans during high school transition? Contemporary Educational Psychology, 31, 44-63.

[14] NICOL, D.J. and DICK, D.M., (2005), ”Formative assessment and self-regulated learning”, A model and seven principles of good feedback practice, Studies in Higher Education, Vol.31, pp.199-218.

[15] DRIGAS, A.S. and PAPPAS, M.A, (2015),” A Review of Mobile Learning Applications for Mathematics”, International Journal of Interactive Mobile Technologies, Vol.9, No.3, pp.18-23.

[16] GOODWIN, K., HIGHFIELD, K., (2013), ”Apps for Mathematics Learning: A Review of Educational Apps from the iTunes App Store”, Conference of Mathematics Education Research Group of Australia, pp.378-384.

[17] CORNO, L. (1993)., “The Best-laid plans Modern conceptions of volition and educational Research”, Educational Researcher, 22, 14-22.

[18] MARTIN. F, ERTZBERGER.J,(2013). “Here and now mobile learning: An experimental study on the use of mobile technology”, vol.68, pp 76-85.

[19] WINNE, P. H. (2009)., “Self-regulated learning viewed from models of InformationProcessing”, In B. J. Zimmerman & D. H. Schunk (Eds.), Self-regulated learning.

[20] DICK, M., CARPENTER II., LINDY. C, RON.W, (2007), “Testing the Efficacy of Team Teaching”, Learning Environ Res springer, Vol.10, pp.53–65.

[21] T. JONES., (2016), “Using Self-Monitoring to Increase Self-Regulation in Young Children”, Masters of Arts in Education Action Research Papers, pp.150.

[22] “An introduction to t-tests”, Published on January 31, 2020, by Rebecca Bevans. Revised on December 14, 2020.

[23] ALISONH.PARIS,(2001),”Classroom Applications of Research on Self-Regulated Learning SELF-REGULPAATREIDS ALNEADR PNAIRNIGS”, EDUCATIONAL PSYCHOLOGIST, vol.36(2), pp. 89–101.

[24] BAHREMAN, V.,CHANG. M,AMISTAD, I. and GARN. K., (2016),” DESIGN and Implementation of Self-Regulated Learning Achievement: Attracting Students to Per-form More Practice with Educational Mobile Apps”, Springer Singapore, pp.263-267.

[25] AMANDA, H. RN., (2005), ”Pre-Test and Post-Test evaluation of students perceptions of a collaborative clinical education model on the learning environment”, Australian Journal of Advanced Nursing, Vol. 23. No.4, pp.8-13.

[26] BOTZER, G. and YERUSHALMY, M., (2007), “Mobile Application for Mobile Learning”, Proceedings of the Cognition and Exploratory Learning in digital age (Celda), Vol.48, No.5, pp.313-316.

[27] BUTLER, D. L., & WINNE, P. H. (1995). “Feedback and self-regulated learning”: A theoretical synthesis. Review of Educational Research, 65, 245-281

[28] CHANG, C., & SHEU, J. (2002), “Design and Implementation of Ad Hoc Classroom and eSchoolbag Systems for UbiquitousLearn-ing”, IEEE International Workshop on Wireless and Mobile Technologies in Education, 2002, Växjö, Sweden. 8-14

[29] CARNEIRO,R.,LEFRERE,P.,STEFFENS, K. and NDERWOOD, J., (2011), “Self Regulated Learning in Technology Enhanced Learning Environments a European Perspective”, Sense publishers.Vol.5, No.42.

Studies, Virginia Union University, pp.12-16.

[30] DABBAGH, N., &KITSANTAS, A. (2012). Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. The Internet and Higher Education, 15(1), 3–8.

[31] DAHLSTROM, E., BROOKS, D. C., GRA-JEK, S., & REEVES, J. (2015). "ECAR study of undergraduate students and information technology", Research report. Louisville, CO: EDUCAUSE Center for Analysis and Research.

[32] DARR, C. and FISHER, J., (2004), "Self-Regulated Learning in Mathematics Class", Nzare Conference, Turning the Kaleido-scope, Wellington, pp.1-10.

[33] FENG Y.C, HUANG Y.C, MA XIU-MIN., (2017), "The Application of Student's T-Test in internal quality control of clinical laboratory", Frontiers in Laboratory Medi-cine, pp. 125–128.

[34] GILMORE, J., FELDON, D., (2010), "Measuring graduate students' teaching and research skills through self-report", Meeting of the American Educational Research Association, Denver, pp.32.

[35] HARNISHFERGER, K. K. (1995), "The development of cognitive inhibition: Theories, definitions, research. In F. N. Demp-ster& C. J. Brainerd (Eds.)", Interference and Inhibition in Cognition (pp. 176-206). San Diego: Academic Press.

[36] HIJAZI S.H., and RAZA S.M., (2006)," Factors Affecting Students Performance". Bangladesh e-Journal of Sociology, Vol.3, No.1.

[37] HYLEN, J., VOSLOO, S., and WEST, M., (2012), "Turning on Mobile Learning in Eu-rope working. Paper published by United Nations Educational, Scientific and Cultural Organization", pp.30-32.

[38] JENNIFER BROWNURBAN,(2015), "Self-Regulation During Adolescence: Variations Associated with Individual", Interna-tionalEncyclopedia of the Social & Behavioral Sciences (Second Edition), vol.2015, pp. 547-552

[39] KLAUER, K., & LEUTNER, D. (2007), "Teaching and Learning Introduction to instructional psychology Weinheim:" Beltz.

[40] LYNCH, M., (2015), "Do mobile devices in the classroom really improve Learning Outcomes. School of Education", Psychology and Interdisciplinary