

Learning at Your Own Pace: M-Learning Solution for School Students

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Abstract—Today's computing trend is more towards anywhere anytime computing. Nowadays m-learning is one of the hot topics in the educational sector and UNESCO believes that mobile technologies can expand and enrich educational opportunities for learners in diverse settings due to the increase in usage of mobile handheld devices. More and more applications are being developed to make the knowledge accessible from anywhere and at any time. The main goal of our work is to observe the usage of m-learning solution in a developing country. Our focus was making recommendation towards the design of self-directed learning. With the help of Quizlet application, we analyzed the effect of m-learning solution in the rural context of Mpumelelo secondary school, Zimbabwe from both teacher's and student's point of view.

Index Terms—Flashcards, own pace, Quizlet, self directed m-learning.

I. INTRODUCTION

A. Quality Challenges in Secondary Education

Education is the key for the economic development of any country. "There can be no escape from poverty without a vast expansion of secondary education, this is a minimum entitlement for equipping youth with the knowledge and skills they need to secure decent livelihoods in today's globalized world." said UNESCO's director-general Irina Bokova [1].

In sub-Saharan Africa, the enrolment of students in secondary education grew nine fold, from 4.3 million in 1970 to 39 million in 2009 [2]. This sharp increase in the number of students attending and completing primary school is placing intense pressure on developing country governments to meet the growing demand for secondary education. This has led to the increase in number of secondary schools. Again, the major challenge is providing quality education due to inadequate number of qualified teachers in all the schools.

One such example is Mpumelelo high school in Zimbabwe. This school also faces the same problem. The teaching paradigm has shifted to teacher centered approach due to increase in student's population. Students passively receive information due to their own learning capability and teachers were not able to pay individual attention to each student due to large class group. This resulted in low pass rate and students are unable to prepare for exams on their own.

One of the most important challenges in traditional

learning environments is coping with the learning pace of naturally varying skilled learners. Not all learners have same learning tendency. They suffer if a proper way is not devised to cope with this challenge. In such a heterogeneous learning environment, they should be provided with personalized instructions based on their own perception skills to give them opportunity to learn on their own pace [3].

B. Need for m-Learning Solution

In the recent past, the educational technology sector has witnessed the emergence of new high tech mobile devices such as tablets for performing different actions required in any education system due to its screen size, multimedia support, lightweight, and long battery life [4], [5]. Many educational applications are being developed based on pedagogical approach and are available in the app stores to support and make learning easier. But the major problem is the content used in classrooms is often course-specific and the content available in the app store are very generic [6] and several studies on the usage of tablets and educational applications are made only in advanced countries.

C. Objective

This paper aims to find the usage of these tablets and educational application in disadvantageous area. The objective of this project is to make recommendation towards the usage of an interactive m-learning solution supporting self-directed learning on tablet computers to primary and secondary school of a developing country and to analyse the same.

Our project focuses on Mpumelelo School where the ICT usage is still in its infant stage and the network connectivity is very poor. We recommended the school to use of self-directed m-learning solution to increase the pass percentage and student's preparation of study at their own pace ICT enabled learning.

D. Thesis Statement

An m-learning solution can support students with self-directed learning in and outside the classroom in a rural primary and secondary school in a disadvantaged area.

Research questions guiding this research work:

- 1) How do teachers and students use the solution?
- 2) Does the solution support self-directed learning?

E. Structure of the Paper

The subsequent sections of the paper deals with the answer related to the research question. The paper is composed in the following sections:

- 1) Literature review: Identification of existing work in self-directed learning, m-learning, flashcard applications and barriers in developing countries.
- 2) Research Methodology: Selection and description of

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the suitable research methodology

- 3) Data Analysis and Findings: Provides our findings related to problem awareness phase and evaluation phase of our framework.
- 4) Conclusion: Gives the conclusion of our work, also provides limitations and Future Work.

II. LITERATURE REVIEW

A. Introduction

This section aims at finding the existing concept available in the field of m-learning which supports self-directed learning and also to find the existing barriers that oppose the implementation of the solution in developing countries. The literatures were collected for analysis from the data bases Web of Science, Google Scholar, IEEE, ACM digital libraries and Google. The key combination used for the search are self-directed learning, m-learning, iPad, tablets, mobile devices, developing countries, challenges, secondary school, education, ICT, and flashcards.

B. Self-Directed Learning

Most widely definitions are proposed by Knowles: Self-directed learning has been described as "a process in which individuals take the initiative, with or without the help of others," to diagnose their learning needs, formulate learning goals, identify resources for learning, select and implement learning strategies, and evaluate learning outcomes [7]. Students should be motivated to learn the concepts on their own. Goal setting can be applied in self-directed learning by creating interest based on their needs. The purpose is to arrive at individualized focused goals which combine learner choice with a greater self-knowledge of ability [8].

Although the research on self-directed learning has been around for several decades, the context has changed with online learning, greater access to technology and opportunities for more personalized learning experiences, and connection to information and resources that were not previously available. Schools are recognizing the importance of self-directed learning as a necessary skill needed for the 21st century as well as the need for teachers to "enhance students' abilities for accessing self-directed learning" [8].

C. M-Learning

In general, mobile learning or m-learning can be viewed as any form of learning that happens when mediated through a mobile device, and a form of learning that has established the legitimacy of 'nomadic' learners [9]. Similar definition for m-learning was given by [10] "any sort of learning that happens when the learner is not at a fixed, predetermined location or learning that occurs when the learner takes advantage of the learning opportunities offered by mobile technologies". In [11] Traxler defines mobile learning as "any educational provision where the sole or dominant technologies are handheld or palmtop devices". He finds that mobile learning can include mobile phones, smart phones, personal digital assistants (PDAs) and their peripherals. Not deviating much from Traxler's view, [12] defines mobile learning as "a new way to learn using small, portable computers such as PDAs, handheld computers,

two-way messaging pagers, Internet-enabled cell phones, as well as hybrid devices that combine two or more of these devices into one".

One of the main reasons for increased attention paid towards m-learning is the increase in the number of mobile devices (such as mobile phones, PDAs, laptops, and iPads) as well as enhancements in the technological capabilities of these devices. With decreasing costs these mobile devices are becoming accessible to more people [13]. Several studies uncovered a shortage of high quality ICT-based teaching material [14]. This is a natural consequence of the generally still-immature stage of development. But since both management and academic staff require inspiration and time in order to begin developing their own material, this is an important obstacle to start doing so. Olasina [15] concluded that there was need for further studies on students'/learners' perceptions of e-learning/m-learning.

D. M-Learning Tools

Since this work is carried out in Mpumelelo high school, the device that they use in the classroom is iPad. We focused our search on iPads. iPad supports many apps related to self-directed learning. These applications allow educators and students to do things in educational settings that they could not otherwise do, from a teaching and learning perspective [16]. [17], [18] found very little research conducted in K-12 settings using the iPad as a textbook. The usage of iPads has shown significant improvement in self-directed learning, personalized learning, extension of learning, accessibility, increased engagement and enhanced social interaction of the students [19]. Some studies suggested a positive effect on academic outcomes when using the iPad as compared to a traditional textbook [20].

Many tablets are also being developed by the governments of various countries specifically for educational purpose. One such device is Aakash tablet promoted by government of India [21]. Thailand government took initiative to support student learning on their own through mobile tablets through the scheme "One tablet per child" usage of XO-3 tablet. This initiative has similarities with a program to increase connectivity in India through the government-sponsored production of a low-cost tablet [22].

E. Flashcard App for Self-Directed Learning

A flashcard is a set of cards bearing information, as words or numbers, on either or both sides. Flash card helps engaging the active recall of concepts allows self-directed personalized study experience and also gauge our progress. Flashcard gives rapid feedback once the user completes the set of questions which helps in improving studying of their key concepts and ideas. This provides a significant and positive effect of improvement among students in understanding and learning of the topics [23].

Several researches on flashcards were carried out in the field of learning of languages and to understand the concepts in science. [24] implemented of flashcard app for Chinese language. they adopted a schedule-based review system for word learning which makes easier for the user to memorize the words learned previously. [25] proved that mobile devices flash card was helpful and efficient in language

learning.[26] made comparison of undergraduate students in English vocabulary learning using mobile flashcard app with that of paper flashcards. He confirmed that using flashcards on mobile phones was effective in improving student's vocabulary learning.

Reference [27] proposed a picture card dictionary authoring system to support young language learners perform communicative tasks using daily-life words, without teaching them the vocabulary directly. The system uses a flashcard metaphor, and it provides 3 functions; 1) a teacher creates picture cards by putting the spellings of photos or video taken by learners, 2) stores those cards to the network server as a picture dictionary, and 3) provides an interface to utilize the vocabulary list. These cards will be displayed on an interactive whiteboard, and learners can touch them to hear their pronunciation generated by text-to-speech synthesis, for vocabulary support.

Medical education is an area of increasing complexity due to the escalating data achievement in Health Science. Successful medical learning requires a considerable time investment. Author developed a study management tool based on flashcard to achieve learning goals with optimized time investment. He proved that flashcard can be used to manage, plan and set study goals based on personal performances [28].

F. Barriers for m-Learning System in Africa

Information and communication technology (ICT) is being integrated in education in many African countries [29]. However the progress and impact is minimal due to inadequate resources and the infrastructural challenges. The main challenges are the high cost of network implementation and lack of customer base, as rural areas are characterized by low income, highly scattered and low population density [30] and the next barrier is language support offered by the devices. In [31] Zelezny-green observed that, the majority of the people are not familiar with the English language or other languages that are used on mobile phones. The next challenge is electricity. If electricity is not obtainable in a person's place of residence he/she have to travel, sometimes long distances (and the trip itself can cost money) to charge the device, to have it recharged at another location where a recharging fee may also apply [32].

G. Conclusion

From the literature review we observed that traditional self-directed learning is changing to mobile device based learning. Tablet computers are playing major role in educational sector. Several national projects are carried out also in developing countries to provide quality education. We also observed that flashcard application supports self-directed learning and it is a good memorizing tool, allows personalized study experience and helps the user in engaging active recall of concepts. M-Learning solutions have given proven results in several research works which was carried out in countries where the network connectivity is better. The major limitation that we observed in the literature review was only few works related to m-learning were carried out in disadvantageous area and we also observed that, network connectivity acts as a barrier in implementing m-learning solution in Africa.

III. METHODOLOGY

A. Introduction

Our research methodology for this research work is design based research. Design research consists of activities concerned with the construction and evaluation of technological artifacts to meet organizational needs as well as the development of their associated theories [33]. The Design research criteria which is applied here is the Design Evaluation, which means - The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation plans. The evaluation is based on the utility to practitioners [34].

In this work, the practitioners are the teachers and the students of Mpumelelo high School. We asked the teachers and students to use the suggested self-directed m-learning solution and we evaluated how self-directed m-learning solution is helpful for the students to study at their own pace and also how teachers could make use of the solution for the betterment of the students.

B. Methodology

We adopted the design research frame work developed by [35]. This frame work involves the following stages: Problem awareness, Suggestion, Development, Evaluation and conclusion.

1) Awareness of the problem

The main problem that schools in South Africa faces is providing quality education to all students. From the literature review, we also observed that self directed m-learning could be the solution for this problem but there is a gap in literature. Only limited studies are made for m-learning in disadvantageous area. The objective of this project is to analyse current usage of ICT and the make recommendation towards the use of interactive self-directed way of m-learning solution in high school located in disadvantages areas.

In order to do so, we had the opportunity to work with Mpumelelo high School, Zimbabwe for our project. Since the school is located in South Africa, they also face the same problem. To identify the real situation of the School with respect to mobile device usage we invited the NGO of World Vision through mail and we got the initial information about the school and ICT usage from them. Then interview questionnaire was sent to the school. It was an open questionnaire and was structured in such a way that it focused on device accessibility, flashcards application usage and how students prepare for the exams. The questionnaire was answered by a mathematics teacher. The main findings of this section are addressed in section IV in *B*

2) Suggestion

To support students to learn at the own pace, we focused on self directed learning. From the questionnaire feedback we identified ebooks and good readers are the apps related to self-directed learning solution that are currently used by the students. The main disadvantage in these apps is the students do not have the option to keep track of their weak areas because these apps are similar to traditional textbooks. They also mentioned that, they use paper flash cards. More time is consumed in preparing paper flashcard and there is a possibility of missing few cards. Many subject specific

flashcard apps available in app stores. These apps are too generic and they do not fit in the school curriculum fully. We focused on open source editable flashcard apps so that the content in the flashcards are specific to the curriculum. To suggest useful self-directed m-learning application to the school we made a market analysis and compared with the existing editable flashcard app and finally selected Quizlet.

Quizlet is a free application. It is used as a memorization tool. The working principle of this app is based on the concept of flash cards. It supports mathematical symbols, various languages, images, text, passage, and also audio enabled. It supports mathematical symbols, various languages, images, text, passage, and also audio enabled (only English text in our case). It works well in all kind of devices and can be accessed from anywhere and anytime at free of cost. Additional functions are available in paid version: where the Teacher can monitor their students' progress, can have unlimited classes, record their own voice and uploading their own diagrams/images in their sets.

3) *Development*

This phase has got two parts. First one focuses on developing flashcards in Quizlet and the other focuses on pilot test. Once Quizlet is selected, the user manual was developed and sent to the teacher as a support guide for creating classes and sets in Quizlet and sharing the same to the students using Quizlet. We also created a sample set with the help of previous year question papers to give an idea for creating the set. This helped the teacher to demonstrate the same to their students.

The pilot test was conducted in Mpumelelo high School, Zimbabwe to find the usability of Quizlet to support students to learn at their own speed and also to find how this app supports teacher to promote education to their students. This test was conducted in classroom and Computer room. Two subjects were chosen for the pilot. One on the high pass rate and other with low pass rate. Based on the feedback from the interview questionnaire, Mathematics and Geography was selected. Two teachers were involved in pilot test. Geography and Mathematics teachers spent 30 minutes for making flashcard using Quizlet Application.

The total number of students took part in the test was 100. Of which 60 were boys and 40 were girls. All the students belong to the age group 15-18. These students belong to form FOUR which is equivalent to class 10. Out of 100 students 50 students took Mathematics test and 50 took Geography test. Time spent by the students for the introduction of the mock test was 45 minutes.

4) *Evaluation*

After the pilot test, students and teachers were requested to fill the feedback form for their respective subjects. The feedback form was mainly focused on the usability aspect of the users. In this case there are two views. One with respect to students and the other with respect to teachers view. In order to confirm the trust worthiness of the results, two questions was intentionally worded differently but had the same meaning and was placed in the beginning and at the end of the students feedback form. We received only the consolidated student's feedback for mathematics and geography. We also got clarification regarding the feedback form from one of the teacher through Skype. The detailed

analyses of students and teachers feedback are provided in Section IV-C.

IV. DATA ANALYSIS AND FINDINGS

A. *Introduction*

This chapter provides our findings related to problem awareness phase and evaluation phase of our framework. With the help of interview questionnaire we were able to gather the current state of the school and the key findings are presented in B. The main data collection method adopted for evaluation phase was feedback form. Sub section C explains the analysis and interpretation of feedback form that was collected from teachers and students after the pilot test.

B. *Findings from Questionnaire*

This section summaries the current usage of ICT in Mpumelelo high School. The main findings are as follows:

- 1) The school has got 5 to 6 PC/ Laptop, 20 iPads, Epson Projector with HDMI and an Apple TV connection to support classroom teaching.
- 2) iPads are being used in two classes since last September. Students use iPads once or two times a week and are comfortable the using the device.
- 3) Many apps are installed in the iPads. The apps which are related to self directed learning are ibooks and good reader.
- 4) They were not able to install further more apps or upgrade the apps due to poor connectivity and storage space.
- 5) Students prepare for the exam use computer lab inside the school and by reading books, do research and excises inside and outside the school. They also use paper flashcards.
- 6) History /Ndebele are the subjects with high pass rate and Science/Mathematics with low pass rate.

C. *Feedback Analysis*

In order to identify the usefulness of Quizlet, pilot test was conducted and feedback was collected from the test users. This section mainly deals with feedback analysis of teachers and students.

Students Feedback Analysis for Mathematics: This section analyses the finding related to student's feedback for mathematics (see Table I). Fifty students studied mathematics using Quizlet. Only 25 students do not have problem in using Quizlet out of which 20 found it to be easy to use. 10 students were partly comfortable with using Quizlet out of which 5 found it to both easy and difficult to use. 15 students had problem in using Quizlet and 25 felt it is difficult to use. 40 students were comfortable in learning mathematics using Quizlet and they said that, "I can read, test myself even in the absence of the teacher. My studies are so interesting." The main reason for being difficult is some pupils are still illiterate as far as the use of iPad is concerned. All the students accepted that, they enjoy learning with Quizlet and they expects that the regular use of Quizlet will help them to better perform in the subject and also feel that they could face the exam without any fear. Fig. 1 gives the graphical representation of our findings. Students

also suggested that they would prefer using Quizlet for studying Mathematics, Geography, Biology, Accounts, Commerce and all the complicated subjects.

TABLE I: STUDENTS FEEDBACK FORM FOR MATHEMATICS

Quizlet application: Students Feedback Form for Mathematics.			
	Number of Students		
	Agree	Partly Agree	Disagree
I don't have any problems using Quizlet.	25	10	15
It helped me to feel comfortable in learning subjects.	40	10	0
It helped me to study subject with joy.	50	0	0
I think that the regular use and training with Quizlet will help me to face the exam without any fear.	50	0	0
I think that the regular use and training with Quizlet will help me to perform better in the subject.	50	0	0
It helped me to develop a more positive attitude towards the subject.	50	0	0
It is (easy/ difficult/ both) to use because	20 (Easy)	25(Difficult)	5 (both)
(please specify your reason)	Easy: I can read, test myself even in the absence of the teacher. My studies are so interesting. Difficult: Some pupils are still illiterate as far as the use of ipad is concerned.		
I would prefer using Quizlet for the following subjects (specify the name of the subjects)	Mathematics, Geography, Biology, Accounts, Commerce and all the complicated subjects.		

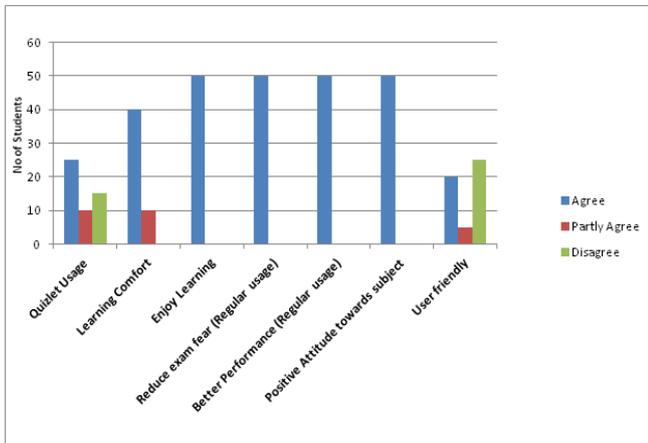


Fig. 1. Students feedback on Quizlet for mathematics.

Students Feedback Form Analysis for Geography: This section analyses the finding related to student's feedback for mathematics (See Table II). Fifty students studied geography using Quizlet. 30 students fully agreed and 20 students partly agreed that they do not have problem in using Quizlet. 25 students, 13 students, 12 students found it to be user friendly, partly user friendly and not user friendly respectively. Even in this case also 40 students found learning geography using Quizlet and they said that, "It has helped me spend more time in my studies. After studying I can test myself and get a grade immediately. My studies are so interesting". Also students said that, "I still have got challenges on how to operate the iPad. I still need more time with the iPad to learn how to operate it by myself". Even in

this case All the students accepted that, they enjoy learning with Quizlet and they expects that the regular use of Quizlet will help them to better perform in the subject and also feel that they could face the exam without any fear. Fig. 2 gives the graphical representation of our findings. Students also suggested that they would prefer using Quizlet for studying Mathematics, Geography, Biology, Accounts, Commerce and all the complicated subjects.

TABLE II: STUDENTS FEEDBACK FORM FOR GEOGRAPHY

Quizlet application: Students Feedback Form for Geography.			
	Number of Students		
	Agree	Partly Agree	Disagree
I don't have any problems using Quizlet.	30	20	0
It helped me to feel comfortable in learning subjects.	40	10	0
It helped me to study subject with joy.	50	0	0
I think that the regular use and training with Quizlet will help me to face the exam without any fear.	50	0	0
I think that the regular use and training with Quizlet will help me to perform better in the subject.	50	0	0
It helped me to develop a more positive attitude towards the subject.	50	0	0
It is (easy/ difficult/ both) to use because	25 (Easy)	12 (Difficult)	13 (both)
(please specify your reason)	Easy: It has helped me spend more time in my studies. After studying I can test myself and get a grade immediately. My studies are so interesting. Difficult: I still have got challenges on how to operate the ipad. I still need more time with the ipad to learn how to operate it by myself.		
I would prefer using Quizlet for the following subjects (specify the name of the subjects)	Mathematics, Geography, Biology, Accounts, Commerce and all the complicated subjects.		

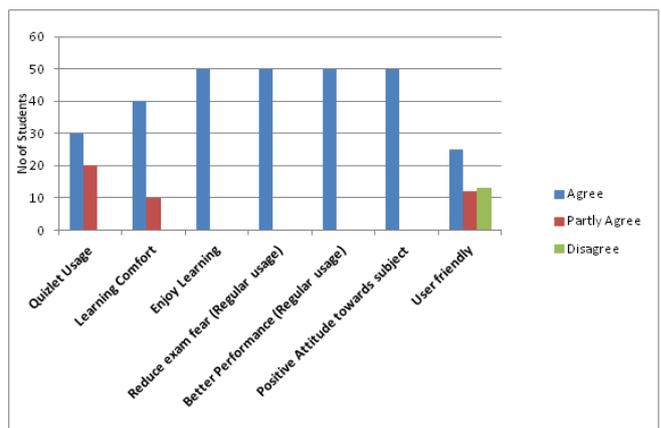


Fig. 2. Students feedback on Quizlet for geography.

Teachers Feedback Form Analysis: This section describes the findings of feedback analysis given by both mathematics and geography teacher. There is no contradiction in the answers of both the teachers. Both the teachers agreed that Quizlet supports their subject, they do not have any problem in creating set, reusing the set created by other users, adding image, sharing contents with their students. They mentioned

that they were happy because they found a remarkable improvement in both performance and interest towards their subjects. They were able to track their student's performance and mentioned that it helped them to plan the next course of action.

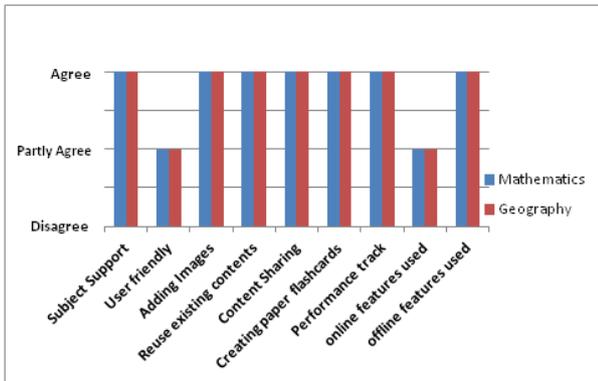


Fig. 3. Teacher's feedback for mathematics and geography.

On the other hand, both the teachers addressed the same problem with respect to Quizlet usage. They told that, they

were not able to provide more alternative solution for the same question and also Quizlet is case/ word sensitive. The problem that was addressed by mathematics teacher was Quizlet accepts the term to be correct only if the answer provided exactly matches with the answer was mentioned in created card. He also explained us with two examples. The Area of triangle is $\frac{1}{2} \cdot \text{base} \cdot \text{height}$. If the student gives the answer as $\frac{1}{2} \cdot \text{height} \cdot \text{base}$ Quizlet recognizes as the answer to be incorrect even though the answer is correct and the circumference of the circle is $2\pi r$. If the student gives the answer as πD even in this case the answer is correct but it was not mentioned in the card so it is incorrect according to Quizlet. Geography teacher also has the same view, he says that, "Students should give the exact answer, else they are marked wrong. This can demoralize them as they are marked wrong when in fact the answer is correct. I think it has to be modified to consider the knowledge based questions that are a bigger part of the examination." Fig. 3 gives the comparison of features used by both the teachers and the graph was drawn based on the information available in Table III and Table IV.

TABLE III: TEACHERS FEEDBACK FORM FOR MATHEMATICS

Quizlet application: Teachers Feedback Form.			
	Agree	Partly Agree	Disagree
It supports my subject.	Yes		
Comment: My students are now more eager to learn and their performance has improved remarkably. I still wish to discover more on Quizlet and how easy it made my job to be.			
I find it easy to use.		Yes	
Comment: I have realized it is limited to the answer that set thus if the pupils use another formula that is not the answer it is marked wrong.			
It is easy for me to add terms and images in the set.	Yes		
Comment: With the internet connected I can browse the images already in the web fast without having to capture them which save time.			
It is easy for me to search and reuse existing topics related to my subject.	Yes		
Comment: it is just at the click of the search button and searching the topic of preference and read which is quite easy.			
It is easy for me to share the content with students.	Yes		
Comment: After creating Gmail accounts one can easily invite the pupils of choice to study the concept both offline and online.			
It helped me to create paper flashcards with the help of print option.	Yes		
Comment: I managed to print for the benefit of the pupils in offline mode and also they can study at home without logging on again.			
It helped me to identify the weak areas of the students with the help of performance track feature.	Yes		
Comment: You can know the pupils performance whether it's changing for the better or worst...in my case. I am having pupils changing as far as the interest is concerned because students hate maths"			
Features used by students are	Used	Not Used	
Flashcards/ Cards	Yes		
Learn	Yes		
Speller		Yes	
Test	Yes		
Scatter		Yes	
Space Race	Yes		
Match	Yes		
In which teaching settings would the use of Quizlet be effective? (Such as practice in class, repetitions, checking previous knowledge, exam, sharing Quizlet cards among teachers, having pupils produce good questions for Quizlet etc.)	The exam is the best way because it has both interest improving and checking if the pupils have understood.		

V. CONCLUSION

A. Introduction

The aim of this study was to determine use of interactive

self-directed way of m-learning solution in high school located in disadvantages areas. To do so, we had the opportunity to contact, conduct pilot test and to collect information from Mpumelelo High School, Zimbabwe.

TABLE IV: TEACHERS FEEDBACK FORM FOR GEOGRAPHY

Quizlet application: Teachers Feedback Form.			
	Agree	Partly Agree	Disagree
It supports my subject.	Yes		
Comment: My students are now more eager to learn and their performance has improved remarkably. I still wish to discover more on Quizlet and how easy it has made my job to be. My students can study, evaluate and correct themselves as they enjoy the ipad. I am experiencing a great improvement on their performance and attitude towards my subject. Learning is so automated.			
I find it easy to use.		Yes	
Comment: Students should give the exact answer, else they are marked wrong. This can demoralize them as they are marked wrong when in fact the answer is correct. I think it has to be modified to consider the knowledge based questions that are a bigger part of the examination.			
It is easy for me to add terms and images in the set.	Yes		
Comment: With the internet connected I can browse the images already in the web fast without having to capture them which save time.			
It is easy for me to search and reuse existing topics related to my subject.	Yes		
Comment: it is just at the click of the search button and searching the topic of preference and read which is quite easy. Students also use this function to expand their understanding of the topic.			
It is easy for me to share the content with students.	Yes		
Comment: After creating Gmail accounts one can easily invite the pupils of choice to study the concept both offline and online.			
It helped me to create paper flashcards with the help of print option.	Yes		
Comment: I managed to print for the benefit of the pupils in offline mode and also they can study at home without logging on again. This saves time and congestion during class discussions. Students can do individual work than the group work in the ipads.			
It helped me to identify the weak areas of the students with the help of performance track feature.	Yes		
Comment: You can know the pupils performance whether it's changing for the better or worst. The current situation resembles a remarkable improvement in both performance and interest.			
Features used by students are	Used	Not Used	
Flashcards/ Cards	Yes		
Learn	Yes		
Speller		Yes	
Test	Yes		
Scatter		Yes	
Space Race	Yes		
Match	Yes		
In which teaching settings would the use of Quizlet be effective? (Such as practice in class, repetitions, checking previous knowledge, exam, sharing Quizlet cards among teachers, having pupils produce good questions for Quizlet etc.)	The exam is the best way because it has both interest improving and checking if the pupils have understood. During class practices, it is a good evaluation of understanding and helps me to plan the next course of action.		

The investigation was directed by two main research questions. The objective of first question is to find the usability aspect of teachers and students in using the suggested m-learning solution. The objective of second question is to find out, if mobile application supports self-directed learning in the view of the students and teachers. Quizlet application was selected to support the above two arguments.

The finding from the previous chapter shows that both teachers and students are partly comfortable with the usability aspect of Quizlet and the finding also infers that the Quizlet Supports self-directed learning. The main reasons are as follows:

Students view: Even though they were able to learn at their own speed and test their learned concept in the absence of teacher, they need the help and support from teachers to operate iPad and apps, since it is new to them. They learned the subjects with joy; they feel that the regular use of this application will help them to face the exam without fear and to perform better. Also they suggested that this application could be helpful to study their complicated subjects easily.

Teachers view: Both of the teachers do not have any problem in creating and sharing the app with the students. They found a remarkable improvement in both performance and interest of their students towards their subjects. They were also able track student's weak area and to plan the next course of action. The main problem addressed by them was less flexibility in answering the questions i.e., only the inbuilt answers are accepted as correct answers. Even though the student gives the correct answer in a different way Quizlet marks it as incorrect. Since Quizlet is word and position sensitive.

The above study showed that teachers/students consider that the regular usage will help them to perform better. Quizlet supports students to learn at their own speed and It helps the teachers to insert their own content and also to figure out and focus on the areas where the student lack.

B. Limitations

- 1) The major limitation in this project is that we cannot generalize our result by considering two teacher and two classes in one school.
- 2) Though Quizlet application supports self-directed learning it has its shortcomings. Quizlet is case and position sensitive.
- 3) Finally, time also acted as a limiting factor. Students had only little time to familiarize themselves with Quizlet usage.

C. Future Work

Future scope of this project would be: Allowing the students to use the Quizlet app on a regular basis for learning their subjects and also test different functions, apply functions to more subjects and involve more classe and then analyse the performance before and after using Quizlet. Based on the result of the analysis, recommendation can be made whether to extend this solution to other schools or not and also whether to reuse the contents prepared by the qualified teachers in other school or not.

Another possible future work would be find solutions to limitations described by teachers by designing a flashcard

based mobile app which accepts the alternate/ possible solution for the same problem presented in the flashcard by quickly searching the alternatives in the internet or from the local server in order to overcome the existing limitation of Quizlet.

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