

A Study of the Construction of a Mobile Learning Oriented Mathematics Learning Activity

Hsin-Chang Lu ¹, Jen-chin Lin ², Chien-chung Lin ³, Ken-I Su ⁴

¹ Graduate student, Department of Industrial Technology Education, National Kaohsiung Normal University, Taiwan

² Graduate Institute of Science Education National Kaohsiung Normal University, Taiwan

³ Senior Professor, Dept. of Business Administration & Management, Meiho Institute of Technology, Taiwan

⁴ Graduate student, Department of Industrial Technology Education, National Kaohsiung Normal University, Taiwan

No.116, Heping 1st Rd., Lingya District, Kaohsiung City 802, Taiwan

Abstract:- This research integrated mathematics education theory and the spirit of mobile learning into authentic context. Researchers designed and implemented the mathematics learning activities takes mathematical ability of K-12 students as the criterion, and combined with wireless network and mobile devices as learning tools to construct a mathematical learning campus that would be helpful for the mathematics learning. The learning activity would also base on constructive learning model and the RME (Realistic Mathematics Education) theory, and consist of interesting competitive game. The mobile learning tools can make the mathematics knowledge to be restructured and present the connection between mathematics concept and authentic context by responding to learning demand immediately, retrieving knowledge actively, providing mobility with learning context, interactivity of learning process.

Learners will have drastic change in mathematics learning. Mathematics learning within real-world context would be linked to real life more instead of abstract thinking. Using the teaching material easy to get on campus, students can get rid of merely dull calculation and formulas in mathematics learning, and they can use mathematical concept in real-life context and find mathematics leaning more meaningful. In the process of constructing mathematics knowledge, students can find the mathematics again from "question context" to "mathematics question solved in the context." They can utilize mathematics tools to reconstructure knowledge, to solve problems of real life, and to experience that mathematics is from life and used in life by the new advantage of mobile learning.

Key-Words: mobile learning, Technology Mediated Learning, mathematic education

1 Introduction

Nowadays, technology progresses constantly, and the application of technology in education changes in its own quality and quantity. For instance, traditional learning ways like correspondence education, broadcasts, and television programs, have changed to the on-line learning in the internet age.

The mobile device technology helps mobile learning which can breakthrough the limit of time and space develop rapidly. The mobile devices applied in education come up with the concept of "learning anytime at anywhere," and that makes learning merge

with different situation except for classroom. This is exactly a new realm of educational development at present--mobile learning.

California State Berkeley University already combined mobile devices with WISE (Web-based Inquiry Science Environment) project in the past, and researchers found using mobile device can improve the inquiry learning activities of K-12 students in mathematics and science [11] This shows that mobile learning is able to break the learning model which consists of one way teaching of teachers and passive learning style of students in the classroom. Mathematics, which was more difficult for students to

understand in the past, can be developed with everyday life questions that are full of creativity and surroundings of the school or the community, such as the court, the trees, and the school gate.

Researches of mobile learning in Taiwan aimed at the use of mobile devices and cooperative learning in observation of the nature which made the learners go outside to experience the real world.

2. Concept of Study & plan of learning environment

2.1 Using the “technology-mediated” supported learning environment

The communication and network technology were progress, increased the information use value. Technology Mediated Learning (TML) to promote the quality of study has already become another choice of learning.[1]

Mobile learning are digital technology and mobile technology combination [8] several scholars addressed the teaching frameworks use the Mediated Technology on the e-learning. The cost of learning on the internet will be lower, the study control right move to learner, can repeated to study, on-line course from getting newer immediately advantage [2][10]

The tool of mobile learning provided portability, the wireless, mobility [12]. Distance learning and mobile technology represent the future of new study [9]. The evaluative report point out in PEP (Palm Education Pioneers Program) of SRI plans, PDA has improved the inquiry-based learning activity effectively:

- (1) Increase student's learning motivation and attention of collecting the materials to the activity.
- (2) Aid the students learns skill of measurement.
- (3) Aid the students learns explanatory of data.
- (4) Support students to make the inference with the evidence regard as argument activity.

This study try to combine Technology Mediated Learning on the internet, in order to set up websites of contest of mathematics(PDA、Smartphone、Keyboard PDA,...etc. Show in the Fig. 1).



Fig.1 The mobile mathematical contest used the mobile devices to link internet.

2.2 Integrating constructivism & situation theory to build the situation mathematics environment.

The teaching model used mobile device to mediated learning resources in this research. This model implemented learning environment and designed activities with constructivism theory, furthermore, and combine situation mathematics to planning mathematics learning activity.

2.2.1 Using constructivism to promote effects of learning.

According to the constructivism, it emphasized knowledge is via learner's initiative exploration and way of the discovery. The key of constructivism learning is to engage learners to enjoy in their learning actively.

2.2.2 Realistic Mathematics Education (RME) integrate the real life into learning

"Realistic Mathematics Education"(RME) model has already been applied by a lot of countries at present, for instance: Britain, Germany, U.S.A., Japan and Malaysia ..., etc.

The processes of guided reinvention are emphasized in mathematics education. Obtain the mathematics concept via the small step progressive, Scaffolding-Based Instruction can bring about a cognitive development through the motive of spontaneity [13] as table 1 Design & Analysis of Mobile Mathematics competitions.

The teaching environment in the learning process should combine with our lives situation [6].

Technology Mediated Learning	Internet application	constructivist learning model		
		situated learning	Learning theory	Learning approach
Mobile device (PDA、SMART PHONE...etc)	Mathematics program wireless network	In the mathematics situation of campus mainly, to show the question.	Scaffold assist Actively explore	Real time interactive Group discuss Collaboration learning

Table 1 Design & Analysis of Mobile Mathematics competition

3. Research Design

3.1 The research structure of Mobile Mathematic contest

Integrating the relevant reference of intermediary technology and mobile learning, plan out the mobile mathematics context. According to the view of Freudenthal [5], mathematics learning is the activity of problem solving, learners must find out and organize the question from the true situation. Mathematics activity' included 'mathematics of the true situation' and' the mathematics knowledge 'at the same time.

The instruction activity present mathematics contest on the internet, in order to increase the learner's interest and enjoyment, when finishes the contests of five rounds finally, the learners will get the reward.

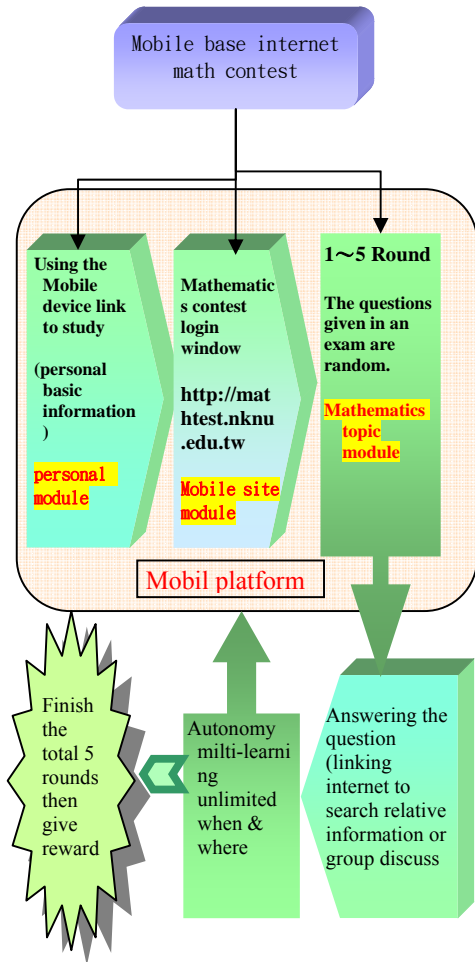


Fig. 2: A framework of mobile math contest

3.2 Network entry platform of the mobile mathematics contest

While participate in mobile mathematics learning activity students can log in to the platform and the learners' learning profile will be logged by the system in order to record and keep track learners' learning paths.



The learner can query about teaching progress and Learning Portfolio at any time on the platform.



4 Practice of mobile internet mathematics contest

4.1 Experiment procedure

The mobile learning had three key elements: mobile device, communication device and learning approach [3], which combine to the internet mathematics, the procedure show in the figure 3.

The learner used the mobile device to enter the platform, and followed with the mathematics topic hints, the activity of Arcade Style Games was then begun.

In this procedure, the learner can retrieve learning material while moved around campus, using the mobile device they can inquiry the situated problem at the same time. Learners can discuss the mathematic problem and solving problem collaboratively in the activity. After accomplished each stage the learner shall enter the next question

and finish all mathematics topics finally.

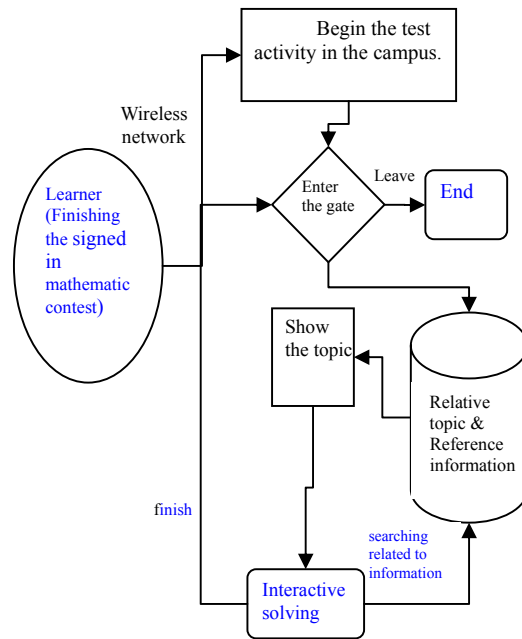
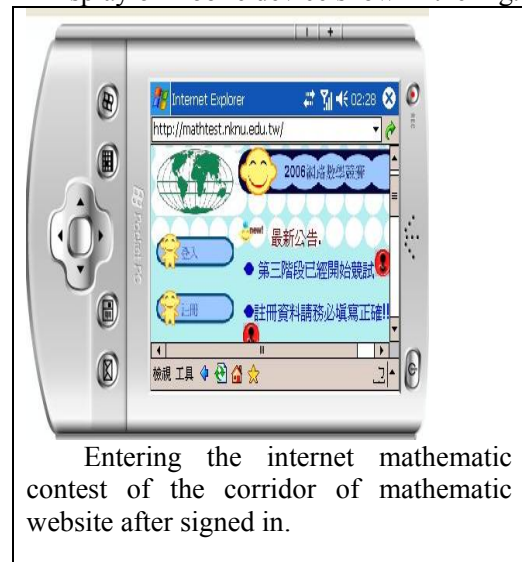


Fig. 3: The mobile mathematics activities operating figure

4.2 Operate interfaces of mobile device

Display of mobile device show in the Fig. 4.



Entering the internet mathematic contest of the corridor of mathematic website after signed in.



Entering the internet mathematic Competition of the corridor of mathematic website after signed in.



Enter the first round and show the topic begins to answer.



To show the topic two, answering the question continuously.



To show the topic two, answering the question continuously.



Using the MSN messenger to collaborate learning with classmate..

Fig. 4: Mobile device operating figure of internet mathematics contest

5. Study result & discuss

Mathematic competitive activities supported with mobile network used mobile devices such as PDA as learning technology to support learning and integrated constructive learning theory and RME theory into learning activities. Students participated in Mathematic competitive activities can engage in mathematic problem solving, peer discussion and information searching with mobile devices to connect with Internet everywhere in campus. Such learning environment provided multiple learning pathways. With mobile devices and situated based mathematic problem solving activities the learning will make excellent change in mathematic concept learning.

(1) "horizontal mathematic": Students get more external links of abstract mathematic concepts. Students can use mathematic learning instruments to organize and solve real-life problems and transform real-life problems into mathematic problems with mathematic concepts.

(2) "vertical mathematic": Students can get more internal links of mathematic concepts and construct mathematic knowledge as bottom-up process, For instance, students can learn geometry with campus buildings means and calculate the measure of area that students can integrate what students already known to solve new problem [4].

In the process in competitive activities, mobile devices support to retrieve digital information everywhere that get over the border of tradition classroom. Students can participate in activities with peers as cooperative learning. The mobile learning tools can make the mathematics knowledge to be restructured and present the connection between mathematics concept and authentic context by responding to learning demand immediately, retrieving knowledge actively, providing mobility with learning context, interactivity of learning process [7]. Learners in such situated based learning environment can aware the relation between mathematic and other disciplines. Learning with Internet is more attractive for learners to engage [12]. Making abstract mathematic concepts to connect with daily problems students will engage in more meaningful learning. Such integral design could change conventional classroom and provide a new perspective of thinking to confront the evolution of education.

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