

MINISTRY OF EDUCATION AND TRAINING
THE VIETNAM INSTITUTE OF EDUCATIONAL SCIENCES

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EXPLOITATION OF APPLICATIONS
ON MOBILE PHONES TO SUPPORT GRADE 12 STUDENTS IN HIGH SCHOOLS
IN MATHEMATICS SELF-STUDY

Major: Theory and Methods of Teaching for Mathematics

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PUBLISHED LISTS OF AUTHOR'S WORKS

RELATING TO THE THESIS TOPIC

1. Trinh Thi Phuong Thao (2011). *M-Learning application on teaching Mathematics at High School*. Science and Technology Journal – Thai Nguyen University Volume 80, No. 04.
2. Trinh Thi Phuong Thao (2011). *Exploitation of teaching software to active the academic activities in teaching Mathematics at High School*. Science and Technology Journal – Thai Nguyen University, Volume 87, No. 11.
3. Trinh Thi Phuong Thao. *Application of mobile phone to support students for self-studying out of class time*. Yearbooks of Science Conference, Hanoi National University of Education Publisher
4. Trinh Thi Phuong Thao (2013). *Exploitation of M-learning in self-studying*. Vietnam Education Journal, Special Issue, 8/2013.
5. Trinh Thi Phuong Thao (2013). *Exploitation of applications on mobile phone to support students in high school for Mathematics self-studying*. Vietnam Education Journal, No 323, Period 1.
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7. Trinh Thi Phuong Thao (2014). *Improvement of compilation capacity, application of electronic learning materials for teaching in teacher training*. Yearbooks of Science Conference, Hanoi National University of Education Publisher
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PREAMBLE

1. Reasons why choose the topic

The eighth Conference Resolution of the eleventh Session Central Committee on fundamental, comprehensive innovation of Vietnam education and training specified: Methods of teaching and learning to overcome the way of such passive transmitting that impose 1 direction, and memorize mechanically; Instead, promote the positive, proactive, creative characteristics and use knowledge, skills of learners, and focus on the way of learning, thinking and self-learning.

In academic year 2013-2014, the Ministry of Education and Training (MOET) has emphasized: academic tasks can be performed inside or outside of class time, in or outside the classroom. In addition to organizing the student to perform the task of learning in the classroom, it is needed to appreciate the task assignment and guide student learning at home, outside the school.

Directive No. 58 CT / TW of Central Committee of the Communist Party of Vietnam of session VIII indicated: "To promote the application of Information Technology in education and training at all educational levels, grades and branches. It is also needed to develop forms of distance education to serve the learning needs of society ".

With the advent and development of mobile devices capable of accessing the Internet has formed the mobile learning method (M-Learning). Therefore, exploiting the potential of learning through web pages on mobile phones is a very consistent trend in the current conditions. In Vietnam, the use of mobile phones to support students study, the research does not mention it in a systematic and comprehensive way. So that, the research of using some kind of mobile phone functionality into teaching in general, self-study in particular are the critical events currently. Stemming from the above reasons, the selected research topics are: *"Exploiting a number of applications on mobile phones to support grade 12 high school students' self-study"*.

2. Research Objectives

Define clearly the orientation of designing, editing and building a system of electronic learning materials with knowledge content of Mathematics of Grade 12 and propose the exploiting plan for electronic learning materials by using a number of applications on mobile phones to support grade 12 students in Math self-study.

3. Objects, research subjects and the scope of the research.

3.1. Object of study: Math teaching process at grade 12 with the help of ICT.

3.2. Research subjects: Exploitation of some mobile phone applications has supported grade 12 students in Math self-study.

3.3. The scope of the research: The exploitation of mobile phone applications in teaching is very wide. Within the scope of the subject, we only focus on the electronic learning materials designing, editing with the knowledge content of Grade 12 Mathematics and exploiting a number of mobile phone applications to support students of Grade 12 in self-study with the aforementioned electronic learning materials.

4. Scientific hypothesis

If designing, editing electronic learning materials system for Grade 12 Math in the direction of differentiation, interaction, suitable for mobile devices and proposing the pedagogical guidance to exploit some mobile phone applications in the self-study, it will enrich the self-study environment; and also contribute to the improvement of the quality of Mathematics self-studying for grade 12 students.

5. Research duty

(1) Study the rationale for self-study, trends and results of mobile phone operation in teaching and learning in the world and Vietnam; (2) Survey, investigate the exploitation of some mobile phone applications supporting grade 12 students in current Mathematics self-study. (3) The designing and editing works of grade 12 Mathematics electronic learning materials systems are more differentiated, interactive, structured, with the proper use to support grade 12 students to self-study Mathematics through mobile phones. (4) Propose plans to exploit a number of applications on the mobile phone and electronic learning materials system to support grade 12 students to self-study Mathematics. (5) Implement pedagogical experiments to test the effectiveness of the plans proposed by the thesis.

6. Research Methodology

Methods of theoretical research; Methods of observation and investigation; Professional method; Case study method; Pedagogical experiment method.

7. The argument given for protection

(1) The use of some functions of the mobile phones to support grade 12 students in Math self-study is feasible.

- (1) May design, edit the electronic learning materials that are appropriate to support grade 12 students in Mathematics self-study with the help of mobile phones in accordance with theory and practice of Mathematics teaching in Vietnam.
- (1) Option to use electronic learning materials through the use of some mobile phones functions to support Grade 12 students in Mathematics is effective, contributing to the quality of study development.

8. The contribution of the thesis

8.1. The contribution of the thesis in term of theory

- (1) Systematize the theoretical basis for the exploitation of a number of mobile phone applications supporting Math self-study.
- (1) Propose the design and edit directions for electronic learning materials to support grade 12 students in Math self-study through the exploitation of a number of mobile phone applications.
- (1) Propose organizational plan for grade 12 students in mathematics self-study based on exploitation of a number of mobile phone applications.

8.2. The contribution of the thesis in terms of practices

- (1) Clarify the practical elements through the results of surveying, analyzing the exploitation of a number of mobile phone applications supporting Grade12 students to self-study Mathematics at some high schools.
- (1) The thesis of supplementing the electronic learning materials to help grade 12 students to self-study Mathematics.
- (1) The thesis initially helped to confirm the feasibility and effectiveness of exploitation of some mobile phone applications supporting grade 12 students to self-study Mathematics.

9. The structure of the thesis

Besides the introduction, conclusion, references and appendices, the thesis content includes 3 chapters:

Chapter 1. Rationale and practice;

Chapter 2. Using a number of mobile phone supporting function for grade 12 students to self-study mathematics;

Chapter 3. Pedagogical experiment.

Chapter 1: RATIONALE AND PRACTICES

1.1. Orientation for innovation of teaching methods

Ideology is also the purpose of the teaching methods innovation process in the spirit of Education Law, while the Party Resolutions

emphasize positive activities of study. The teaching methods should be directed to the organization for students in voluntary, active and creative activities, to be implemented independently or in interaction.

Article 5, Chapter I, the Law on Education (2005) stated that "Methods of general education should promote a positive, self-discipline, initiative and creative characteristics of students; consistent with the characteristics of each class, and each subject; foster self-learning method, and practice skill of knowledge manipulation into practices, impact emotion, bring joy, excitement for student in learning. "

Orientation was concretized and indicated the specific measures to modernize the teaching methods by the educational specialists: Nguyen Huu Chau, Thai Duy Tuyen, Tran Kieu, Tran Ba Hoanh, Nguyen Ba Kim...

1.2. Self-study issue

1.2.1. The concept of self-study

Analysis of the self-study concept, experts found out that:

- When having learning activities, there will be self-study activities. Self-study is a cumulative process and experience change of the individual by their activities of interaction with environmental factors. Self-study is learning at the level of independence, self-discipline, initiative.

- The nature of the self-study process is that the students individualize the study to meet the learning needs, voluntarily undertake learning activities to implement effective goals and learning tasks.

- Self-study is not forced by another but by learners to explore and experience more. Learners completely control his study and may learn anywhere and anytime.

- Self-study is self-exploration, self-questioning, self-learn to understand the problem deeper, even understand differently by being creative, coming to an answer, a different conclusion.

- Self study is brainstorming, thinking, using of intellectual capacity and even the muscle, also with qualities and emotional engine, perspectives to dominate a certain field of humanity knowledge, turn that area into his possession.

1.2.2. The process of self-study

According to Thai Duy Tuyen, Tran Ba Hoanh ... the self-study process comprises of the steps: Formation of self-study engine; Planning for learning; Implementation of the plan; Self test for plan implementation. Therefore, the

self-study method includes of many consecutive processes of assimilation and implementation.

1.2.3. The role of self-study

Nguyen Canh Toan and Nguyen Ky have highlighted the role of self-study as an internal force. Learning is basically self-study, including students' internal and external forces.

1.2.4. The levels of self-study

It can be divided in two self-study activity levels: low level, high level. It can be divided into levels of study: Self study at lower levels is first step to become familiar to the study method; Study at a higher level is process of forming and training study skills; The next level is the study awareness, initiative to self-study; Finally, the passion of self-study.

1.2.5. Form of self-study

According to Nguyen Canh Toan, there are many forms of self-study as followings: face-to-face method (teachers and students face each other in class); Study mode with books, without teachers beside; Forms of self-study with guidance and support:

1.2.6. Organize self-study activities

Many experts agree that self-study organization is to arrangement of self-study activities with the teaching activities. With this point of view, organization of self-study activities for student is the process of design, arrangement of teacher's training organizing measures to carry out control instructions, directing how to design, to arrange self-learn measures, self-study, and help students to promote the highest level of self-study ability, leading to a good learning purpose and tasks.

1.2.7. Mathematics self-study Capacity

The self-study capacity may be defined as the psychological properties to ensure the success of each individual study.

1.2.8. Capacity fostering for students to self- study math

Must foster Mathematics self-study capacity for student's more success in Maths.

1.3. Self- study with the assistance of information technology and communications

1.3.1. The impact of information technology and communications to the self-study of students

ICT creates a favorable environment for the self-study of students.

ICT makes an active contribution to the learning activities of students.

1.3.2. Exploitation of information technology and communications in the study

Exploitation of information technology and communications in the form of self-study with direct guidance of teachers.

Exploitation of information technology and communications in self-study without direct guidance of teachers.

Exploitation of information technology and communications in the study without the guidance of teachers.

1.4. Overview of mobile learning

1.4.1. The concept of mobile learning (M-Learning)

In our opinion, *the M-learning indicates the learning, training that the management, sharing of content and interaction are accomplished through the use of mobile devices on the wireless network technology.*

1.4.2. Component, object, model of communication of M-Learning system

The main components of the M-Learning system: learning management system and learning content management system (*Figure 1*). The participants in M-learning system: System administrators, teachers, students.

1.4.3. Process of M-learning system design

Step 1: Planning; Step 2: Design of M-Learning system structures; Step 3: Developing M-Learning system; Step 4: Designing, Editing electronic learning systems; Step 5: Design of online studying courses; Step 6: Experiment, evaluation and application of M-Learning system.

1.4.4. Electronic learning materials

Electronic learning materials are the learning materials digitized in the certain structure, format and certain scenario stored on the memory device for use in the teaching and learning through digital devices such as electronic calculators, mobile phones...

1.5. Self-study in the M-Learning environment

1.5.1. Some features of M-learning

In our opinion, with the use of compact mobile devices with the ability to connect a wireless network, M-Learning has the following basic characteristics: (1) Do not be limited by space and time; (2) Create a flexible learning environment, and highly interactive; (3) Allow to individualize the learning; (4) Establish the role of teachers and students towards student-centered orientation.

1.5.2. Study in M-learning environment

Study in M-learning environment has the following characteristics: (1) The difference between the learning activities in M-learning with other

learning activities is the initiative; (2) The process of learning and assessment of learning outcomes takes place both inside and outside the classroom; (3) The learning must come from practical needs before new forms of learning in the high time of technology development.

1.5.3. Some skills of students during self-study in M-Learning environment

(1) Planning and time management skills; (2) Reading and following instructions skills in writing; (3) Raising questions skills during self-study; (4) Self-assessment skills of self-study results; (5) Using mobile phone skills.

1.5.4. Some skills of teachers teaching in M-Learning environment

(1) Teaching skills; (2) Management skills and (3) Technology skills

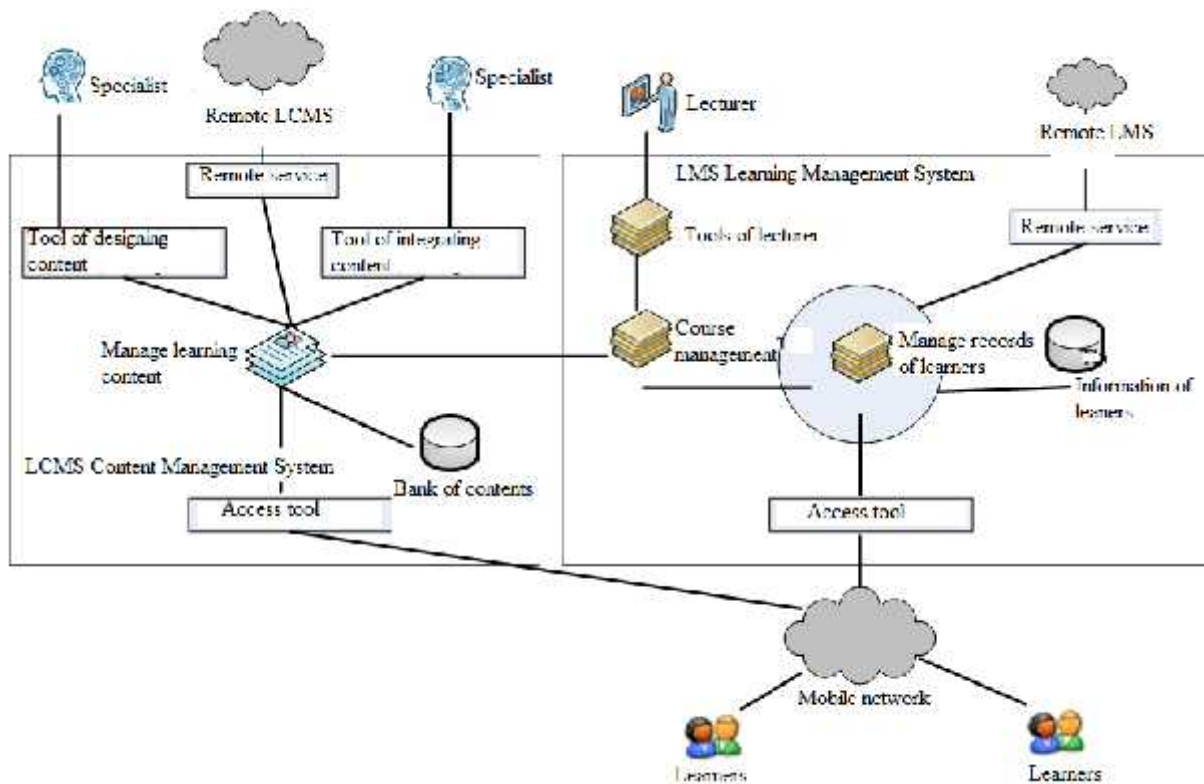


Diagram 1. Components of an M-learning system

1.6. Current state of exploiting M-learning in teaching

1.6.1. Current state of exploiting M-learning in the world

Presently, M-learning is exploited for laptops, mobile phones and other equivalent devices.

1.6.2. Current state of exploiting M-learning in Vietnam

In Vietnam, research on E-Learning has grown since 2002. However, research and application of M-Learning for purpose of assisting students in self-studying mathematics are limited.

1.7. Reality of self-studying mathematics and using mobile phone in self-studying mathematics of grade 12 students.

1.7.1. Current situation of self-studying mathematics of grade 12 students

Opinion poll towards 12 school administrators, 40 teachers shows that engine of students' self-study is primarily to get good test results. They are unaware explicitly of self-study for increasing knowledge and ability to apply their knowledge into practice.

1.7.2. Current situation of using mobile phone for self-study mathematics

In Vietnam, mobile phone is not focused on as a tool to support teaching. It is also not exploited strengths of M-Learning in teaching mathematics in general, supporting students in self-study mathematics in particular. A common drawback of existing M-Learning system is poor electronic learning materials for Mathematics which has loose linkages with the content, programs, teaching methods and assessment in teaching mathematics at high schools. In particular, most of electronic learning materials do not present differentiation and branching.

1.7.3. Opinion on self-study materials in Mathematics of students and teachers

Most of the students believe that materials supporting self-study the best were compiled in the form of: Systematizing theory in a selective manner with examples and exercises for self-practice and multiple choice test in theories and problems.

1.8. Conclusion of Chapter 1

Contents of Chapter 1 have codified theoretical and practical issues for basis of implementing research of Fellow, namely:

On theoretical aspects: Focus on clarifying arguments on self-study; Self-study with support of information technology in which advantages of information technology in training self-study are focused; Mobile Learning (M-Learning) and the essential skills for teachers, students in e-learning model.

On practical aspects: Processing of survey data shows current situation and problems posed from practice of self-studying Mathematics at high schools. The collected data also shows that mobile phones and models of mobile phones capable of accessing 3G are popular within grade 12 students,

especially in developed economic areas; but in most case applications of mobile phones in self-study mathematics do not exploited inefficiently.

Besides, contents of Chapter 1 have partly clarified the following important issues:

(1) It is necessary to use mobile devices to ensure the study taking place at anytime and anywhere. In contrast, mobile devices are motivation and agent ensuring highly personalization in study as well as meeting study demands of learners at anytime, anywhere.

(2) The use of mobile devices in education and training has opened a new training model, which is M-learning with many positive elements appropriate to purpose of supporting students in self-study.

3) Actual conditions of Vietnam make the use of mobile phone applications in supporting students' self-study feasible.

(4) In Vietnam, there is limited M-learning system which is designed to support students' self-study in mathematics, and its common limitation is electronic learning materials without evident differentiation, interaction mechanisms for self-study.

(5) One should be noted during implementation of self-studying Mathematics in M-Learning model is investment in research to design and edit electronic learning materials to support self-study in mathematics in which advantages of M-learning should show linkages with the program, content, purpose of educating mathematics at high school as well as differentiated instruction.

Chapter 2: USING SOME FUNCTIONS OF MOBILE PHONES TO SUPPORT GRADE 12 STUDENTS IN MATHEMATICS SELF-STUDY

2.1. Orientations for exploiting some functions of mobile phones to support students in self-studying mathematics

2.1.1. Ensure the feasibility within practical conditions of Vietnam

Based on results of research on the use of some mobile phone functions to support students' self-study in mathematics, select topics and deploy in the following directions: (1). Teachers assign self-study tasks for students and receive feedback via SMS or website; (2). Guiding students to participate in virtual classes, exploit electronic learning materials for self-study and self-assessment; (3). Storing electronic learning materials, installing applications on mobile phone to guide students in offline self-study; (4). Teaching in classroom based on students' preparation by self-study with electronic learning materials through mobile phones and textbooks.

2.1.2. The positive elements of M-Learning

The use of some mobile phone functions in supporting student's self-study in Mathematics has brought new and positive elements: (1) highly personalizing in self-study; (2) Creating motivation of self-study; (3) Expanding collaboration and communication; (4) "self-created" learning materials (5) Providing timely support and assign tasks to students; (6) offering students opportunity to perform as teacher; (7) saving costs; (8) saving time.

2.1.3. Ensure the pedagogical criteria

The use of some mobile phone functions to supports students' self-study must meet the below pedagogical criteria: (1) ensuring consistence with purposes and requirements, contents and deployment methods for students' self-study in Mathematics; (2). Promoting the relationship between teaching and self-study; (3). Assuring formation of self-study skills for students from low to high level, partly to entirely self-study consistent with their cognitive process; (4). Focusing on receiving and processing feedback on study results so that teachers may timely navigate and assist self-study of students if required; (5). Combining with the other self- study measures to diversify this activities in Mathematics, exploit strengths of each measure and overcome limitations of mobile phones.

2.2. Developing M-Learning system to support grade 12 students in self-studying Mathematics

2.2.1. Some requirements for M-Learning System

Some requirements on technological perspective: (1) providing functions of basic system administration; (2) security mechanisms and data security; (3). system of abundant utility and (4) Friendly interface.

Some requirements on pedagogical perspective: (1). Offering basic functions to manage instruction; (2). basic functions for designing, compiling e-learning materials; (3). functions deploying instruction; (4). functions of supporting students' self-study.

2.2.2. The process of developing M-Learning system to support grade 12 students in self-studying Mathematics

(1) Analyzing requirements for system; (2) Identifying functions of the system; (3) Designing and compiling electronic learning materials; (4)

Implementing and testing each component; (5). Exploiting each part and updating system.

2.2.3. Structure of M-Learning system to support grade 12 students in self-studying mathematics (diagram 2)

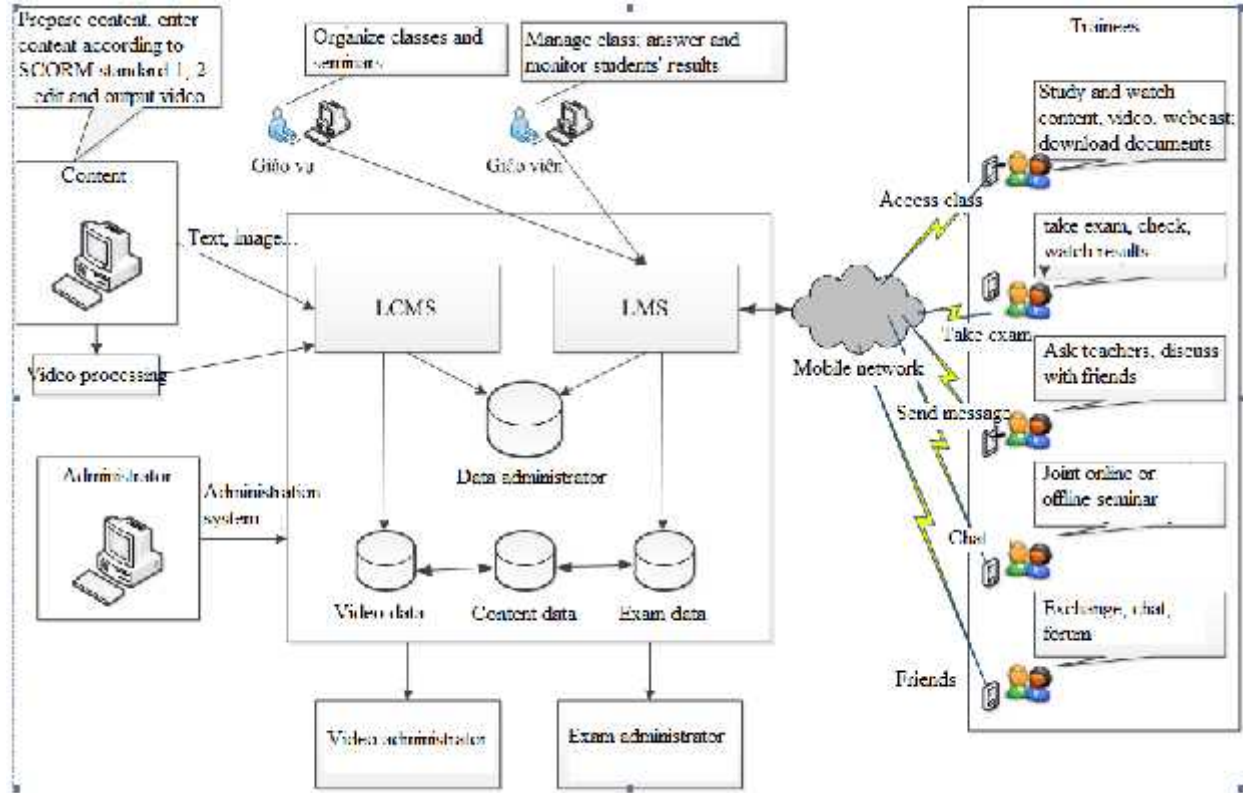


Diagram 2: Structure of an M-Learning System

2.2.4. Function of M-learning system for supporting grade 12 students in self-study mathematics

- Diagram of functions of system:

2.3. Developing electronic learning materials to support students' self-study in mathematics through the exploitation of some applications on mobile phones

2.3.1. Requirements for e-learning materials

- (1) A high pedagogical adaptability;
- (2) Flexible access;
- (3) Popularization assurance and
- (4) Technological adaptability



2.3.2. Design principles towards content of e-learning materials to support students' self-study via the exploitation of some mobile phone applications

(1) Strictly follow functions of managing teaching process: Contents of learning materials that support grade 12 students in self-studying mathematics by mobile phones include four main modules: Module 1: Theory summary. Module 2: Exercises with instructions. Module 3: Assignments for self-practicing. Module 4: Self-testing.

(2). Show the thought of the differentiated teaching: We design the materials for self-study on mobile phone through the following steps:

Step 1: Based on the standards of knowledge, skills to define the knowledge, skills that material content should be expressed.

Step 2: Design the system of differentiated requirements, exercises ... accompanied by detailed instructions in order that the weak students can select and complete the requirements in accordance with their capabilities and through the process of self-study, they gradually fill the gaps in terms of knowledge as well as raise the knowledge of Mathematics.

Step 3: Design and transform the knowledge, exercises ...in form of learning tasks, problem situations to encourage students to study.

(3). Access to programmed teaching

The sequencer is showed the tasks of self-study such as reappearing and completing knowledge; applying knowledge in the exercises; self-assessing; systematizing knowledge, training the skill of applying knowledge to solve problems in studying and life.

The branch is presented in the connection of self-study tasks which are controlled by a number of multiple-choice questions. The results answer the test will suggest students to select the self-study tasks corresponding to capabilities. On the other hand, making the support will not simultaneously but it will be flexible depending on the difficulties that students encounter in the process of completing the steps of self-study task.

(4). Consistent with the self-study method: the electronic learning materials content must meet the following criteria: (1). Clearly define the target that students need to dominate in the study; (2). Give more choices to ensure that all students are able to learn by themselves; (3). There are modules for student to evaluate and test their self-study results; (4). Consistent with WAP technology for mobile phone.

2.4. Exploitation process of some applications on mobile phone supporting student to study Mathematics

- Step 1: Define objectives, tasks of self-study;
- Step 2: Define reference content for students;
- Step 3: Organize self-study for students;
- Step 4: Evaluate the self-study results of students;

2.5. Exploitation method of some applications on mobile phone in Mathematics self-study of student outside the class hours

2.5.1. Objects of “teachers”, “students” participating in the system

Teachers include: Teachers to teach mathematics in the classroom. Teachers involved in the design, compilation of electronic learning materials; organize self-study, answer questions; test and evaluate the self-study of students through the functions of system. Student participates in supporting others in the process of self-study.

Students include: Students of a tradition class, the students are not the same school, same class, same residence but they have the same interest like to learn, share content posted on system. Teachers act as a student in self-study to lead to discuss, learn and explore a particular problem.

2.5.2. Self-study method with directly instructions of teachers

In term of mobile phone support, the self-study with instructions is wider than the traditional, namely: (1). Teachers will give the tasks and instruct students to self-study and receive the feedbacks via SMS; (2). Teachers and students together go online to use the “chat” function to exchange information; (3). Teachers guide students through the “chat video” function to allows transmission of multimedia information; (4). Teachers can simultaneously support many students by using group function...

In this form, students use mobile phone as a tool supporting for the calculation abilities, search information and interact with teachers (Figure 1).

2.5.3. Self-study method without direct instructions of teachers

Teachers design, edit the guiding document for self-studying and instruct students to complete their tasks as well as the form of multiple choice questions so that they can check their



Figure 1

studying result. For example, students access to mlearningvn.com, select “Plane equation” and confirm the following tasks:

Task 1: Access to the concept of the normal vector of the plane.

Task 2: Find the normal vector of the plane P passing through 3 points: A(2; -1; 3), B(4; 0; 1), C(-10; 5; 3). Students will receive the following suggestions:

(i). The plane passing through three points, how is the position of the vector set from 2 of the 3 points to the plane?

(ii). What is the relationship between direction of two vectors \vec{AB} and the said two vectors?

(iii). Our task is to find a non-zero vector with value perpendicular to the plane, so which vector can we select?

On this basic, students will define:

- Vectors \vec{AB}, \vec{AC} are located in the plane need to find.

- From the coordinates of three points, we have: $\vec{AB} = (2; 1; -2)$, $\vec{AC} = (-12; 6; 0)$

- Calculate the direction of two vectors, we have: $\vec{n} = [\vec{AB}, \vec{AC}] = (12; 24; 24)$

Students come into conclusion: One of the normal vectors of the plane passing through three points A, B, C will be: $\vec{n} = (12; 42; 24)$

2.5.4. The plan for independently self-study of students

We will analyze the role of mobile phones in this form of self-study:

- *Formation of self-study motivation for students:* (1). Use your mobile phone to search for information related to the tasks of self-study; (2). Using mobile phones creates an exploratory self-study environment; (3). Share and check the self-study results:

In the process of pedagogical practice, the self-study without the teachers' instruction is implemented by students under the following steps:

Step 1: Access to website: mlearningvn.com. After login, open any lectures, students will be assigned tasks of self-study by a “virtual teacher” (*Image 2*); Step 2: Students study the theoretical summary and the accompanying examples (*Image 3*). Next, students will study the accompanying examples (*Image 4*).

Electronic learning materials only points out the most common solution; students can use the item "Comments" at the end of each exercise to give your own comments or ideas on the website to share with everyone. After catching the theory and studying to apply the theory into solving

exercises through accompanying examples, students begin to challenge themselves with exercises with instructions and suggestions (image 5).

Students will self-check and evaluate their own self-study results by login the system of multiple choice questions. With each multiple choice question, students must solve problems and exercises in rough as a basis to choose the final answer.

If the answer is correct, students will continue to receive a new request with more difficult level and higher requirements (Image 6).

If the answer is incorrect, a “virtual teacher” will help students solve that problem. However, in this case, the system will not give an explanation as guided in the above exercises, but only gives suggestions for students which parts students should read and which examples student should review... So, students shall make their efforts to complete their exercises. This form of independent self-study is only relative.

2.5.5. Implementing self-study activities in groups

Firstly, in this form, the concept self-study student groups together means student groups with the same interest and motivation to search a problem and manage to solve an exercise together...

These students do not necessarily to be at the same location, but each student can be at different locations, even necessarily access to the network at the same time. The tasks of self-study of the group may be suggested by the teacher or posted on the forums by a student to share and exchange with others (Image 7).



Image 2



Image 3



Image 4

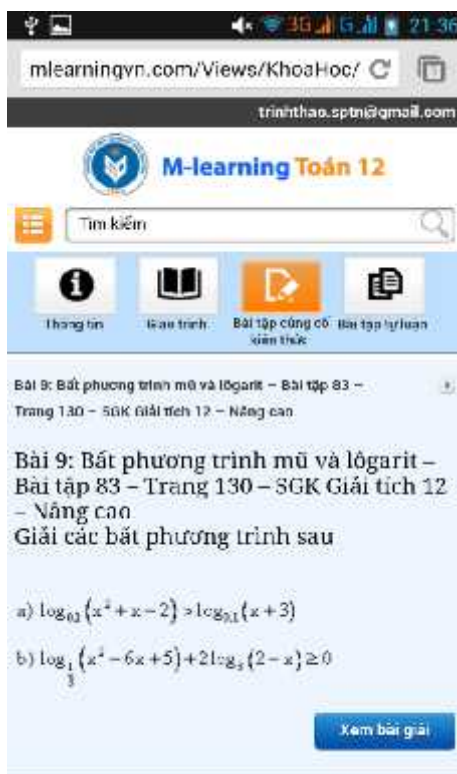


Image 5



Image 7

In addition to organizing for students to self-study according to the academic progress under the Mathematics 12 program, teachers can organize self-study groups according to the difficult topics to gather students with the same interest to solve any forms of exercises or mathematical methods. Teachers divide the class into many groups and assign each group a task, offer a variety of topics for students to make a fully active choice of the self-study topic.

mlearningvn.com/Views/KhoaHoc/

=> Hàm số đạt cực tiểu tại $x = 2$,
 $y_{CT} = y(2) = -3\sqrt[3]{4}$; Hàm số không có cực đại.
 (11h48 | 28/05/2014)

nguyenhung@gmail.com
 Từ làm bài này ko thấy đúng đáp số 😊 ai biết sai đâu chỉ họ cái!
 Tìm các điểm cực trị của hàm số

$y = \sqrt[3]{x^2}(x-1)$

+ TXD: \mathbb{R} ; $f'(x) = \sqrt[3]{x^2} + \frac{2(x-1)}{3\sqrt[3]{x}} = \frac{3(x-2)}{3\sqrt[3]{x^3}}$;
 $f'(x) = 0$ tại $x = 2$.
 + Bảng biến thiên:

x	$-\infty$	2	$+\infty$
y'	-	0	+
y	$-\infty$	$3\sqrt[3]{4}$	$+\infty$

=> Hàm số đạt cực tiểu tại $x = 0$
 $y_{CT} = y(2) = -3\sqrt[3]{4}$; Hàm số không có cực đại.
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 (12h56 | 28/05/2014)

nhu dấu của tích $(x-2)\sqrt[3]{x}$
 (12h56 | 28/05/2014)

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 Bạn ngodinh vẫn sai, bảng xét dấu phải thế này cơ mà

x	$-\infty$	0	2	$+\infty$
y'	+		- 0 +	+
y	$-\infty$	0	$-3\sqrt[3]{4}$	$+\infty$

=> $y_{CT} = y(2) = -3\sqrt[3]{4}$; $y_{CB} = y(0) = 0$
 (11h50 | 28/05/2014)

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 Sai ở chỗ $f'(x) = 0$ tại $x = 2$ và $f'(x)$ không xác định tại $x = 0$ nên bảng biến thiên phải như này:

x	$-\infty$	0	2	$+\infty$
y'	-		- 0 +	+
y	$-\infty$	0	$-3\sqrt[3]{4}$	$+\infty$

Image 7

2.6. Plans for exploiting a number of applications on mobile phones in the mathematical self-study of students in the lessons

2.6.1. Exploiting the self-study results of students during class

Based on the content, pedagogical scenario of lessons, teachers will assign some tasks for students to prepare during self-study at home. The results of this self-study will ensure students to get fully necessary knowledge and skills to actively participate in activities during the approach and dominate the new knowledge. For example, before teaching §7 – “Exponential and Logarithm Equations”, teachers assign students a content diagram with many blank items (*Diagram 3*).

The tasks of self-study of students are to research the textbooks and access to Electronic learning materials to complete the content of each “key point” of the diagram.

During the lessons, instead pointing out each content of the lesson according to textbooks in turn, teachers organize activities for students to

discuss with the knowledge gained in the process of self-study at home, fill the contents in proportion to the “key points” of the diagram. Through conversations, teachers organize for the remaining students to exchange and supplement or even reject other students’ ideas.

After completing, we will get a complete diagram showing the core knowledge of lesson (*Diagram 4*).



Diagram 3

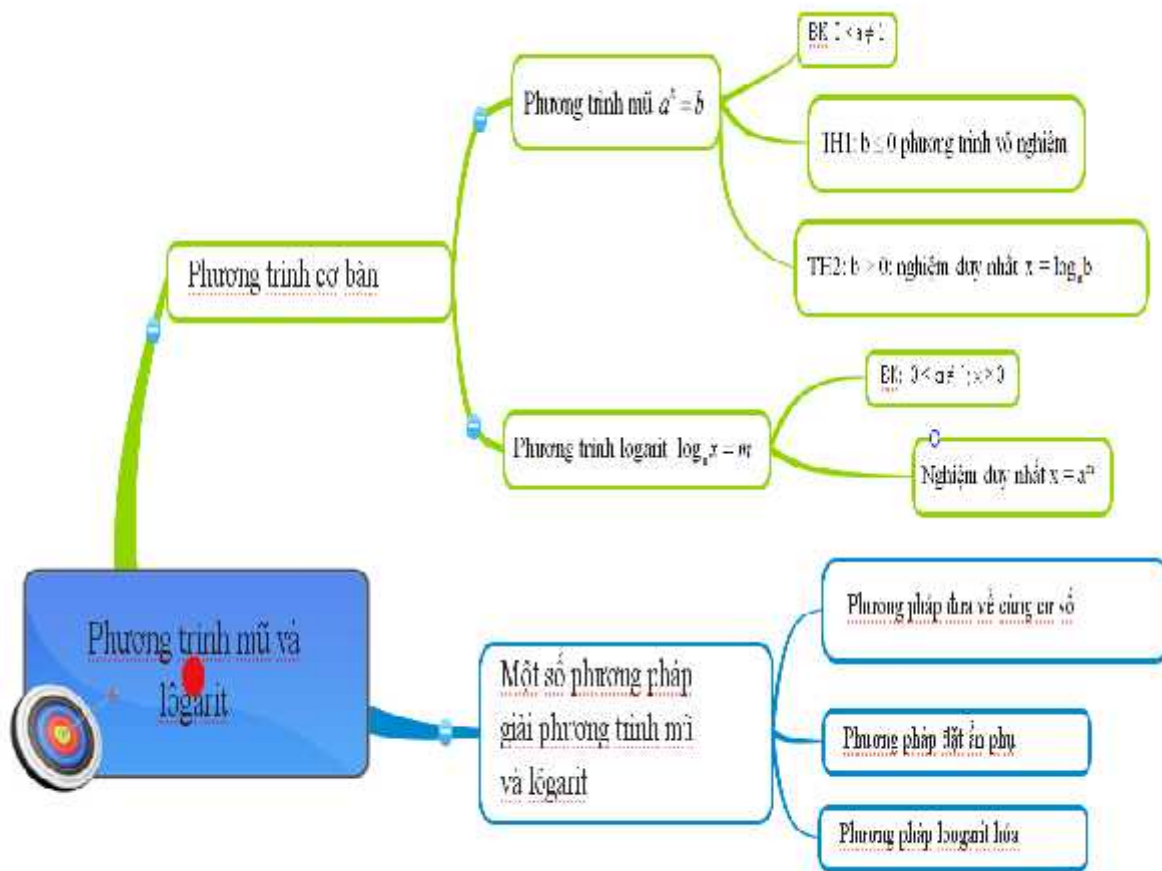


Diagram 4

At the end of the lesson, teachers spend 7-10 minutes on organizing activities to review new knowledge with the following tasks:

Task 1: Access to the system, do and answer the following multiple choice questions:

Task 1: Solution to an equation $\left(\frac{1}{4}\right)^{x^2-4x+3} = \left(\frac{1}{2}\right)^{-x}$ is:

- A. 1 and 3; B. 1 and 2; C. 2 and $-\frac{3}{2}$; D. 2 and $\frac{3}{2}$ Answer: D.

If students need the guidance after choosing wrong answer or getting out of time to prepare, those students will get suggestions: “Take the left side to the base of $\frac{1}{2}$ and solve the equivalent equation”...

Task 2: Solution to an equation $4^x + 9^x = 25^x$ is:

- A. 1; B. 2; C. $\frac{1}{2}$; D. 0 Answer: C

If students need the guidance after choosing wrong answer or getting out of time to prepare, those students will get suggestions: “Divide both sides of the

equations for 25^x . Use hidden side to convert the equation into polynomial form”

Task 3: Solution to an equation $\log_{\frac{2}{3}} x + \sqrt{\log_{\frac{2}{3}} x + 1} - 5 = 0$ is:

A. No solution; B. $3^{-\sqrt{3}}$; C. $3^{\sqrt{3}}$; D. $3^{\pm\sqrt{3}}$ Answer: D

If students need the guidance after choosing wrong answer or getting out of time to prepare, those students will get suggestions:

Step 1: Set the conditions for valid equations.

Step 2: Using hidden side to convert the equation into polynomial form.

For this problem, set $t = \sqrt{\log_{\frac{2}{3}} x + 1}$ (Condition: $t \geq 0$).

Step 3: Solving equivalent equations to find solutions.

Task 2: Divide the class into three groups according to the level of awareness. These groups will access to the system and exchange to complete exercises of the own group together, for example:

Exercise 1: Solve the equation: $2^x + 3^x = 5^x$

If students need the guidance after getting out of time to prepare, those students will get suggestions: Divide both sides of the equation for 5^x , comment $x = 1$ is the solution of the original equation. Prove $x = 1$ is the only solution of this equation.

Exercise 2: Find all solution under the segment $\left[-\frac{3}{4}; \frac{5}{2}\right]$ of the equation $4^{\cos 2x} + 4^{\cos^2 x} = 3$.

If students need the guidance after getting out of time to prepare, those students will get suggestions: Apply the formula $\cos 2x = 2\cos^2 x - 1$. Convert the equation to: $4^{2\cos^2 x} + 4^{\cos^2 x} - 12 = 0$. Set $t = 4^{\cos^2 x}; t \geq 1$ solve the equation with the hidden side t and then find the solution x . Combine with the initial condition $x \in \left[-\frac{3}{4}; \frac{5}{2}\right]$ to find the solution of problem.

Now, teachers continue assign self-study tasks for students to do at home: Systematize the core knowledge of the lesson, then access to the website and compare with theory gained with the theoretical summary on the website (*Image 8*).

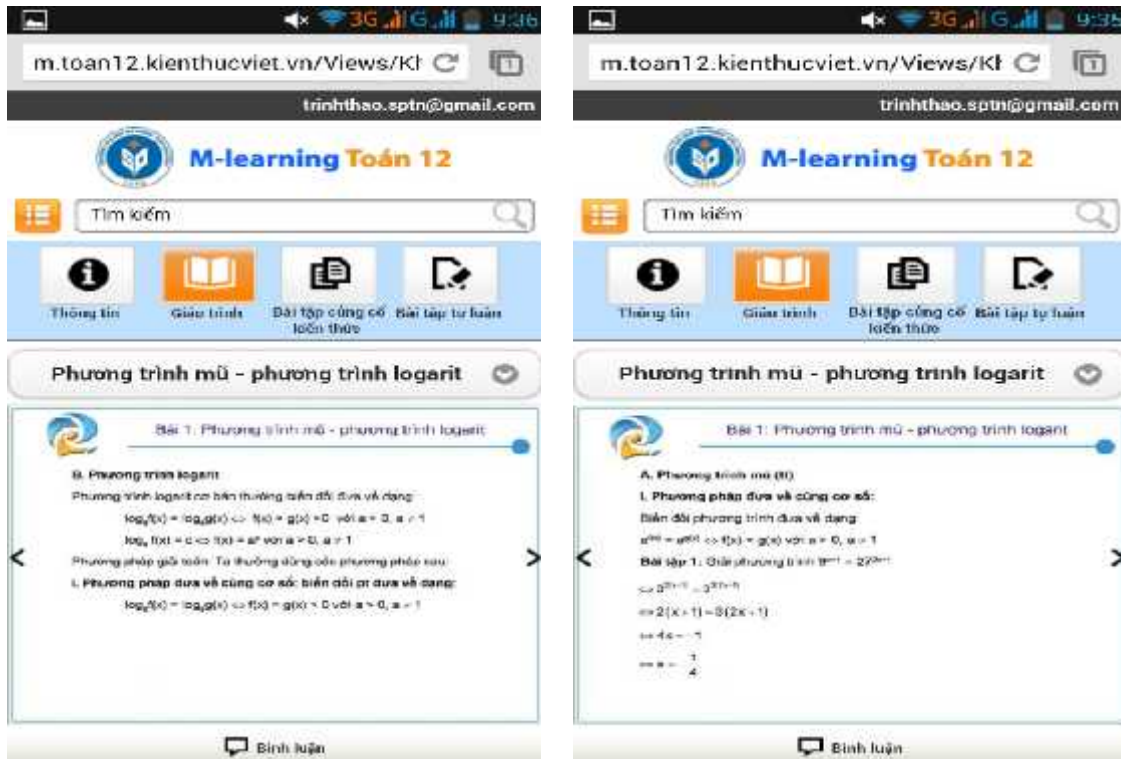


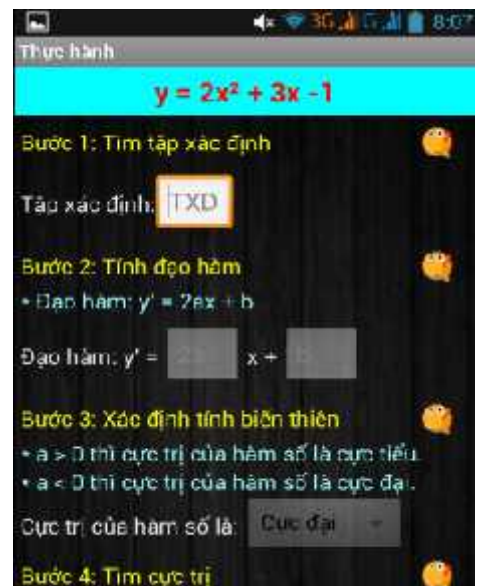
Image 8

2.6.2. Exploiting functions on storage and lookup information of mobile phone

In this case, students will download Electronic learning materials, mathematical manual, e-book... and save in the own mobile phone. Searching information will be done almost immediately and easily to share the searching results to you by specifying how to find or use function of sending files to convert Electronic learning materials into your own mobile phone.

2.6.3. Exploiting the application installed on a mobile phone

Students can use mobile phone to check their own self-study results or yours, for example, use such features of calculating derivative, integral, solving equations, inequation, etc. If the results on the mobile phone match with the self-study results of students, students will be more confident to



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continue to receive a new learning tasks; on the contrary, students will self-study and review the process to detect and recover the mistakes (*Image 9*).

In addition, in a short time during the traditional periods, teachers can organize self-study for students by exploiting the following applications of mobile phone: (1). Organize for students to learn and find out the nature of the observation and interaction with the live model on mobile phone; (2). Organize for students to perform, report self-study results and prepare the lessons before the class period; (3). Do multiple choice questions, etc.

2.7. Chapter 2 conclusions

Content of Chapter 2 concentrated on the following main issues:

(1). To make “self-study assistance” concept and indicate some mobile phone applications in which this topic focuses on and researches to support students’ Math self-study. (2). To generally describe requirements, processes, structures and major functions of an M-learning system with orientation of supporting students’ Math self-study.

(3). To make “electronic learning materials” concept, requirements, principles of designing, editing content clear to support students’ Math self-study.

(4) Give a deployment process of operation some mobile phone applications to support students to self-study Math, based on this to propose specific plans of using mobile phone on self-studying Math (in and out of class time). These plans were experienced actually and they will be tested, evaluated through pedagogical experiment content (presented in Chapter 3 content).

By these early results, we can give some following comments:

(1) The operation of some mobile phone applications supporting students to self-study Math must ensure the viability, promote the positive elements of M-learning and especially ensure the pedagogical.

(2) M-learning system building supporting self-study students should ensure requirements of both technological and pedagogical functions which are to support students to self-study.

(3) One of the factors that ensure M-learning’s success of supporting student self-study is electronic learning materials. The designing, editing of electronic learning materials is in accordance with the pedagogical principles and requirements that the topic suggested.

(4) The deployment of operators some mobile phone applications supporting students self-study Math must be deployed scientifically and well

following: Identify mission objective of self-study; identify information content; organize student self-study and evaluate self-study results.

Chapter 3: PEDAGOGICAL EXPERIMENT

3.1. Aims of pedagogical experiment

Purpose of pedagogical experiment is to test scientific hypothesis of the topic.

3.2. Time, place and object of pedagogical experiment

Pedagogical experiment round 1: To implement in second semester of the academic year 2012-2013 with some Grade 12 students in foreign language specialized classes of Thai Nguyen Gifted high school, Trieu Son 5 – Thanh Hoa high school. Pedagogical experiment round 2: To implement in second semester of the academic year 2012-2013 with some Grade 12 students in Russia, Frech specialized classes of Thai Nguyen Specialized high school, Grade 12 students in Trieu Son 5 – Thanh Hoa high school, Duc Trong – Lam Dong high school.

3.3. Pedagogical experiment method

3.3.1. Investigating methods; 3.3.2. Observation methods; 3.3.3. Mathematical Statistics Methods; 3.3.4. The case study method; 3.3.5. To build methods and evaluation criteria.

3.4. Pedagogical experiment content

3.4.1. Pedagogical experiment document;

3.4.2. Content 1: Training teachers and students of the experimental group;

3.4.3. Content 2: Investigating, interviewing teachers and students;

3.4.4. Content 3: Organization of teaching prepared lesson plans:

For Experimental Group: operating some mobile phone applications with electronic learning materials in website mlearningvn.com to complete self-study mission and study 2 lessons with prepared plans in Chapter 2. *For Comparison Group:* self-study and teaching is conducted by prepared plans without technology support. After experimental lessons, give a test for students.

3.4.5. Content 4: The case study method

To subscribe the self-study Math process of a group of typical students, analyzes self-study process with the support of M-learning 12 Math system.

3.5. Pedagogical experiment results

3.5.1. Training results

After training by prepared content of the topic, all trained teachers and students were able to operate some mobile phone applications supporting Grade 12 students' self-study under the plans mentioned in Chapter 2.

3.5.2. Pedagogical experiment results of round 1 (academic year 2012-2013)

3.5.2.1. *Sample selection of pedagogical experiments:* using students' first semester exam scores as the basis for selection of experimental groups and comparison groups and mobile phones can connect to Wi-Fi or 3G internet connection.

3.5.2.2. *Analyze the pedagogical experiment results of round 1:*

Qualitative analysis: Experimental group: the majority of students are very confident in presenting knowledge and how to solve their problems. Most other students are excited commenting the results. Comparison group: students didn't exciting study, not many students answer teachers' questions and most of them depend on teachers' guidance.

Quantitative analysis: The results of the Experimental group are higher than Comparison group.

3.5.3. The pedagogical experiment round 2 results (academic year 2013 - 2014)

3.5.3.1. *Sample selection pedagogical experiments:* the selection of Experimental group and Comparison group based on the first semester exam scores:

High school	Group	Class	Number of students	Total	Teacher
Thai Nguyen Gifted high school	Experimental	French 12	30	65	Dinh Thi Hai Yen
		English 12	35		
	Comparison	Russia 12	27	63	Dinh Thi Hai Yen
		Chinese 12	36		
Trieu Son 5	Experimental	12C1	35	35	Do Duc Thong
	Comparison	12C3	34	34	
Duc Trong	Experimental	12A1	33	69	Nguyen Thuy Phuong Tram
		12A2	36		
	Comparison	12A3	35	68	
		12A4	33		

3.5.3.2. *Analysis the pedagogical experiment round 2 results*

Qualitative analysis: Experimental group: students were very interested and active in the process of building a new lesson, and self-practice so remember fluently the theory of lesson. Comparison group: some students didn't answer teachers' questions.

Quantitative: at the end of pedagogical experiment round 2, we gave with both groups the same test as in the round 1. The tests were marked and conducted following statistical theory and the following results:

High school	Group	Average mark	Variance	Standard Deviation
Thai Nguyen Gifted High school	Experimental	6.4	2.65	1.63
	Comparison	5.85	1.96	1.4
Trieu Son 5	Experimental	6.45	1.84	1.36
	Comparison	5.88	1.5	1.23
Duc Trong	Experimental	6.23	3.15	1.78
	Comparison	5.51	3.06	1.75

Thus, we find the average mark of students in Experimental group in the schools is higher than the Comparison group.

Using statistical methods with test to review the effectiveness of pedagogical experiments, we have results: the following statistical index: (TN: Experimental group, DC: Comparison group)

High school	Degrees of freedom	Quantity $t = \sqrt{\frac{\bar{x}}{S_{TN}}}$	t_r	Compare t and t_r
Thai Nguyen Gifted High school	65	1.98	1.67	$t > t_r$
Trieu Son 5	34	2.16	1.6	$t > t_r$
Duc Trong	68	3.5	1.6	$t > t_r$

Thus, pedagogical experiment round 2 in all three cases is markedly effective.

- Testing of hypothesis E_0 :

High school	Degrees of freedom		Quantity $F = \frac{S_{TN}^2}{S_{DC}^2}$	F_r	Compare F and F_r
	f_{TN}	f_{DC}			
Thai Nguyen Gifted High school	65	63	1.34	1.85	$F < F_r$
Trieu Son 5	34	35	1.22	2.19	$F < F_r$
Duc Trong	68	69	1.03	2.85	$F < F_r$

All 3 cases were the result accepting hypothesis E_0 , i.e. the difference between variance of Experimental group and Comparison group in the each case is insignificant.

- Testing of hypothesis H_0 :

High school	Degrees of freedom ($N_{TN}+N_{DC}-2$)	Quantity $t = \frac{\overline{x_{TN}} - \overline{x_{DC}}}{s. \sqrt{\frac{1}{n_{TN}} + \frac{1}{n_{DC}}}}$	t_r	Compare t and t_r
Thai Nguyen Gifted High school	126	2.01	1.96	$t > t_r$
Trieu Son 5	65	1.95	1.67	$t > t_r$
Duc Trong	134	2.55	1.96	$t > t_r$

The above results confirm the statistical results reject H_0 hypothesis. Thus the difference between the results of Experimental group and Comparison group in three schools is significant. It proves that pedagogical experiment in 3 schools all have Experimental group's results higher than Comparison group.

3.5.4. Monitoring the progress of a group of students (case study)

3.5.4.1. Selection of Sample:

The topic has selected 04 students to conduct observation, collect and process information to make comments on self-study process of each student.

3.5.4.2. Analysis of monitoring results:

Looking at the results of the self-study with 4 students, we found that the progress of the students is markedly positive, self-supporting in the learning process.

3.6. Investigating the feasibility of the M-learning system of Mathematics of grade 12 in order to support the self-study for high school students

3.6.1. Opinion poll of teachers on the M-learning system of Mathematics of grade 12

Through the survey data, at the first step, it can be confirmed that: (1). Electronic learning materials on the M-learning system of Mathematics of grade 12 has contents of standard knowledge and are consistent to support the self-study of the students; (2). The system has a user-friendly interface that is easy to use; the expressions are clear and easy to understand; (3). The structure of the contents are logical; (4). The system has contributed to supporting the process of teaching of teachers and the self-study process of the students.

3.6.2. Opinion poll of students on the exploitation of M-learning system of Mathematics of grade 12 in the process of self-study of Mathematics

The survey results show that M-learning Mathematics of grade 12 helps students to be active and self-reliant in the process of self-study and helps to improve the quality of teaching Mathematics in high schools.

3.7. Conclusion of Chapter 3

After determining the purposes, objects, pedagogical experiment methods, we conducted the pedagogical experiment, with the results obtained and the data processed from statistical methods, methods of observation, methods of investigation, methods of case study; it has been able to assert that:

(1) The exploitation of Information Technology applications in teaching Mathematics is essential with theoretical and practical significance. (2) With the living conditions of high school students in Vietnam today, it is possible to exploit some mobile phone applications to support students in general and self-study process of Mathematics in particular. Specifically, electronic learning materials are designed to be able to support the self-study of Mathematics of students of grade 12. (3) Teachers and students basically have the skills to exploit the mobile phone applications to support the teaching and self-study.

Although the deployment of the topic still faces some difficulties: Some students still do not have mobile phones or have mobile phones but do not have internet connection (under the areas with difficulties of economic conditions) or some teachers has not been familiar with the use of modern media to support the teaching, so they do not want to use mobile phones to support the process of teaching; the skills to exploit electronic learning materials on mobile phones of some students are not good ... but the process of pedagogical experiment has obtained the following results: (1). The contents of electronic learning materials designed, edited by the topic are entirely consistent with the program and contents of Mathematics of grade 12 in high schools. The structure of the electronic learning materials helps students to choose their own self-study contents in accordance with their capabilities and to make good use of the ability to interaction in the process of self-study. (2). The self-study implementation plans proposed by the topic are feasible and after overcoming some limitations, they are entirely possible to be implemented widely. (3). The results of pedagogical experiment in both qualitative and quantitative methods, pedagogical experiment shows that the exploitation of a number of mobile phone applications really helps the students to be positive, proactive in the self-study process from which contributes to improving results of self-study of Mathematics for the students of grade 12 in high schools.

CONCLUSIONS

For the purpose of researching and testing the use of mobile phones in order to effectively contribute to improving self-study process of Mathematics for the students of grade 12 in high schools, the thesis has achieved some initial results, in particular:

In terms of theory:

(1) Systematizing the theories on self-study and contribute to clarifying the role of information and communication technology in supporting the self-study of Mathematics of students.

(2) Through the investigation, extensive interviews with the objects who are teachers, students, parents of students, they clearly show the status of the current self-study process of Mathematics in high schools, as well as the problems posed for the self-study process of Mathematics for students of grade 12 in high schools to consider and handle.

(3) Based on the overview of the model of mobile learning (M-learning), the thesis has focused on clarifying the positive elements of M-learning in order to support the students to study on their own as well as the fundamental skills for the teachers and students when participating in M-learning system from which to recommend the model of M-learning system with the proper functions for self-study process of students as well as self-study implementation steps with M-learning.

(4) Contributing to clarifying some concepts such as self-study support, mobile phone applications, electronic learning materials ... and recommend the requirements, design principles of electronic learning materials for the purpose of exploiting some applications on mobile phones in order to support the students to self-study Mathematics.

(5) Proposing the specific pedagogical plans to organize for students to exploit a number of mobile phones applications in the process of self-study Mathematics (focusing on the exploitation of electronic learning material sources designed by the topic).

In terms of reality:

(1) The thesis has designed a system of electronic learning materials in accordance with the objectives, standard knowledge, and the skills of Mathematics of grade 12. This product was put on the Internet at the address: mlearningvn.com. This material can completely be used for the self-study process of students who are able to access to the Internet. Currently, Artificial Intelligence Co., Ltd has signed a contract with the topic to continue to

improve and put the findings of the research into the exploitation.

(2) The thesis has initially tested the options for the exploitation of some of mobile phones applications to support the self-study process of the students of Mathematics - the pedagogical experiment objects.

(3) The research results of the thesis provide access to the assumptions: In real conditions of Vietnam today, the deployment of M-learning, including the exploitation of a number of mobile phones applications to support the self-study process of Mathematics of the students is feasible, it allows us to exploit even the latest achievements Information and Communication Technology into teaching Mathematics.

(4) Electronic learning materials are designed according to the directions recommended by the thesis have shown the theories on self-study, at the same time, exploited the strengths of M-learning in self-study process of Mathematics so it is completely possible to continue to improve and develop to support self-study process of Mathematics of the students.

(5) The plans of exploiting a number of mobile phones applications to support students to self-study Mathematics recommended by the thesis meet the requirements of the self-study and contribute to improving the quality of self-study of Mathematics for the students of grade 12 in high schools.

On the other hand, the exploitation of a number of applications of mobile phones to support students to study Mathematics on their own also contributes to fostering the use of Information and Communication Technology into learning and the life of students (this is one of the indispensable skills for workers in the 21st Century).

With these results, the thesis can come to the conclusion that the scientific hypotheses of the thesis are reasonable, the researching purposes of the thesis are achieved, and the researching tasks have been completed.

**LIST OF WORKS OF THE AUTHOR HAVE BEEN PUBLISHED
RELATED TO THE TOPIC OF THE THESIS**

1. Trinh Thi Phuong Thao (2011). *Exploiting teaching software to activate learning activities in teaching mathematics in high schools*. Journal of Science and Technology, Thai Nguyen University, Vol. 87, No. 11.
2. Trinh Thi Phuong Thao (2011). *Applying M-Learning into teaching Mathematics in high schools*. Journal of Science and Technology, Thai Nguyen University, Vol. 80, No. 04.
3. Trinh Thi Phuong Thao (2012). *Using mobile phones to support students to study on their own outside the class hours*. Proceedings of Scientific Seminar. University of Education Publishing House.
4. Trinh Thi Phuong Thao (2013). *Exploiting M-learning in self-study*. Journal of Education, Special Issue, 8/2013.
5. Trinh Thi Phuong Thao (2013). *Using mobile phones to support high school students to study Mathematics on their own*. Journal of Education, Vol. 323 No. 1.
6. Trinh Thi Phuong Thao (2014). *Compiling contents of learning materials to support students in grade 12 to self-study mathematics on mobile phones*. Journal of Education, Special Issue, 3/2014.
7. Trinh Thi Phuong Thao (2014). *Problem of improving the capacity of compiling and using electronic learning materials for teaching in teacher training*. Proceedings of Scientific Seminar. University of Education Publishing House.
8. Trinh Thi Phuong Thao, Nguyen Danh Nam (2014). *A model for using mobile phones in teaching and learning mathematics*. Proceedings of the 7th International Conference on Educational Reform, Hue University.