

Designing, Building and using Interactive e-Textbooks according to the Organization of Discovery Learning Acts in Vietnam

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Abstract. When the educational target changes then the factors of education such as the learning content, the forms of learning organization, the check, the assessment and the learning equipment will change. Conversely, if an above factor such as learning equipment changes then the educational target also changes. ICT and media act not only on the educational target but also on itself in order to create new learning equipment. One of the new equipment now is e-textbooks. The article refers to designing, building and using e-textbooks according to the organization of discovery learning acts in Vietnam.

Keywords: e-textbooks, discovery learning, plane geometry.

1. Introduction

Teacher needs to prove the activity, the independency, the creativity and needs to be against the passivity of students in order to innovate teaching and learning. There are many different methods in order to prove the activity, the self-learning competence of learners. One of the usual methods is discovery learning. However, the traditional discovery learning has a very large weak point. Discovery learning is restricted because it desires a lot of efforts of teacher. Teacher spends a lot of time for writing lesson according to discovery learning. The traditional discovery learning cannot simulate the processes, phenomena of nature, social and human. The record of document and traces of acts of students is usually cumbersome in traditional discovery learning. Especially, the environment of interaction with students, friends and other objects is restricted in the traditional space of classroom. Applying ICT & media in teaching and learning is one of the best choices in order to remedy these restrictions. Basing on the needs of learning of students, ICT and media make learning flexible. Students are active and they choose effective learning methods suitable with their competence. ICT and media make students themselves independent and

better in learning process as well as create the advantageous environment for self-learning and self-discovery.

E-textbooks are a concretization of applying ICT and media in teaching and learning. E-textbooks have strong points that paper textbooks do not have such as: their contents are formatted in order to see on the screen, they can be packaged and transported easily; their images are eye-catching, we can zoom in and out text size; we can interact and get feedback; there are live videos, images and sound. E-textbooks protect the digital technology right, do not allow copy and print (if users do not permit) and their content updates are usually downloaded from the Internet. Especially, E-textbooks are a tool to help discovery learning become the most effective tool compared to the other teaching forms using ICT and media. In addition, e-textbooks also create a new using form in teaching and learning. E-textbooks have high interactive ability, do not restrict the number of students, do not distinguish between geographical places, skin colors and nationalities. In addition, e-textbooks will create an advantageous environment when users do with geometric objects.

2. Content research

2.1. Discovery learning

Discovery learning is attributed by Dewey, Piaget and Vygotsky. (wikipedia.org/wiki/Constructivism)

After these psychologists, there are some people who continue to develop point of views of these psychologists. Joolingen said that: Discovery learning is a type of learning where learners construct their own knowledge by experimenting with a domain, and inferring rules from the results of these experiments. They actually construct their knowledge by themselves. Because of these constructive activities, they will understand the domain at a higher level (edutechwiki.unige.ch)

Borthick & Jones supposed that: In discovery learning, students learn to recognize a problem, search for relevant information, develop the solution of problem. (edutechwiki.unige.ch)

Discovery learning is an approach to instruction through which students interact with their environment-by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments. Discovery learning makes students remember concepts long and students discover on their own. Discovery learning is most successful when students have basic knowledge and experiences. (edutechwiki.unige.ch)

2.2. The strong points and weak points of discovery learning

Discovery learning has advantages and disadvantages as follows:

Strong points:

- To support the activities of students in their learning process.
- To foster students' curiosities.
- To enable the development of learning skills on the life.
- To personalize the learning experience
- To motivate students highly and allow them to experiment and discover something by themselves.
- To base knowledge on the students' understanding.

- To develop the sense of independence and autonomy of student.
 - To make students responsible for their own mistakes and results
 - To develop solving problems and creative skills
- (Kristenlockwood13.tripod.com)

Weak points:

- To make student confusing if he has not basic knowledge.
 - To create misconceptions ("knowing less after instruction")
- (Kristenlockwood13.tripod.com)

In traditional classroom (do not use ICT and media), the organization of discovery learning also gets some restrictions as follows:

- Discovery learning in traditional classroom only adapts to a small number of students, students who live in different places do not interact together. The interaction of discovery learning in traditional classroom is restricted.
 - If there are a large number of students in traditional discovery learning then there are not enough educational experts for helping these students immediately. If students choose incorrect choices then they do not get instructions immediately.
 - There must be teacher then traditional discovery learning just happens. Students discover according to the acts and requires of teacher.
- Using ICT and media will help traditional discovery learning to prove strong points and to minimize weak points. We concentrate on the researching, designing and using e-textbooks (A concretization of ICT and media) according to discovery orientation in learning mathematics of students.

3. Some problems on e-textbooks

3.1. The concepts on textbook

A textbook is a book which students learn school subject. Students use textbook to learn facts and methods. Textbooks sometimes have some questions to test the knowledge and understanding of students.

(Simple.wikipedia.org/wiki/Textbook)

Textbooks in Vietnam now are understood according to the whole program of secondary school education as follows: *Textbooks are main documents for teaching and learning in schools, adapt to all of criteria due to regulations imposed by the State of Vietnam, instruct the acts of teaching and learning that focus on the contents and methods of teaching and learning.* (Pham., T., T.)

In our opinion, textbooks are learning document for students. Textbooks must cover over the whole program from their targets to their contents, ensure the requests on the standard of knowledge and skills, orient to the methods as well as help to assess and assess themselves according to the minds of competent development of students.

3.2. The concepts on e-textbooks

According to Le, C., T., e-textbooks are textbook documents, in which their knowledge is displayed under many different informational channels such as texts, graphics, animated figures, static figures, sounds, ect. The important characteristic of e-textbooks is knowledge displayed at the same time in many different ways: the focus, simplification, detail, ect. These are advantageous for

learners to look up and find information fast. E-textbooks now allow users to connect and update more information from websites that their addresses are given by e-textbooks. (violet.vn)

According to the research of given e-textbooks as well as designed and built a concrete e-textbook at the address: <http://e-edvietnam.edu.vn>, our opinions are as follows:

E-textbooks are the software of textbooks ensuring the requests of paper textbooks, however, e-textbooks can exist independently and their content cover whole program. E-textbooks must have electronic features, interactive features and feedback.

(i) Electronic features are as follows: E-textbooks can act on the Internet or without the Internet. We can see the contents of e-textbooks on personal computers (PCs, laptops), e-readers (Kindle, Nook, Sony, Reader, etc.), tablet computers (Multiform: iPad, Android Tablets (Galaxy Tab, Kindle Fire, etc.), Surface; Specialized: Kno, Class-book) or smart-phones. E-textbooks can integrate many kinds of the advanced and modern technology of informatics and media in order to serve information transmitting, learning, and studying best.

(ii) Interactive feature and feedback are as follows: e-textbooks ensure the converse relations, have dialogues or have impacts between e-textbooks and users. For example, when a student choose a wrong option on computer then he intermediately gets a message from e-textbooks on what his errors, knowledge and skills are and the instruction of next learning act for him in aiding discovery learning.

3.3. The structure of an e-textbook according to the discovery learning of students

E-textbook is a textbook software ensuring the requests for (paper) textbook, however e-textbook can exist independently and their contents cover the whole program. E-textbook must have electronic features, interactive features and feedback. That's reason why we can say that, e-textbook is the textbook software digitized according to a concrete structure, format and script. According to Nguyen, M., T., and the authors adding the title and contents of e-textbook, the structure of e-textbook is the same e-document including four main parts: The title of e-textbook, the contents of e-textbook, the connections and the interactive and communicative environment. (Nguyen, M., T)

- *The title of e-textbook.* This is the name oriented for whole contents of data, connections and the interactive and communicative environment. They must conform to and concentrate on the correct description of chosen title.

- *The contents of e-textbook.* The contents of e-textbook include sections, slides, data tables, sound files using the illustration or explanation of knowledge, files of knowledgeable simulations, Flash files (or similar formats), video files, ect. In addition, the contents include concrete lesson plans of each lesson or each chapter due to the compilations of the authors of e-textbook, due to the reference documents relating to the help of leaning, researching and exploiting of users on e-textbook such as the document on knowledge based system, artificial, etc. E-textbook also contains the bank of test questions and the assessments of students.

- *The hyperlinks and hypertexts.* Hyperlinks connect between the interfaces of users and the knowledge based system of e-textbook. These hyperlinks include the created orientations, feedback and instructions to help users find, access, interact and activate the functions of e-textbook and data that need to use and exploit. Hyperlinks allow users to note text paragraphs, emphasize focused knowledge.

- *The interactive and communicative environment.* It will be a created space for users to approach data, display desired information and get feedback when users interact with e-textbook. The interactive and communicative environment of e-textbook is often designed under a software or a website.

3.4. The process of designing e-textbook

Through the researching, designing and building an e-textbook at the address <http://e-edvietnam.edu.vn>, we propose the process of designing e-textbook according to the orientation of discovery learning as follows:

Step 1. Researching program

- Find out about the contents of e-textbook.
- Find out about e-textbook according to the orientation of discovery learning.

Step 2. Designing e-textbook according to the organization of discovery learning acts

- Design necessary features and data according to discovery learning.
- Carry out programming, design e-textbook according to the orientation of discovery learning.

Step 3. Building e-textbook

- Synthesize information and build the whole features according to the requests of e-textbook according to the orientation of discovery learning;
- Build sample data and required data according to discovery learning

Step 4. Testing e-textbook

- Input all of data and carry out test run;
- Fine-tune other factors and complete all of features according to the orientation of discovery learning.

Step 5. Checking and completing

- Carry out the checking of all features and completing e-textbook.

4. The use of e-textbook to help teaching and learning plane geometry according to the organization of discovery learning acts

4.1. The process of teaching and learning a lesson on e-textbook according to the organization of discovery learning acts

E-textbook is designed to help the self-learning and the self-discovery of students. E-textbook helps students to learn according to their needs and velocities by themselves, helps students to predict, find out, confirm and generalize the results of problems. However, teacher will correct, assert all main knowledge that needs to be learned, check the solutions of theorems, properties, problems when students have needs. That 's reason why, if we use e-textbook according to the organization of discovery learning acts then the best form is blended learning. According to Michael, H., blended learning is the integrating of online learning and traditional learning with time, process and progress under control. (Michael, H)

The process of learning a lesson on e-textbook according to the organization of discovery learning acts includes the following stages:

- Teacher gives home tasks to students (in the previous lesson in class)
- Student learns with e-textbook by himself
- Students learn in class (after students have learned the lesson in the e-textbook)
- Teacher gives home tasks to students (in the next learning period)

4.1.1. Teacher gives home tasks to students (in the previous lesson in class)

Teacher gives home tasks to students in the previous lesson in class; Students access the given website and do according to the requests of teacher at home. If students do not understand and have any questions then students note them on paper and ask teacher in the next lesson in class, teacher will explain and answer these questions.

Concretely, students received home tasks according discovery learning on the e-textbook in the previous lesson.

The example is illustrated by teaching and learning the lesson “The reflectional symmetry” on e-textbook. The previous lesson in class is “The translation and transformations”, teacher gives home tasks to students before finishing the lesson: You learn the reflectional symmetry, the symmetric axis of a figure, read illustrated examples and do the ramified problem of §3. The reflectional symmetry on e-textbook by yourselves. After you finish learning “the reflectional symmetry” with the help of e-textbook, you will fill in the following notes:

- What is the reflectional symmetry?
- Do you give an example on the axis of a figure in the real life?

Students write their answers on the notes and submit them to teacher in the next lesson in class.

4.1.2. Student learns with e-textbook by himself

Student enters the **Registration** and **Login** procedures of website. Student interacts with the objects and symbols on the screen. After that, student accesses the contents of website, observes the examples, does the tasks and answers the questions of teacher, receives feedback from the computer to form his knowledge by himself. From that, student not only obtains knowledge but also practices the skills of observation, analysis, comparison, generalization in order to find the rules for objects and relations as well as the way of finding out and solving problem. After student has finished the lesson on the website then student will answer the questions that teacher gives to student in class.

Concretely, student learns the lesson on e-textbook by himself according the organization of discovery learning acts. He does the questions suitable with his competence. E-textbook has ramified problems to check the knowledge fast, especially, it is suitable with average and weak students. If student chooses the incorrect answer then he has just get feedback from the e-textbook: What are the incorrect knowledge and mathematical skills? After student finishes the lesson at home, student will have any questions on the needs of finding knowledge and solving problem that e-textbook does not adapt to him then student will note these questions in order to ask teacher or his friends in class. The type of discovery learning which student does at home is free discovery one.

The illustrated example of learning the lesson “The reflectional symmetry” according to the organization of discovery learning acts is as follows:
Student enters the browser **Firefox**:



accesses the Internet address of e-textbook to do his self-learning:

<http://www.e-edvietnam.edu.vn>.

E-textbook has a common account for empty user (name: luanan, password: 123456).

If a certain user wants to create new account for himself then he enters the square **Đăng ký** on the left side:

ĐĂNG NHẬP - HỌC TẬP

Bí danh

Mật khẩu

Ghi nhớ

Student enters the square on the left side **Tôi đồng ý các quy định của Website** as the below figure and continue to enter the square **Tiếp tục**

Nội quy
Thành viên của website đồng ý với việc chịu sự quản lý của Ban Quản Trị.

Thông tin do thành viên đưa lên sẽ do Ban Quản Trị website quản lý và thành viên phải tự chịu trách nhiệm về bản quyền, tính xác thực, hợp pháp của các thông tin do mình đưa lên. Thành viên phải tuân thủ các quy định của chúng tôi, đảm bảo tuân thủ luật pháp và các quy định có liên quan đến Website này.

Nội quy này sẽ được cập nhật và thay đổi khi cần thiết.

Tôi đồng ý các quy định của Website Không đồng ý, đưa tôi về trang chủ

Student fills in the squares marked by * and fills in his password according to the requests e-textbook:

Đăng ký thành viên mới

Bí danh:*

Tên hiển thị:

Email:*

Mật khẩu:

Lập lại mật khẩu:

Chọn câu hỏi:

Câu trả lời:*

Ô có đánh dấu (*) bắt buộc phải khai báo.
Hệ thống sẽ cung cấp cho bạn một mã số truy cập nếu bạn được chấp nhận.
Việc chọn câu hỏi và trả lời là cần thiết. Nó được dùng để kiểm tra khi bạn muốn khôi phục mật khẩu

[[Thành viên đăng nhập](#) | [Quên mật khẩu?](#)]

Student clicks on the square **Đăng ký** and finishes the process of registration of e-textbook.

After that, when student accesses e-textbook, student will enter the above name and password in the left square:

ĐĂNG NHẬP - HỌC TẬP

Bí danh

Mật khẩu

Ghi nhớ

Student sends the address of his username to teacher by email; teacher saves the username in the account of e-textbook. After teacher saves the username, teacher will follow the traces of acts of student on e-textbook.

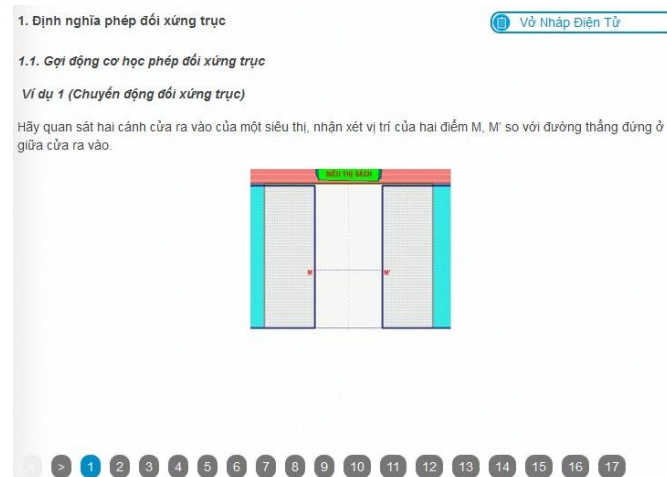
The way of doing with e-textbook:

- When students read a question of a certain page of e-textbook, they themselves answer it before clicking on the next page in order to receive its answer (if yes), after that students compare with their choices.

- Students need to install the supplemental software such as Adobe Flash, Java script in order to do with e-textbook

After students read the instructions of e-textbook, students will carry out the self-learning of transformations in the plane according to discovery learning on e-textbook:

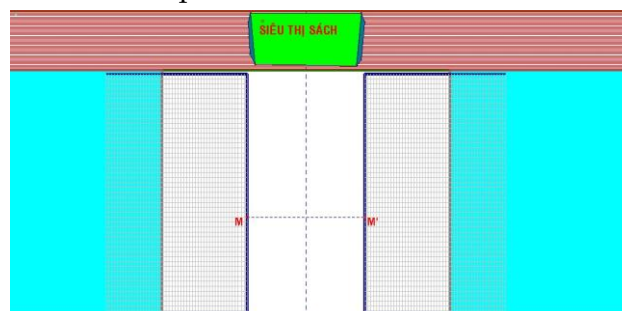
- Students click on the function *E-notebook* → *Vietnamese advanced geometric text book 11th* → *Chapter 1* → §3. *The reflectional symmetry* → *A. Theory* → *1. Definition of the reflectional symmetry* → *page 1* then the screen of e-textbook displays two sliding doors as follows:



Students observe the sliding door and answer the question of e-textbook:

Example 1 (*The move of a reflectional symmetry across the axis*)

Observe the two entrance doors of a supermarket, and give remarks on two positional points M , M' compared with the midline of the entrance.



- When students observe the two entrance doors of a supermarket on the screen, all of good, rather good, average and bad students answer the question of e-textbook correctly.

- Students click on the next page 2 to see the answer of the question:

(Two points M, M' are symmetric with respect to the midline of entrance door.)



- Students will continue to discover the reflectional symmetry when they click on the page 3, read and answer the example 2 of e-textbook.

Example 2

Given a pine tree. Observe the axis of this pine tree.

We call the left pine tree being the figure (H). Let (H') be the figure symmetric to the axis (Click on the right arrow of the figure (in the next page)). With each of points M on (H), observe point M' symmetric to point M with respect to a . When M moves on (H), give remarks on the positional points M' . See the figure and answer of the question at the next page.



- When students observe the pine tree on the screen, all of good, rather good, average and bad students answer the question correctly: Point M is symmetric to point M' with respect to the axis of the pine tree.

- Students click on the next page 4 then e-textbook displays the following figure:



After click on **the right arrow** then the figure will move to become the pine tree:



Students interact with the table of choices of the page 4 of e-textbook in order to confirm the answer for e-textbook:

Choose the correct answer! <input type="button" value="Confirm"/>	
<p>Let M', N' on figure (H') be points symmetric to the points M, N on figure (H) with respect to the axis of pine tree. Let the intersection points of MM' and NN' with the axis be O and O', respectively.</p>	
<p>A. $MO = M'O$; $NO' = N'O'$; MM' and NN' are perpendicular to the axis of reflection.</p>	<p>B. $MO = M'O$; $NO' > N'O'$; MM' and NN' are perpendicular to the axis of the reflection.</p>
<p>C. $MO = M'O$; $NO' = N'O'$; MM' and NN' are not perpendicular to the axis of reflection</p>	<p>D. $MO < M'O$; $NO' < N'O'$; MM' and NN' are not perpendicular to the axis of reflection</p>

When students interact with the table of choices, all of good, rather good and average students choose the correct answer A.

Bad students still do not master knowledge through the visual symbols, so they choose the answer that is not A. E-textbook automatically gives the announcement and feedback on the incorrect choice of bad students as follows:

Incorrect! The correct answer is A Confirm

Let M', N' on figure (H') be points symmetric to the points M, N on figure (H) with respect to the axis of pine tree. Let the intersection points of MM' and NN' with the axis be O and O' , respectively.

A. $MO = M'O$; $NO' = N'O'$;
 MM' and NN' are perpendicular to the axis of reflection.

B. $MO = M'O$; $NO' > N'O'$;
 MM' and NN' are perpendicular to the axis of the reflection.

C. $MO = M'O$; $NO' = N'O'$;
 MM' and NN' are not perpendicular to the axis of reflection

D. $MO < M'O$; $NO' < N'O'$;
 MM' and NN' are not perpendicular to the axis of reflection

When students click on the page 5, they will continue to discover the reflectional symmetry, read and answer the question of the below figure of e-textbook:
 Two given lines a and d satisfying that they intersect at A . With each of points M on d , draw point M' symmetric to the point M with respect to a . When M moves on d , give remarks on the positional points M' .

The discovery question:

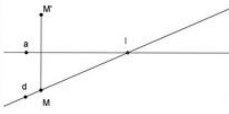
When M moves on d , give remarks on the positional points M' .

Ví dụ 3

Cho hai đường thẳng a và d cắt nhau tại I . Với mỗi điểm M thuộc d , vẽ điểm M' đối xứng với M qua a . Hãy nhận xét về vị trí của các điểm M' khi M chuyển động trên d .

Câu hỏi khám phá

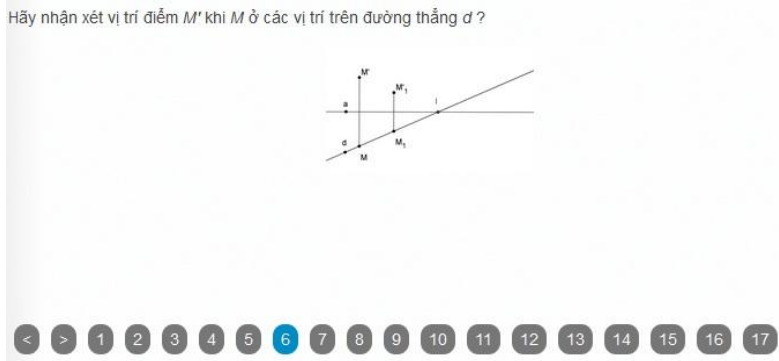
Hãy nhận xét vị trí điểm M' khi điểm M ở trên đường thẳng d ?



< > 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

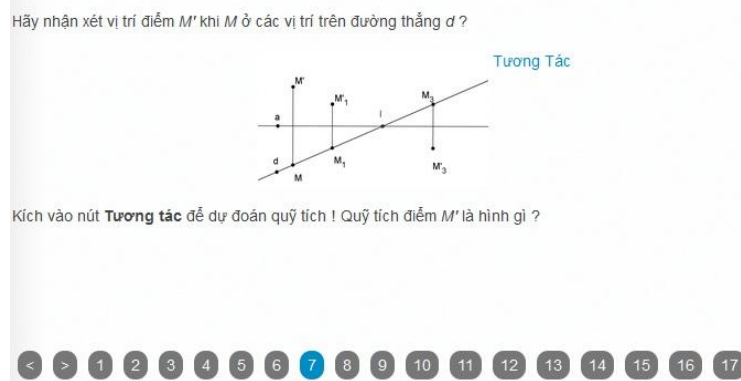
Good Students answer the given question of e-textbook correctly.
 The other students need more instructions by clicking on the page 6 of e-textbook.

When M moves on d , give remarks on the positional points M' .

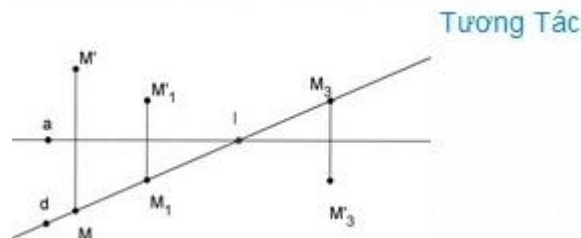


Rather good students answer the given question of e-textbook correctly. The other students need more complement instruction by clicking on the page 7 of e-textbook.

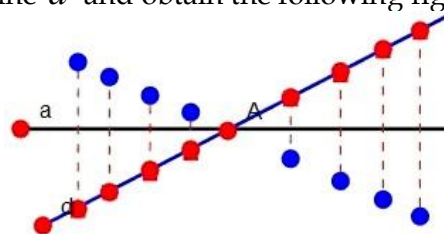
When M moves on d , give remarks on the positional points M' .



Average students answer the given question of e-textbook correctly. The other students need more complement instruction by clicking on the **interactive (tương tác)** symbol of the page 7:

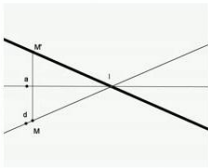


E-textbook displays the interactive square, Students interact with e-textbook by clicking points on the line d and obtain the following figure:



Students continue to click on the page 8 in order to see the remarks and answer: **(Remarks:** M' moves on d through A such that d' and d take a as a bisector line of a pair of vertically opposite angles formed by d' and d .)

Quy tích của điểm M' là hình gì ?



Nhận xét

M' chuyển động trên đường thẳng d' đi qua I sao cho d' và d nhận a là đường thẳng chứa các tia phân giác của một cặp góc đối đỉnh tạo bởi d' và d .

< > 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Students will continue to discover the reflectional symmetry when they click on the next page 9, read and answer the below question of e-textbook:

Example 3

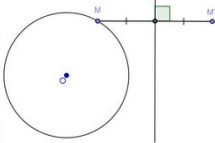
Given line a and circle (O) . With each of points M on (O) , draw point M' symmetric to point M with respect to a . When M moves on (O) , give remarks on the positional points M' .

Ví dụ 4

Cho đường thẳng a và đường tròn (O) . Với mỗi điểm M thuộc (O) , vẽ điểm M' đối xứng với M qua a . Hãy cho nhận xét về vị trí của các điểm M' khi M chuyển động trên (O) .

Câu hỏi khám phá

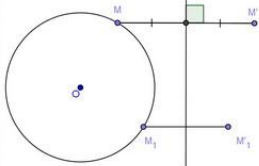
Hãy nhận xét vị trí điểm M' khi điểm M ở trên đường tròn (O) ?



< > 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

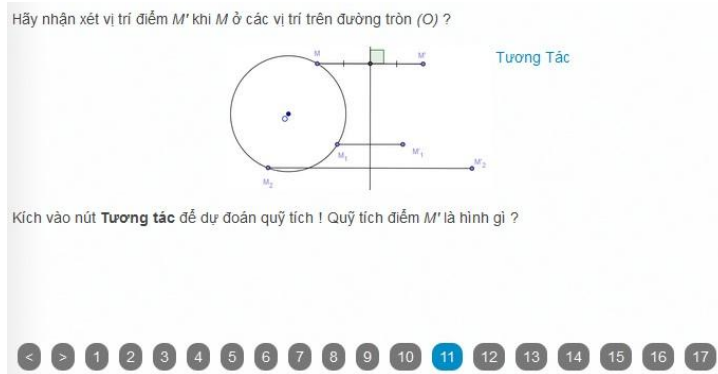
Good Students answer the given question of e-textbook correctly. The other students need more complement instruction by clicking on the page 10 of e-textbook.

Hãy nhận xét vị trí điểm M' khi M ở các vị trí trên đường tròn (O) ?

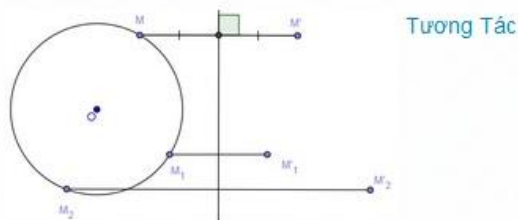


< > 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

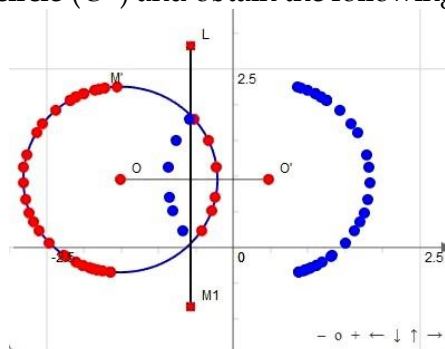
Rather good students answer the given question of e-textbook correctly. The other students need more complement instruction by clicking on the page 11 of e-textbook:



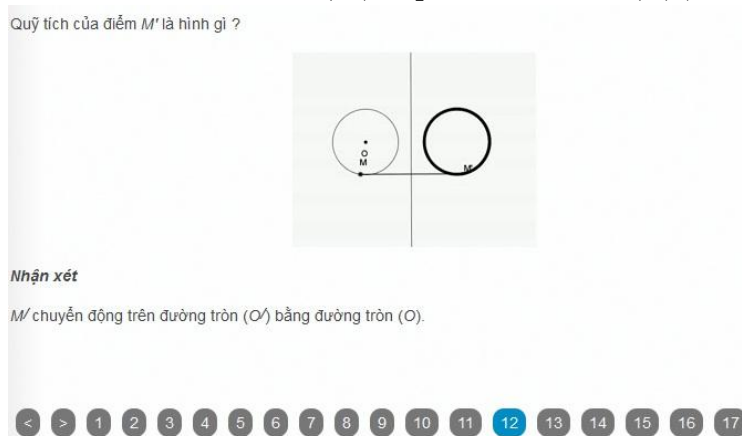
Average students answer the given question of e-textbook correctly. The other students need more complement instruction by clicking on the **interactive (tương tác)** symbol of the page 11:



E-textbook displays the interactive square, Students interact with e-textbook by clicking points on the circle (O) and obtain the following figure:



Students continue to click on the page 12 to see the remarks and answer: **(Remarks: M' moves on the circle (O') equal to the circle (O))**



Students click on the pages 13, 14, 15, 16, 17 of E-notebook → Vietnamese advanced geometric text book 11th → Chapter 1 → §3. The reflectional symmetry → A.

Theory → 1. *Definition of the reflectional symmetry* in order to see the remarks and definition of reflectional symmetry:

Observing all of the above figures, we see that they have a common detail: Given a line a , with each of points M , we only definite a point M' symmetric to point M with respect to a .

From this, we have the definition of reflectional symmetry as follows:

The symmetry with axis a , called S_a , is a transformation that maps each of points M onto point M' as follow : If $M \hat{=} a$ then $M' \circ M$; if $M \hat{=} a$ then M' is symmetric to the point M with respect to a . Line a is called the axis of symmetry or symmetric axis.

4.1.3. Students learn in class (after students have learned the lesson in the e-textbook)

Teacher asks students to answer the given questions at the previous lesson. All of students discuss these questions, teacher answer these ones of students. There are a lot of different methods in order to organize the acts in class. Teacher can organize the common learning acts for all of students or for groups or each of individuals.

The acts of teacher in class are:

- To stabilize the class.
 - Act 1: Receive the replies of students, answer students' questions and organize the common acts for class by the questions of checking students' knowledge fast.
 - Act 2: Organize the acts for groups of students.
 - Act 3: Send private notes to students.
 - Act 4: Assert the main knowledge that needs to be learned.
 - Act 5: Teacher give home tasks to students (in the next learning period)
- (The type of discovery learning in class is the guided one.)

4.1.4. Teacher gives home tasks to students (in the next learning period)

Teacher gives the same home tasks to students (in the next learning period) as the home tasks to students (in the previous learning period). Concretely, teacher gives home tasks to students in the next learning period in class; students do the exercises of textbook, find out more different solutions and generalized problems. Students access the address given by teacher at home and do according to teacher's requests. When students learn with e-textbook by themselves, students do not understand or have any questions, then students will ask teacher in the next learning period, teacher will explain and answer the questions.

Teacher gives home tasks to students; students consolidate knowledge, do problems of developing thought. Students learn the next learning period on e-textbook by themselves.

The illustrated example that teacher gives home task to students (at the next learning period of lesson "the reflectional symmetry (period 2)" is as follows

- Homework: Exercises 7, 8 (page 13 -E-textbook).
- Teacher consolidates, broadens knowledge and gives the advanced and development problems of creative thought to students. For example, these are the problems of reflectional symmetry having many solutions, similar and generalized problems of the origin one.
- Teacher gives home tasks to students on the remaining lesson of the

reflectional symmetry on e-textbook. After students themselves finish the period 2 of the lesson “the reflectional symmetry” at home, students will answer two following questions of teacher:

- Is the reflectional symmetry an isometry?
- Give your statements on the coordinate expression of a reflectional symmetry across Ox -axis?

Students note on paper and give their answers to teacher in the next learning period.

4.2. The process of learning a lesson on e-textbook according to the organization of discovery acts without the learning step in class

Because of some private reasons that a student can not learn the lesson in class, for example, he is ill then e-textbook helps him to finish learning knowledge by himself adapting to the standard of knowledge and skills. The type of discovery learning is free one.

The process of learning a lesson on e-textbook according to the organization of discovery acts without the learning step in class include the following steps

- a) *Using e-textbook to help discovery acts*
- b) *Using e-textbook to help students learn by themselves*
- c) *Using e-textbook to help corporate acts*
- d) *The method of learning with e-textbook*
- e) *The method of interaction with e-textbook*
- f) *The results of doing tests of students*

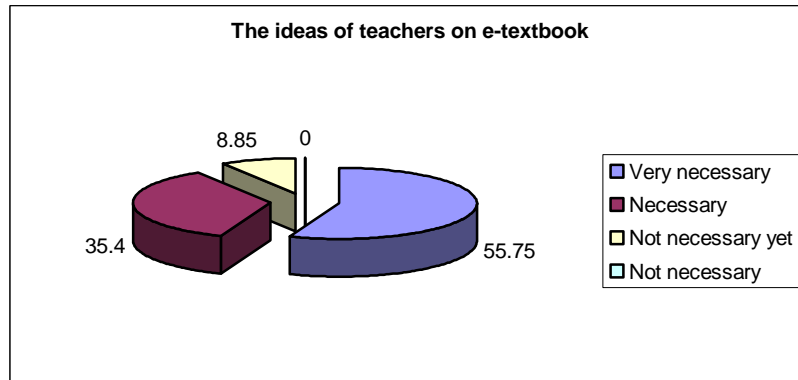
Because of some private reasons that a student misses a certain lesson, the effectiveness of self-learning is not good as the blended learning; however, student can understand and apply basic knowledge. From that, e-textbook helps student continue to master the new knowledge more easily, more efficiently.

5. Results and discussion

5.1. Delivering survey forms

We delivered survey forms to 113 teachers of senior high schools in Hanoi city, Viet Nam in order to test the application of interactive e-textbook in learning mathematics. The result shows that 63 teachers (55.75%) think that it is very necessary; 40 teachers (35.40%) think that it is necessary; 10 teachers (8.85%) think that it is not necessary yet; nobody thinks that it is not necessary. It shows that teachers are interested in using interactive e-book in teaching.

The chart 1. The attitude of teacher towards the application of the interactive e-book in teaching



We also delivered survey forms to 253 students of senior high schools in Hanoi city, Viet Nam in order to test the application of interactive e-textbook in learning mathematics. The result is as below:

Chart 2. The ideas of students on using e-textbook

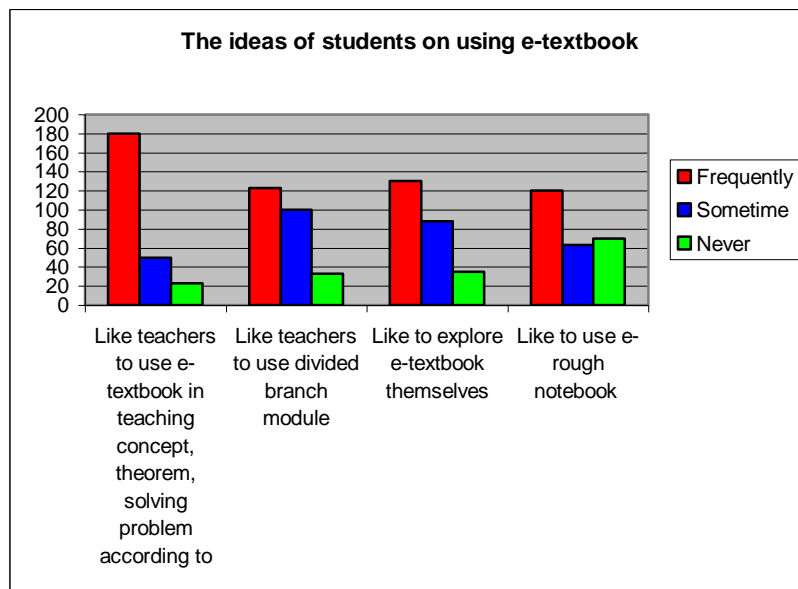


Chart 2 shows that students very like teachers to use e-textbook in learning concepts, theorems as well as properties according to discovery learning. Students are interested in teacher using the feature of divided learning as well as discover e-textbook by themselves. Students very like rough e-notebook in doing with plane geometric objects.

5.2. The following of the progression for a group of students (case study)

5.2.1. The model choice

The point of view of model choice: The choices of student's presenters must be different levels from bad and average students to good students. The presenters are all of male students. The choices of objects are to follow the progressions and interactive acts with e-textbook of students on the transformations in the plane of grade 11th with the help of teacher and the other friends. The following of the

learning process as well as the exploitable acts of some applications of e-textbook in learning the transformations of students bases on the below criteria:

- The levels of the need, target and motivation of learning.
- The levels of the building and performing of learning plan on the transformations in the plane according to discovery learning.
- The real abilities of the interaction with e-textbook.
- The levels of the reading and comprehension of contents in e-textbook.
- The levels of the checking and assessment of learning the transformations in the plane according to discovery learning.
- The levels of finishing learning target and tasks.
- The applicative levels of learning knowledge for new lesson and the reality, ect.

For each of criteria, we base on the reality and theory of learning transformations in the plane according to discovery learning concretely.

We carry out communicate with mathematical teachers, observe the altitudes, acts and learning results of students in order to get information. We choose objects based on the result of the processing of the above information.

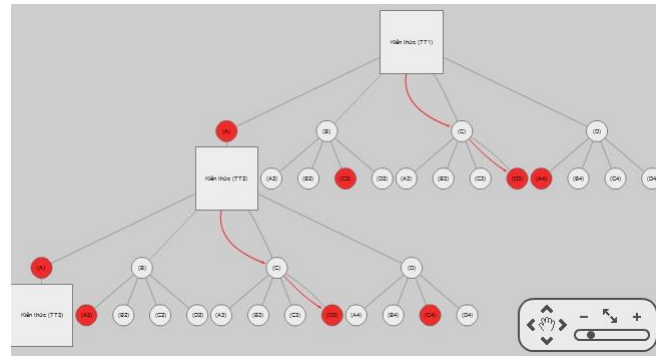
The result of model choice: For the above approach, we choose 04 students to observe, collect and process information in order to give the opinions on the process of learning the transformations in the plane according to discovery learning. Each of students has different level of learning ability. Concretely:

(1) *Vu Vuong An* (username: vuongan) is a student of grade 11A1 of Samson high school, Thanh Hoa province.

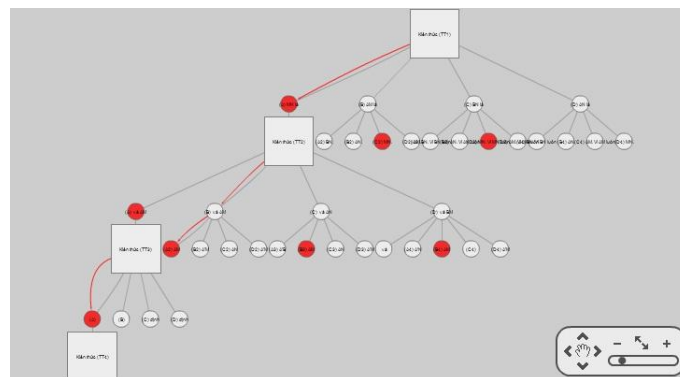
Vu Vuong An is good at learning. He is good at mathematics, Physics, Chemistry, ect, and is bad at literature. He is talented at physics. Vuong An is nearsighted. He does not talk in class, he likes to join in class acts. The skills of mathematics such as geometric skill, solving problem skill, computational skill and using mathematical tool skill are good. The self-learning ability of Vuong An on e-textbook is good. The time of finishing the given requires of e-textbook of Vuong An is always at the top. After he finishes the self-learning, Vuong An will be quite good for catching the self-learning knowledge. Vuong An also helps the other friends, he often accesses the forum feature to help bad students. He usually asks teacher about difficult problems concerned with the self-learning on e-textbook.

(2) *Le Quoc Hung* (username: quochung) is a student of grade 11A1 of Samson high school, Thanh Hoa province.

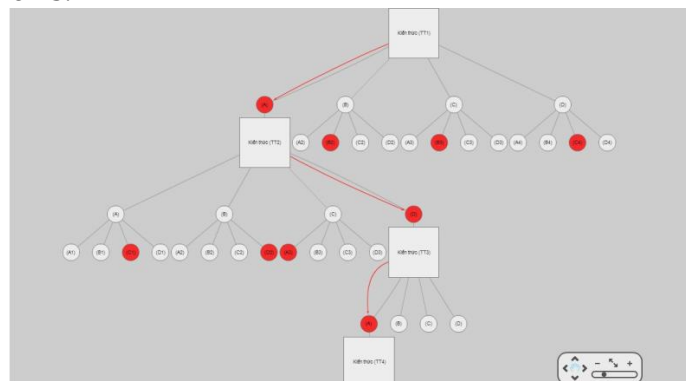
Le Quoc Hung is quite good at learning. He is quite good at mathematics, is bad at literature and he is especially talented at chemistry. Hung is nearsighted. He does not talk in class, he likes to join in class acts. The skills of mathematics such as geometric skill, solving problem skill, computational skill and using mathematical tool skill are quite good. The self-learning ability of Quoc Hung on e-textbook is also good. The time of finishing the given requires of e-textbook of Quoc Hung is always at the top. The time that Quoc Hung finishes his self-learning is little longer than Vuong An. After Quoc Hung finishes the self-learning, Quoc Hung will be quite good for catching the self-learning knowledge. Quoc Hung also helps the other friends, he often access the forum feature to help bad students. He also asks teacher about difficult problems concerned with the self-learning on e-textbook.



At the next period “*The translations and transformations*” (period 2), Tri Ngoc can communicate with his friends about lesson. Tri Ngoc also chooses incorrect choices however the time of his incorrect choices is shorter than before. The chart of the learning process of ramified problem (problem 2) of Tri Ngoc on e-textbook is as follows:



At the next periods “*The reflectional symmetry*” (period 3, period 4), Tri Ngoc chooses all of correct choices of ramified problems however the time of his correct choices is quite long. Tri Ngoc is better through every period. The chart of the learning process of ramified problem (problem 2) on e-textbook of Tri Ngoc is as follows:



Tri Ngoc does not ask teacher about knowledge concerned with his self-learning in class. Teacher must give more exercises to consolidate his knowledge. In class, Tri Ngoc is passive in two first periods. At the two next periods, Tri Ngoc is also active in solving simple exercises however the time of doing exercises is quite long. Tri Ngoc also finishes private notes of teacher well.

- *Quantitative assessment:*

We follow the learning of 04 students by e-textbook, from the traces of the students on e-textbook, we realize that, students usually enter their login to learn knowledge, do exercises and tests, the following results of 04 students in a month are as follows:

TT	Full name	Score 1	Score 2	Score 3	Score 4
1	Vuong An	7.5	8.5	8.5	9.0
2	Quoc Hung	7.0	7.5	7.5	8.0
3	Tien Dzung	6.0	7.0	7.5	7.5
4	Tri Ngoc	4.5	5.0	5.0	6.0

Observing the scores of 04 students, we realize that they are better on the activeness, self-awareness and creation.

Thus, the experimental results show that e-textbook helps student to learn mathematics and to improve their active and creative abilities.

6. Conclusion

Interactive e-textbooks have many strong points such as to help students to discover knowledge conveniently; to transmit images, sound, MP3, MP4 files. E-textbooks allow us to educate an infinite number of students. Students can interact together by e-textbooks easily. E-textbooks will create an advantageous environment when users do with geometric objects.

References

- Doan, Q., Van, N. C., Pham, K., B., Ta, M. (2016), *Advanced geometry 11th*, The Vietnam Educational Publishing House.
- Joi, L. M., Camille, D., D., Krista, G., (2011), *e-learning, online learning, and distance learning environments : Are they the same?* Internet and Higher Education, Vol. 14, 129-135.
- Joolingen, W., V (1999), Cognitive tools for discovery learning, *International Journal of Artificial Intelligence in Education*, Vol 10, 385-397
- Michael, H. (2015), *Workshop application of information technology in blended teaching meeting the new school curriculum's demand*, Ministry of Education and Training of Vietnam.
- Mogens, N. (2003), Mathematical competencies and the learning of mathematics: The danish KOM project. In Gagatsis, A., & Papastarvridis, S. (eds.), *3rd Mediterranean Conference on Mathematical Education* (pp. 115 - 124). Athens, Greece: Hellenic Mathematical Society and Cyprus Mathematical Society.
- Nguyen, T., D. (2014), *The research of the lessons of teacher concentrated on the mathematical discovery of students in teaching and learning mathematics at upper secondary school*. A Dissertation for the Degree of Doctor of Education, Hanoi National University of Education (Dissertation written in Vietnamese).
- Nguyen, V., H. (2007). *Applying guided discovery teaching in the process of teaching mathematics at upper secondary school*. Journal of Vietnamese Educational Science, 28-29.
- Nguyen, M., H., Khu, Q., A., Nguyen, H., T. (2016), *Basic geometric exercises 11th*, The Vietnam Educational Publishing House.
- Nguyen, M., T. (2012), *The e-document of teaching and learning – A model of blended learning software*, Journal of Vietnamese Education, number 280 (2/2012), p.51-53.
- Nguyen, T., T., Nguyen, H., C., Quach, T., C., Nguyen, T., H., Doan, T., P., Pham, D., Q., Nguyen, T., Q., S. (2006), *The instructions of performing the standard of knowledge and skills of mathematical subject 11th*, The Vietnam Educational Publishing House.

- Pham, T., T., Dang, T., T., H., Do, D., L., Pham, D., T., Dao, T., L. (2015), *The research on mathematical textbooks of some countries, the proposal of applications to write Vietnamese mathematical textbook adapting to the requires of secondary school educational program after 2015*, The report of the summarization of the science and technology topic of the Vietnam Institute of Educational Sciences, Hanoi.
- Roger, S. (1989), *The elaboration of school textbooks methodological guide*, Division of Educational Sciences, Contents and Methods of Education UNESCO.
- Tran, T. (2011), *Applying ICT to teaching and learning mathematics at secondary school*, The Vietnam Educational Publishing House.
- Tran V., H., Nguyen, M., H., Khu, Q., A., Nguyen, H., T., Phan, V., V. (2016), *Basic geometry 11th*, The Vietnam Educational Publishing House.
- Van, N., C., Pham, K. B., Ta, M. (2016), *Advanced geometric exercises 11th*, The Vietnam Educational Publishing House.
- Edutechwiki.unige.ch. Retrieved from
http://edutechwiki.unige.ch/en/Discovery_learning
- En.wikipedia.org. Retrieved from <http://en.wikipedia.org/wiki/E-book>.
- Violet. Retrieved from http://violet.vn/atomic281/present/showprint/entry_id/797183
- En.wikipedia. Retrieved from
[https://en.wikipedia.org/wiki/Constructivism_\(philosophy_of_education\)](https://en.wikipedia.org/wiki/Constructivism_(philosophy_of_education))
- Kristenlockwood13. Retrieved from <http://kristenlockwood13.tripod.com/id22.htm>
- Simple.wikipedia.org. Retrieved from <https://simple.wikipedia.org/wiki/Textbook>