The Process of Designing Electronic Lesson Plans Based on Constructivism Theory in Teaching at Elementary Schools in Northern of Vietnam

Nguyen Thi Thu Ngan[1,*], Nguyen Huyen Trang[2]

[1]Academic Affairs Department, The National College for Education, Hanoi, Vietnam
[2]Primary Education Department, Hanoi College of retraining manager and teacher for Education, Hanoi, Vietnam
*Corresponding author: nguyenngan2807@gmail.com

Abstract The four major characteristics of the 21st century context are globalization; information technology, knowledge economy and ethnic issues. They require a strong innovation, synchronization in terms of program, content, methods and evaluation. The use of teaching theories in the direction of capacity development, application of information technology teaching became the trend of modern education. This paper deals with the design of electronic lesson plans based on constructivism theory that help teachers and students access to rich and diverse sources of knowledge. As a result, their needs for exploration, research and problem solving are stimulated. This not only makes the lesson more lively and attractive but also enhances the ability to learn and use the technology of teachers and students.

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1. Introduction

Constructivism Theory is one of the dominant theories of teaching that is being studied and applied in elementary schools to meet the learning needs of learner capacity development. This theory encourages students to build their own knowledge based on individual experiences, and directly apply what they learn into practice to solve problems of life [10]. The application of information technology to the design and organization of teaching based on constructivism theory helps to make the lessons more lively and relevant to the psychological characteristics of elementary students. This increases the interest in learning, encourages students to explore the lesson, and helps them get acquainted with technology applications in life.

It is obvious that elementary school administrators and teachers are aware of the effectiveness of instruction based on constructivism theory that supported by information technology. However, they do not understand the nature of constructivism theory as well as the teaching process based on constructivism theory. Therefore, the design of the lecture as well as teaching organization has not brought desired effects and outcomes. On the other hand, the level and capacity of using information technology of teachers is limited that leading to the exploitation of software tools to design e-lecture is formal and ineffective.

Starting from this situation, the purpose of this study refers to two main issues as follows:

1. Assess the current state of information technology application in the design of electronic lesson plans in elementary education in Vietnam.

2. Propose the process of designing electronic lesson plans based on constructivism theory in teaching at elementary schools in order to improve the quality and effectiveness of teaching, thus ensuring the implementation of the objectives of teaching and developing students' competences.

2. Content

2.1. Constructivism Theory in Education

Constructivism Theory in Education is considered as a trend of modern teaching in order to actively promote the thinking of learners, helping learners to find, discover, and solve problems in teaching process. In constructivist teaching, learners build their own knowledge based on the knowledge and experience that available in the organization and orientation of the instructor. Learning is made easier by social interaction. Practical exercises promote learning to make learning more meaningful and effective, and the way student study is based on collaboration and teamwork [12].

Constructivism theory affects the learning program, the guide and the evaluation of student learning outcomes. In particular, a program that differentiates the learner is replaced, in accordance with the student's perceptions.

Parallel to that is organizing the students to experience and seek new ways of perceiving and enhancing the interaction of the instructor - the learner and the learner - the learner. Constructivism theory requires the removal of standardized tests and classification of levels. Rather, evaluation becomes a part of the learning process so that students are involved as self-regulators of their own intellectual development [11].

The instruction based on constructivism theory emphasizes on the organization for students to interact and find solutions to solve problems in five steps: Attention; Survey; Explaination; Statement; and Evaluation. In it, "Attention" aims to focus the learner's attention, stimulate thought and help students to restore the knowledge they have learned about the problem to be explored; "Survey" is the stage in which students think, plan, collect and organize relevant information; "Explaination" is the process of analyzing the results of the survey to find a way to solve the problem, thereby extending and condensing the insights and application into the actual situation in the "Statement" step. The end of the process is the synthesis and evaluation of problem awareness so that the teaching method as well as the learning method of both teachers and students can be adjusted.

2.2. Application of Information Technology in Teaching

Today, the applications of technology, especially the Internet, have truly become a bridge between teachers, students and the school. The exploitation and application of specialized software for teaching is increasingly focused in elementary schools. Positive lectures combined with the support of instructional softwares attract students' attention, and create an appeal to the lesson. The acquisition of knowledge is highly effective when students receive information from various sources of perception and in their own activity, synthesizes and selects those sources [8,9]. In fact, the application of information technology in teaching in general and teaching in elementary school in particular is limited because teachers often find it difficult to build multimedia resources such as film, photos, etc, for use in the design of electrical lesson plan. In addition, the teaching softwares used by teachers are mainly performed to illustrate students' knowledge, but are not fully concerned about the method of use in order to support the students' self-reliance and creativity in the teaching process.

Therefore, in order to apply information technology in teaching effectively, it is necessary to exploit the use of multimedia tools such as Microsoft Producer for PowerPoint 2003, Photoshop, and Video Maker, etc. Active electronic teaching supports positive teaching methods. Using instructional softwares supports students' self-reliance and creativity that means creating a system of active electronic lectures for each subject.

3. Design of Active Electronic Lesson Plans in Teaching at Elementary Schools

Lecture design is a lesson plan for a specific lesson that demonstrates a teacher-to-student interaction, between students and students in order to help them achieve the goals of the unit [3]. In order to be able to construct an active lecture with information technology application, it is necessary to proceed as follows:

- Step 1: Learn and search for the content of the lesson, select the content to design.

- Step 2: Writing pedagogical scripts for the design of computerized lectures (When this step is taken, the teacher must visualize all the content as well as the pedagogical activities in the class of the entire teaching period and determine which part of the content of the lesson requires computer support for the lesson to be effective. Scene name (Activity) - Time - Content - Image shown on the computer).

- Step 3: Demonstrate computerized scripting (using software tools to design)

- Step 4: Review, adjust the test on the computer (test run), test teach

- Step 5: Write a manual on how to use e-lesson plan (pedagogical intentions, use techniques, teacher and student activities, and interaction between students, teachers, and technology) [4].

Thus, the nature of the teaching process is the communication process that includes the selection, arrangement and distribution of information in an appropriate pedagogical environment; interaction between learners and information [6, 13]. That message is usually a topic to be taught, as well as questions about contents for the learner, feedback from the learner to the instructor. At the elementary level, however, research on this issue has generally not been effective and needs to be continued and there are concrete situational assessments to suggest a more targeted development.

3.1. Methodology

To gain an unbiased view of the current situation of information technology application in the design of e-lesson plan based on constructivism theory in elementary education in northern of Vietnam, we conducted a survey of 1420 administrators, teachers and elementary students, including 288 administrators (Hanoi: 90, Phu Tho: 107; Lang Son: 91), 532 teachers (Hanoi: 150, Phu Tho: 192, Lang Son: 190) and 600 elementary students (Hanoi: 250, Phu Tho: 185, Lang Son: 165).

The survey focused on the following issues:

- Awareness of elementary school administrators, teachers and students on the role of designing and organizing teaching based on constructivism theory with the support of information technology in elementary school.

- The level of information technology and the level of application of information technology in the teaching of primary teachers.

- Difficulties in designing tectonic e-learning in teaching in elementary schools.

Through surveys and statistics, we have a basis for evaluating the reality of information technology application in the design of tectonic e-learning in primary education in northern Vietnam. This is an important basis for researching and proposing the process of constructing e-learning positively active in teaching in primary school.

3.2. Research Results

The innovation in teaching methods and application of information technology in teaching to train high quality human resources are a great concern to educators in Vietnam [1]. The problem is that the combination of teaching based on constructivism theory with the support of information technology to achieve the effectiveness of teaching while promoting the capacity of students. The actual situation survey gives us an overview of the design of active e-lesson plans in teaching at elementary schools in northern of Vietnam.

Results of cognitive surveys that conducted by administrators and elementary teachers in 3 provinces/ cities: Hanoi, Phu Tho, Lang Son (Table 1) on the role of designing and organizing teaching based on constructivism theory with the support of information technology show the interest and understanding of the positive effects that teaching based on constructivism theory and information technology bring to the education process.

The data in Table 1 shows that most of the surveyed ideas suggest that the use of information technology in lesson and teaching design will help teachers and students access modern technologies (85.5%); followed by "Enhancing the excitement of learning and teaching for teachers, students" (accounted for 77.8%); "The lesson is attractive, lively, easy to remember, understandable" accounted for 73.7% and "Updating new information" accounted for 72.2%. The "Saving time" effect was rarely chosen by administrators and teachers because they believed that designing a lecture and teaching organization with the application of information technology required a lot of time to prepare, construct, search, select, and arrange the information in the lesson accordingly. However, most students in the survey said that learning with the help of information technology saves time and makes the lesson much more attractive. As a result, it can be seen that administrators, teachers and elementary students all saw the positive role of design and teaching based on constructivism theory.

In order to be able to design an effective e-learning lesson, the teacher should have the skills to use the basic software to teach. In fact, the levels of information technology of administrators and teachers of elementary school in this survey ensured standards of the degree but the skills of using the technology of teachers in teaching are not effective. When investigating elementary teachers about the levels of using basic teaching softwares such as Microsolf PowerPoint, Flash, Violet, Adobe Presenter, Lecture Maker, Movie Maker, and Photoshop, *etc*, or using Google search, Email, sufting Website, *etc*, to

design of lesson plans based on constructivism theory of teachers in Hanoi, Phu Tho, Lang Son, we have the results as presented in Table 2.

These statistics show that the number of teachers using ICT in designing lesson plans based on constructivism theory is low (11.8%). This rate is lower with teachers in midland and mountainous provinces. The number of teachers employed at the level of proficiency is only 26.9%, while the majority is not proficient (42.9%). This shows that teachers have been conscious and active in using technology in instructional lesson plan design based on constructivism theory. However, due to the limited use of information technology, the effect of lesson plans is not high. By looking at the teacher's e-learning products and through communication and observation with teachers, we found that most teachers just use Internet data and put in PowerPoint lectures but they do not edit the data and information according to a concrete lesson plan. This result partly reflects the limitations on the informatics capacity of elementary teachers. In order to be able to design e-lesson effectively, teachers not only need to have knowledge but also master basic computer skills. However, only some teachers are fluent with ICT, the application of information technology into elementary school has not achieved the desired effect.

On the other hand, in order to design an effective electronic lesson plan, administrators and teachers need to clearly identify the difficulties in implementing specific solutions. Investigating on the issues that elementary teachers have to face when designing e-lesson plan based on constructivism theory (selecting, defining teaching content, developing lesson plans, searching and processing language; use of software to digitize knowledge units and design learning activities, identify learning environments with the support of information technology) at levels (very difficult, normal, not difficult), we get results as presented in Table 3.

Looking at the statistics, it can be seen that most elementary teachers find it most difficult to digitize knowledge and design learning activities (the first in the ranking). Following are the difficulties in identifying a learning environment with the support of information technology and developing lesson plan. This is understandable because when the teacher has not designed a reasonable scenario and has not been able to convert the data and arrange the data properly, it is impossible to write clear and effective instructions. When discussing with teachers we found that choosing and determining teaching content for them is not difficult, but the most difficulty is how to transform the content into a positive e-lesson without overuse technology effects.

Table 1. Levels of awareness of the role of lecture/lesson design and instructional organization based on constructivism theory with the support of information technology

Order	Survey contents	Hanoi (490 surveys)		Phu Tho (484 surveys)		Lang Son (446 surveys)		Total (1420 surveys)	
		No	%	No	%	No	%	No	**%**
1	Updating new information	325	66.3%	388	80.2%	312	66.9%	1025	**72.2%**
2	Enhancing the excitement of learning and teaching for teachers, students	427	87.2%	402	83.1%	276	61.9%	1105	**77.8%**
3	The lesson is attractive, lively, easy to remember and understandable	382	77.9%	373	77.1%	292	65.5%	1047	**73.7**
4	Accessing to modern technologies	458	93.5%	358	73.9%	398	89.2%	1214	**85.5%**
5	**Saving time**	**181**	**36.9%**	**165**	**34.1%**	**129**	**28.9%**	**475**	**33.5%**

Table 2. Popular technology education in the education of primary teachers

Level of use of IT in teaching	Hanoi (150surveys)		Phu Tho (192surveys)		Lang Son (190surveys)		Total (532surveys)	
	No	%	No	%	No	%	No	%
Very fluent	25	16,7%	21	10.9%	17	8.9%	**63**	**11.8%**
competently	48	32%	50	26%	45	23.7%	**143**	**26.9%**
Not skillful	62	41.3%	84	43.8%	82	43.2%	**228**	**42.9%**
No skill	**15**	**10%**	**37**	**19.3%**	**46**	**24.2%**	**98**	**18.4%**

Table 3. Difficulties in designing tectonic electure in primary teaching

Level	Hanoi (150 surveys)		PhuTho (192 surveys)		Lang Son (190 surveys)		Total (532 surveys)	
	Ave. score	Level	Ave. score	Level	Ave. score	Level	Ave. score	**Level**
Selecting, defining the content of teaching	1.24	3	1.19	5	1.23	5	1.21	**4**
Developing lesson plan	1.16	4	1.24	3	1.25	4	1.22	**3**
Searching and processing data	0.94	5	1.22	4	1.36	3	1.19	**5**
Identifying the learning environment with the support of information technology	1.32	1	1.34	2	1.40	2	1.36	**2**
Digitizing learning units and designing learning activities	**1.26**	**2**	**1.44**	**1**	**1.54**	**1**	**1.42**	**1**

Based on the results of the current survey, we have studied and proposed the process of designing active e-lesson plan based on constructivism theory as follows:

1. Identifying principles when designing active e-lesson plan based on constructivism theory

- Ensuring general principles of the teaching methodology of the subject

- Complying with the characteristics of teaching based on constructivism theory

- Following the teaching process in 5 steps of constructivism theory

- Ensuring basic requirements when applying information technology

- Following the process of designing lesson plans with the application of information technology in teaching at elementary schools

2. Based on the principles to define the process of designing active e-lesson plan based on constructivism theory:

- Step 1: Identifying Learning Objectives based on constructivism theory with the support of information technology

- Step 2: Designing learning contents based on constructivism theory with the support of information technology

- Step 3: Designing learning activities

- Step 4: Designing teaching - learning tools with the help of information technology

- Step 5: Designing assessment and synthesis with the help of information technology

- Step 6: Designing an exploratory learning environment with the support of information technology (the conditions and means required to implement the teaching plan)

Here is a lesson plan based on constructivism theory in Science:

Lesson: Heat sources
(According to the 4th grade science program in Vietnam)

I. Purpose:

After the lesson, students can:

- Name and address the role of common sources of heat in life.

- Implement simple rules to prevent the risk and the danger when using the heat sources.

- Be save when using heat sources in daily life.

- Love science, enjoy the learning method of discovery with the support of IT.

- Develop the capacity to solve practical problems.

II. Teaching aids:

1. Teachers: Electronic lesson plan has integrated video clips, images of heat sources and pictures of using the heat source at home.

Task cards

Computer, projector.

2. Students: A3 paper, color pens.

III. Major teaching activities

Steps to explore	Activities of teachers	Activities of students
Step 1: Prepare - Using knowledge and experience foundation	- Give examples of insulators, heat conductor and their applications in life. - Describe the contents of the experiment to demonstrate that the air is insulating.	- Think and answer the question
Step 2: Orient the discovery with the help of IT	- In addition to the application of insulation, heat conductor in life, what do you still want to know? - Today we are exploring more about the sources of heat in life.	**-** Name ideas. - Identify exploration missions: the sources of heat and their roles.

Steps to explore	Activities of teachers	Activities of students
Step 3: Observe and guide students to explore with the support of IT	**Activity 1: Explore the sources of heat and their roles** - Organize student discussion in pairs. -Requirements: Observe illustrations and exchange and answer the following questions based on practical knowledge: + What is the sources of heat for the surrounding? + What do you know about the roles of each source of heat? - Students present. Teachers quickly record heat sources and their roles: cooking, drying, heating. **Working full time:** - Teacher shows images on the screen. - Each group reports the results of their group discussions. + What are the sources of heat used for? + When there is a fire or the coal is burned out, is there another source of heat?	- Discuss - Reply based on their knowledge. + The sun: helps all living things warm up, dry hair, dry rice, corn, and clothing, sea water evaporates quickly to make salt, etc. + The fire of gas stove and firewood help us cook food and boil water, etc. + Electric heaters make the air warm in winter, help people warm up, etc. + Electric iron: help us dry clothes, etc. + The light is on: help chicken, and pig feel warm in winter,. .. + Heat sources used for cooking, drying, heating, etc. + When the charcoal or firewood is burned out, the fire is turned off, it means the heat resource no longer exists.
Step 4: Guide students to compare, comment, and draw conclusions about the nature of knowledge	- Instruct students to report, discuss, and draw conclusions. - Teacher concludes about the heat source.	**- Working in the whole class:** + Each group reports the results of their work. + Other groups commented. + Draw conclusions. Heat sources are: + The fire of burned objects such as matchsticks, charcoal, firewood, oil, candles, gas, etc., helps to light and cook. + Electric stove, electric arc furnace, and electric heater in operation help to heat, cook food, or melt something. + The sun always radiant heat up many things. The sun is the most important source of heat, indispensable for the life and activities of humans, animals, and plants. Experiencing thousands of years, the sun still does not get cold.
Step 5: Organize student to practice and apply knowledge to the reality	**Activity 2: How to avoid risks and danger when using heat sources** + What kind of heat source do you use? + Do you know any other sources of heat? - Organizing learning games: Organize students to participate in two teams and nominate a referee, each team think, discuss, and answer the following question: What are the risks and hazards that can occur when using heat sources in everyday life? - Comments, conclusions. ***Risks can occur when using a heat source:*** - Feeling sun sensitivity. - Burning by playing near the heat: kitchen table, coal, wood stove, etc. - Burns by calf, pans, warmth out of heat. - Burning objects close to charcoal stove, wood stove. - Fired pot, saucepan, and food when the fire is too big. Why do you have to use hand pads to calf pots, pans out of heat source? *** What should be done to ensure the safety of using home heat sources? Share tips with your friends.** *** What did you and your family do to save the heat?**	+Sunlight, electric table, electric stove, coal stove, gas stove, wood stove, hair dryer, and electric heater, etc. + Ceramic oven, ceramic furnace, etc. - 4 - 6 studentsper team, watch video clips, exchange, discuss, and record answers to the task sheets. - Representatives of the two groups posted the questionnaire and read the results of the group discussion. ***Prevention:*** - Wearing hat and glasses when driving. - Do not play in the sun at noon. - Do not play near: the iron, the coal, electric stove when they are used. - Usehand padswhen touching pans or kettle out of heat. - Do not leave flammable objects near coal stove and wood stove. - Keep the fire at moderate. - In operation, the heat source is radiated around a large heat. The heat goes into the saucepan or the pot. They are made from cookware so thay they are very good thermal conductivity. Hand pads is insulated, so using hand pads to calf pots and pans out of the heat source will prevent the heat source to hand, avoid making burns. - Students respond. + Turn off the stove when not in use. + Do not let the fire out when cooking. + Cover the thermos jug to keep the water warm for longer. + Watch the boiling water, do not let the water boil until it drain. + Hollow out the kitchen when using in order to let air can enter to keep the fire on, it is not necessary to put a lot of charcoal or firewood. + Do not cook food for too long. + Do not turn on the heater when it is not needed.

Steps to explore	Activities of teachers	Activities of students
Step 6: Evaluate discovery activities with the help of IT	- Give students a multiple choice test. - Guide and create opportunities for students to experience and evaluate their own activities and their peers. - Suggestions for new issues: You have named and identified the role of common heat sources in life, what else do you want to know about the heat?	- Take multiple choice tests. - Experiment and self-assess thei process and results of their discovery and their peers. - Suggest new issues: + How is heat needed for life? + What happens if the temperature of the environment is too cold or too hot?

3.3. Discussion

The application of information technology in designing e-lesson plans based on constructivism theory is an approach that is in line with modern teaching. However, in order to design effective e-lesson plans, teachers need to have certain skills in information technology while learning the design process to ensure effective teaching.

The above results show that both administrators and elementary teachers see the effectiveness of applying information technology in designing e-lesson plans based on constructivism theory: the lesson is more attractive and ensures for students to have experiences and discovery based on their knowledge and skills. Through communication with students, we also see their interests when learning with the support of technology equipment. They actively participate in activities and have more interaction as well as desire to speak and pay more attention in activities. This shows that the application of information technology in designing e-lesson plans based on constructivism theory actually improves the quality and effectiveness of teaching. However, the use of information technology is still limited, so the quality of lesson plan is not high.

Survey results show that elementary teachers have identified the basic difficulties in designing e-lesson plans based on constructivism theory. These difficulties stem mainly from the lack of information technology skills and the arrangement of teaching content when designing lectures. Therefore, designing a process is essential for teachers to have a good foundation and direction for doing the job effectively.

The design process that we have created helps teachers imagine the sequence of tasks that need to be done when designing e-lesson plans based on constructivism theory, thereby actively selecting contents, searching for teaching materials, improving the level of information technology, or finding ways to coordinate with information technology experts in a reasonable way to be able to design effective teaching activities.

components of the action capacity (professional competence, methodological capacity, personal and social capacity) [7]. This helps them to be proactive and flexible in addressing diverse situations of real life.

The design of e-lesson plans based on constructivism theory, based on criteria consistent with the cognitive psychology of elementary students, is essential and consistent with modern teaching trends, create a 'positive and friendly' learning environment for students to develop their own abilities.

However, the fact that the design of active e-learning lectures in teaching is not really effective due to the limited capacity of information technology of teachers and especially the difficulty when designing teaching and learning activities as well as digitizing unit of knowledge in the lesson.

The design of e-lesson plans based on constructivism theory is positively difficult for elementary school teachers. There is a need for both theoretical as well as technical skills for teachers to implement this activity on a large scale. In fact, elementary teachers in northern of Vietnam now have designed e-lesson plans based on constructivism theorybut they just focus only on some familiar and easy-to-use activities. Moreover, the economy and infrastructure of different regions lead to the application of many restrictions. Therefore, identifying a specific design process and organizing technical training will provide teachers a solid foundation on these issues. As a results, they can be more active in the regular implementation of the application of information technology in designing e-lesson plans based on constructivism theory

Acknowledgements

4. Conclusion

Constructivism Theory is essentially a theory based on observation and scientific research. It argues that man creates knowledge and information about the world through experience and reflection [2]. When facing with a new problem, people tend to deal with situations based on their available experience. Therefore, in reality, human beings are the creator and judge of the knowledge that they has acquired in any case. Knowledge is built and applied consistently with individual experiments. The discovery process for knowledge acquisition will enable students to form and fully develop the structural

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