Applying Contextual Teaching and Learning on Multimedia to Enhance Logical Thinking Skills

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Abstract

Contextual teaching and learning is a learning concept that encourages students to make a connection between knowledge and its application in real life. This concept can stimulate students to think logically so that they can improve their logical abilities. By having good logic skills, students will find it easier to solve various problems that occur. To facilitate the learning process based on contextual teaching and learning, in this research, web-based multimedia learning was developed by applying the Contextual teaching and learning model with the ADDIE method. From the results of the research conducted, it was found that the increase in students' logical abilities was evaluated based on three indicators: the coherence of thinking with a value of n-gain = 0.32 (moderate improvement), argumentative ability n-gain = 0.27 (low improvement), and drawing conclusions n-gain = 0.33 (moderate improvement).

Keywords *— Multimedia Learning, Logical Thinking, Contextual Teaching and Learning*

1. INTRODUCTION

Students can be said to have the ability in logical thinking if they can express concepts or ideas in a structured sequence of words or sentences so that their arguments are correct[1]. Vocational High School (SMK) is a form of formal education unit that organizes vocational education at the secondary education level[2]. One of the fields of science that can be studied in thinking logically is to make logic and algorithms contained in basic subjects in class X SMK. Logic and algorithms study the basics of forming digital electronic systems that are used to convert one or several inputs into an output signal that logical[2].

Another thing that can support the success of learning, students need a tool or media that can make it easier for them to understand the concept of the learning material being studied. This is reinforced by previous research conducted by[3] which states that ICT-based learning media can make it easier for students to understand learning materials and increase positive attitudes and learning motivation in students. With the multimedia learning used will provide convenience in the teaching and learning process. By listening to the material, asking questions, responding to the material presented so that it will show an interactive teaching and learning process[4].

Learning model is very important in creating effective learning objectives by integrating the learning process to help students achieve learning and foster learning motivation in students. Contextual Teaching and Learning (CTL) learning is one of the models that are currently often used in the process of learning activities. CTL learning is a model that

emphasizes the relationship between the material being taught and students' real life conditions[5]. The CTL learning model is a learning model that emphasizes the full involvement process of students to be able to find the material being studied and relate it to real life situations so as to encourage students to be able to apply it in their lives[6].

One of the platforms that can be easily accessed by students is the web. The web is one of the technologies that currently has a positive trend for use in learning process. Reference[7] says that web-based learning is learning that can be accessed via the internet and learning activities can be done easily anytime and anywhere[8]. So that the website is used as a support as a medium that applies the Contextual Teaching and Learning (CTL) model as research. in previous studies by applying the Contextual Teaching and Learning (CTL) model using the web also experienced cognitive improvements to students[8][9].

Based on this background, the objectives of this research are as follows:

a) Designing Multimedia Learning system by applying contextual teaching and learning
b) Increasing the ability of logical thinking with the Contextual Teaching and Learning model on Multimedia Learning

With the achievement of thus two objectives, this research can be used as a reference in the field of education that processes the improvement of students' logical thinking skills with a web-based multimedia-assisted Contextual Teaching and Learning model.

2. RESEARCH METHOD

This research procedure was carried out by following the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) stages. The explanation of each stage will be discussed in detail in the next sub-section.

A. Analysis

The analysis stage is the first stage to obtain the needs in the development of learning multimedia. In the process of analyzing the development of multimedia learning, the requirement is divided into 2 main parts: multimedia needs and learning content needs. The analysis process is carried out by observing the existing learning process and interviewing the teacher. Based on the results of the analysis of multimedia needs, we found that:

a) Multimedia must contain video elements
b) Web-based multimedia for easy access by students during the learning process
c) Media flow map according to CTL learning stages

Learning content requirements:

a) Content and other learning tools must contain material and questions with cognitive levels of analysis (C3), evaluation (C4), and create (C5) according to bloom’s taxonomy.

B. Desain

At this stage, flowcharts, storyboards, preparation of material and instrument questions are made. This stage is a conclusion of the system requirements generated from the previous stage. In addition, according to the results of the needs analysis, that the learning media built is web-based, so at this stage it is also designed how to design the multimedia system database to be built.

C. Development

The development process is a process to realize the results of the design that has been done. The stage is divided into 2 parts : development of teaching content and the development of multimedia. The teaching content developed consists of materials, questions, and student worksheets in the form of text and videos. Before teaching content is implemented in teaching multimedia, validation of teaching content is carried out in the form of materials, questions and worksheets involving a team of teaching content experts.

After the content development has been completed, the next development is the development of web-based teaching multimedia which is developed according to the contextual teaching and learning design.

D. Implementation

At the implementation stage, learning scenarios that have been prepared in real classes involve vocational students.

E. Evalution

The evaluation stage was carried out to see how the influence of the learning process by applying CTL to the multimedia was built. To conduct the evaluation, a comparison of the results of the pretest and posttest was carried out. The pretest was carried out before the learning process while the posttest was carried out after the learning process. The two tests measure students' logical abilities which are measured based on 3 indicators, namely the ability to think logically, the ability to argue and the ability to conclude. according to Gardner[10].

3. RESEARCH RESULTS AND DISCUSSION

In this section, we present the result and the discussion of the research.

A. Model Contextual Teaching and Learning on Learning Multimedia

In this study, the application of the CTL model in multimedia was carried out by adopting the description of the components Contextual Teaching and Learning model[11]. In detail the description and application of multimedia is carried out as follows:

a) Making meaningfull connection

In this component, the teacher presents some apperception videos in the learning multimedia. The video is an apperception video that connects to the context of problems in real life. In this stage student will do learning by theirselve after watch the video.

b) Critical and creative thinking

After students watch the learning videos in the learning multimedia, students will be asked by the teacher to answer the questions at the end of the video regarding problems and solving problems in everyday life so that they can hone students' thinking skills and do questions and answers.

c) Reaching high standars

After students make observations in groups and then discuss with their friends, students are asked to fill in the tasks contained in the learning multimedia so that students can recognize and identify learning goals to achieve high standards. By doing this students can motivate other students to achieve them.

d) Authentic assessment

After studying learning material in the learning multimedia, students are asked to work on questions or evaluations. After doing this, automatically students will get the results that have been studied objectively based on the abilities that have been possessed by students.

e) Nurturing the individual

This component is not included in the learning multimedia, but students do it manually. Students can maintain their own personality by paying attention, knowing themselves, having high expectations of themselves, motivating themselves and strengthening themselves before starting the learning process.

f) Collaborating

This component is carried out manually, students are asked to sit in groups and then the LKPD will be distributed which is different for each group. Then students will discuss and present it in front of the class.

g) Reviewing

In this component, the process of reviewing the learning materials that have been obtained previously is carried out. So that students can also draw conclusions based on what they have learned

B. Result Pretest and Posttest for Cognitif

To find out the impact of multimedia learning in cognitive aspect, the pretest and posttest instruments were used in the form of multiple choice, each of which has 35 questions. Giving pretest questions aims to determine the initial knowledge possessed by students before using web-based learning media with Contextual Teaching and Learning models. After students carry out the pretest and posttest assessment process, it can be seen in the diagram below.

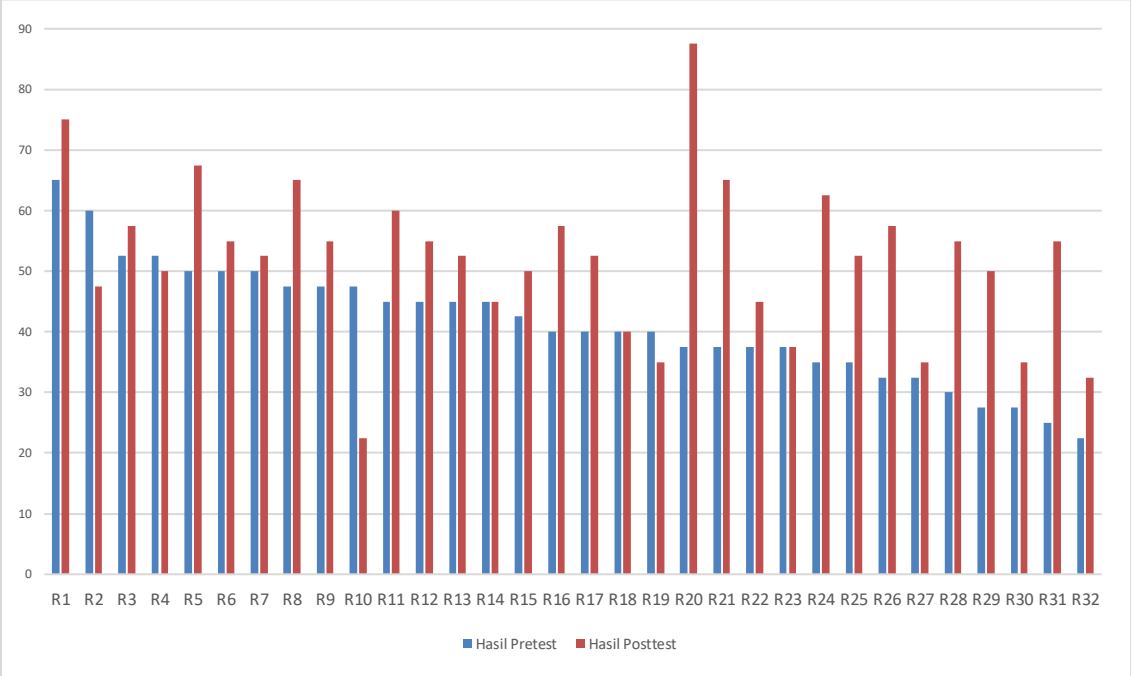

Figure 1. Pretest and Posttest for each student

Table 1. The Avarege of Pretest and Posttest

	Pretest	***Posttest***
Avarege	41,33	52,03

Based on the Table 1, it can be seen that there is an increase between student scores before and after using web-based learning multimedia with Contextual Teaching and Learning models. This can be known based on the increase in the pretest and posttest scores. The average value obtained from the pretest and posttest based on the results of the table calculation is 41.33 for the pretest value and 52.03 for the posttest value.

C. Logical Thinking Evaluation

The logical thinking test was carried out to determine the increase in students' logical thinking skills. The pretest and posttest questions were given to students with a total of 20 items each in the form of multiple choice. Giving pretest questions aims to determine the initial knowledge possessed by students before learning to use learning media. And posttest aims to determine the effect of the learning media that has been given to students' logical

thinking skills on the material of Logic and Computer Algorithms. The results of the analysis of the logical thinking ability assessment can be seen in the Table 2.

Table 2. Logical Thinking Skill

Skills	Coherence of thinking	Argumentative ability	Drawing conslusion
Pre-test (avarage)	48,21	41,52	40,1
Post-test (avarage)	64,66	57,14	59,9
n- *Gain (avarage)*	0,32	0,27	0,33

From the data above, it can be concluded that the 7 questions of thinking coherence indicators get an average pre-test value of 48.21 then the average post-test score of students is 64.66 there is an increase in the average gain value of 0.32 which is interpreted as in the "medium" level of effectiveness. From these results it can be assumed that students may be able to argue well. Then on the 7 questions of the ability to argue indicators, the average pre-test score of students is 41.52 then the post-test average of students is 57.14 there is an increase with an average gain value of 0.27 which is interpreted as "low effectiveness". " From the results of the analysis, it turns out that in the learning process using web-based media questions about the ability to argue get a low score because there are some students who have not answered the questions well so it can be assumed that students do not study the material well.

Then on the 6 questions of Conclusions indicators, the average value of the student's pre-test is 40.1 then the average post-test score of students is 59.9 there is an increase in the average gain value of 0.33 which is interpreted into the effectiveness level of "medium " From this analysis, it can be concluded that by using the Contextual Teaching and Learning model, logical thinking skills are carried out and there is an increase in each indicator, but it is only effective on the Continuity of Thinking and Drawing Conclusions indicators and web-based media can help students to think logically, especially on the indicator of Continuity of Thinking. and Drawing Conclusions.

4. CONCLUSION

The application of the multimedia-assisted Contextual Teaching and Learning model to measure students' logical thinking skills can be developed in 5 stages of ADDIE. Beginning with analyzing literature studies and field studies to determine user needs, then designing them by designing learning materials and compiling question instruments. With the design that has been designed then proceed with making media and validated by material experts. After completing the validation, then the media and the questions were implemented to the students to measure the students' abilities and continued with evaluating the results of the research.

From the research, it was found that there was an increase in students' logical thinking abilities from before the treatment until after being given media treatment. it was found that the Thinking Confusion indicator got an average gain value of 0.32 with a "medium" effectiveness level, the argumentative ability indicator got an n-gain value of 0.27 with a "low" effectiveness level, and the Conclusion Drawing indicator got an average the average gain

value is 0.33 with a "medium" level of effectiveness. So it can be concluded that there is an increase in each indicator, but it is only effective on the Consistent Thinking and Drawing Conclusions indicators and web-based media can help students to think logically, especially on the indicators of Continuity of Thinking and Drawing Conclusions.

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