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Development of cyberblog-based intelligent tutorial system to improve students learning ability algorithm

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Abstract. E-learning as a learning activity conducted online by the students with the usual tools is favoured by students. The use of computer media in learning provides benefits that are not owned by other learning media that is the ability of computers to interact individually with students. But the weakness of many learning media is to assume that all students have a uniform ability, when in reality this is not the case. The concept of Intelligent Tutorial System (ITS) combined with cyberblog application can overcome the weaknesses in neglecting diversity. An Intelligent Tutorial System-based Cyberblog application (ITS) is a web-based interactive application program that implements artificial intelligence which can be used as a learning and evaluation media in the learning process. The use of ITS-based Cyberblog in learning is one of the alternative learning media that is interesting and able to help students in measuring ability in understanding the material. This research will be associated with the improvement of logical thinking ability (logical thinking) of students, especially in algorithm subjects.

1. Introduction

Improved information technology in the field of education is increasingly perceived by learners and teachers, especially in learning activities. Almost most of the lessons delivered in the classroom have been using media or applications that aim to help learners understand the material presented. But very few media or applications can know the level of mastery of the material of learners at the time of learning. Education aims to establish a healthy human body and spirit, and to have the knowledge and skills to be able to develop quality, high intelligence and noble character. To achieve these objectives, there is a need for quality and outcomes of education through improvement and refinement of the learning process in schools [1].

Conventional learning approaches less cover the aspects of student's activity and creativity in the learning process. In order to solve it, ICT-based learning strategies can be involved. This learning strategy has many types, such as: Interactive Multimedia (IM), Macromedia, Hypermedia, Hypertext, Weblog, and so forth. Weblog or blog is a kind of learning strategies that have many advantages [2]. It can accommodate the needs of individual learning, connecting geographically dispersed learners, and asses the student's performance quickly. Moreover, by using weblog, it can improve teacher's knowledge [3] and also improve student's reading habit [4].

In his book [2] says that the basis of all logical thinking is sequential thought. This process involves taking the important ideas, facts, and conclusions involved in a problem and arranging them

in a chain-like progression that takes on a meaning in and of itself. To think logically is to think in steps.

Previous research conducted by [5] which suggests that learners who have the ability to think logically earn higher grades than the students who have the ability to think logically below the average. It can be seen from the results of these studies, that the ability to think logically affects the learning outcomes of students. This shows that by increasing the ability to think logically learners the learning outcomes of students will be increased.

According Albercht in [5] says that the basis of logical thinking is sequential thought. This process involves taking the important ideas, f6cts and conclusions that have involvement of the problems and unite these things like a chain sequences that take meaning in and of itself. Logical thinking is thinking gradually.

Based on the above opinion, there is a relationship between logical algorithms, which both use the concept of sequential thought. This indicates that the algorithm created by mimicking the logical thinking of humans, in other words, logical thinking ability of a person affects the manufacture and preparation of algorithms that person, the better the ability to think, the ability of the algorithm would be better, and the lack of ability to think someone would affect the ability of the algorithm.

Algorithm and programming is difficult to learn, because in the algorithm, it requires not only knowledge but also the ability of logical thinking. Algorithms and programming is an important subject for the student in computer programming because the algorithm is a core competency for vocational high students who study in the Department of Software Engineering. Algorithm and Programming can be defined as a work procedures and build a program, also as a basic. These subjects become difficult for students because most of them never learned about the programming before. So that when receive the material they are confused.

Cyber blog is one of the products produced by the E-Learning. Cyber blog is web-based software that unifies the functionality of web and blog in the form of video or computer simulation sourced from the Internet or from the researchers themselves [6].

Based on the results of research by [6], suggests that learners who use cyber blog as a tool INM algorithm, the overall increase understanding of the concept of the algorithm participant students with positive feedback from the students indicated on the questionnaire.

Based on the description and the opinions that have been expressed above, the researchers want to conduct research into developing new models based cyber blog in improving the logical thinking ability of students.

2. Methods
The method that used in this research is Quasi Experimental Design Method. Quasi-Experimental Design is a method of research that aims to determine whether there is a result of a treatment in a subject and compared with subjects who did not receive treatment. According [3] form of this experimental design, the development of true experimental design that is difficult to implement. This research is better
 to use pre-experimental design, using two groups of classes as a sample, group of experimental and control class. Determination of experimental and control class done by a random placement of the subject using a cluster random sampling technique after the two classes were tested with normality and homogeneity, this technique is used to determine the experimental class and control. Experimental class at the time of the study is given cyber-blog learning with multimedia-based system, while the control group received conventional learning.

The population is students from Universitas Pendidikan Indonesia (Indonesia University of Education), Department of Computer Science Education with a sample of one class (30 students) who had been randomly selected. The process in this research and development strategy includes the preparation of the study, the implementation of the preliminary studies, planning and strategy, implementation and development.

2.1. Location and research subject

Research on the development of cyber blog based learning model is done in one of the public universities in Indonesia, Universitas Pendidikan Indonesia (UPI) in Bandung, more precisely in department of computer science education. The research location is selected based on the knowledge and experience of the informant/related to the implementation of educational policies and systems that ensure the internal quality of the site, as well as considering the ease of access (accessibility) and a few other considerations.

Subjects selected are teachers and students majoring in computer science education, computer science education courses. Subjects were selected based snowball technique, which gives authority to researchers in determining the subject of research based on the search results data sources that are tailored to the needs of research

2.2. Techniques and data collection

2.2.1. Observation. Observation is used to complete the data will provide information about the quality of the learning process of writing. These instruments do aim to solve problems facing learners. During the observation, researchers looked at the activity of respondents and researchers recorded the things that are important and directly related to the research problem. The instrument used in this study was a questionnaire in the form of multiple choice, check list forms and checklists. To obtain accurate data, then do a cross check with data from interviews and documentation study.

2.2.2. Documentation study. This research is to collect and examine the documents required in development-based learning model cyberblog from both educational establishments and of the educator, for example, the curriculum used in the study, planning for learning, lesson plans, and other matters related to learning resources, instructional media used by learners. This is done so that the information obtained is actually derived from the object used as a place of research. Technique documentation can be done in the form of photographing all the events that took place during the researchers conducting the study.

2.2.3. Interview. Interviews conducted by the researchers is that the interviewer structured interview questions that correspond to the problems being studied. The information gained from the interviews will be viewed as an answer to the problem in this study, because of information obtained from the interviews is accurate answers for the questions that have been prepared in accordance with the matter under investigation.

2.2.4. Questionnaire. The results of the questionnaire will be considered as inputs of the subjects that will be observed, the question in the questionnaire is to seek information about student opinion of the learning is done by using model-based cyberblog and student opinion of the learning is done without using model-based cyberblog.

2.3. Research Instrument

2.3.1. Validity. Validity test is done to determine whether the instrument measuring instrument has been running a measuring function. Validity demonstrated the reliability and accuracy of measuring instruments in doing measuring function. To determine the consistency and accuracy of data collected from the use of the instrument validity test using product moment correlation. The product moment correlation technique is as follows:

$$r = \frac{(N \sum XY) - (\sum X \sum Y)}{\{N \sum X^2 (\sum X)^2\}\{N \sum Y^2 (\sum Y)^2\}} \tag{1}$$

Explanation:
r =correlation coefficient
N =number of samples
X =questions score/item
Y =total questions score

The result of the calculation of product moment correlation values (r count) compared with the value of r table. R table value obtained from statistical tables moments product on degrees of freedom (m-1) and alpha 5% of 0.3610 to 30 respondents. The validity criteria used are: (a) If the results count $r \geq r$ table, then the question is valid and (b) If the results count $r \leq r$ table, then the question is not valid.

2.3.2. Reliability. The reliability of an instrument is tested using the approach of internal consistency using Cronbach Alpha reliability is to identify how well the items posed as a question in the questionnaire associated with each other. This reliability calculation using the following formula:

$$a = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right)$$

(2)

Explanation:
α = reliability instrument
k = many of questions
σ_t^2 = total variance
$\sum \sigma_b^2$ = item number variants

2.4. Qualitative Data Analysis
Qualitative data analysis core activities, namely data reduction with field reports concluded, noting the key points that are relevant to the focus of the problem. The focus of these issues include: a) to develop a systematic way based on specific categories and classifications, b) to create tables, graphs or images so that the relationship between the data with other data visible and intact, c) to analyze the data in depth, d) to present the findings, draw conclusions in the form of a general trend, as well as recommendations for the developers.

2.5. Quantitative Data Analysis
In this study, the analysis is carried out as follows:

2.5.1. Analysis Descriptive Statistics. Descriptive statistical analysis used in this study is the presentation, with the following steps: Creating a distribution table answers to the questionnaire variables X and Y, Determine a score of respondents with a score of predetermined conditions, Summing score the answers obtained from each respondent, and Enter the scores into the formula:

$$DP = \frac{n}{N} \times 100\%$$

(3)

Explanation:
DP   =   Description Percentage
n   =   the amount of the expected score
N   =   Percentage value or result

2.5.2. Hypothesis testing. In this research, hypothesis testing was done by t-test to see how far the influence (positive or negative) of the independent variables related variables.
Testing the hypothesis can be stated as follows:

Ho: $\rho = 0$, means that the independent variable (X) has no effect on related variables (Y).
H1: $\rho \neq h0$, means the independent variable (X) positive or negative effect on related variables (Y).
If $t_{count} < t_{table}$, then H0 is accepted, the independent variable does not affect the relevant variables.
If $t_{count} > t_{table}$, then H1 is accepted, the independent variable has an influence on related variables.

3. Results and Discussion

Researchers obtained two types of data, qualitatively and quantitatively. Quantitative data obtained by conducting pre-test and post-test, while qualitative data obtained through a questionnaire addressed to students when they use cyberblog.

From the interviews there are some of the conclusions obtained a potential and problems, including it makes students simply copying what is done by the teacher so that there are students who are constrained in logical thinking because they do not understand the process / sequence of the material being taught, students' ability in understanding depends on how able and know him to follow what is taught by the teacher. This makes some students are in a state with no sign of lectures it will be difficult to follow the subject matter further, and the facilities available in the department of computer science education is sufficient UPI good computer for practice, classrooms and internet connection is capable of supporting ICT-based learning.

3.1. Collecting Information

Based on the potential and problems that have been identified previously, the authors propose solutions to overcome problems that occur by utilizing existing facilities in the department of computer science education. The solutions can be described as follows:

3.1.1. Required media learning that encourages students to understand the concept of logical thinking independently so that students can understand the sequence of instructional material taught in class to ensure that students really understand not just imitate what is done by the teacher. Algorithms and programming difficulty level is quite high because of the concepts taught hard to imagine that require picture material in the form of design that is packed in multimedia.

3.1.2. By utilizing the facilities available in the department of computer science education, researchers conducted cyberblog development specifically designed to assist students in logical thinking so that students are able to understand the material sequentially.

From the above solutions, researchers implemented a redevelopment of multimedia based learning with cyber-blog system. That was developed with using IMSDD (Interactive Multimedia System of Design and Development) method is very suitable for the development of multimedia which also requires the development aspects of the Software Engineering optimal. IMSDD method is the development of the waterfall method adapted to the needs of multimedia application development.

3.2. Software and Hardware Requirements

3.2.1. Hardware Requirements Analysis. When using a program or application then there will be a minimum requirement to be considered so that the programs/applications can be used as well. These applications also require a browser, which is recommended by the researchers is google chrome. For Redeveloped Cyberblog, the minimum requirement to be considered are as follows:

Table 1. Minimum Requirements of Hardware

Hardware	Specification

Processor	Pentium 4
RAM	256 MB
VGA	32 MB
Monitor Resolution	800 x 600
Hard disk	64 B

3.2.2. Software Requirements Analysis. To support the development of this web-based multimedia required adequate and appropriate software. Here are some of the softwares used by researchers in developing web-based multimedia: Notepadd++, Xampp, Google Chrome Browser, and Adobe Photoshop CS5

3.3. Cyber blog Products based on intelligence tutorial
In this research, cyber blog redeveloped with the aim to assist students in logical thinking with some adjustments.
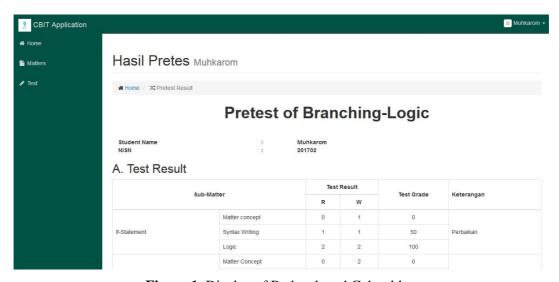

Figure 1. Display of Redeveloped Cyber blog

There are two types of users, students and teachers. Students have access to select subjects in which there are course materials and tests as a form of evaluation. While teachers can determine where the material will be displayed and the matter of what will be used in the test and see the value generated by the students.

Figure 2. Result Feature in Cyberblog

Figure 3. The results of program execution

After the program's source code is displayed, the user can view the execution results in the form of CMD featuring the execution of the program has worked.

3.4. Research Data Analysis
Quantitative data obtained was a pre-test score and post-test score of the control group and experimental group.

3.4.1. Pre Test Data Analysis. Before the student given treatment in learning, students are given first pre-test to measure students' initial ability. After that the student will be given treatment in terms of learning and after that given post-test to determine the increase students' understanding of the concept. This is the following descriptive results of the control and experimental group pre-test.

Table 2. Student initial ability

Value	Experiment	Control
Mean Value	73.78	71.22
Standard Deviation	9.36	8.05
Variance	86.45	62.74
DK	58	
t_{count}	1.58	
t_{table}	2.00	
$t_{count} \leq t_{table}$	There is no difference	
$t_{count} > t_{table}$	There is a difference	

From 30 students on experimental group their mean initially capability reached 73.78 while 30 students on the control group mean initially capability reached 71.22. From the table, it is seen that there is no significant difference between students' initial capability of the experimental group with the initial capability of the control group.

3.4.2. Post Test Data Analysis. Post-test is done to determine ability of logical thinking of the student. After the post-test data results obtained, the next step is to perform data processing to obtain descriptive statistics of the data value post-test experimental group with the control group.

Table 3. Student mastery concept after the learning/research

Value	Experiment	Control
Mean Value	82.23	74.22
Standard Deviation	8.86	8.65
Variance	80.22	76.58
DK	58	
t_{count}	4.16	
t_{table}	2.00	
$t_{count} \leq t_{table}$	There is no difference	
$t_{count} > t_{table}$	There is a difference	

The 30 student from experimental group the average value capability reached 82.23 while 30 students from control group reached 74.22. From the data we can see that the differences between final student ability in the experimental group and control group.

3.4.3. Student Logical Thinking Mastery Test. After being tested to determine the increase in student logical thinking mastery of using a normalized gain obtained mean gain between the experimental class and control class. The test results of student logical thinking mastery in experimental group and the control group after following learning can be seen in table 4.

Table 4. Student Logical Thinking Mastery Test

Data	Class	N	Mean	Standard Deviation
	Control		65,22	8,65
Post-test	Experiment	30	77,22	8,99

Improved understanding of the concept that was achieved by the students in the experimental group was made possible because the students do not merely passively receive materials, but students actively construct their understanding of the stages of learning using redeveloped cyberblog.

The last Effectiveness is often closely related to the comparison between the objective achievements with the predetermined plan or comparison of actual results with the planned results. This is consistent with the results conducted by researchers that there is an increase in the ability of understanding the logical thinking after implemented the redeveloped cyberblog.

4. Conclusion

From the analysis and discussion of research data that has been done, some conclusions can be drawn from this research. First, redevelopment of interactive multimedia learning in this research that is cyberblog, just as a tool in the process of delivery of algorithm material. Multimedia development is made in several stages, beginning of the analysis, design, development, implementation, and the assessment stages. Second, Student ability in logical thinking is increased as seen from the comparison pretest formerly 73.78 into 82.23 in posttest after the researchers applied a redeveloped cyberblog in

learning. Third, Most of the students gave positive responses regarding the learning that using cyberblog because there is a blocky that helps them in sequence algorithms view on each case/problem.

Researchers also have suggestion based on the results of this research include the following: To use this redeveloped cyberblog system needs good internet connectivity so that the school/college should provide the infrastructure that supports these activities and In applying this redevelped cyberblog system, teachers should pay attention to the time allocated when giving a lecture and tried to gauge student understanding with problems or other challenges.

5. References

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