# Development of Computer Assisted Instruction (CAI) Based Teaching Materials in Junior High School

Sri Wahyuni

Universitas Jember, East Java, Indonesia

Email : sriwahyuni.fkip@unej.ac.id or yunifisika@gmail.com

*Abstract*— **CAI-based teaching material is a material delivery system that incorporates multiple media learning. The interactive media is designed and programmed into a computerized system. Teaching materials in science that based on CAI system has been suggested to improve student's learning outcome. The purpose of this study is to produce a CAI-based interactive teaching material, to describe students' response after learning the CAI teaching materials, and to assess student's learning outcome. The CAI teaching materials were developed in 4D designs. This study was carried out in the state middle school (MTs Bustanul Ulum) Panti Jember. Subject of the study were students at the seventh grade. Data were collected in interviews, documentation, logic validation, questionnaire and test. Expert validation on instruments was at 3.77 categories. Score of student's learning outcome showed 76.5. The conclusion is a science teaching materials based on CAI can be used in junior high school.**

*Index Terms*— **Computer Assisted Instruction (CAI), Validation, Learning Outcome**

## I. INTRODUCTION

Nowadays Information and Communication Technologies (ICT) are widely used in a variety of fields all over the world, As for instance in education, ICT in education really change the way of traditional learning to more effective learning. ICT has become an important tool for teaching and learning. It allows a more personalized learning in schools and greater flexibility [1]. Millennium newborn significant impact on research in the emerging digital home education students will encounter, we need to consider the cognitive skills of digital technology and the impact of learning expectations [2]. Moreover, social values and lifestyles of the evolution of important issues All this will have an impact on education, we must take into account in the design of a new syllabus should also be noted that the increasing use of information and communication technology will also affect the valuation techniques. Using ICT throughout the academic year and then providing end of year pen and paper tests are not a compatible exercise and will affect adversely the pupil performance. Therefore, the evaluation should also be mirrored, ICT in the classroom and how general education has been used [3].

The use of information and communication technology as a teaching and learning aid must be integrated into virtually every subject curriculum [4]. With ICT innovative teaching and learning methods, which can be developed independently, the student center, they are actively involved in the learning process and encourage discovery and learning experiences, problem solving skills, and so on [5]. At the same time develop the skills and efficiency aspects of digital, digital tools such as online collaboration, self-confident and critical use [6].

Not all students will have the opportunity at home or elsewhere, digital resources, there are several reasons. In some countries, the most advanced computer from home is almost 100%, but there are still some homes without. Some people do not have access to the Internet (or broadband), because of where they live or their socio-economic status. Schools should provide students with the opportunity to develop digital literacy [7].

The implementation of curriculum 2013 in schools should be done by ICT in secondary schools usually doubled, information and communication technology is used as a tool throughout the course depends on the device and access to resources, but also as an independent discipline in its own. It is like what in the regulation of ministry of national education Number 22 year 2006 about the standard content that the substance for science learning in junior high school based on ICT [8]. According to [9] science teacher will be able to give science knowledge to student in simple and suitable procedure if he/she masters science material well. Besides that, is teaching material based on ICT is very needed to be guidance for teacher and student. Thus, the implementation of science learning based on ICT in junior high school has strong legal basis.

Globalization demands education world always to adapt technology development to the improvement of education qualify, especially learning process. Teachers should be familiar with a variety of teaching methods, especially learning process. One of the important thing in learning process is teaching [10].

Teaching material is everything that is prepared and used by teacher to help to do learning process in the classroom [11]. One of them through developing

computer based teaching material that utilizes computer flexibility to solve the problems. The instruction uses computer is known with learning concept with computer assist or known well as CAI (Computer Assisted Instruction). CAI concept has function as learning material presenter, learning material depositor, still gives learning evaluation analysis [12].

For the last twenty five years the development of CAI especially in developed countries was very rapid. Many experimental researches about CAI has been conducted to evaluate the effectiveness of some CAI programs. The result of researches was inclided to conclude that learning using CAI would increase the learning achievement than others. Even according to [13], if it was compared with the others, CAI was very effective and dan efficient. The pupils will learn faster, mastery and memorize the concept wider what they have learnt.

But according to [14] criticized that learning program such as CAI could be effective but if only put learning material into computer randomly, it would not increase learning effectiveness. Thus according to [15] suggested that making CAI had to be planned well and focused on using CAI in different situation from others.

Thus CAI learning program developed in this paper made in learning material on science learning. This is because of abstraction level and high reasoning, and application of mathematics, and those things will be learnt easily through tutorial approach with computer.

CAI is expected can help learning process to get satisfy learning outcome. Science teaching material based on CAI is teaching material development product that has been arranged by researcher based on student's need, so it can be reached learning objective what is desired.

Based on the background, the objectives of this research are to produce interactive teaching material based on valid CAI and to describe student's learning outcome after using teaching material based on CAI in state middle school (MTs Bustanul Ulum) Panti Jember.

## II. LITERATUREW REVIEW

Nowadays the educator has gotten access to use some technology application for increasing the effectiveness of teaching and learning. Computer is as one of technology application appropriate to be used in learning process. Some instrucsional approaches are made in computer assisted can be gotten through computer.

Learning process uses CAI has been developed lately and it has helped the teachers and students to learn. The computer can help tens students in the future and expected to help thousands students at once. CAI is as approach using computer in teaching by involving students actively and giving feedback. Model of CAI is divided into five i.e. tutorial, exercise and practice, problem solving, simulation, and game [16].

a. Tutorial

Tutorial uses theory and learning strategy by giving material, question, sample, exercise and quiz so that the students can understand a correct concept. This tutorial is also with remedial form, because if the students fail, they will be given remedial only with the topics they fail.

b. Exercise and Practice

Exercise and practice is instructional method used to give some exercises again and again, the objectives are the students will be more skilled, fast, and precise to show their skills. For example typing skill and answering analytical question.

c. Problem solving

Problem solving is method of teaching which the students are given some exercises, then asked the solutions, the objective is to analyze the problems and solutions.

d. Simulation

The process of simulation is usually used to teach the process or concept that is abstract e.g. how the impact from pollution, landslide, flood and etc.

e. Game

The game material is something will be taught, all at once it is also as motivator. Motivation approach in this paper is intrinsic motivation i.e. where there is award or without reward whether the students like or dislike with that game.

Learning based CAI has some aspects that can increase learning effectiveness. Those aspects are feedback, branching, assessment, monitoring of progress, guideline, and appearance. To get high effectiveness, the development of CAI needs good planning. CAI made randomly will not increase learning effectiveness for the user. So CAI can be good media for learning but also the other way.

According to [17] good CAI program should cover four activities: (1) information (subject) has to be given or skills gotten, (2) the students have to be given instruction, (3) students are given exercises, and (4) students' learning outcome have to be assessed. Some aspects in CAI program CAI are: feedback, the interaction between students and program, clear introduction and objective, sample and demonstration, clear guideline and assignment.

A CAI program need to be evaluated to know the level of validation. According to [18] validation showed that how learning prgram based CAI had function as should be planned. Evaluation sheet from The National Center for Research in Vocational Education has been widely used to evaluate CAI program on engineering and vocational field. Some aspects evaluated e.g. matter, appearance, students' interaction, documentation, and students' learning outcome.

## III. METHOD OF RESEARCH

This research is research and development. The research subject is students at the seventh grade in state middle school (MTs Bustanul Ulum) Panti Jember. Technic of determining sample from this research uses purposive sampling through analyzing the student. Purposive sampling is sample determining technic with consideration so that it is worthy to be sample. This consideration is done on analyzing student step in phase definition, in model has been explained about student characteristics appropriate with planning and development of teaching material [19].

Teaching material based on CAI design in this research uses 4-D developed by Thiagarajan, then modified by researcher become : 1) definition; 2) planning; and 3) development. On its principle the first step is to determine what method will be used. There are five methods of CAI i.e. tutorial, exercise and practice, problem solving, simulation, and game.

Data was gotten through some instruments i.e. 1) CAI evaluation sheet developed by The National Center for Research in Vocational Education that is attitude assessment with Likert model scale, 2) post-test for assessing students' learning outcome, 3) video recording so it can be observed how the students used CAI based teaching materials, and 4) interview to encompass students' response to teaching materials.

The instrument of acquisition data is tool uses to get data that will be analyzed so that the researcher can know that developed teaching material has valid or not valid category. The instrument used in this research is teaching material validity sheet based on CAI, questionnaire response sheet and test.

Teaching material validity is examined by validator so that it can produce valid product that can be used for development test. Student's learning outcome is student mastery of learning outcome got from the result of total score average on cognitive, affektive and psychomotor domain. Where the category of student's learning outcome is from very low till very high [20].

## IV. DISCUSSION AND RESULT

The result of experts validity by two lecturers from University of Jember and one science teacher in state middle school (MTs Bustanul Ulum) Panti Jember, shows that teaching material based on CAI is classified on valid category. The result of assessment analysis from validator to CAI can be seen on Table 1.

TABLE 1. THE RESULT OF LOGIC VALIDITY ANALYSIS

| Number | Validator | Score Percentage | Score | Category |
|---|---|---|---|---|
| 1 | Content | 95 | 3.90 | Worthy |
| 2 | Format | 60 | 3.71 | Worthy |
| 3 | Language | 58 | 3.70 | Worthy |
| Score of Validation | | | 3.77 | Worthy |

Based on Table 1. is known that the assessment from experts from content side reviewed from broadness, depth, and true concept got average score 3.90. This score is got from validity score average, where validity total score gets 95 then divided total statement aspect 25, then multiplied 100%, so the teaching material from the content side gets score 3.90. While from on format side is 3.71 and from language side is 3.70. Teaching material is worthy if the score above or equal to 2.06 and not worthy if gets score below or equal to 2.05 [21]. Thus it can be concluded that teaching material based on CAI that is developed by researcher has worthy criteria to be used in learning process. On this step also get suggestion from the experts.

The result of learning outcome data analysis from three domains i.e. cognitive, affective and psychomotor that has been analyzed using learning outcome formula can be seen on Table 2.

TABLE 2. THE RESULT DATA OF STUDENT'S LEARNING OUTCOME

| Number | Domain | Score Percentage | Category |
|---|---|---|---|
| 1 | Cognitive | 78.5 | High |
| 2 | Affective | 77.5 | High |
| 3 | Psychomotor | 71.5 | Moderate |
| Score of Learning Outcome | | 76.5 | High |

Analysis of student's learning outcome is got from analyzing data of cognitive, affective and psychomotor domain. Cognitive domain is got from post-test score where the student do exercise in the end of learning process using computer. Cognitive score average is got 76.5. It shows that student's cognitive learning outcome can be categorized high.

Affective score average is high category. Affective domain assessment is showed on learning activity score in the class begin with pray, curiosity, thorough, responsibility and cooperation. In learning activity uses this teaching material the student is demanded to learn independent and more active.

Psychomotor consist of the student observe video instruction with teaching material based on CAI and collect the data from that observation. This domain gets moderate category. Psychomotor score result is categorized moderate because there was some troubles with some computers that had no function smoothly when video observation process, it influenced the process of student on observation till make conclusion.

## V. CONCLUTION

Based on the result of research and discussion, it can be concluded that teaching material based on CAI that is developed it has been worthy used on instruction in junior high school because it gets score 3.90, 3.71, and 3.70 from experts validity result. Besides that teaching material based on CAI that is developed also can increase student's learning outcome. It can be seen that cognitive score average is 78.5 on high category, affective score average is 77.5 on high category, and psychomotor score average is 71.5 on moderate category. Teaching material based on CAI can be solution to increase student's learning outcome. Besides that, the teacher is expected to be able to make teaching material by his/herself to increase student's learning outcome in different chapter.

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**Sri Wahyuni** was born on December 15th 1982 in Sidoarjo. She is Lecturer of Physics Education Department, Universitas Jember. She graduated in 2004 from Physics Education Department Universitas Jember. In 2010 She graduated from post graduated science education Universitas Negeri Surabaya with thesis about developing virtual laboratory based teaching material in junior high school.

In 2013 and 2014 she got grant for research from DIKTI (Directorate of Higher education) abaut developing macromedia flash based teaching material for improving student's critical thinking skills in junior high school.

She became member of ALSI (Assosiation of Lesson Study Indonesian), organization that care about learning and teaching of Indonesia. She became participant or member in national conference. The title of scientific articles, under the title "Developing WEB-Based Performance Assesment in Integrated Science Course" and published as Indonesian Journal of Science Education.