

Problem Based Learning (PBL) as a learning device integrated with Computer Assisted Instruction (CAI) to enhance junior high school students comprehension on the concept of sound

by Muhammad Nur Hudha

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Problem Based Learning (PBL) as a learning device integrated with Computer Assisted Instruction (CAI) to enhance junior high school students comprehension on the concept of sound

S D Aji, A D Hendrayana and M N Hudha*

Physics Education Study Program, Universitas Kanjuruhan Malang, Jl. S. Supriadi no 48, Malang, Indonesia

*muhammadnurhudha@unikama.ac.id

Abstract. This research is a research development using 3D models that have been modified from 4D models by Thiagarajan. The aim of this research and development is to describe the developed learning device model that is the Problem Based Learning model integrated with Computer Assisted Instruction to enhance Junior High School students comprehension on the concept of sound. The data are gathered through the interview, filling out the questionnaire about validation of the learning device, physic test on the comprehension of the student, observation on the study process and students responses questionnaire. The test result shows that PBL learning device model integrated with CAI is feasible to be used in the learning process to enhance the students concept comprehension. The finding is based on the fulfillment of the four eligibility criteria such as; (1) Expert validation result and physic teacher for the developing learning device is highly feasible for the learning process; (2) The average percentage on the learning implementation in the test activity is decent; (3) There is an improvement on the concepts comprehension that is showed by the improvement of the average on the comprehension tests result; (4) The students responses are favorable in learning using the learning device PBL model integrated with CAI.

1. Introduction

Physics learning will be very effective if the students are trained in thinking skills [1,2]. The ability to think will be easily understood by students by using a constructivist-based learning model. One of the learning models is problem-based learning (PBL) [3,4].

Technology can be used to facilitate the learning, how the teachers utilise these tools to reach its optimal values [5], especially in the application of computer as the media in learning (Computer Assisted instruction / CAI) [6,7]. With a computer as the media, the animation will be able to provide much needed external visualization and content so it can enhance the student's understanding of the concept. Animation can be used to show a certain situation in a way that is more convincing than writing or graphics to increase the student's understanding. So, animation can be very helpful in giving opportunities for students to ask and understand the concept and works as an effective assessment tool. Students find it more difficult to interpret graphs or static images compared to animated images. An animation provides more information than static objects or motion descriptions because animation shows all aspects of motion at any time.



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The incorporation or integration of CAI into PBL needs to be done because each has advantages. In addition, not all learning materials, especially physics, can be learned and proven through experiments in the laboratory, so not all materials can be provided using the PBL model. It takes a learning model that can be used to study physics material which is expected to provide an increase in students' cognitive abilities which means the comprehension of students' physics concepts will be getting better.

Research on the integration of PBL with technological devices has often been used in the learning process [8,9]. The purpose of this study was to develop learning devices for Problem Based Learning (PBL) and Computer Assisted Instruction (CAI) models to Enhance the Comprehension of Physics Concepts for Middle School Students.

2. Method

The carried out research is part of development research (Research and Development). This research is focused on the development of learning devices to enhance the comprehension of the concepts of Physics for Middle School students. In this study, the learning device developed was using the Problem Based Learning (PBL) model which would be integrated with the Computer Assisted Instruction (CAI) model which was implemented for the eighth-grade students of the SMP on the subject of sound.

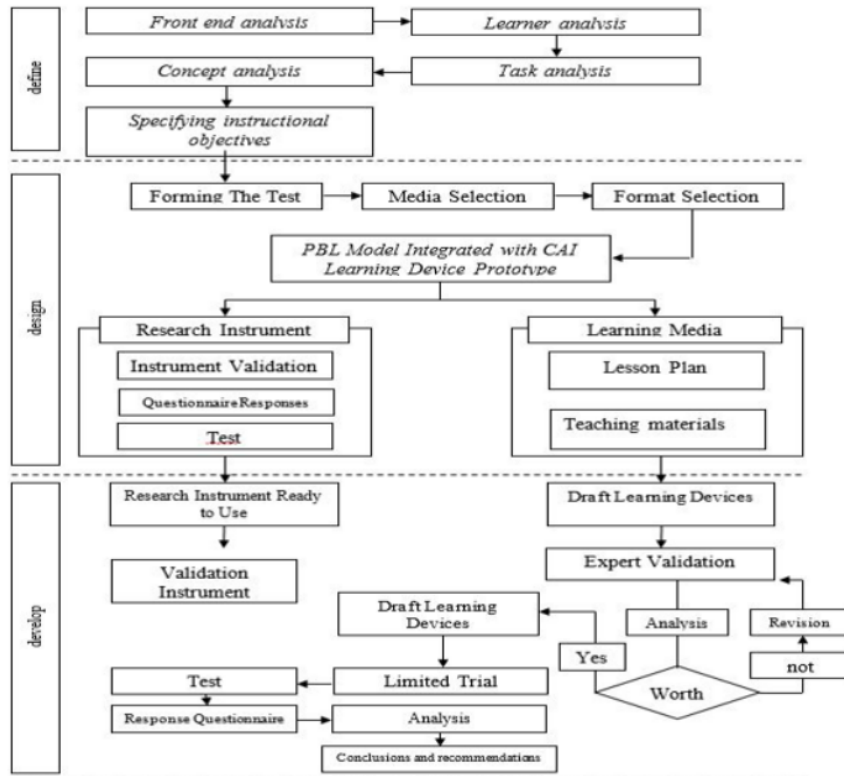


Figure 1. Proccedur research and development.

To be able to assess various variables that have been determined, this study uses research and development methods (3D) that are modified from the 4D model, define, design, develop and disseminate [10,11]. The development model can be seen in Figure 1. The instruments used in this research and development are interview instruments, validation instruments, and student response questionnaires

3. Results and discussion

The teaching materials elaborated in accordance with the learning model developed by researchers which is the integrated PBL CAI. CAI has positioned the computer more as an aid in learning [12]. Learning material has been packaged and programmed to be easily learned by students. Students simply follow the steps contained in programmed teaching materials. The model chosen by researchers to develop this teaching material is the tutorial model. So that the flowchart developed to describe teaching material programs can be seen in Figure 2.

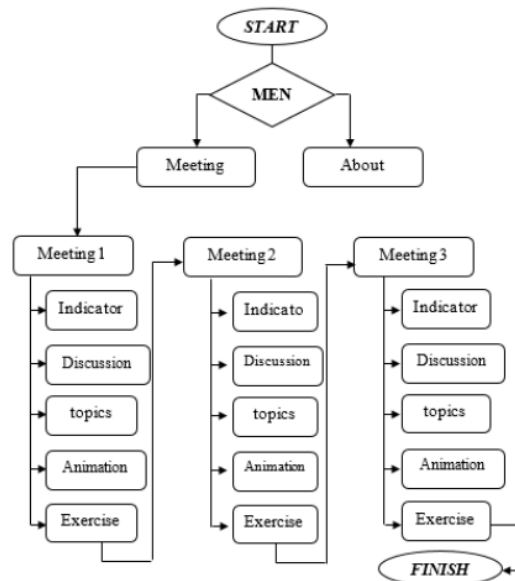


Figure 2. Flowchart teaching materials.

Learning devices using the integrated Problem Assisted Learning (PBL) Computer Assisted Instruction (CAI) model to enhance the comprehension of physics concepts for Grade VIII SMP Taman Dewasa students is a learning device developed through the 3-D stages namely defining, designing and developing in the form of learning syllabus, Learning Implementation Plan (RPP) and teaching materials. Learning stages in the Problem Based Learning Model (PBL) integrated Computer Assisted Instruction (CAI) using the guidelines in accordance with the Learning Implementation Plan (RPP) and as supporting part of the implementation of learning used teaching materials that are packaged in the programs stored on Cassette Disk (CD) that can be run on a computer. The learning steps using the Problem Based Learning (PBL) integrated Computer Assisted Instruction (CAI) model are (1) the teacher divides the class into groups; (2) the teacher divides the Student Worksheets to each student and teaching materials with computer as the media to each group; (3) the teacher expose the students to the problems regarding the material to be taught through demonstrations or displays in teaching materials; (3) students elaborate to find the answers to the problems given through group discussion activities or conducting experiments in groups utilizing teaching materials as a tool and source of learning; (4) One group representative presents the results of the observation, the results of the discussion or the results of the experiment in front of the class; (5) The teacher aligns the answers to the initial problems given and directs the students to independently evaluate the discussion or experiment activities by answering the questions in the teaching material in accordance with the steps of the discussion or experiment; (6) The teacher evaluates learning by directing students to do problem training in teaching materials through computer media that immediately gets feedback; (7) The teacher concludes the learning material learned together with students.

Learning devices use the Problem Based Learning (PBL) model of integrated Computer Assisted Instruction (CAI) is feasible to be utilized in learning to enhance the comprehension of students' concepts [13,14]. This is because after the research has been carried out it has fulfilled the four points of the eligibility criteria, (1) the results of expert validation state that the learning device is declared appropriate for use in learning; (2) learning devices developed have been tested with good criteria or the average percentage of the implementation of learning in the trial activities is 80.921%; (3) an increase in the comprehension of concepts as indicated by an increase in the average test results of the concept in class VIII E SMP Taman Dewasa from 53.50 with students completing 0% to 65.46 with completeness of 25% and the average comprehension of concepts physics between classes taught using a developed model is better than a class taught conventionally or not using a developed model; (4) Good students' responses in learning using learning tools developed.

4. Conclusion

Learning devices using the Problem Based Learning (PBL) model of integrated Computer Assisted Instruction (CAI) is feasible to use in learning to enhance the comprehension of student concepts based on four eligibility criteria. This can be seen from the results of validation and student responses that are quite good.

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