Computer game-assisted intructional model for teaching science in elementary school

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Abstract. This paper discusses the results of an experimental study on the implementation of computer-assisted science teaching in an elementary school in Indonesia. With a goal to enhance student learning interests and outcomes, we experimented a science teaching practice using a computer game. To this end, we involved as many as 31 students in our study. Student learning interests were measured using questionnaires. After conducting three experiments, we found that the use of a computer game effectively improved their interests in learning science. In addition, the improvement was made in their learning outcomes.

1. Introduction

Teaching and learning are two basic processes underlying the activity of students and teachers nowadays. Learning process puts both parties toward each other, what it teaches, and what it takes, the teacher and the student. Today takes great importance to the training of students to teach themselves, their education, equipping them with the skills of independent work with the most advanced methods of learning conscious, sustainable, active and creative [1].

Furthermore, innovation in learning will be closely related to the times that surround it. Say, like today, the world community feels helped by digital technology which makes it easier in every field, including education. Therefore, several multimedia-based innovations were introduced to achieve competent learning objectives [2].

Learning will feel easier and more fun if you have an interest in learning. According to Pierce interest is how much the individual feels like or dislikes a stimulus. Something you are interested in will attract more attention. Interest in learning is closely related to the learning outcomes of students. Student learning outcomes in essence as changes in behaviors as learning outcomes in a broader sense covering the cognitive, affective, and psychomotor fields [3].

Researchers assume that technology-based educational innovations have a great opportunity in increasing the interest and learning outcomes of students in learning, especially the application of computer game-based learning media (games). This is based on the fact that students who are young teenagers will feel attracted to interactive media (games) that are kinesthetic. In the world of education, the game model is indeed developed based on “fun learning” because students will be faced with several instructions and game rules [4]. Learning is designed as if students follow the games that are presented
through certain simulations needed so that students are able to apply all their learning experiences in solving the problem in question [5].

From this phenomenon, researchers have the view that learning can be responded to through the application of interactive media games can be more meaningful by providing a more up-to-date (inventional) digital-based breakthrough so that it can be accessed by the wider community.

2. Methods
The approach used in this research is a quantitative approach. The experimental design used was Pre Experimental Design. The form of this research design is a one-shot case study. This study uses one class as an experimental class, learning with this game is given three times, at the end of each meeting students are given a written test sheet to see the learning outcomes of students at each meeting. The sample in this study was one fourth grade elementary school in Natural Sciences learning which was taken using purposive sampling technique. The instrument used in this study was a learning interest questionnaire that was used to determine students’ interest in learning during the learning process. This questionnaire uses interest indicators, namely: feeling happy, feeling attracted, attentive, having a positive attitude, and meeting needs. Furthermore, a written test sheet consisting of questions according to the subject matter. This written test consists of 20 questions, which are multiple choice questions consisting of four answer choices. Data analysis in this study using inferential statistics, is a statistical technique used to analyze sample data and the results are applied to the population. To analyze the statistical data in this study, IBM SPSS version 20 was used.

3. Results and discussion
Students’ learning interest after participating in learning using games in this study was measured through a learning interest questionnaire. The statistical test was carried out using the help of IBM SPSS version 20 and the results were as follows:

| Study Interest | Sum of Squares | df  | Mean Square | F     | Sig.  |
|----------------|----------------|-----|-------------|-------|-------|
| Between Groups | 451.763        | 2   | 225.882     | 3.865 | .025  |
| Within Groups  | 5259.355       | 90  | 58.437      |       |       |
| Total          | 5711.118       | 92  |             |       |       |

Based on the Table 1, it is known that the significance value of interest in learning is 0.025 which is smaller than α = 0.05, so it can be concluded that there is an increase in interest in learning by applying the Computer Assisted Instruction (CAI) game model in science learning.

Learning outcomes in this study were measured using a written test that was given three times at the end of each lesson. The statistical test was carried out using the help of IBM SPSS version 20 and the results were as follows:

| Learning Outcomes | Sum of Squares | df  | Mean Square | F     | Sig.  |
|-------------------|----------------|-----|-------------|-------|-------|
| Between Groups    | 5827.032       | 2   | 2913.516    | 9.100 | .000  |
| Within Groups     | 28816.258      | 90  | 320.181     |       |       |
| Total             | 34643.290      | 92  |             |       |       |

Based on the Table 2, it is known that the significance value of learning outcomes is 0.000 which is smaller than α = 0.05, it can be concluded that there is an increase in learning outcomes by applying the CAI game model in science learning.
The results of the calculation of N-Gain in 1st learning with 3rd learning for interest in learning is 0.20, while the value of learning outcomes is 0.45. These results indicate an increase in interest and learning outcomes in each lesson. Based on the results of these calculations, the researcher concluded that the CAI Game Model was effectively applied to science learning.

Increasing students' interest in learning cannot be separated from the precise selection of learning media, the use of CAI game media in this study, the emphasis lies in continuous efforts to maximize teaching and learning activities as a cognitive interaction between students, subject matter, and instructors [6]. Therefore, learning media has a contribution in improving the quality of learning. Learning media not only helps educators in delivering their teaching material, but also provides a different atmosphere in learning activities, such as increasing student interest and understanding [7].

Learning is based on instructional games. Instructional games require students to play a role in dealing with problems [8]. Dickey [9] explains that there is a link between the game model and generating motivation. There are two things that can generate motivation from this game model, first a plot hook and secondly, there is emotional proximity.

Researchers assess that the game model is a suitable medium for use in natural science learning in Biology material because students can be directly involved in an atmosphere that is created similar to the original. This is indicated by the results of the study that the application of the CAI game model as a form of interactive multimedia has an influence on increasing students' interest in learning. This increase in interest in learning is in accordance with states that interest is not permanent, but temporary or changing. When a person judges that something will be useful, he becomes interested, then that will bring satisfaction. When satisfaction decreases, interest will also decrease [10]. Increasing the cognitive abilities of students can not be separated from the factors that can make students interested in learning. Factors that can make students interested in learning, namely: factors of how to teach educators, factors of teacher character, factors of calm and comfortable class atmosphere, and factors of learning facilities. The basis of implementing the CAI game model is fun learning. This helps increase students' interest in learning because it attracts attention and is also fun, because students learn while playing [11].

The application of the CAI game model as a form of interactive multimedia has an effect on improving student learning outcomes. The improvement of learning outcomes in this study is supported by external factors that influence it, namely teaching methods and learning tools in the form of game media. This is in accordance with what [12] states that one of the factors that influence learning outcomes is the factor of teaching methods, curriculum, and learning tools. The effect of the CAI game model is able to provide more relaxed conditions for students when learning. With this condition, students will not experience learning fatigue because the material presented is a form of play [13].

The CAI game model is an interactive learning medium that maximizes the use of learners' senses for learning. In the game model there are animated images, narrative text, sounds, and direct involvement of students in completing games that allow students to maximize the use of their senses so that learning becomes more effective.

4. Conclusion
Based on the research results, it can be concluded, namely: there are differences in the interests and learning outcomes of students by applying the CAI game model, so it can be concluded that the application of the CAI game model can increase interest and learning outcomes in natural science learning. The increased interest and learning outcomes of students shows the effectiveness of learning by using the CAI game model. Based on this, the researchers concluded that the CAI game model was effectively applied to science learning in grade IV elementary schools.

Acknowledgments
This work will not be possible without financial support from the Institut Pendidikan Indonesia of Garut. I am especially indebted to Dr. Nizar Alam Hamdani, M.M., M.T., M.Si, Chancellor of the Institut Pendidikan Indonesia of Garut, who supported and gave me time to complete this research.
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