The development of web-based multimedia physics learning tool to enhance student’s character

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Abstract. The learning media could (1) make more attractive learnings; (2) realize interactive learning through the application of learning theories and psychological principles in terms of student participation, feedback, and knowledge; (3) improve the quality of learning outcomes when integrated with words and illustrations to accurately and clearly communicate the elements of education; (4) enhance students’ positive attitudes towards the things they have learnt and learning processes. Furthermore, Dewey emphasised that educational purposes are not only to result in well-informed people but also to know the culture, master science, and develop intellectuality. This research aimed at revealing the effectivity of web-based physics learning tool aided with educational videos to enhance the students’ characters and learning outcomes. The research population was X High School graders. The data were taken from observation and test. Shortly, the research found that the learning tool could enhance the students’ characters and learning results.

1. Introduction
The phenomenon of juvenile delinquency often occurs in Indonesia. [1] and [2] argued that several factors underlying such juvenile delinquency are family, environment, and school. Therefore, school character education intends to instil positive habituation to students to behave accordingly to the existed values.

An integration of character education is conveniently done at either the preparation, implementation or evaluation stage. The synthesis of character education in science could be performed through the selection of the learning model, learning media, assessment type, and learning topic. Science learning models that have modest effects are cooperative, contextual, problem-based, problem-solving, and inquiry learning [3].

Character education for students has to be supported by an appropriate learning tool designed mainly for the learning objective, i.e. by integrating positive values in learning [4]. The first step to develop characterised learning tool is analysing the initial state of students and the environment. The obtained data were referred to as the basis on the development of a web-based multimedia physics learning tool.

The presence of characterised learning tool is essential to cultivate positive characters of students. The students’ frequent interaction with the learning tool would show changes in their attitudes [5]. The values dig from the learning materials would also create a meaningful lesson.

We can deny that multimedia technology could provide a remarkable impression in the communication and educational field as it integrates text, graphic, animation, audio, and video. Multimedia has developed a dynamic teaching and learning process [6,7]. On this basis, multimedia
can be used in learning to explore the positive and negative impacts of science related to physics to develop students’ characters.

With this in mind, this study has formed a research problem as the research focus; ‘how is the effectivity of web-based multimedia physics learning tool to enhance students’ characters and learning outcomes?’ The research objective was to find out the effectivity of the learning tool containing peace-loving character and environmental care value.

2. Methods
A field trial to the use of the developed tool was carried out. The established learning tool consisted of lesson plans, independent worksheet, learning website, learning video, pre-test, and post-test.

The research population was X grade students of SMA N 1 Wonotunggal, Batang. The study began with the pretest followed by learning activities using learning tools that have been developed and ended with a pretest. Student achievement data were taken using a test and analysed statistically while the student character data were collected through observation and analysed descriptively.

3. Results and Discussion
3.1. Learning Outcome
Learning outcome is changes in behaviour as a result of learning in the broader scope of cognitive, affective, and psychomotor determined by evaluation. Learning outcome evaluation is a process to decide a student’s score through assessment activities after experiencing certain learning activities. This study employed a post-test as the indicator of student cognitive learning and humanity value contained in the developed learning media.

A data normality test with Chi-Square revealed that the data were not normally distributed as appeared in Table 1.

| Class Interval | Class Limit | Z for Class Limit | Probability for Z | Class Area for Z | Ei | Oi | (Oi-Ei)² | Ei |
|---------------|-------------|--------------------|-------------------|------------------|----|----|----------|----|
| 50 - 58       | 49,5        | -1,304             | 0,404             | 0,188            | 6,206 | 5   | 0,2     | 5  |
| 59 - 67       | 58,5        | -0,570             | 0,216             | 0,281            | 9,259 | 15  | 3,6     | 15 |
| 68 - 76       | 67,5        | 0,163              | 0,065             | 0,250            | 8,259 | 8    | 0,0     | 8  |
| 77 - 85       | 76,5        | 0,896              | 0,315             | 0,133            | 4,404 | 3    | 0,4     | 3  |
| 86 - 94       | 85,5        | 2,363              | 0,491             | 0,008            | 0,266 | 2    | 11,3    | 2  |
| 103,5         |             | 3,097              | 0,499             |                  | 33   | 16,931 |        |

The above testing results indicated that the gain was probably measured using the Mann Whitney U Test and the result showed that the students’ cognitive learning outcomes based on the pre-test and post-test values were not the same and there was an increase in the average value of cognitive learning outcomes.

The research obtained that the developed learning tool could increase the students’ learning results and that the outcome of the experimental class was higher than the control class.

3.2. The Use of Media in Character Education
The observation results suggested that the use of learning media in this study could to increase the students’ cognitive learning results. Interest and learning motivation are two psychological factors that have been proven empirically for their significant influence on the students’ academic performance [8,
9]. The conclusion of the analysis pointed out that the results supported the prior research about the relationship between media and the escalation of students’ interest in the learning outcomes.

The media adopted the Hiroshima-Nagasaki Bombing historical events and Niagara Falls as an appealing aspect. The two objects are widely known phenomena that show two sides of energy use and its good and bad effects. The observation found that the students took a great interest in the video of atomic bombs on Hiroshima and Nagasaki, which was seen when they discuss the video which indicated an idea of peace-loving.

Positive view also emerged from the students while talking about Niagara Falls which was utilized as an electrical generator. The students also revealed the importance of preserving the environment to maintain water availability. This is in line with [10] and [11] who argued that the use of video could have a better impact in environmental education.

The observational data showed that the students in the experimental class tended to be active in asking questions and discussing the presented materials, especially on the atomic bomb topic. Students in the experimental class were also involved in discussions and expressed their opinions and views about the nuclear bomb and world peace. The wise use of atomic energy for the sake of humanity and protection of the natural and human resources environment is also in the spotlight in the ongoing discussion activities.

By the time being, character education has not been implemented as expected. As the education practitioner, many teachers have planned to achieve character education by incorporating values into the learning scheme. Based on the observational results, the researchers could draw a red thread between learning media carrying elements of character development as support in learnings.

4. Conclusion
The defining stage through a preliminary analysis with library method found that the Law of National Educational System Act. 20 of 2003, Chapter II, Article 3 demands schools to produce not only creative, independent, and responsible graduates with high cognitive level but also well-informed students. Moreover, the research results revealed that the developed learning tool could improve the students’ positive characters seen from their enthusiasm in discussing the utilisation of energy as an atomic bomb. Besides, the learning tool had a positive impact on students’ learning outcomes.

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