

Development of Cavendish Balance of Aids Based on Blender Application in Learning Physics

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Abstract. The objectives of this research were: (1) to improve the learning outcome; (2) to differentiate the learning outcomes between experimental class and control class, and (3) to investigate the effect of learning motivation on learning outcome. This study was a research and development study (R&D) which consisted of three steps namely (1) Pre-study step; (2) Development step; and (3) Implementation step. The instruments of the study were as follow: (1) Expert assessment; (2) test; (3) student responses; (4) observation; and (5) learning motivation. The results of this study were as follows: (1) Learning process by using the Cavendish Balance of Aids based on Blender Application could improve the learning outcome of the students. The result was 28 students or 30% of the students were in middle category and 12 or 30% students were in high category for experimental class. While in the control class 32 students or 80% students were in middle category, 17 or 17,5% students in low category and 1 student or 2,5% student in high category. (2) There was a significant different between experimental class and control class result because the t calculate score was higher than the t table. (3) There was an effect of learning motivation on learning outcomes.

Keywords: Cavendish Balance of Aids based on Blender Application, Learning outcome, Physics Learning.

1. Introduction

Teacher plays an important role in determining the learning outcomes of students. One of the expected ability is controlled by the teacher how to teach science well so that the learning objectives can be achieved so expect the yield improvement and motivation of students, [1]. It is supported by [2] stated that the aids can be used to explain the facts and phenomena that exist in the environment of the students. This requires teachers to create innovative media or aids to take advantage of the value novelty, but also its capacity to create interactive situations that can increase motivation in learning activities. Additional work that will be undertaken by teachers is needed to better identify potential relationships between motivational learning and problem underlying the issue.

[3] said that learning process by using multimedia can increase the confidence and the motivation of the students. Based on the statement, it can be concluded that the benefits of using multimedia in learning process is it able to present an object or event that is not exist in the classroom. In addition, the use of multimedia in learning process is also able to stimulate the students' curiosity and increase the motivation of students. [4], [5] explained that the effects of using blender application and audio visual in learning process was to generate the students understanding of the concept. so It can be concluded that the blender application was effective to use in the learning process. [6] shown that there was a belief about the difficulty of learning science. As a result of this belief, the target level of success could not be achieved in learning science.



[7] stated that the motivation was the internal factor that generates, and maintains the behavior of learner towards the achievement of a specific purpose. In this research the researchers tried to explain why the students striving for a particular purpose, how they try, how long they try to achieve that goal. Based on the statements above, it can be concluded that the motivation to learn was an important factor that lead the behavior of students in learning. Therefore, teachers needed to strive for having the students' motivation to learn in order to achieve an optimal result. [8] also stated that the motivation to learn helped the students in the learning process, so that teachers were required to have a good way in teaching the students, therefore the students were motivated to learn and the learning outcomes as well as we hope

2. Research Methodology

This study is a research and development (R&D) study which consists of three steps (1) the preliminary study (2) the development step and (3) the implementation step. The instrument used is a feasibility assessment rubric. Feasibility instrument consists of several indicators (1) maintainable, (2) Easy to use, (3) Economical, (4) Educative, (5) Manageable, (6) Treatment. To validate the data, the researchers used validated assessment instruments learning motivation, lesson plan and test instruments. The populations of this study were all students of class E in Mathematics education Department. They were divided into experimental class and control class. The design of the test used a pretest-posttest control group design. The analysis of the data consisted of prerequisite test, expert validation on method, and field test analysis.

3. Results and Discussion

The specifications of Cavendish Balance of Aids based on Blender Application were as follows: (1) The mirror was used to reflect the light which came from the laser, (2) The rod is used to connect the two small balls at the ends of the iron (the minimum mass of the ball is 345 grams, the diameter of the ball is 3 cm and the length of the rod 25 cm), (3) The Wire is used to hang the iron rod and as the stand of the mirror (the length of Wire is 30 cm), (4) the diameter of the big ball is 9 cm, the mass of the ball is 2000 g or 2 kg, and (5) the two big balls were helded in ball's holder, the length of the holder is 40 cm. Generally, the results of the validation experts on development Cavendish Balance of Aids based on Blender Application is "Very Good". The validation result of the aid could be seen as follow:

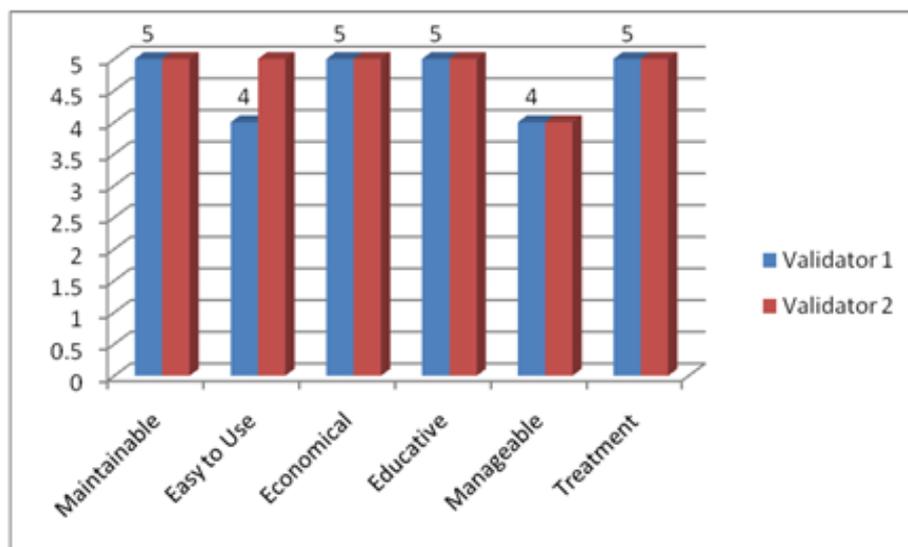


Figure 1. Validation of Cavendish Balance of Aids Based on Blender Application

To determine the development of the learning process the researchers used descriptive analysis. The result of pretest and posttest in experimental class and control class is as follow.

Table 1. Results of Experimental Class and Control Class

Scores	Experimental		Control	
	pretest	posttest	Pretest	posttest
Number of students	40	40	40	40
Average	57,95	74,65	46,88	61,08
Mean	58	75	47	61
Standard deviation	6,60	5,23	7,87	6,84

Based on the analysis, the result of learning process using Cavendish Balance of Aids based on Blender Application is better than using conventional learning process. [9] explained that the media is a tool that could help students to understand and to develop the concept and behavior in learning process. [10] stated that application of learning strategy by using Blender application and the other media could enhance the ability of critical thinking of students. [11] also shown that the usage of multimedia learning applications based on Blender application could improve the student learning outcomes.

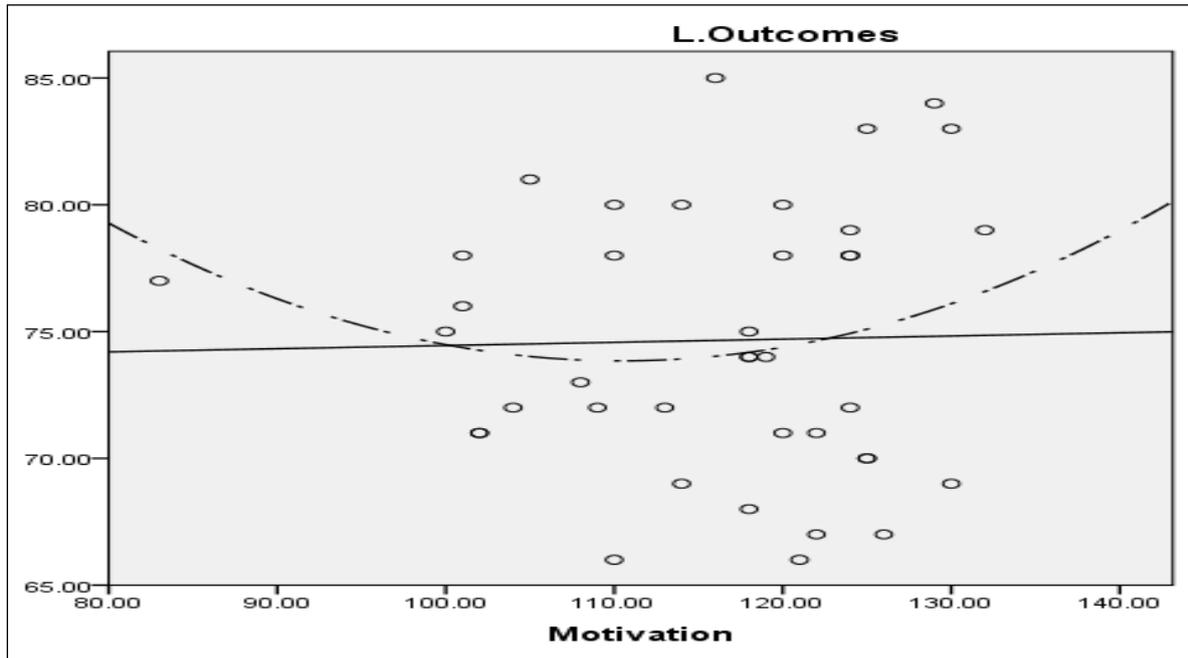
The aids provide an opportunity for the students to express their prior knowledge related to the materials [8]. [12] stated that this literature review will prove that problem solving method will stimulate teaching and learning process. Problem is the main focus of teaching and learning process that will happen through problem solving activities.

The motivation of students gained after using Cavendish Balance of Aids based on Blender Application is very positive. Furthermore, the effect of learning motivation on learning outcomes is as follow.

Table 2. Effect of Learning Motivation on Learning Outcomes.

Model	Standardized Coefficients	Sig. (1- tailed)	Effect (Learning outcomes)
Motivation	0,01	0.878	0.03

The results of the analysis above indicated that motivation of the students in using Cavendish Balance of Aids based on Blender application in learning process had a significant effect on the learning outcomes of the students. The level of the correlation coefficient is 0,03.



Figures 2. The relationship between Learning motivation and learning outcomes

The score of students’ motivation can be seen in quadratic curve (minimum scale). The data showed that the student who had good participation in the class got a score 110 and 130. Therefore it could be concluded that the learning motivation had effect on student learning outcomes. Normality of the test is done to determine the normal distribution of the data. It also used to determine the effect of using statistical parametric or non-parametric statistics. To test the normality of the data the researchers used *pretest* and *posttest* learning outcomes of the students. The data were analyzed using SPSS 20. it obtained *Asymp. Sig.* ≥ 0.05 then H_a is accepted and H_o is rejected.

Based on the, *t-test* calculation it is found $t_{count} = 9,636$ and $t_{tables} = 1.684$. it meanted that the learning outcomes of using Cavendish Balance of Aids based on Blender Application were greater than the results of studying physics using Cavendish Balance of Aids. So it could be concluded that the use of Cavendish Balance of Aids based on Blender Application in learning phisycis more effective than using Cavendish Balance of Aids.

The test result of experimental class and control class in *pretest* and *posttest* is as follow.

Table 3. Results of Experimental class and Control Class in *pretest* and *posttest*

Classroom	Experimental			Control		
	Low	Medium	High	Low	Medium	High
Number of students	0	28	12	7	32	1
Percentage (%)	0	70	30	17,5	80	2,5

The final results of this research is learning physic by using Cavendish Balance of Aids based on Blender Application could be used by the teachers in delivering their material, especially on the concept of gravity Newton's law.

4. Conclusions

Based on the results of the research it can be concluded that: (1) Cavendish Balance of Aids based on Blender Application can improve the learning outcomes of students in learning physic. (2) There were significant different between the experimental class and control class, (3) Based on the questionnaire, learning physic by using Cavendish Balance of Aids has effect on students learning outcome, and (4) Cavendish Balance of Aids based on Blender Application is effective to use in learning physic.

5. References

- [1] A. Assor, H. Kaplan, Y. Kanat-Maymon, and G. Roth, "Directly controlling teacher behaviors as predictors of poor motivation and engagement in girls and boys: The role of anger and anxiety," *Learn. Instr.*, vol. 15, no. 5, pp. 397–413, 2005.
- [2] R. Vebrianto and K. Osman, "The effect of multiple media instruction in improving students' science process skill and achievement," in *Procedia - Social and Behavioral Sciences*, 2011, vol. 15, pp. 346–350.
- [3] H. F. O'Neil, R. Wainess, and E. L. Baker, "Classification of learning outcomes: evidence from the computer games literature," *Curric. J.*, vol. 16, no. 4, pp. 455–474, 2005.
- [4] D. F. Majidah Khairani, "Pengembangan Media Pembelajaran Dalam Bentuk Macromedia Flash Materi Tabung Untuk Smp Kelas Ix," *J. Ipteks Terap. Res. Appl. Sci. Educ.*, vol. 10, no. 12, pp. 95–102, 2016.
- [5] Toheri and A. Azis, "Pengaruh Penggunaan Media Belajar Audio Visual Terhadap Hasil Belajar Siswa Mata Pelajaran Matematika Pada Pembahasan Dimensi Tiga," *Eduma*, vol. 1, no. 2, pp. 48–54, 2012.
- [6] N. Taşkin and B. Kandemir, "The affect of computer supported simulation applications on the academic achievements and attainments of the seventh grade students on teaching of science," in *Procedia - Social and Behavioral Sciences*, 2010, vol. 9, pp. 1379–1384.
- [7] R. W. C. and W. Y. K. M. Shui-fong Lam, "Teacher and Student Intrinsic Motivation in Project-Based Learning," *Instr. Sci.*, vol. 37, no. 6, pp. 565–578, 2009.
- [8] S. Rasul, Q. Bukhsh, and S. Batool, "A study to analyze the effectiveness of audio visual aids in teaching learning process at unviversity level," *Procedia - Soc. Behav. Sci.*, vol. 28, no. April 2016, pp. 78–81, 2011.
- [9] F. S. Towne, "Is Adolescence a Critical Period for Learning Formal Thinking Skills? A Case Study Investigating the Development of Formal Thinking Skills in a Short-Term Inquiry-Based Intervention Program," 2009.
- [10] M. Simbolon, E. Surya, and E. Syahputra, "The Efforts to Improving the Mathematical Critical Thinking Student ' s Ability through Problem Solving Learning Strategy by Using Macromedia Flash," vol. 5, no. 7, pp. 725–731, 2017.
- [11] B. I. Cahya, "Penggunaan Aplikasi Multimedia Pembelajaran Flash Untuk Meningkatkan Hasil Belajar Mata Pelajaran Tik Siswa Kelas Xi Sma N 1 Godean," *Univ. Yogyakarta*, 2013.
- [12] M. N. M. Zabit, "Problem-Based Learning on Students' Critical Thinking Skills in Teaching Business Education in Malaysia: A Literature Review," *Am. J. Bus. Educ.*, vol. 3, no. 6, pp. 19–32, 2010.