

Multimedia Learning Science Development in improving the Problem Solving Skill of Elementary School Student

Fitria Febriani^{#*}, Yetti Supriyati[^] and Ucu Cahyana[^]

[#]Primary Education, State University of Jakarta, North Jakarta, Indonesia

[^]Faculty of Math and Science, State University of Jakarta, North Jakarta, Indonesia

Received 10 May 2018, Accepted 11 July 2018, Available online 13 July 2018, Vol.6 (July/Aug 2018 issue)

Abstract

This study aims to develop multimedia products and measure the effectiveness of multimedia in improving the problem solving skills of primary school students. The type of this research is development research that is by developing media product content of science matter of influence of heat 2 to change body shape and temperature. The research subjects consisted of 50 respondents in 5th grade. The development model used was Lee and Owens model which was adapted to the research with steps: 1) analysis, 2) multimedia design, 3) multimedia development, 4) empirical analysis, 5) implementation, 6) final product. Effectiveness test was conducted to measure problem solving skill through pre-test and post-test then processed using t-test. The result of t-test indicate that there is a difference of the mean value of pretest and posttest value with trust level $\alpha = 0.05$, there is an increase of mean value or in other words, H_0 is rejected, mean pre-test value 61.12 and average post-test value 75. Respondents also showed positive attitude using multimedia supported with the result of questionnaire response value 81% with criteria very good. Based on the results of effective multimedia used by learners in learning and improve problem solving skills.

Keywords: Science, Multimedia, Problem Solving Abilities

Introduction

Science studies various natural phenomena about the surrounding natural knowledge of life, including living things and non-living beings. Aryawan, *et al* (2015) stated that studying science is not just memorizing and listening to the explanation of science, but requires understanding so that learners can apply it in everyday life because science is much related to the environment. Lessons learned are not merely material delivered through the book, but required components that support to deliver materials such as learning resources and learning media such as objects, text, images, video, multimedia, picture stories, etc. Students understand more when the material submitted is supported by direct observation or visualization.

Delivery can be done using the media, Mahnun (2012) mentions the media in the learning process becomes a means of channeling the message to learners by teachers to facilitate in delivering material that is abstract. Media makes it easy to deliver materials that are difficult to appear in the classroom.

According to Sharma (2013) nowdays science and technology are progressing rapidly, computer-based technology is used in every life not least in education especially in teaching-learning, but now educators and researchers have not yet believed in the computer-based learning process can be effectively used. The development of Information and Communication Technology (ICT) becomes a part of human activities, not least in the education process (Sawsan, 2012), the rapid rate of technological development and knowledge can be utilized in education to be more advanced and developed so as to make the process in quality learning but utilization of technology is still less utilized in education especially the implementation of learning (Fatmala & Upik, 2016). Media in the learning process can take advantage of existing technological developments, such as the use of computers, Liquid Crystal Display (LCD), projectors, and loudspeakers. Utilization is a means of infrastructure that needs to be provided by the school. These developments are less accompanied by the use of devices that develop in schools, just like computers.

The expected competence in learning matter of the influence of heat on changes in the form of matter and temperature one of which is the ability to solve the problem, it is known through the syllabus and the learning is carried out. The relationship of matter with the

*Corresponding author's ORCID ID: 0000-0000-0000-0000
DOI: <https://doi.org/10.14741/ijmcr/v.6.4.17>

influence of the caloric life of learners expect learners have the ability in problem-solving, the phenomenon of events in the environment related to the influence of heat as in the activities of living things.

Based on the results of TIMSS 2015 (international result in science) Indonesia ranks 45th out of 48 countries following TIMSS 2015, Indonesia scores especially in science ie 397 in grade 4, development agency assessment center (2018) mentions average percentage of participants' answers students in the cognitive domain is 37 to know, 29 to apply, and 35 to reason. The results show that the ability of learners in reasoning is still low, learners are accustomed to doing routine questions and tend to show the answer, in the development of thinking ability is still relatively low as in the ability problem-solving.

Lack of problem-solving ability is also expressed by Ben-Zhi (Nursaila, et al 2015) states that learners tend to memorize and do not emphasize problem-solving methods. This causes the ability of learners is limited to solving problems that are routine and contained in the book. The results of research conducted by Nursaila and Faridah (2015) showed that the problem-solving ability of students is still low it is because of lack of exercise. .

The advancement of science and technology in modern society is increasingly complex, it creates a multidimensional problem so that it needs a contribution in providing solutions to emerging problems (Mukhopadhyay, 2013). Problem-solving skills can make it possible to deal effectively with problems or challenges. According to Mawadah and Hana (2015), the problem is the process of individual thinking directed to determine what should be done in overcoming a problem. Problem-solving ability is the ability of the learners in identifying problems, finding solutions, then implemented to solve problems. Problem-solving skills provide wider knowledge and give meaning to learners (Ali, et al. 2010). Based on this Sawsan (2012) revealed that multimedia has the potential to implement quality learning and create a realistic learning context for learners. This research will use the type of research development that is by producing interactive multimedia products of science.

Method

This type of research i.e. research development by applying the steps of Lee Owens and model. Stages in developing multimedia namely analysis, multimedia design, multimedia development, empirical analysis, implementation, and final product. Research will be carried out at the elementary school Al Irsyad 2 and Sukanegara 1, previous products validated by experts and practitioners before the test implemented in small groups and large groups. The data is taken based on the value of pre test and post test to find out the effectiveness in improving the ability of problem solving and question form for validation of the response and for learners. Test result value pre test and post test is conducted with a test

of paired sample t-tests to test the difference in average, the results to find out the problem-solving ability increased significantly.

Result and Analysis

Development of multimedia payload science on this research developed with reference to the model Lee and Owens. Lee Owens and model consists of 1) analysis, 2) product design, 3) product development, 4) implementation, and 5) evaluation. Lee Owens and model on this research has been modified but still refers to the step of the development model of Lee and Owens. The steps in this research are: 1) analysis 2) multimedia design, 3) multimedia development, 4) empirical analysis, 5) implementation, and 6) final product.

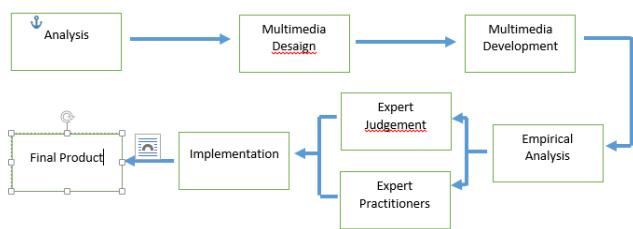


Figure 1 Multimedia product development flow

The results of the analysis showed that the charge for learning science on class V primary school has not varied, with a variety of learning resources or the media. Availability of facilities that support learning on learning the science as props tool kit, and the image is not fully available. Other facilities available at the school, namely electronic devices such as LCDs, projectors, and computer devices. The use of LCDs and projectors have not maximized given not all schools have the facilities that support each class so experiencing limitations, while for computer facilities are still focused on ICT, so that charge use of the media has not performed to its full potential.

The media play a role in the teaching and learning of prose because media serves something concretize abstract in nature. The use of media can help learners in obtaining information that abstract to make it more concrete. SCIENCE covers all the symptoms including the nature of living things or non-living things so that the materials have not been able to bring in the classroom can be helped through learning. Based on this development is done by developing multimedia via the adobe flash program. Multimedia can integrate text, video, audio, image, and animation into a single component.

The next step in development is to create a multimedia design. The design is made by making a story board or flow concept in multimedia included in determining the beginning of the display as well as the

content of the material. Multimedia has designed further developed i.e. stages of production, determine program in making multimedia, structure of colors, forms, navigation buttons, and button States. Products that have been made are then validated by experts and practitioners, expert validation carried out by expert content, media experts, and linguists. Validation practitioners are performed by five teacher 5th grade in elementary school.

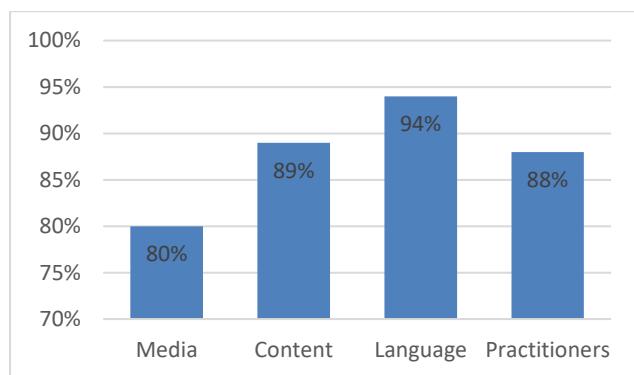


Figure 2 The results of the validation of the product by experts and practitioners

Based on Figure 2 validation results by product experts and practitioners meet the minimum success criteria. Calculations to assess the results of validation must meet the minimum success criteria, i.e. should be 80% or belongs in the category either. The result belongs to the good so that the product can be tested on learners.

Validation assessment of media experts judged from several aspects include: 1) clarity of the display, 2) visual attractiveness, 3) display interpretation, 4) efficiency of system, and 5), learning from some aspects of the obtained percentage of 80% media validation with good criteria. Expert validation assessment of the material consists of: 1) relevance curriculum, 2) consistency content, 3) independence, 4) flexibility content, and 5) interaction of learning, the results of expert validation material retrieved 89% with criteria very well. Validation assessment rate linguist aspects of language use in multimedia, obtaining a percentage of validation language 94% with the criteria very well. Product validation is also done to the practitioner to assess aspects of content, media, and the validation of the assessment of the language, acquired for 88% of the criteria very well. Based on product validation by experts and practitioners then multimedia can be tested to learners because it had met the criteria of success are minimum.

Validation is not only in the product but a matter that will be given in the measure increased the skill of problem solving using multimedia products validated by experts, linguists, and practitioners. The results of the validation are shown in figure 3.

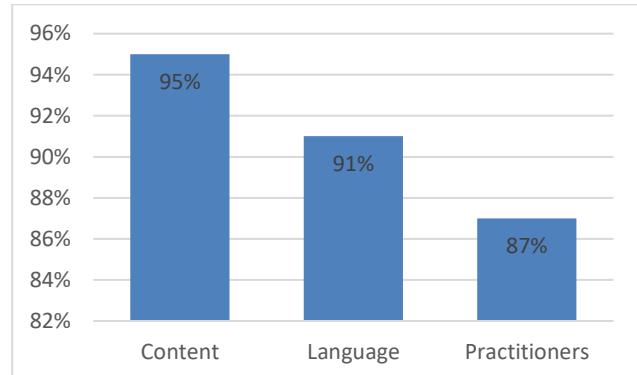


Figure 3 The results of the validation are reserved by experts and practitioners

Based on figure 3 the results of the validation are performed by expert material and linguistic questions given to the learners through the pre test and post test shows results of expert material amounting to 95% with very good criteria, judged from the aspect of consistency the material and the suitability of the grain problem. Linguists of 91% with very good criteria, assessed the compliance aspects of the use of the language in question. Validation of a matter by the practitioner obtained the percentage of 87% with criteria very well. The results show that the percentage of each validation achieved success criteria at least 80% so that the matter could be given to the learners to assess the pre test and post test. The question made reference to the problem-solving aspect which consists of identifying the problem, devise a plan of problem solving, applying, and check again.

Products and reserved the subsequent validation has been tested to learners, trials are conducted in small groups with a total of 3 students and large groups with 50 number of learners. Product trial results indicated by the now small group response and supported with interviews to learners. The results of the now small response group presented in Figure 4.

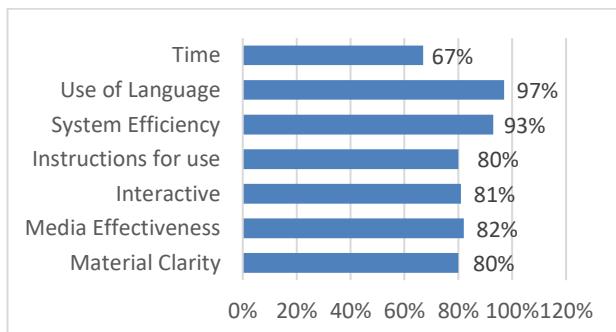


Figure 4 The results of the now small response group

Figure 4 is a result of the now small groups of learners responses, students overall loved the use of the multimedia aspect of the look, the effectiveness of the media, as well as the ease of use of multimedia, besides

making learners active easy to learn and understand the material. Aspects on quisioner repson particsciencents meets the criteria of success, but there is one aspect that has not met the criteria that is 67% of the time, the aspect of time associated with the use of multimedia and time spent by students in answering the question or an exercise on multimedia. Overall response was the now the learners have 84% results with criteria very well, which means that the use of multimedia preferred learners and can be used to test large groups.

Product trials and reserved then conducted on a group of 50 students. The question was given to pre test and post test, the results of the assessment of pre test and post test showed effectiveness in improving the ability of problem solving. The value of pre test and post test next tested the average difference using paired samples t-test, the previous data is tested using kolmogrov smirnov-normality test with test criteria for normality of data views with $\alpha = 0.05$.

Table 1 Test result data normality kolmogrov smirnov test

Variabel	Sig. Value	Test Criteria	Test Decision
Pre tes dan post tes	0.026	Sig. Value $\geq \alpha = 0.05$	Normal

Table 1 data normality test results showed P-value Sig. testing means 0.026 has more value of $\alpha = 0.05$ Gaussian data.

The average difference test using paired sample t-test the average difference test is done by using paired sample t-test with $\alpha = 0.05$, the hypothesis used in the test of difference of two average are:

H_0 : there are no problem solving skill increased significantly

H_a : there is a growing problem solving skill significantly

Criteria for testing the hypothesis of normality of data views with $\alpha = 0.05$. If the P-value (Sig) $\geq \alpha = 0.05$ means that H_0 is accepted and if the P-value (Sigs.) $< \alpha = 0.05$ means that H_0 was rejected

Table 2 Test results the average difference of two paired sample t-test

Data	Average	Standard Deviation	t	Sig. (2-tailed)	Category
Pre Tes	59.49				
Post Tes	83.11	10.52626	-15.861	0.000	Significant

The result is that the P-value Sig (2-tailed) 0000 means less of $\alpha = 0.05$ then H_0 denied. Based on the hypothesis then there are problem solving skill increased significantly.

Test result average difference suggests that there is a growing problem-solving ability to significantly influence

materials science payload pda heat against a change of form objects and the temperature. Multimedia train the learners to be active in learning, trying to identify, and answer questions. Developed multimedia helps learners to understand material as well as help in learning. Multimedia provide a positive impact for the comprehension of the material as well as learners are no longer abstract thinking with the multimedia used the teacher in the classroom or in the laboratory. The media can help declare something abstract in order to facilitate the learners know in real terms, given the characteristics of the learners in elementary school is located on operational concrete phase.

Neo, *et al* mention that problem-solving strategies can help students develop problem-solving abilities, such as on the results of his research, Neo, *et al* develop MILE @ Home Project where students learn there is reference to a module Interactive displayed online and create a project in a group to come up with a positive impact on the attitudes of learners. Through this technology learners can provide comments to build, establish communication, and report the development of the projects. Opinion of the Neo, *et al* showed that the use of multimedia gives a positive impact on learners in building called and communication between teachers and learners as well as between learners.

The results of this research to develop multimedia learning products in improving problem solving ability, the result is that the learners have high enough enthusiasm in the use of multimedia. Multimedia helps learners in acquiring new knowledge in ways that vary, as in multimedia contains various kinds of media such as video, audio, text, animation in a single component as well as make it easier for students to understand the material.

Conclusion

Based on the research results and data obtained show that multimedia worthy and effective in improving the ability of problem solving. Test results validation against 80% of the media expert with good criteria, expert materials 89%, 94%, language experts and practitioners 88% each with criteria very well. Multimedia products heat influence of material science payload to changes form objects and temperature have been developed and are effective in improving problem solving ability learners significantly.

Reference

- [1]. Ali, R., Khan Anwar., & Hukam Dad. (2010). Effect of Using Problem Solving Method in Teaching Mathematics on the Achievement of Mathematics Students. *Asian Social Science*, Vol. 6 (2), 67-72.
- [2]. Aryawan, I Made Prasetia. A. A. Gede Agung., & I Wyn Romi Sudhata. (2015). Pengembangan Multimedia Interaktif dengan Model Waterfall pada Mata Pelajaran Ilmu

Pengetahuan Alam Kelas VII. *e-Journal Edutech Universitas Pendidikan Ganesha*, Vol. 3 (1).

[3]. Fatmala, D., & Upik Yulianti. (2016). Pengembangan Media Pembelajaran Multimedia Interaktif Berbasis Android pada Materi Plantae untuk Siswa SMA Menggunakan Eclipse Galileo. *Jurnal Biodik*, Vol. II (1), 1-5.

[4]. Lee, William W., & Diana L. Owens. (2004). *Multimedia Based Instructional Design*. San Fransisco: Pleifer.

[5]. Mahnun, N. (2012). Media Pemebelajaran (Kajian terhadap Langkah-langkah Pemilihan Media dan Implementasinya dalam Pembelajaran). *Jurnal Pemikiran Islam*, Vol. 3 (1), 27-33.

[6]. Mawaddah, S., & Hana Anisah. (2015). Kemampuan Pemecahan Masalah Matematis Siswa pada Pembelajaran Matematika dengan Menggunakan Model Pembelajaran Generatif (Generative Learning) di SMP. *Jurnal Pendidikan Matematika Edu-Mat*, Vol. 3 (2), 166-175.

[7]. Mukhopadhyay. (2013). Problem Solving in Science Learning – Some Important Considerations of a Teacher. *IOSR Journal of Humanities and Social Science*, Vol. 8, Issue 6, 21-25.

[8]. Neo, M., et all. (2012). Problem solving in a Multimedia Learning Environment: The MILE@HOME Project. *International Educational Technology Conference IETC2012*, Proceia-Social and Behavioral Sciences 64, 26-33.

[9]. Nursaila, S., dan Faridah. (2015). Problem Solving Strategy in Balanced Forces. *International Journal of Bussiness and Social Science*, Vol. 6 (8), 94-98.

[10]. Nursi, S., et al. (2012). Studying The Impact of Using Multimedia Interactive Program at Children Skill to Learn Basic Math Skills. *Journal Acta Didactia Napocensia*, Vol. 5 (2), 17-32.

[11]. Pusat Penilaian Badan Penelitian Pengembangan (TIMSS Infographic),
<https://puspendik.kemdikbud.go.id/seminar/upload/Hasil%20Seminar%20Puspendik%202016/TIMSS%20infographic.pdf> diakses 17 Januari 2018.

[12]. Rusmiyati. I., Joko Nurkamto., & Samsi Hardiyanto. (2014). Penggunaan Multimedia dalam Pembelajaran Bahasa Sastra Indonesia di SMP Negeri 2 Bawen Kabupaten Semarang. *Jurnal Teknologi Pendidikan dan Pembelajaran*, Vol. 2 (2), 171-184.

[13]. Sharma, P. (2013). Role of Interactive Multimedia for Enhancing students' achievement and Retention. *International Women Online Journal of Distance Education*, Vol. 2 (3), 12-22.

[14]. TIMSS 2015 International Result in Science, <http://timss2015.org/timss-2015/science/student-achievement/> diakses 17 Januari 2018.