Development of 3dimensional Diorama in The Natural Science Learning Especially Lesson of Ekosistem for Grade V Students

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Abstract

Sains education is the one of lesson that must be given for student of elementary school, but in fact, Sains education still unoptimally done. Based on datas of observation, interview, and document that be found at Kalibanteng Kidul 02 Semarang State Elementary School is showed information that there is problem with the relevance learning media is still low. So, need to be developed 3 dimension diorama media in sains education. The purpose of this research is to describe the steps of developing 3 dimesion diorama media, to know about validity of 3 dimension diorama media, and to know about efectivity of 3 dimension diorama media in the learning. Type rsearch is Research and Development (R&D) with some step are pra research, collecting data, preparing the media design, product validation, product reparation, small scale test, big scale test, and the last product. Research population is all student of grade V at Kalibanteng Kidul 02 Semarang State Elementary School. Research sample is student f grade V with jenuh sample technic. Collecting datas technic are observation, interview, test, angket, and documentation. Analyzing data technic use analyzing product data, analyzing first data/normality test, T test, and N-Gain test. The result of the research shows that 3 dimension diorama media can be used in sains educational learning with the value percentage from media specialist is 94%, content specialist is 97%, media practicy is 97%, and content practicy is 93% with Ttest result is T -assesment (7,396) is bigger than T-table (1,671) and N -Gain test result is 0,7063 with high criteria. This research conclusion is effectively be used in sains educational learning toward student learning result. Instruction for the next research can use 3 dimension diorama media in other lesson by adapted with component and design is related with the content that be teach.

Keywords: Diorama Media; 3 Dimension, Sains Education

1. Introduction

Education plays important role in human life development. Therefore, someone must get the appropriate education, and the appropriate education is the one based on Pancasila dan Undang-Undang Dasar Negara Republik Indonesia Tahun 1945. As stated in Undang-Undang Nomor 20 tahun 2003, the function of the National Education is to develop skill and to build the character as well as the civilization of nation, aiming to develop the students' potencies in order to become the faithful and God-frearing man, to have good character, to become health, skillful, creative, independent, and to become the democratic and responsible citizen.

One of the compulsory subjects that the students must take is Natural Science, which is strengthened by the explanation stated in Peraturan Menteri Pendidikan Nasional Nomor 22 Tahun 2006 (Decree of Minister of Education: 22/2006) on Content Standards of Primary and Seciondary Schools, that Naturral Science is one of the subjects obliged to deliver from Primary/Islamic Primary/Special Primary School to Secondary/Islamic Secondary/Special Secondary School. In general, the set-up purposes of Natural Science learning are proper, in fact, however, its impelementations are still not at its best, and it causes the students poor learning outcomes.

Based on the analysis made by PISA (Programme for International Student Assessment) on reading literacy, mathematics, and science achievements attained by 15-year-old students carried out every 3 years, I get the data of average score of science literacy achievement. Based on the collected data, rank of Indonesia is much below the international average. In 2003, Indonesia ranked 38 out of 40 sates/countries. In 2006, Indonesia ranked 50 out of 57 countries/states, while in 2009, Indonesia ranked 60 out of 65 states/countries, and in 2012, Indonesia ranked 64 out of 65 countries/states. And then in 2015, Indonesia ranked 62 out of 70 states/countries participating.

Based on the conducted observation and interview, the implementation of Natural Science learning in Grade s V SDN Kalibanteng Kidul 02 is in compliant with the process standards of education. Its employment, however, is not optimum or irrelevats. The students find concentrating

during learning difficult. The students are not enthusiat and often do not pay attention in the classroom. This causes poor natural Science learning outcomes. Based on the score data received from grade V teacher during school year 2016/2017, the average score for Natural Science ix below that of the other subjects such as Social Science, Mathematics, Indonesia, and Citizenship. From document archive containing the students' scores received from grade V teacher, the average score of natural Science is 75.19 shown by the data containing 36 students, 14 (39%) get scores below learning mastery criteria (67), while the remaining (22) students (61%) get scores above learning mastery criteria.

Based on the cfact above, an effort needs to be made in order to better the learning outcomes. The best effort is by applying the media stimulating their spirit, activeness and attracting their attention as well as their enthusiasm when being engaged in the learning. The suitable media for Natural Science learning is 3dimensional media. Diorama can be an alternative solution as diorama is relevant for Natural Science which dicusses about the natural phenomena.

The learning applying the 3dimensional media benefits very much. Sudjana (2015:206) states that a model gives the 3dimensional impression of a real object either the living one or unliving one. Therefore a model is very helpful in case of communicating the nature of many objects: too big ones, too small ones, too faraway ones, or too close ones, in order to be understood by the students

This study is strengthed by the relevant investigation conducted by Kiswandari Septi (2016) titled "Pengembangan Media Pembelajaran Diorama Daur Air pada Mata Pelajaran IPA Kelas V SD" (Development of Diorama as Teaching Tool during Water Cycle learning in Natural Science Learning in Grade V). The study shows that (1) from the validation carried out by media specialist, the average score attained is 3.88 which mean good. (2) From the validation carried out material specialist, the average score attained is 4.21 which mean excellent. (3) From the assessment carried out by practitioner, the average score attained is 4.69 which mean excellent. (4) The experimental testing scored average 4.17 which mean excellent. (5) The field experimental testing scored average 4.32 which mean excellent.

Another invstigation was carried out by Enti[1], M., Brako-Hiappa[1], G., Adu-Agyem[1], J., Osei-Poku[1], P., Steiner2, R.(2010) titled "Diorama Art-A Potential Medium For Museum Education". The study shows that diorama is an effective media for educational museum. In addition, diorama can be changed into a mini museum, the best and appropriate tool to store the records, to documentate precious cultural and historic information which will inspire and educate the common people, as well as the appropriate way to build the school museums to enhance classroom learning and teaching sources. This research is designed to guide all people in order to be interested in creating diorama to acquire a skill themselves. From the analysis above, we can draw conclusion that diorama may function as an alternative media to enhance the scope of the museum education in the country.

An investigation conducted by Rule, Audrey, C., Lindel, Lois, A. (2009) titled "Making Cereal Box Diorama of Native American Historic Homes and Cuilture" on 3dimensional diorama creation during the learning. According to this research, the diorama making is the most impressive experience of all the ones in primary school. Generally, however, they seldom do such activity because of being afraid. Therefore, it is important to provide the teacher with a skill to lead the children conducting a project. Eighty preservice teachers are registered in diorama making course. The theme of the diorama is American natives, and the diorama is made by the teacher from cereal box, recycled photocopy paper, glue for handicrafts, the paint, pictures, and general handicrafts.

The prior research shows that diorama as teaching tool is very applicable to the classroom learning, and it is proven to be able to make the learning better. Based on the research reference above, I choose to conduct the research and development by developing the diorama.

Based on the background mentioned above, I conduct the research and development titled "Pengembangan Media Diorama 3 Dimensi dalam Pembelajaran IPA Materi Ekosisem Kelas V SDN Kalibanteng Kidul 02 Semarang" (Development of 3dimensional Diorama in Natural Science Learning Lesson of Ecosystem for Grade V Students in SDN Kalibanteng Kidul 02 Semarang).

2. Research Methods

Design of research and development used in this research is Borg and Gall Design in work of Sugiono (2015:409). This development design consists of 10 steps, i.e.; (1) potentials and problems identification; (2) data collection; (3) developing the preliminary form of product; (4) preliminary field testing; (5) main product revision; (6) main field testing; (7) operational product revision; (8) operational field testing; (9) final product revision; (10) dissemination and implementation. The analyzed data sources and research subjects are the students, teachers, specialists and practitioner, research location, time, variables, population, and samples. The data are collected through observation, test, questionnaire fulfillment, and documentation. The research instruments are field testing by media specialist, field testing by materials specialist, field testing by media practitioner, and field testing by materials practitioner.

The first testing conducted is questions testing, and then the result of the testing is processed through validity testing, reliability testing, difficulty level analysis, and differentiability testing. The question is stated as valid if rcount > rtable, therefore the instrument is stated as valid. Question is stated as reliable if rcount > rtable, so the instrument is stated as reliable too. The range of difficulty index is 0.00 – 1.0. Differentiability of question is the ability of the question to differentiate the high-performing students from the low-performing ones. Based on the calculation above, 21 questions pass the four testings. Subsequently, the 21 are used in pretest and posttest ones.

The next testing conducted is the assessment of the testing conducted by the specialists and the practitioners. The instruments used to assess the testing are media specialists testing, materials specialist, media practitioner, and materials practitioner. The assessment result is then calculated using percentage correction formula, and after we find the percentage, it then is converted into the assessment criteria of the specialists and practitioners' testing.

3dimensional Diorama as media finished the testing, then I go to next step, i.e., small-scale test and large-scale test. The small-scale test is conducted to reveal the students' views on 3dimensional diorama. The instrument used for this is questionnaire of students' response. The next test conducted is large-scale test; it is carried out by conducting test prior learning and after learning. The teacher and the students fulfill the questionnaire on response to 3dimensional diorama after the students finish doing the test. The results of pretest and posttest on the large-scale test are then assessed in initial data analysis by testing its normality using chi kuadrat formula to find what type of statistics should be used in the next step. Based on the normality test, I draw a conclusion that it is normal data and then I am going to use the parametric statistics. And the next testing conducted is t-test and N-Gain. T-test is conducted to compare the learning output before and after the treatment can be tested through one-tailed testing. To assess the average raise (gain) which will show the emergence of the raising learning output after the learning using 3dimensional diorama.

3. Results and Discussion

The preliminary step to make 3dimensional diorama is by creating the design of 3dimensional diorama, and then creating the initial media i.e. the preliminary form. The preliminary form is then field-tested by media specialist, material specialist, media practitioner, and material practitioner. The field testing of the specialists and practitioners is shown below:

Table 1. Recap of Calculation of Field Testing Instruments Conducted by Media Specialist, Material Specialist, Media Practitioner, and Material Practitioner

No.	Instruments	Score	Maximum Score	Percentage	Remarks
1	Field Testing by Media Specialist	30	32	94%	Highly Applicable
2	Field Testing by Material Specialist	31	32	97%	Highly Applicable
3	Field Testing by Media Practitioner	31	32	97%	Highly Applicable
4	Field Testing by Materi Practitioner	26	28	93%	Highly Applicable

The next step is revising the 3dimensional diorama in order to be better, in accordance with the specialists' and the practitioners' suggestions.

Based on the normality test above, I found the result that the pretest and posttest

scores are distributed normally because X2count < X2table. As the data are distributed normally, then the type of statistics that will be applied is T-test and N-Gain.

T-test is used to compare the learning outputs before and after using 3dimensional diorama. T-test is calculated, and then its result is compared to T-table. As T-count > T-table, I may conclude that3dimensional diorama is applicable in Natural Science learning, mainly part of Ecosystem. The following is the calculation of T-test:

Table 2 T-test for Pretest and *Posttest* Scores

Data	Tcount	Alpha	dk	Ttable	Remarks
Pretest					
	7.396	5%	58	1.671	Ha accepted
Pottest					

N-gain test is used to assess the average raise (gain) which will show if the learning outcome rises or doesnot after using media 3dimensional diorama. It is calculalted using N-Gain formula. The following table shows the result of N-Gain calculation.

Table 3. *N-Gain* Calculation Result

Category	Score
Average *Pretest* Score	55.17
Average *Posttest* Score	86.83
Average margin	31.67
N-*Gain*	0.7063
Remarks	High

Based on table 3, I find out that N-gain of pretest and posttest is 0.7063 and it is included in the high category at average margin 31.67.

Based on the final data analysis through T-test dan N-gain, I can make conclusion that 3dimensional diorama is applicable in Natural Science learning and the average raise of pretest to posttest is 0.763 and included in high category.

The research supporting this investigation is the study conducted by Robbayani Annisa (2016) titled "Pengembangan Media Diorama pada Mata Pelajaran Geografi Materi Perairan Laut terhadap Hasil Belajar Siswa Kelas X IIS di MAN Tempursari Ngawi Tahun Ajaran 2015/2016" (Development of Diorama as Media in Geographic Learning Especially Lesson of Oceanic Water on Grade XIIS Students Learning Output in MAN Tempursari Ngawi during School Year 2015/2016). The study shows that: (1) from field testing conducted by media specialist, acquired percentage 90% and included in "highly applicable" category. (2) From field testing conducted by materi specialist, acquired percentage 94.28% and included in "highly applicable" category. (3) Based on the observation, teacher's activity is at percentage 86.66% and included in "excellent" category. (4) Based on the fulfilled questionnaire on students' response, I acquire 96.09% and included in "excellent" category.

3dimensional diorama is a concrete media and gives personal and direct experience to the students in studying ecosystem. This is in line with basic theory of media usage, i.e., Dale's Cone of Experience. Based on Edgar Dale's Cone of Experience, it is explained that the best learning media is through personal experience. 3dimensional diorama gives the students personal experience through observation on the diorama. The students also become active during the learning by collecting data available in the diorama and then make conclusions from it. 3dimensional diorama is in concrete form, so it eased the students to learn. This is in line with theory of cognitive development stated by Piaget, which states that primary scbool students are in the concrete operational stage whose learning style is through the concrete objects.

The study conducted by Darajati Pintanti (2016) titled "Pengembangan Media Diorama Lingkungan (Dolan) sebagai Media Pembelajaran IPS Kelas III SDN Tahunan" (Development of Environmental Diorama as Social Science Learning Tools for Grade III Students in SDN Tahunan) shows that: (1) final material validation acquired average score 4.47 meeting "excellent" criteria; (2) Final media validation acquired score 4.1 meeting "excellent" criteria; (3) the assessment conducted by practitioner scored 4.1 meeting "excellent" criteria; (4) the field testing average score is 4.2 meeting "excellent" criteria. Diorama as learning tool makes the students active in the learning. The students conduct the observations on the 3dimensional diorama, and then the result of the observation is recorded, classified, and then concluded, so that it will become meaningful learning. The Natural

Science learning activities by using 3dimensional diorama are observation, taking notes of the observation results, classifying and making conclusion. These activities are included in process skill in Natural Science. Funk (1985) in Dimyati's writing (2002:140) explains that process skill can be classified into two categories, they are basic skill and integrated skill, and through 3dimensional diorama, the students' process skill in Natural Science will be stimulated.

Natural Science learning using 3dimensional diorama also applies 4 natures of Natural Science. According to Carin and Sund (1993) in the book written by Wisudawati (2015:24) Natural Science has 4 natures; they are Natural Science as process, Natural Science for behavior, Natural Science as product, and Natural Science for application. In this investigation, Natural Science for behavior is shown in the scientific behavior of the students, such as curiosity, carefulness, discipline, and optimism. These behaviors are shown when the students produce the Natural Science products through process of observing this 3dimensional diorama. Natural Science as process in this investigation means that the students acquire the Natural Science knowledge on ecosystem by noticing and observing the objects in this 3dimensional diorama, and then they classify biotics and abiotics based on the presented diorama. By doing the activity, the students will find it easier to understand the explained learning materials. Natural Science as product in this study means the materials comprising facts, concepts, and theories of ecosystem. For example, the fact of an ecosystem consists of several components of living creatures and the concepts regarding biotics and abiotics existing in an ecosystem. Natural Science for application in this study is adjusted to the learning materials, i.e., ecosystem. Its application is intended to conserve the ecosystem and environment from the disaster and damage, mainly the global warming the effects of which starts being experienced. The efforts we can make by our own to conserve the ecosystem are reforestation and putting the trash to rubbish bin.

The effectiveness of this 3dimensional diorama can be found through T-tes and the students' learning improvement. Based on the basic theory of media usage in Edgar Dale's Cone of Experience in the book written by Arsyad (2014:14), it is stated that direct experience will ease the students to understand the things they have learnt because the students experience the learning directly. Through the direct experience, the students will find the learning more meaningful. The learning through 3dimensional diorama gives the students direct experience in case of observing an ecosystem, so that the students will comprehend the learning materials better. According to theory of cognitive development stated by Piaget, primary school students are in concrete operational stage and they learn through the concrete or real objects. Through 3 dimensional diorama, the students concretely observe the ecosystem of forest, so the students will comprehend the learning materials better and their learning outcomes will raise, too.

The previous research supporting this investigation is the study conducted by Lestari Tri (2015) titled "Pengaruh Penggunaan Media Diorama terhadap Hasil Belajar Siswa Kelas V pada Tema Ekosistem di Sekolah Dasar" (Impacts of Diorama Usage on Grade V Students Learning Outcome on the Lesson of Ecosystem in Primary Schools)

Based on the investigation conducted SDN Ketintang I Surabaya it can be concluded that the diorama usage as media in the lesson of ecosystem has significant impact on the students' learning outcome so that the formulated hypothesis remarks Ha is accepted and ho is rejected. This is shown by this result: t-test at significance rate 5%, db = 68, acquire: tcount (2.678), if compared to ttable (1.667), then tcount is bigger than ttable (2.678 > 1.667), so the significant difference in case of the learning outcome of the experimental group using the diorama as media from control group which doesnot, exist. From the fact above, we can draw a conclusion that the usage of diorama as media has significant impact on the students learning outcome in lesson of ecosystem.

The study conducted together by Marandino, Martha, Oliveira, Adriano, Dias, Mortensen, and Marianne (2009) titled "The Important Role of Natural History Dioramas in Biological Learning" shows that research and program evaluation of diorama usage in museum empirically and statistically show that the program meets the determined goal. The qualitative data also support the fact that the target and the goal are reached, they are: (1) the visitors find the unique, interesting, educative, fun, and memorable figures; (2) the exhibition

in the museum room is regarded as more powerful, more unique and more personal or more meaningful by the visitors who interact with the figure. Through their diorama, they do not only remember the real substances but also the accuracy.

4. Conclusion

Based on the results and discussion, I can make the following conclusion: The development of diorama as media uses the preliminary form developed by *Borg & Gall* as stated by Sugiono. The research steps which have been taken in this research are: pre-research, data collecting, making the media design, product field testing, product revision, small-scale test, large-scale test, and final product.; The developed 3dimensional diorama is verified as applicable by media specialist, materials specialist, media practitioner, and materials practitioner; 3dimensional diorama is effectively applied in Natural Sciemce learning and effectively raise the students' learning outcomes, i.e., t_{count} is bigger than t_{table} at N-Gain test score (0.7063) which meets the criteria of "High".

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