Interactive Multimedia Development in The Natural Science Learning Mainly Lesson of Transformation of Earth and Sky Topographies

Kharisma PratamaPutri, FlorentinaWidihastrini

Corresponding Email: kharisputri86i@gmail.com

Abstract

The purpose of this research is to develop interactive multimedia on science learning material change of earth appearance and sky in 4th grade Elementary school Klepu 04. This research type is Research and Developement (R&D) using Waterfall model consisting of Analysis, Design, Implementation, Testing, and Maintenance. The results showed interactive multimedia is feasible to use. Based on the assessment of media experts, get an assessment of of 88% (very feasible), material experts of 92%, (very feasible), and linguist of 92% (very feasible). In addition, the assessment of the practitioner's expertise on presentation, content, and linguistic components is 100%, 92%, 96% categories very feasible. Interactive multimedia is also effectively used in science learning based on difference test average by using t test obtained t count equal to 12,05 and t table equal to 1,67 and increase of average (Gain) equal to 0,57 with medium criterion. The used of interactive multimedia in science lesson material changes in the appearance of the earth and sky increases student activity at 1st meeting with percentage of 82,5% (very high) and student activity at 2nd meeting with percentage of 86,8% (very high). The conclusion of this research is interactive multimedia feasible to be used, effective to be used in learning, and increase student activity.

Keywords: Audio visual media; Mind mapping; Social studies.

1. INTRODUCTION

Education is the resource to improve the quality of human resources of a nation. One of the reason for being developed nation is the educated, intelligent, and respectful human resources. The statement is in line with Law of Republic of Indonesia(20/2003) on National Education System which states that education is conscious and well-planned efforts to manifest learning atmosphere and learning process so that the students actively develop their own potencies to have spiritual-religiosity, self-controlling, personality, intellegency, high moral, as well as the skills required by himself, public, nation, and the country-state.Decree of Minister of National Education (Permendiknas) (22/2006) on Standard of Contents for Primary and Secondary Shools which states that in the structure ofcurriculums for Primary/Islamic Primary Schools upon School-Based Curriculum, there are eight components of subjects which should be well mastered by the students. One of them is Natural Science. It is important to teach the student Natural Science as Natural Science has close relations to how to find out about the nature systematically, so that natural Science is not only about mastering a bunch of konwledge comprising the facts, concepts, or priciples, but also through process of discovery and invention. (Depdiknas, 2007:8).

The Natural Science learning in Primary School in still has many problems. Based on the pre-research conducted to grade IV SDN Klepu 04 through observation, intertopographies, and documentation, I find some problems concerning the implementation of Natural Science learning. From the data mentioned above, it was found out that the Natural Science teaching the teacher has not optimally provides the teaching tool. The teacher does not operate the teaching tools in innovative way. The teacher only uses tool such as the pictures contained in the student book. Those pictures are very limited, there are only a few pictures and they are in small size and in black and white. The students scrutinize the content of the learning materials more, so the students act passively.

The issues are strengthened with the pre-research through data of the students' learning outcome taken from the final exam of semester I average scores in the subject of Natural Science, which can be called very low. The determined minimum mastery criteria is 75. Of 22 students having average score 71.2there are 11(50%) do not metminimum mastery criteriaand 11 (50%) do.

Survey conducted by *Programme for International Student Assessment* (PISA) in 2015 shows that the field of science in Indonesia places rank 62 at score 403 out of 70 countries. While based on the survey conducted by *Trends International Mathematics and Science Study* (TIMSS) in 2015,Indonesia ranks 44 of 47 member countries at average score 397. Based on the fact above, I make analysis by conducting research on interactive multimedia development in the learning of Natural Science. Through this media, the students will be more interested in learning the lesson of transformation of earth and sky topographies.In the lesson of transformation of earth and sky topographies, there are some natural phenomena the students cannot see directly. Therefore the students need a liaison to visualize information. Multimedia

is the media covering several kinds of media to stimulate all senses within one learning activity. Multimedia is emphasized more on the usage of various ICT-based and computer-based media. Interactive multimedia can make the students learn actively with high motivation due to their interest in multimedia able to display test, pictures, audio, animations, and video (Darmawan, 2014:55).

The research encouraging the solution to this issue is the one conducted by I Made Prasetia Aryawan, A. A. Gede Agung, I Wyn Romi Sudhita in 2015 titled "*Pengembangan Multimedia Interaktif Dengan Model Waterfall pada Mata Pelajaran IPA Kelas VII*" (Development of Interactive Multimedia using Waterfall Model in the learning of Natural Science for Grade VII). This study elaborates media by employing the advance of technology as well as the facilities available at school, i.e., LCD. The considered-proper teaching tool is interactive mltimedia because this media is attention-grabbing and attractive, so it will motivate the students to study Natural Science, get the students more enthusiastically learning hence they will attain the best learning outcome. Based on the applicability test conducted by the media and materials specialists, the interactive Multimedia is verified as applicable, and in the application testing, the students learning outcome raised after applying interactive multimedia compared to before use.

Another supporting study was conducted by Thongchai Kaewkiriya in 2013 titled *A Design And Development Of E- Learning Content For Multimedia Technology Using Multimedia Game.* This research was aimed at developing *e-learning* multimedia through a game. Game was used to make the learning more attractive as well as to give real-life role model using multimedia. *Game* in this research was created using Adobe flash CS5 with 2D animation.

Based on the facts mentioned above, the issues are analyzed through developmental research titled "*Pengembangan Multimedia Interaktif pada Pembelajaran IPA Materi Perubahan Kenampakan Bumi dan Langit Kelas IV SDN Klepu 04*" (Development of Interactive Multimedia during the Learning of Natural Science Mainly Lesson of Transformation of Earth and Sky Topographies to Grade IV Students inSDN Klepu 04). The purpose of this research is to develop the multimedia, to assess its applicability, to test its effectiveness, and to describe the students' activities during the learning applying interactive multimedia.

2. RESEARCH METHODS

This is Research and Development (*R&D*) study, with*waterfall* model comprising*Analysis, Design, Implementation, Testing,* and *Maintenance.* The main subject of this research is the grade IV students of SD Negeri Klepu 04, consisting of 21student.The sampling method applied is *Saturation Sampling*, which means that all population members are used as samples. The research variables are interactivemultimedia, Natural Science learning outcome,and the students' learning activities. While the data collection methods applied are test, questionnaires fulfillment, interview, observation, and documentation. The data analysis methods applied are product data analysis, initial data analysis, and final data analysis. The product data analysis is used to test the applicability of the developed media. The initial data analysis is used to find out if the collected data are normally or abnormally distributed. In this research, data normality test is conducted using *Liliefors*. While final data analysis is used to assess the effectiveness of the developed data, i.e., applyingt-testandN-Gain.

3. RESULTS AND DISCUSSION

Development of Interactive Multimedia

Interactive Multimedia is designed by combining media components comprising texts, picture, video, and animation with the navigation buttons so the teachers and the students will find them usable. The interactive multimedia's display is as follows: (1) opening page; (2) main menu; (3) additional menu; (4) guide menu; (5) lesson materials as submenu; (6); Standard of Competency and Basic Competencies menu; (7) lesson materials menu; (8) the display of the main lesson; (9) observation during learning; (10) mini dictionary and bibliography; (11) evaluation using *quiz game*; (12) evaluation scoring.

Applicability Assessment of Interactive Multimedia

Media applicability assessment stage 1 covers three aspects, i.e., contents appropriateness comprising the suitability of the lesson materials with standards of competencies and basic competencies, its fitness with the developmental stage of the students, the logic and sequence of the lesson materials, and concept of lesson materials. The interactive multimedia passing the assessment part 1 subsequently must get through the assessment part 2 comprising the assessment of each media component. The result of the applicability assessment of the interactive multimedia for each component conducted by the specialist is shown below.

Table 1 Validation Summary of Applicability Assessment of the Contents, Presentation, and Linguistics

Assessor	Component	Total Score	Percentage	Remarks
	Media	22	88%	Very Applicable
Valuator	Lesson Materials	23	92%	Very Applicable
	Language	23	92%	Very Applicable
	Media	25	100%	Very Applicable
Practitioners	Lesson Materials	23	92%	Very Applicable
	Language	24	96%	Very Applicable

Based on Table 1, it is revealed that in the assessment the percentage score of presentation applicability assessment validation is 88%, the percentage of applicable contents is 92%, and applicable language is 92%. On the whole, based on the validation, each component meets the criteria of very applicable. Meanwhile the assessment conducted by practitioner on the presentation, contents, and language parts, respectively, are 100%, 92%, and 96% which meet the criteria of very applicable. The empirical study supporting this research is the research conducted by Afdal Aria Gumilang in 2017 titled "*Pengembangan Multimedia Pembelajaran Interaktif Untuk Kelas V Sekolah Dasar Mata Pelajaran IPA Materi Pengenalan Struktur Bumi*" (Multimedia Development for Interactive Learning in the Natural Science Learning Applied to Grade V Students, for Lesson of Recognizing the Structure of Earth). Based on the assessment of each component conducted by media and materials specialists, the interactive multimedia is verified as very applicable, which means that the end product of the development in form of interactive multimedia meets the applicability criteria and can effectively applied to the learning of Natural Science particularly the lesson of Recognizing the Structure of Earth for grade V students of primary school in Semester 2. Another research strengthening this opinion was also conducted by Ulya Shoffa Hana in 2016 titled "*Pengembangan Multimedia Interaktif Mapel IPA untuk Siswa Kelas VDi SDN Kuwaron 1*" (Development of Interactive Multimedia for Learning of Natural Science Conducted by Grade VDi Students in SDN Kuwaron 1). The outcome of assessment conducted by media and material specialists shows that it meets the criteria of very applicable. Based on the testing conducted by field

Valuator, it is included in category of Good. Therefore the interactive multimedia to learn natural Science for grade V students of SDN Kuwaron 1 is applicable to be used as teaching tool.

Effectiveness of Interactive Multimedia Application during the Natural Science Learning Particularly Lesson of the Transformation of Earth and Sky Topography

The students' cognitive learning outcome is taken find the effectiveness of the interactive multimedia. The students' learning outcome is found from the test score they get before the starting the learning using the interactive multimedia, i.e., pretest, and posttest after the learning which applies the interactive multimedia. The pretest and posttest scores are shown below.

Table 2 Students' *pretest* and *posttest* scores

Action	Average	Highest Score	Lowest Score	Amount of Mastering Students	Learning Mastery Percentage
Pretest	65	83	37	11	52.3%
Posttest	85	100	67	20	95.2%

Based on Table 2, the learning outcome of grade IV students of SD Negeri Klepu 04 after conducting *pretest* and *posttest* it is found out that the average pretest score is 65 and the average posttest score is 85. Based on the data above we find the improvement from pretest score into posttest score, i.e., 42.9%. the amount of students meeting the mastery learning raises from 11 or 52.5% in pretest into 20 or 95,2% in posttest so the learning outcome of grade IV students of SDN Klepu 04 changes from before into after applying interactive multimedia. Another empirical study supporting this research is the study conducted by Ni Kadek Ria Anggriani Dewi, I Nyoman Jampel, A.A. Gede Agung in 2015 titled "*Pengembangan Multimedia Pembelajaran Interaktif IPA Dengan Model Assure Untuk Siswa Kelas VII SMP 1 Sawan*" (Multimedia Development for Interactive Learning in the Natural Science Learning Applying the Assure Model for Grade VII Students of SMP 1 Sawan). The research finds that the design of interactive multimedia development creates flowchart and storyboard. Also, based on the calculation, average score of the learning outcome after using the media is higher (81) than before using the media (55.83). So, it is concluded that multimedia for interactive learning can effectively improve the learning outcome in the subject of Natural Science when applied to grade VII students of SMP Negeri 1Sawan during the even semester.

The collected *pretest* and *posttest d*ata are then tested for their normality, to find if the pretest and posttest scores are normally distributed or are not

and to determine the statistic analysis that will be conducted. The followings are the result of normality test using *Liliefors*.

Table 3 Normality Test of Pretest and Posttest Scores

Action	L o	L t	α	n	Remarks
Pretest	0.115	0.190	0.05	21	Ho accepted
Posttest	0.103	0.190	0.05	21	Ho accepted

Based on Table 3, Liliefors calculation result for pretest is 0.115 and Liliefors calculation result for posttest is 0.103. Lo *pretest* and *posttest* < Lt i.e., 0,190 so from the data above it can be concluded that pretest and posttest score are normally distributed. Then the next calculation will be conducted in statistic parametric technique.

I also conducted *t-test* to find the score margin of *pretest* and *posttest*. Here is the summary of calculation of the average margin of the scores the students make before and after using interactive multimedia.

Table 4 T-test Assessment of Pretest and Posttest Scores

Data	A	Dk	t_{tabe}	t_{hitung}	Keterangan
Pretest *Posttest*	5%	40	2,021	12,0528	Ha diterima

Data	A	Dk	t_{count}	t_{table}	Remarks
Pretest	5%	40	2.201	12.0528	Ha accepted
Posttest					

Based on Table 4 above we can find that from the average margin between pretest and posttest scores we get t_{count} = 12.05 or bigger than t_{table} (1.67). If $t_{count} < t_{table}$, then Ho is accepted and if $t_{count} > t_{table}$, then Ha is accepted. Based on the data above, it can be concluded that interactive multimedia is effectively used for learning Natural Science, particularly lesson of Transformation of Earth and Sky Topography to grade IV students in SD Negeri Klepu04.

From the empirical aspect, the study supporting this research is the one conducted by Gede Eka Pratama, Ign WayanSuwatra, Wayan Romi Sudhita, in 2014 titled "*Pengembangan Multimedia Pembelajaran Interaktif Mata Pelajaran Ilmu Pengetahuan Alam Kelas V SD Negeri 4 Peliatan*" (Multimedia Development for Interactive Learning in the Natural Science Learning for Grade V Students of SD Negeri 4 Peliatan). The value of t_{table} at significance rate 5% is 2.00. So the value of t_{count} is higher than t_{table}, so that H_0 is rejected and H_1 is accepted. It means that there is significant margin between the students' learning outcome of Natural Science after using the media (81.67) which is better than the one before using the media. In

addition, it was the study conducted by Irlidiya in 2015 titled *The Development of Interactive Multimedia for First-grade Beginning Readers of Elementary School: An Innovative Learning Approach,* using t-test analysis by applying the statistic application, i.e. IBM SPSS 20 showing that there is a difference of the learning outcome between the classroom using the interactive multimedia and the classroom which does not.

Another supporting study is the one conducted by Dian Mustika Anggraeni and Muhammad Walid in 2016 titled *Developing Interactive Flash Media for Thematic Learning*. Based on that research, t_{count} (4.48) > t_{table} (1.860), then Ha is accepted and Ho is rejected. The conclusion is that there is a significant margin between initial score (pretest) and final score (posttest).

After the average margin of pretest and posttest is found through t-test, subsequently I tried to find the average improvement rate by calculating N-gain. Here is the summary of N-gain calculation.

Table 5 Test of Average Raise (*Gain*)

Category	Score
N-Gain	0.575269
Average *pretest*	65
Average *posttest*	85
Average margin	20
Remarks	Moderate

Based on Table 5, it is found out that average improvement (*gain*) of *pretest* and *posttest* is 0.57 at average margin 20. The average improvement shows that the media for interactive multimedia is effectively used for the learning of Natural Science in part of Transformation of Earth and Sky Topography to grade IV students of SD Negeri Klepu 04. The raise of the learning outcome illustrated in *pretest and posttest* score befire and after using interactive multimedia is presented in the following Line chart.

Picture 1. Improvement of Learning Outcome for using interactive multimedia

The effectiveness of interactive multimedia is also assessed based upon the questionnaire responses fulfilled by the teachers and the students.

The students' questionnaire responses consisting of 15 aspects are distributed to all grade IV students of IV SDN Klepu 04 amount of which is 21. The questionnaires are fulfilled by the students after being engaged in the learning using interactive multimedia. Here is the summary of questionnaire fulfilled by the teacher and students during the experiment.

Table 6. Summary of Questionnaire Fulfilled by the Teacher and Students

Respondents	Percentage	Remarks
Students	92.3%	Very Effective
Teacher	100%	Very Effective

Based on Table 6, it is found out that grade IV students of SDN Klepu 04 during the experiment of interactive multimedia in the learning of Natural Science in part of Transformation of Earth and Sky Topography, aspects 1, 2, 5, 10, and 15 attain the assessment percentage 100%. In addition, aspects 3, 6, attain the assessment percentage 95.2%. Meanwhile the aspects 4, 8, 12, 13, and 14 attain the assessment percentage 90.4%. While aspects 7 and 11 attain the assessment percentage 85.7% and aspect 9 attains the assessment percentage 71.4%. The teacher's questionnaire response is the questionnaire given to the teacher to assess the effectiveness of the interactive multimedia in the Natural Science learning. The questionnaire contains 15 questions completed with note column to give suggestions concerning interactive multimedia usage. The fulfilled Teacher's questionnaire attains score at percentage 100% for all aspects. The supporting research is the one conducted by R. Gita Ardhy Nugraha, in 2017 titled "*Pengembangan Media Interaktif Berbasis Adobe Flash CS4 Pofessional pada Pembelajaran Tematik untuk Siswa Kelas 2 SD*" (Development of *Adobe Flash CS4 Pofessional*-Based Interactive Media in the Thematic Learning for Grade 2 Students). The fulfilled questionnaire show the average attained scores 4.34 included in category of Excellent. In addition, the questionnaires fulfilled by 50 students on the experiment shows that the average attained score is 4.26 which means Excellent

Observation Outcome of Students' Activities

The outcome of observation of students' activities is attained from Students Activeness Observation Sheet. The observation was conducted within two sessions. The amount of the observed students is 36, consisting of 16 males and 20 females. The activities the students do influence their understanding of the delivered lesson materials during the learning. Therefore it will determine the students' learning outcome. The mastery criteria for the students' collective activities are: excellent, if getting $80\% \leq score < 100\%$; good, if getting $60\% \leq score < 80\%$, fair, if getting $40\% \leq score < 60\%$, and poor if getting $20\% \leq score < 40\%$. Here is the summary of the observation of the students' activeness during Session 1 and Session 2.

Table 6 Summary of observation of students' activeness

Session	Total Score	Percentage	Remarks
1	587	81.5%	Excellent
2	639	88.75%	Excellent

Based on Table 6, it is found out that result of observation of students' activeness in Session gets score 587 or 81,5% which means Excellent. While the score of students' activeness in Session 2 is 639 or 88,75% which means Excellent.

The empirical study supporting this research is the one conducted by Susanto, Novi Ratna Dewi, Andin Irsadi in 2013 titled *Pengembangan Multimedia Interaktif dengan Education Game Pada Pembelajaran IPA Terpadu Tema Cahaya Untuk Siswa SMP/MTS* (Development of Interactive Multimedia applying Education Game in Learning of Integrated Natural Science for Secondary/Islamic Secondary School Students). This research conducted in MTS Nuril Huda Grobogan Regency developed interactive multimedia combined with education game inserted into interactive CD. The result was that the students put high interest because they were motivated in the learning..

4. CONCLUSION

The developed multimedia for interactive learning in the learning of Natural Science, part of Transformation of Earth and Sky Topography, based on the assessment carried out by media and material specialists, linguist, and practitioner, it is certified as applicable with the percentage of the following components: presentation (88%), lesson materials (92%), and linguistics (92%). While the assessment given by practitioner is as follows: presentation (100%), lesson materials (92%), and linguistic (96%). Based on the data above the assessment score on every component meets the criteria of very applicable, so the interactive multimedia is applicable to the learning of Natural Science. Interactive multimedia can effectively be used in the learning of Natural Science, particularly lesson of Transformation of Earth and Sky Topography shown by the margin of average pretest and posttest scores in following calculation: t_{count} (12.05) is bigger than t_{table} (1.67) as well as the average improvement rate of pretest and posttest is

0.57 or fair. The usage of interactive multimedia in the learning of Natural Science, particularly lesson of Transformation of Earth and Sky Topography successfully improves the students activeness to 82.5% in Session 1 which means Excellent and to 86.8% in Session 2 which means Excellent.

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