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Research Article

Validity and Reliability Study of Science-Edutainment Interactive Multimedia on Earth Topic for the 7th Graders of Junior High Schools

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Abstract

Natural science, as a fundamental science, requires a series of observations to be understood. For the subject about structure of earth, earthquake, and volcano, the students need the direct observation because the nature of the subject that tends to be abstract. In order for the students to be able to observe directly about the subject of earth that tends to be formed in an abstract concept, therefore the students need the learning media that is able to change that concept into the concrete one moreover also can change it into a fun education for the students. The media that is able to solidify the abstract concept is a media in a form of interactive multimedia. In order to make the students become ecstatic during the learning process, it is a need to do the edutainment approach. Therefore, it is a necessary to do an observation with a purpose to produce the product in a form of interactive multimedia named science edutainment with the topic of earth that is applicable and valid for seventh grade of junior high school students. This research used 4D method without dissemination step. The applicability of the developed product is obtained from the validation of product and the readability test. According to the results of media validation done by the expert, the media was considered appropriate by the percentages of 76.4% for media appropriateness and 88.5% for content appropriateness. On legibility test, it obtained 91.3% by teachers and 93.5% by students, which mean that the media was very appropriate. Hence, the interactive multimedia of science-edutainment on earth topic for the 7th graders of Junior High Schools is considered appropriate and valid.

Keywords: *learning media, interactive multimedia, science-edutainment, earth*

Studi Validitas dan Reabilitas Multimedia Interaktif Science-Edutainment | pada Topik Bumi untuk Siswa SMP Kelas VII

Abstrak

IPA, sebagai sains fundamental yang mempelajari fenomena alam, mensyaratkan serangkaian kegiatan pengamatan untuk dipahami. Pada materi struktur bumi, gempa bumi, dan gunung api siswa memerlukan pengamatan secara langsung karena sifat materi tersebut cenderung abstrak. Agar siswa dapat mengamati secara langsung materi pada tema bumi yang cenderug abstrak, maka siswa membutuhkan media pembelajaran yang mampu mengkonkritkan konsep yang abstrak dan dapat membuat siswa merasa senang. Media yang mampu menkonkritkan konsep yang abstrak adalah media berupa multimedia interaktif. Agar siswa merasa senang selama kegiatan pembelajaran maka perlu

menggunakan pendekatan edutainment. Oleh karena itu, penelitian yang bertujuan untuk menghasilkan produk berupa multimedia interaktif science-edutainment pada tema bumi untuk siswa SMP kelas VII yang layak dan valid perlu dilakukan. Model penelitian yang digunakan dalam penelitian dan pengembangan ini mengadaptasi model penelitian 4D tanpa tahap desiminate. Kelayakan produk yang dikembangkan diperoleh dari validasi produk dan uji keterbacaan. Berdasarkan hasil validasi media yang dilakukan oleh ahli, produk dinyatakan layak dengan persentase 76,4% untuk kelayakan media dan 88,5% untuk kelayakan materi. Pada uji keterbacaan diperoleh persentasi sebesar 91,3% oleh guru dan 93,5% oleh siswa, yang berarti sangat layak. Dengan demikian, multimedia interaktif science-edutainment pada tema bumi untuk siswa SMP kelas VII dinyatakan layak dan valid.

Kata Kunci: *media pembelajaran, multimedia interaktif, science-edutainment*

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I. INTRODUCTION

The learning of Science can be essentially viewed from two points of view, which are Science as product and Science as process [1]. Science as product involves fact, principle, theory, and law. While Science as process is in the form of problem solving procedure or concept discovery through scientific method. In other words, Science learns about fact or natural phenomena. When studying about fact or natural phenomena, it is essential to do observation. The results of interview with junior high school students in Malang city showed that most of them found it difficult to understand the material about the earth and its phenomenon due to the abstract concepts. To make students understand about materials of the earth structure, earthquake, and volcano, they require to do direct observation because the characteristic of those materials tend to be abstract [2]. However, the current learning activity is still teacher-centered and it is done on textual way by using student coursebook that makes students easily get bored and uninterested [3-5]. The results of interview with one of the science teachers in junior high school in Malang city showed that the students' interest in reading the book was quite low, and they tended to feel bored in which it had impact on the students' learning motivation.

The students learning motivation will appear if they are interested in the learning media that can help them to study [6-8]. The interesting media is the one that can make students study about phenomena directly. The phenomenon of the earth such as the movement of the earth's plates is an example of a phenomenon about the earth layer that cannot be observed directly so that the students need a medium that can visualize how the movement of the earth's plates [9]. One instance of media that can help the students to learn the material about the earth is using virtual application of earthquakes that can help them to explore the epicenter and the magnitude of Richter scale of earthquake strength [10]. Earthquake is a natural phenomenon that happens on the earth and its process cannot be observed directly by students. Junior High School students require learning aids to concrete the abstract materials

and help students to review the learning materials [11].

A tool or a learning medium that can visualize how the earthquake process is using a multimedia that combines an animation, a video, texts, and an audio. Multimedia is an effective tool to improve the students' learning activities on phenomena that cannot be observed directly such as the process of volcano eruption [12]. A good learning medium is an interactive medium. The use of interactive video on natural disaster materials leads the students know not only about the learning concept of memorizing, but also the concrete form of natural disaster such as the earthquake and volcano [13]. It shows that through using interactive multimedia, students are able to observe a phenomenon directly. Hence, students will be easy to comprehend the concept.

In addition, students' learning motivation will be increased if they feel contented during the learning process. To make students pleased during the learning activities, it uses edutainment approach [14]. Science learning that is conducted by using education game is able to make students active and interested to the learning activities [15-17]. By using edutainment approach, students are going to study happily during the learning activities [18-21].

The learning media of interactive multimedia that currently uses edutainment approach especially on earth topic for Junior High School students has not been spread yet. The interactive multimedia that has been developed previously is focusing on the materials of volcano eruption process for Senior High School students and the interactive CD on materials of earthquake [22] and volcano disasters for the sixth grade of elementary school [23]. Besides, the learning media of interactive multimedia which are distributed in the market related to the earth topic are not really specific or do not match the students' needs for the seventh grade of Junior High School on 2013 curriculum. Due to the weaknesses of Science learning media on earth topic for Junior High School, it is essential to conduct further development. The learning media developed is in the form of interactive multimedia by the approach of science-edutainment. Applied teaching science-edutainment give positive influence to increase the students learning outcome in comprehending the difficulties and bored science concept [24-26].

II. RESEARCH METHOD

The steps used in this research and development adapted the steps of the 4D model developed by Thiagarajan et al. (1974) in which the steps followed until Develop and validation stages so that the stages of the study consisted of Define, Design, and Develop [27]. The define step consists of preliminary final analysis, students analysis, task analysis, concept analysis, and objective specification. The design step consists of media selection, format selection, and preliminary planning of instrument. The develop step consists of the assessment conducted by media and materials experts. The product validation activities are conducted by media and material experts with the following qualifications: 1) is a university lecturer with minimum education in master's degree in the study program of informatics or physics technology, 2) mastering multimedia, 3) mastering material of earth science.

The try-out design of this study involves product improvement activity and small-scale try out. The try out is conducted by 2 Science teachers of Junior High School and 15 students of the 7^{th} grade. The type of data obtained are quantitative and qualitative data. The instruments used to obtain the data are using validation sheets of media expert, materials expert, and readability. The validation sheet is created in the form of questionnaire. The questionnaires of media

expert and readability validation sheets use Likert scale that involves range of scale from 1 to 4. While the validation sheet of materials uses Guttman Scale containing description of "YES" or "NO".

The techniques of data analysis used are technique of analysis on media and evaluation instrument. The technique of media analysis uses percentage analysis technique. The validation criteria used in this research and development can be seen in Table 1.

Table 1. Criteria of Feasibility and Validity [28]

Percentage	Feasibility	Valid
81%-100%	Very Feasible	Very Valid
61%-80%	Feasible	Valid
41%-60%	Fair	Fair
21%-40%	Less Feasible	Invalid
0%-20%	Very Infeasible	Very invalid

The technique of evaluation instrument analysis which is in the form of test items to measure concept mastery on earth topic uses percentage technique, product moment (r) technique, and reliability. Then, the valid test items will be tested in terms of their reliability. Reliability criteria of evaluation instrument on the learning media developed can be seen in Table 2.

Table 2. Reliability Criteria of Evaluation Instrument [29]

No	Value	Criteria
1	0.800 – 1.00	Very high
2	0.600 – 0.800	High
3	0.400 – 0.600	Fair
4	0.200 – 0.400	Low
5	0.00 – 0.200	Very low

III. RESULTS AND DISCUSSION

Product Validation Results

The product validation consisted of media and materials validations. The media validation obtained quantitative data that could be seen on Table 3.

Table 3. Quantitative Data of Media Validation Results

Statements	Percentage (%) Average	Description
Software Engineering Aspect	75	Feasible
Learning Media Design Aspect	79.2	Feasible
Visual Communication Aspect	75	Feasible
Average of All Aspects	76.4	Feasible

According to the validation results toward three main aspects on the media, it was obtained the average value of 3.06 out of 4 or 76.4%; therefore, it could be concluded that the media was feasible and valid according to the feasibility and validity criteria in Table 1. However, it needed to be revised first before use. The media was categorized as feasible to use because the media can be used effectively, efficiently, and can be operated easily which consisted of animations, videos, and games that attracted to the students. Next, the product revision was conducted based on qualitative data of media validation results in the form of comment/suggestion. The comment/ suggestion obtained were: (1) The animation of convection current on the earth mantle needs to be improved, (2) The animation of compound composing sial and sima layers should not use arrow, and (3) The hydrology cycle video needs to be improved. Furthermore, the product revision was conducted based on comment/suggestion and it obtained feasible and valid media through revisions as follow: (1) one of the three animated convection motion movements

showed that the direction of the movement was not in accordance with the direction of the earth's plate movement. The direction of the convection moved to the left while the direction of the movement of the earth's plate was vice versa. Hence, the animation of the convection motion movement to the right that produced the movement of the earth's plates to the right should be fixed, (2) the animation of the compound of sial and sima layers was visualized by the circle shape because when it used an arrow, non-compound motion seemed appear, and (3) a hydrological cycle video consisted of long, medium, and short hydrologic cycles in which previously, the hydrological cycle only consisted of a short one. The materials validation involved validation of materials concept correctness, evaluation instrument concept correctness, materials depth, and evaluation instrument feasibility. The materials validation obtained quantitative data which could be seen on Table 4.

Table 4. Quantitative Data of Materials Validation Results

Aspects Rated	Percentage (%) Average	Description
Concept Correctness on Materials	100	All True
Materials Depth	75	Feasible
Evaluation Instrument Feasibility	79	Feasible
Concept Correctness on Evaluation Instrument	100	All True
Average of All Aspects	88,5	Very Feasible

The validation result of materials feasibility on correctness aspect of materials concept obtained the feasibility percentage value of 100%. While the validation result of materials feasibility on materials depth aspect obtained the feasibility percentage value of 75%. Based on those validation results, it was stated that all concepts included on the materials were very valid and the materials included on the media were appropriate. The validity came from all correct concepts in the material.

The assessment of instrument's concept correctness evaluation was conducted toward 53 test items that were developed. Clearly, it was obtained that the percentage value of concept correctness was 100%, and the percentage value of test item feasibility was 79%. Furthermore, it was concluded that all concepts that were on test items were correct and it was feasible to be tested empirically to the students.

After validation step conducted by the materials expert, the next steps are validity and reliability test towards the evaluation instruments. Those activities aim to obtain valid test-items and high reliability that is in accordance with the field condition. Those valid test items then are included into the media that are developed as the evaluation test-items. According to the result of validity test towards 53 test-items that are tested to the seventh graders of SMP Karangploso, it obtained 41 media valid test items. Those valid test items were then analyzed using reliability test. According to reliability test result, it obtained reliability value that was 0.87 and those test items were categorized into high criteria in terms of their reliability according to the criteria level of reliability of evaluation instrument in table 2. Then, those 41 test items which had been valid and reliable were selected to the amount of 30 test items that represented every indicator to be included into the media.

Readability Test Results

The readability test of media was conducted by 2 Science teachers and 15 students of the 7th grade in SMP Negeri 1 Karangploso, Malang Regency. The assessment of readability test conducted by teachers consisted of three main aspects involving software engineering, media design, and visual communication. The readability test conducted by teachers obtained quantitative data that could be seen on Table 5.

Table 5. Quantitative Data of Readability Test Results Conducted by Teachers

Aspects Rated	Percentage (%) Average	Description
Software Engineering Aspect	87.5	Very Feasible
Learning Media Design Aspect	90.9	Very Feasible
Visual Communication Aspect	95.5	Very Feasible
Average of All Aspects	91.3	Very Feasible

Based on the readability test result towards those three main aspects on the media, it obtained the average score of 3.65 out of 4 or 91.3%; therefore, it can be stated that the media is very feasible to use. The media was categorized as feasible to use because the media can be used effectively, efficiently, and can be operated easily, and consisted of animations, videos, and games that attracted the students. In addition, the material on the media was in accordance with the Basic Competence and with the level of cognitive development of the students.

The qualitative data obtained were in the form of comment or suggestion. The comment or suggestion obtained were 1) The sentences used on test items should not be too long, and 2) The back sound used should not be too loud. Moreover, the product revision was conducted based on comment/suggestion and the result showed it was feasible and valid media by the improvement of back sound voice that was not too loud and the sentences used on test items had been managed not to be too long. The readability test conducted by the students obtained quantitative data that could be seen on Table 6.

Table 6. Quantitative Data of Readability Test Results Conducted by Students

Aspects Rated	Percentage (%) Average	Description
Software Engineering Aspect	89.2	Very Feasible
Learning Media Design Aspect	95.5	Very Feasible
Visual Communication Aspect	96.0	Very Feasible
Average of All Aspects	93.5	Very Feasible

According to the readability test result towards those three main aspects on the media, it obtained the average score of 3.74 out of 4 or 93.5%; therefore, it can be stated that the media is very feasible to use. The media was categorized as very feasible because it was easy for the students to operate it, and consisted of fun animations, videos, and games for the students, as well as using sentences that are easily understood by them.

The qualitative data obtained were in the form of comment or suggestion. The comment or suggestion obtained were 1) The learning media were good and understandable,

interesting, entertaining, and motivating to study, and 2) If the learning media was used on noisy condition, it was expected to use speaker in order to make the voice clearer. Then, the product revision was conducted based on comment or suggestion and it obtained feasible and valid media by the improvement of louder voice volume.

According to the previous research, the materials related to the earth, volcano eruption, and earthquake that are included into the application of interactive multimedia can be delivered attractively and can be mastered well. The application of interactive multimedia has been effective to improve learning motivation and mastery of volcano eruption's process material for Senior High School students [22] and it is able to improve the learning quality for the sixth grade of elementary school [23]. Nowadays, the interactive multimedia on the earth topic or includes the materials of earth structure, earthquake, and volcano for Junior High School students are still not available in the market. The interactive multimedia specifically on earth topic is intended to Elementary and Senior High Schools only.

The interactive multimedia that has been developed is using science-edutainment approach, so it makes students study through fun activities that are included in the Science media. The science-edutainment is an educated and joyful Science learning that involves science elements, inquiry process, and educated games [24]. The learning process that is fun and interactive is expected to increase students' interest to learn Science concepts [30]. To create fun learning process, it is essential to make the media in the form of video, animation, and game. Those three aspects which are included in the interactive multimedia is proved that it can make students interested and feel glad during the learning activities showed by the average percentage of 97.23%.

IV. CONCLUSION

From our study, it can be concluded that the designed research and development in form of interactive multimedia science-edutainment on earth topic for the seventh graders of Junior High Schools which is feasible and valid. Therefore, teachers may apply such interactive multimedia to help their students understand abstract concepts.

The suggestion that is recommended for further study is developing this product by combining game and materials files to improve the weaknesses on this interactive multimedia, so the media will be better and conducting empirical try out by using broader samples. This empirical test is conducted aiming to find out the effectiveness of science-edutainment interactive multimedia on earth topic.

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