Research Article

Development of a Visual Novel Game on Evolution Material

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Abstract.
Technological developments are closely related to improving the quality of education. Currently, games are widely used as learning media. One of these games is visual novel games. This study aimed to determine the characteristics of the visual novel game learning media, the level of student learning outcomes, and student responses. The research method used is Research and Development using a 3-D model. The characteristics of the website-based visual novel game learning media were developed using visual novel maker software to produce media products that match the specifications of the learning media. The results of the validation test were 85.33% of the material expert validation assessment (very feasible), the media expert validation assessment 76% (very feasible), the media and material validation assessment from the biology subject teacher 71.34% (adequate), and the media readability validation assessment from students was 76.9%. The average value of validation obtained from the four validators was 77.39% (very feasible). The level of student learning outcomes after using learning media can be known by doing a pretest and post-test, the results obtained in the form of a normalized gain calculation value (N-Gain) of 0.56 and these results include moderate criteria. Finally, the average value of student responses obtained was 74.24% including the positive category. Based on the data from the analysis of the research, it shows that the website-based visual novel game learning media can improve student learning outcomes.

Keywords: visual novel game, evolution, material

1. INTRODUCTION

Current technological developments are closely related to improving the quality of education, which has a major influence on the development of the world of education. Improving the quality of education must be carried out continuously in line with the progress of global development to make today's generation become competitively student [1]. Technology that is growing rapidly has an influence on people's life so that various technologies such as smartphones, tablet PCs and laptops are used by people in our daily life. Various kinds of technology are used by the public to access a lot of information. One technology that is favored by many people is a game or

game based on a computer, android or website. Currently, games are widely used in the learning process. The use of games as learning media can actually create a fun learning atmosphere for students and increase learning motivation [2].

Games can be used as learning media to help achieve learning objectives in a learning process. Besides having interactive features that can make students active in the learning process. Several factors in a game that can attract the attention of users are gameplay and graphics. The flow of the game can make gamers curious, the appearance of graphics or images, and an attractive background make the gamers feel at home playing it [3].

There are various types of games in current technological developments, one of which is visual novel games. As a digital game product, visual novel is a type of game with visual-audio media that offers visual power through gameplay characters and narration. This game features a choice of interactions, dialogues and storylines that contain mystery [4]. Interactive static visual stories are the main basis for visual novel games. There is also a conversation box containing a narration that conveys story information to the players [5]. The difference between this game and the others is the plot and character development, it also has many plots and many endings [6]. The development of visual novel games in Indonesia has begun to develop with the existence of several visual novel games in which the theme of high school children's activities at school.

This visual novel game can be used as learning media process to display learning materials. The potential in this visual novel game can support the creation of good learning conditions. This is because in this visual novel game there is an entertainment component so that the level of motivation of students increases. The use of this visual novel game can be a learning media that focuses on students as a motor for the ongoing learning process [7]. This visual novel game can also be used as a design in the learning process to provide a great attraction for students' learning interest in participating in learning activities in class and increasing the quality of learning [8].

Based on the results of the preliminary study through deep interview with the teacher at SMA Negeri 4 Bandung, that the learning media that she often uses during class learning include only PPT (Powerpoint), videos, and learning recordings. He never used games as learning media in class. The survey was also conducted through online questionnaires filled out by students. The results show that 88% of the media that is often used in their classroom learning is power point (PPT) from 75 people who filled out an online preliminary study questionnaire, 80% of students know about visual novel games and 98.7% of students admit that their biology teacher has never used visual

novel games as a learning media in the classroom. As many as 92% of students who filled out online questionnaires were interested in using website-based visual novel games as learning media. The selected learning materials are based on the results of filling out online questionnaires by students. The result show that 18.7% who chose evolutionary material.

Based on the background of the problems above, the research questions are 1). What is the validity of website-based visual novel game learning media on material evolution? 2). How is the effectiveness of website-based visual novel game learning media on evolution material? 3). What is the response of students to the website-based visual novel game learning media on evolution material?

2. RESEARCH METHOD

This study uses the Research and Development (R&D) method. Therefore, this research only focuses on creating visual novel game products as biology learning media that can be used by teachers and students. The model used in product development is a 3D model. This development model is a limitation of the 4D development model (Define, Design, Development, and Disseminate). The source of the research trial data came from 28 people and the research data source came from 75 students. Data collection techniques were carried out by teacher interviews, validation media (quality and operational aspects) and validation material (curriculum, presentation of material and language aspects) by supervisor, pretest and posttest, and collecting student response questionnaires after the learning media trial. For technical data analysis, there are several steps including:

2.1. Learning Media Validation

Learning media can be categorized as valid if they are in accordance with the applicable curriculum and are interrelated with each other. Thus, the validity test is testing the product with predetermined conditions. Products that have been successfully developed can be categorized as valid if the product is based on sufficient theory and the elements contained in the learning media are connected to each other. Valid or not a learning media depends on the quality level of the learning media. Generally, the results of this validity test can strengthen the validity of the learning media used [9]. According to

Karina, et al [10] the criteria for determining the value of the validity of a learning media are expressed in percent with the following calculation formula.

$$\% \; validity = \frac{Overall \; score}{Highest \; score \; ideal \; total} \quad (1)$$

The results of this percentage validity value are calculated on the overall average from the assessment given through the media and material validation sheet, then matched with the validity criteria in Table 1 as follows.

TABLE 1: Criteria for validity of learning media.

Score	Percentage	Value	Classification
4	76-100%	A	Very Valid
3	56-75%	B	Valid
2	40-55%	C	Not Enough Valid
1	0-39%	D	Very Not Valid

2.2. Learning Outcome Level Data Analysis

The test of the level of student learning outcomes after using learning media was measured from the results of the post-test scores. The test question indicators consist of bloom taxonomy levels C1, C2 and C4. After collecting data on the results of the students' pre-test and post-test scores. Furthermore, the data analyzed include the following:

1. Adding up the scores for each question with the provision that the score for multiple choice questions is given a score of five for the correct answer and a score of zero for the wrong answer or the question is not filled in. The final value calculation is calculated by the following formula.

2.

$$NA = \frac{Xi}{k} \times 100 \quad (2)$$

Description :

NA = Final score

Xi = The correct number of items

k = Number of questions [12]

1. The last step is to find normalized gain (N-Gain) to determine the level of student learning outcomes after using website-based visual novel game learning media. The equation of the formula is as follows.

$$N - Gain = \frac{Sf - Si}{Nmax - Si} \tag{3}$$

Description :

N-Gain = Normalized gain

Sf = Average score posttest

Si = Average score pretest

Nmax = Maximum value [12]

The results of the calculation of the normalized gain (N-Gain) are interpreted into the criteria for the level of learning outcomes that have been set in Table 2 as follows.

TABLE 2: Criteria for the level of student learning outcomes.

Range Normalized Gain	Criteria
0.7 ≤ N-gain ≤ 1	High
0.3 ≤ N-gain ≤ 0.7	Medium
N-gain < 0.3	Low

2.3. Response Data Analysis

Student response is one aspect of the assessment in addition to the validity test in determining the feasibility of a learning media. Student responses were obtained through a questionnaire in the form of a closed answer questionnaire structure. The form of this questionnaire structure is a questionnaire structure in which each item of the choice of answers has been determined by the variation of the alternative answers [11]. Analysis of response data in the form of a questionnaire includes:

1. The calculation of the score of the question items answered by the students using the following formula.

$$interval = \frac{Statement\ item\ score}{The\ highest\ score\ of\ statement\ items} \tag{4}$$

Score interpretation criteria:

0% - 20% = Very Weak

21% - 40% = Weak

41% - 60% = Enough

61% - 80% = Strong

81% - 100% = Very Strong

1. Determination of the average overall response (RS) from limited trials that have been carried out. Then determine the category of student responses by matching the following positive criteria in Table 3.

TABLE 3: Criteria for the Level of Student Learning Outcomes.

Score Percentage	Category
85% $\leq$ RS	Very Positive
70% $\leq$ RS < 85%	Positive
50% $\leq$ RS < 70%	Less Positive
RS < 50%	Not Positive

3. RESULTS AND DISCUSSION

3.1. Validation of Learning Media

The media development using the help of visual novel maker software to be able to develop media products that are in accordance with the specifications of the website-based visual novel game learning media using the Java script and HTML programming languages in game development, the game display pixel size is 1280x720, there are additional images and files. Videos related to game development with jpg and png file formats for images and mp4 for videos, as well as an internet connection for game operation. Then developed and analyzed the validation with a validation test which aims to determine the value of the feasibility of the learning media and corrected if there are deficiencies found in the learning media by the validator. The validation results are obtained from the validator who fills out the media and material validation test sheet. In particular, the media validation assessment on the readability aspect is filled out by students on a separate readability test sheet from the assessment of other aspects. All validation tests were carried out once and were revised once. The following is a recapitulation of the results of the overall media and material validation test assessment in Table 4.

The results of the percentage value validation in all aspects of media and material assessment in learning media obtained an average percentage value of 77.39%. This shows that the learning media received a fairly good assessment from all validators, both in terms of material, media, and readability aspects. From the results of the average percentage of the overall validation value, it can be classified that the material, media,

TABLE 4: Results of Overall Validation Value Recapitulation.

No	Validator	Result of Validation Value (%)	Classification
1	Material Expert	85.33%	Very valid
2	Media Expert	76%	Very valid
3	Biology Teacher	71.34%	Valid
4	Learners	76.9%	Very valid
	Average	77.39%	Very valid

and readability of the website-based visual novel game learning media that has been developed are classified as very decent.

3.2. Level of Student Learning Outcomes

The pretest and posttest consist of 20 questions on evolution material in the website-based visual novel game learning media trial for students. The pretest and posttest work aims to determine how much the value of the level of student learning outcomes after using learning media. The following are the results of the pretest and posttest of the website-based visual novel game learning media on the graph of the results of the pretest and posttest scores in Figure 1.
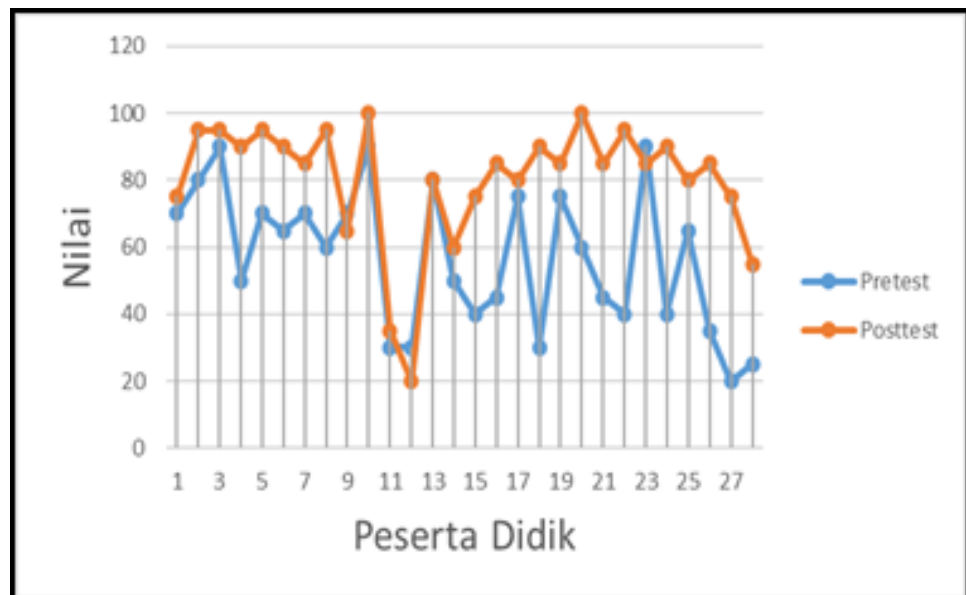

Figure 1: Results of students' pretest and posttest scores.

Based on Figure 1, the results of the test scores of 28 students showed that there was an increase in the posttest average score from the pretest average score. The average value of the increase was 23.4 points. The average value of the pretest and posttest is

calculated for the N-Gain value per bloom taxonomy indicator on the question using the normalized gain calculation formula (N-Gain) to determine the level of student learning outcomes which can be seen in Table 5 as follows.

TABLE 5: Results of n-gain calculations every question indicator.

Number of Questions	Question Indicators (Bloom's Taxonomy)	N-Gain	Description
20 Questions	C1	0.50	Medium
	C2	0.53	Medium
	C4	0.66	Medium
	Average	0.56	Medium

Based on the results of the calculations in the Table 5, the results of normalized gain (N-Gain) with a total of 20 questions. In the C1 (Knowledge) indicator questions, the N-Gain results are 0.5. These results indicate that the level of student learning outcomes on the C1 (Knowledge) indicator is included in the moderate criteria. Furthermore, the indicators for questions C2 (Understanding) get an N-Gain of 0.53. The results of the N-Gain on the C2 indicator questions show that the criteria for the learning level of students are included in the medium criteria. Finally, on the C4 indicator questions (Analysis) the N-Gain result is 0.66 and this result shows that the level of student learning outcomes on the C4 indicator questions is included in the medium criteria. After knowing the results of N-Gain per question indicator which shows moderate criteria at the level of student learning outcomes, then all N-Gain results for each question indicator (C1, C2, and C4) are calculated on average and get a result of 0.56. The average results of the N-Gain on each of these indicators give the final result that the level of student learning outcomes after the learning media trial is included in the medium criteria. The level of student learning outcomes with moderate criteria shows that the website-based visual novel game media on evolutionary material is quite effective for students to use as learning media in class and the material explained in the learning media is delivered to students.

3.3. Student Response

Test the student's response to the website-based visual novel game learning media. This is done to determine the level of student response after the learning media trial. The following is a graph of the results of the student response assessment scores in Figure 2.
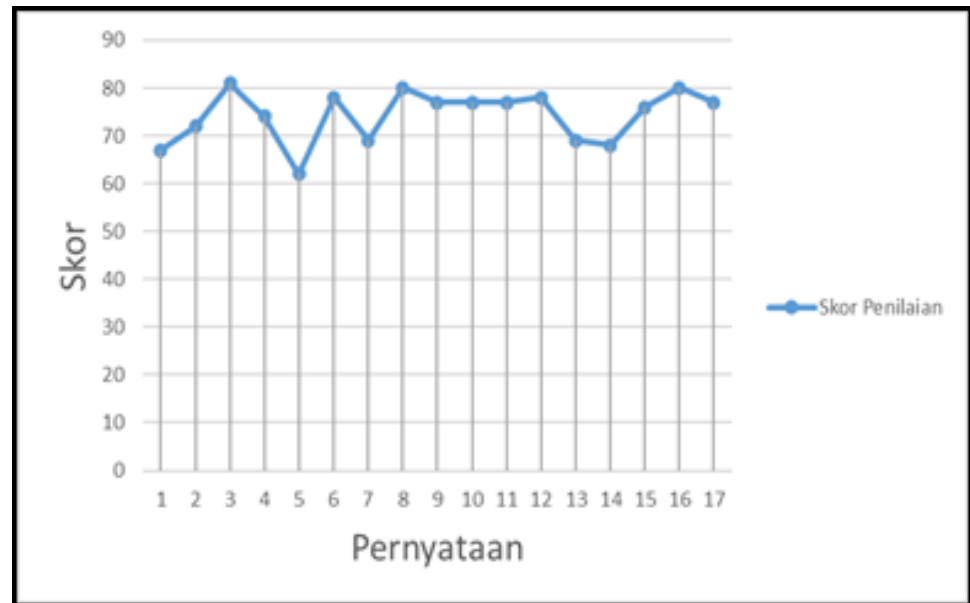
Figure 2: Student response assessment score results.

Data collection in this study was based on a questionnaire technique. This response questionnaire is in the form of 17 statements as shown in the graph in Figure 2 and then filled with values ranging from 1-5 by 28 students with the ultimate goal of knowing the level of student response to learning media that have been developed and used in the learning process. Based on the calculation on the graph the average score of the student response test assessment on the learning media obtained a value of 74.24%. The average score of this value indicates that the website-based visual novel game learning media gets an assessment of the student response level which is included in the positive category. The high results of student responses indicate that there is a sense of interest in students towards the learning media [15].

4. CONCLUSION

Based on the results of research that has been done regarding the development of website-based visual novel game learning media on evolutionary material, the conclusions are : the results of the analysis of media and material validation assessments show that website-based visual novel game learning media is very feasible to use in the learning process in class. This is indicated by the test results there was an increase in the posttest average score on evolutionary material after using the website-based visual novel game learning media during learning process. Student responses to the website-based visual novel game learning media on evolutionary material is a positive category.

Acknowledgments

References

[1] Satrio A, Abdul G. Development of visual novel games for social science subjects in junior high schools. Journal of Educational Technology Innovation. 2017;1:1–12.

[2] Yulandari SN, Kustijono R. The effectiveness of using visual novels to practice critical thinking skills. 2017.

[3] Agusalim ID. Developing visual novel game of english conversation for DEP EEPIS. J Educ Pract. 2015;6(33):113–24.

[4] Pratama D, Wardani WG, Akbar T. Designing visual novel characters of Gajah Mada and Tribhuwana Tunggadewi as representation of history figures. Humanus: Jurnal Ilmiah Ilmu-ilmu Humaniora. 2018;17(1):84–96.

[5] Eko HIS, Luqmanul H. Application of visual novel media assisted CTL model in identifying the usefulness of application programs. Indonesian Journal of Educational Research. 2016;2:8–12.

[6] Chalysta AF, Damayanti A. Vinoval (Visual Novel Modal Auxiliary): a simulator game to introduce modal auxiliary to student. Karya Ilmiah Dosen. 2020;3(2).

[7] Park H. Relationship between motivation and student's activity on educational game. Int J Grid Distrib Comput. 2012;5(1):101–14.

[8] Agos CT Jr, Bal-Ut ML, Calam LG, Cantuba RN, Vallo MH, Apsay MR. Game development of ibong adarna visual novel. Fatima University Research Journal. 2013;5(1):1.

[9] Rochmad. Mathematics Learning Device Development Model Design. Kreano's Journal. 2012;1:59–71.

[10] Karina D, Inelda Y, Eka PR. Development of Maritime-Based Learning Media for Snakes and Ladders Chemistry (ULTAKIM) on the nature of chemistry. Zara's Journal. 2019;1:13–6.

[11] Riduwan, *Measurement Scale of Research Variables*. Bandung: Alphabeta Publisher; 2012.

[12] Panjaitan M. The Effectiveness of Using Computer Animation-Assisted Physics Science Learning Media on Student Learning Outcomes of SMA Negeri 3 Tambusai Rokan Hulu Riau. Pasir Pengaraian; 2015.

[13] Rachmawati D. Andini, Baiduri, and E. Mahfud, "The effectiveness of web-assisted interactive learning media in developing creative thinking ability.,". Axiom. 2020;3:540–50.

[14] Yamasari Y. Development of high quality ICT-based mathematics teaching media (Pengembangan media pembelajaran matematika berbasis ICT yang berkualitas). Seminar Nasional Pascasarjana X-ITS. FMIPA Unesa; 2010.

[15] Arini W, Lovisia E. Student responses to plastic waste pyrolysis tools as media environment-based learning at Musi Rawas middle school. Thabiea : Journal of Natural Science Teaching. 2019;2:95–104.