Development of E-Comic Learning Media in Biology Subject Excretion System for 11th Grade

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Abstract: *Learning media is an important factor to determine a student's learning achievements. The lack of media that consists of illustrations and simple explanations in Biology subjects, especially in the excretion system caused decreased student learning outcomes. The purpose of this research and development is to develop e-comic learning media, knowing the validity, practicality, and effectiveness of e-comic towards student learning outcomes. The development model used in this research is ADDIE. The result of the validity test obtained was 81% in the media aspect, 94% in the content aspect, and 85% in the language aspect with very feasible interpretation. The result of the practicality test obtained from teacher and student was 87% and 85% with very practical to use interpretation. The result of effectivity obtained from student learning outcomes showed the class that used e-comic have higher learning outcomes compared to the class that used e-module, it can be interpreted that e-comic utilization in learning activity could increase student learning outcomes. Thus, e-comic is very valid, practiced, and effective to be used in the learning activity.*

Keywords: *e-comic, learning media, Biology, excretion system.*

INTRODUCTION

Education is a system that is built from interrelated educational components. These components determine the success of education. The components that determined an education include educators, students, educational goals, educational tools, and educational environment. An educational tool or educational media is a device that used tools used in learning activities (Saefuddin & Berdiati, 2016). Educational media is used by the teacher to help them communicate the learning subject to the student. Thus, the utilization of learning media is not only for the teacher to help them explain the learning content but learning media can be used by the student as learning material for independent learning.

Learning media is very important to determine students' learning outcomes (Smaldino *et al.,* 2011). Therefore, it's crucial to choose appropriate learning media that could accommodate learning objectives and students' needs (Salomon & Clark, 1977). Biology is the science that studies living things and complex bioprocesses. The purpose of using media in Biology learning is to reduce the abstraction of concepts so that it is easier for participants to understand the concepts conveyed through the media (Nadhifah & Agustin, 2020).

Illustration and animation are used as media to convey Biology content that consists of complicated and abstract concepts which are difficult to be explained verbally such as in the excretion system (Hafzah *et al.,* 2020). Comics is an art form that uses images that do not move and are arranged in such a way that they form a story (Eisner, 1985; McClaud, 2020). The comic is a familiar visual media

and easy to understand because comics can impart complex content into the story in a few images (McVicker, 2018; Kohnke, 2019). E-comic is illustrated story that is adapted into digital form and able to get access using an electronic device (Rasiman, 2014). Illustration used in e-comic is not only still images, but e-comic can include moving images such as animation, video, and audio form. E-comic is easier to get access because the media is not print media that require physical forms such as a book or magazine, thus teachers and students can access e-comic anywhere and anytime as long as they are using an electronic device. Research that has been done before stated that comic utilization in learning activities could improve and increase students' learning outcomes (Wicaksono *et al.,* 2017; Surijah *et al.,* 2018; Nofista, 2018). However, research using e-comic in learning activities hasn't been conducted before. Learning activities using electronic devices could provide flexibility and innovation to improve the learning environment. Thus, developing learning media-based e-comic is very appropriate to improve and increase students' learning outcomes.

METHODS

The method used in this research is the Research and Development (R&D) which is a method used to produce products and test their effectiveness of these products (Sugiyono, 2017; Molenda, 2008). The ADDIE model was chosen because it fits the problem behind this research. ADDIE is an approach that analyzes how each component that is owned interacts with each other according to the existing phase. This model was chosen based on the consideration that this model is programmed with systematic sequences of activities to solve problems related to learning media according to the needs and characteristics of learning. ADDIE model consists of five phases including analysis, design, development, implementation, and evaluations (Welty, 2008).

The data in this research was obtained from validity, practicality, and effectivity test. A validity test was conducted to obtain e-comic validity. Validity tests used instruments such as a validity questionnaire. A practicality test was conducted to verify the media utilization, in this test teachers and students participated as respondents. The instrument used in the practicality test is a practicality questionnaire for teachers and students. Effectivity test is conducted to obtain student learning outcomes which are pretest and post-test. In this test, experiment class learning using e-comic and control class using e-module as learning media. After the learning activities are completed, learning outcomes from the experiment and control class are compared to determine media effectiveness in the learning activity.

RESULTS AND DISCUSSIONS

3.1 Results

Validity Test

A validity test was conducted by three experts. Validity data obtained from an expert, the result of validity are as follows (Table 1).

Table 1. Validation test results

Aspect	Percentage	Category
Media	81%	Very Valid
Content	94%	Very Valid
Language	85%	Very Valid

Based on validity data, assessment validity aspect media obtained 81%, content 94%, and language 85%. Assessment validity media refer as very valid used in the learning activity.

Practicality Test

A practicality test was conducted for teachers and students participating as respondents. The practicality test was conducted by 36 students from the experiment class and one Biology teacher. The result of the practicality test is as follows (Table 2).

Table 2. Practicality test results

Media Practicality	Percentage	Category
Teacher	87%	Very Practice
Student	85%	Very Practice

Based on validity data, media practicality with the teacher and student respondents obtained 87% and 85%. Practicality media refer to a very practical learning activities.

Effectivity Test

The effectivity test was conducted in the experiment class consisting of 36 students and the control class consisting of 34 students. Effectivity obtained from the assessment of students' learning outcomes consists of pretest and posttest. Before the learning activity begins, a student from the experiment and control class takes on a pretest to find out their prior knowledge. Learning activity in a class experiment using e-comic as learning media, and class control using e-module as learning media. After the learning activity, a student from the experiment and control class takes on a post-test to measure and differentiate their improvement after learning using different media. The result of the effectiveness test is as follows (Table 3).

Table 3. Effectiveness test results

Class	Average	
	Pretest	**Posttest**
Experiment	53,75	79,17
Control	53,97	71,18

The result of the giant test is as follows (Table 4).

Table 4. Giant test results

Class	Gain	Category
Experiment	0,56	Average
Control	0,39	Average

The result of the t-test with an independent sample is as follows (Table 5).

Table 5. T-test results

Learning Outcomes	$L_{measure}$	L_{table}	Category
Experiment	0,1758	0,1772	Normal
Control	0,1040	0,1519	Normal

The result of passing grades after a learning activity is as follows (Tabel 6).

Tabel 6. Passing grade results

Class	Passing Grade	
	Passing	**Not Passing**
Experiment	86%	14%
Control	52%	38%

Based on the data obtained, experiment class have different learning outcomes compared control class. The data shows experiment class have higher learning outcomes compared students in control class.

Both experiment and control class have the same category in gain test with average category. Passing grade shows experiment class have higher passing grade than control class. The data obtained shows learning using e-comic very effective to increase student's learning outcomes.

3.2 Discussions

This research consists of five steps as follows.

Analyze

In this step, the researcher analyzes students' need to choose the right media they've been developing. In this step media that has been selected has to be provided for the student's needs and compatible with the subject. To find the primary information researcher conducted observation with learning activity in the class and interviewed with teacher and students to find out the problem in the learning activity and how to overcome the problem.

Design

In this step, the researcher designs the prototype. The prototype needs to be evaluated to be ably implemented in the learning activity. The information obtained in the analysis step is used in this step as information to design the media to be able to provide for students' needs and the subject.

Develop

E-comic has been tested for validity, to determine feasibly or not the media to before implemented in the learning activity. Validity is conducted by three experts consist of media expert, a content expert, and a language expert. Media that's been declared valid implemented in the learning activity in experiment class.

Implementation

A practicality test was conducted for teachers and students participated as respondents. The practicality test was conducted by 36 students from the experiment class and one Biology teacher. The data obtained media is very practiced to be used in the learning activity. Media utilization brings positive responses from teachers and students in experiment class.

Evaluation

The effectivity test conducted in the experiment class consisted of 36 students and the control class consisted of 34 students. Effectivity obtained from the assessment of students' learning outcomes consists of pretest and posttest. Evaluation is conducted to determine media utility with student's learning outcomes, in other words, determines the success or not media to improve and increase student's learning outcomes. The data obtained shows learning using e-comic is very effective to increase students' learning outcomes.

Based on the obtained e-comic learning media is very valid, practical, and effective to be used in learning activities. This research has similar outcomes to the research of Faraptana *et al.,* (2019); Ningrum *et al.,* (2022). Similar research with different subjects has been conducted by Hadi *et al.,* (2021) and Najwa (2022) and the result shows comic increasing student learning outcomes.

CONCLUSIONS

The feasibility of e-comic learning media developed by the researcher has been validated by an expert in the media, content, and language aspect. Based on validity data, assessment validity aspect media obtained 81%, content 94%, and language 85%. The result of the validity test obtained e-comic is a valid media to be used in the learning activity. The data obtained in practicality tests that have been conducted for teachers and students shows practicality with the respondent consisting of teachers 87% and students 85%. The data shows that e-comic is very practical in the learning activity. Effectivity

test obtained from student's learning outcomes shows learning using e-comic is very effective to increase student's learning outcomes. It was proven by students' learning outcomes in the experiment class were higher than control class.

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