REPRODUCTIVE SYSTEM LEARNING: DEVELOPING ANIMATED-BASED CROSSWORD PUZZLE MEDIA

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ABSTRACT

This study aims to achieve the following objectives: (1) develop animated crossword learning media on the topic of the reproductive system for Class XI MA Madani Alauddin; (2) determine the validity of animated crossword learning media on the reproductive system material for Class XI MA Madani Alauddin; (3) determine the practicality of animated crossword learning media on the reproductive system material for Class XI MA Madani Alauddin; and (4) determine the level of effectiveness of animated crossword learning media on the reproductive system material for Class XI MA Madani Alauddin. The study utilized the research and development (R&D) method, referring to the 4-D development model, which included four stages: defined, designed, developed, and disseminated. The product was an animated crossword puzzle learning media, tested through validity, practicality, and effectiveness tests. The study involved 33 students from Class XI MA Madani Alauddin 2022–2023 as the subjects. Validation sheets, student response questionnaires, teacher response questionnaires, and test items were used as research instruments to collect data on practicality and effectiveness. Material and design experts determined that the developed animated-based crossword puzzle learning media for the biology subject demonstrated a high level of validity, scoring 3.66. Assessing student and educator responses, the level of practicality fell within the "very practical" category, with an average total score of 3.61. Tests conducted on student learning outcomes using animated crossword learning media showed effective criteria, achieving a mastery proportion of 87%. As a result, animation-based crossword learning materials are appropriate for use because they satisfy the requirements for validity, usability, and effectiveness.

Keywords: Animated; learning media; crossword puzzles

1. INTRODUCTION

Education is a conscious effort to foster and develop human personality both spiritually and physically (Nurkholis, 2013). Besides that, according to Yusuf, 2015, education is an indicator that determines the progress of the nation. Education is a process of changing the attitude and behavior of a person or group that aims to mature through teaching and training (Maunah, 2009). The existence of education can have a major influence on humans, especially in eradicating illiteracy and increasing skills, and mental resilience (Pratiwi, 2019).

One manifestation in the world of education is the learning process in schools. There are several factors that influence the learning process of students, namely external factors and internal factors. External factors are factors that come from outside the individual and are influenced by family, school, and community factors (Sugiarto, 2019).), psychological (intelligence, attention, interest, talent, motive, maturity, readiness), and fatigue (Slameto, 2015). In addition, teaching staff, facilities, and also the use of learning media are also aspects and factors that have a major influence on the learning process (Simbolon, 2014).

Students still find it difficult to understand if they are only given advice in the form of a lecture method in delivering a lesson. According to Susilo, 2020 to overcome this, an alternative that can be done by educators is to combine various methods so that the learning process becomes more creative. In addition, the learning media used is up-to-date and not boring. In the presence of a learning media, students will certainly be interested in learning so that the quality of learning outcomes to be obtained can be increased.

Learning media is a tool that can help the teaching and learning process so that the meaning of the message conveyed becomes clearer with educational or learning objectives being achieved effectively and efficiently (Nurrita, 2018). Learning media aims to stimulate the thoughts, feelings of interest, and attention of students to participate in learning activities (Zaini, 2017). In this era, learning media is designed in the form of technology as a stimulus for students to receive learning (Audie, 2019). Media is not only a complement to the teacher in teaching and learning activities but can be a conditioner in achieving maximum learning outcomes (Mahnun, 2012). Media consists of several types of learning media, including realia, models, text, visuals, audio, video, and multimedia (Yaumi, 2018). Technology that can be utilized in the learning process can be in the form of interactive learning media. Interactive media is a learning process that can improve students' reasoning abilities (Husein, 2015).

The results of an interview conducted on February 4 2021 with a Class XI Biology teacher at MA Madani Alauddin obtained some information on the learning methods applied at the school. Based on the initial conditions, it appears that learning takes place centered on educators with the help of textbooks, boards, and markers. The method used by educators in learning is the lecture and question and answer method. Educators explain more orally and in writing so passive students pay attention to educators explaining, there are even some students who are busy playing alone so that the impact on student learning outcomes decreases. One thing that can be done to make students active in the learning process is to use media and combine it with learning models.

Based on the problems that exist in schools, several researchers are trying to develop interactive learning media such as crossword learning media. A crossword puzzle is a game where the way to play is to fill in the empty spaces in the form of boxes with letters so that they form a word that matches the instructions. Seeing the characteristics that are relaxed and put more emphasis on the similarities and differences in words, it is very suitable to be used for student training. Previous research developed crossword media for social studies subjects which described the development of character education-oriented educational games (Wulan et.al, 2019). Furthermore, similar research aims to determine the effectiveness of using online crossword media to increase student learning interest (Sababalat et.al, 2021). Until now, research on the development of animate-based crossword puzzles on reproductive system material has never been explored. The purpose of this study was to determine the level of validity, practicality, and effectiveness of animate-based crossword puzzle (TTS) learning media for reproductive system material.

2. METHODS

This type of research is research and development (R&D) aimed at improving existing products (Hamzah, 2019). The product developed in this study was an animated crossword puzzle. The development of animated-based crossword puzzles utilized the 4-D (four D) model, consisting of four stages: define, design, develop, and disseminate (Trianto, 2013). The subsequent stage involved testing the product's feasibility with a sample of 33 students.

For the validity stage, the instrument employed was the validation sheet for animated-based crossword learning media, which was validated by two expert validators. The validity level categories can be observed in Table 1. The data were analyzed to determine validity based on the following criteria:

$$\overline{Ki} = \frac{\Sigma_{j=1}^{n} \overline{Vij}}{n}$$

Note:

$\overline{Ki}$ = the average criterion - i

$\overline{Vij}$ = the value of the assessment results against the criteria -i by the validator to -j

n = many validators

Table 1. Validity Level Category

Value	Validity
3,5 ≤ V ≤ 4	Very valid
2,5 ≤ V < 3,5	Valid
1,2 ≤ V < 2,5	Pretty valid
0 ≤ V < 1,5	Invalid

The level of validity refers to the accuracy of the intervention implemented in the data generated by an instrument concerning specific goals (Mustami, 2015). Each aspect had an average validity value that met the criteria for a valid category (Nurdin, 2007). The practicality of the media was evaluated based on the assessments of educators' and students' responses. The analysis technique is presented in Table 2.

$$Xi = \frac{\Sigma_i^n = 0^{Ai}}{n}$$

Note:

b x = total average

Ai = aspect average

N = many aspects

Table 2. Practicality Level Category

Value	Practicality
$3,5 \le V \le 4$	Very practical
$2,5 \le V < 3,5$	Practical
$1,2 \le V < 2,5$	Practical enough
$0 \le V < 1,5$	Not practical

The criterion for determining the practicality test is in the average value range $2,5 \le xi \le 2,5$ shows quite positive criteria (Nurdin, 2007). The media effectiveness test was measured based on student learning outcomes. The effectiveness of data analysis techniques can be seen in Table 3.

$$N= \frac{W}{n}$$

Note:

N = The value obtained by students

W= Correct number of questions

n = Number of question items

Table 3. Criteria for the Level of Effectiveness

Percentage	Classification Completeness
> 80	Very effective
> 60 – 80	Effective
> 40 – 60	Effective enough
> 20 – 40	Less effective
$20 \le$	Very Less Effective

Media sources are effective when the percentage of completeness is at a value of > 80 in the good category or at least at > 60–80. According to Doalusiatin (2022),

academic mastery standards are tentative, meaning that schools can make their minimum mastery standards (KKM) according to the rules that apply in schools.

3. RESULTS AND DISCUSSION

The results of the development of learning media equipped with animated crossword puzzles referred to the 4D development model, which consisted of 4 stages: the defining stage, the designing stage, the developing stage, and the disseminating stage.

Defining Stage

The defining stage (defined) was the initial stage carried out to develop learning media equipped with animated-based crosswords. This analysis phase consisted of the initial and final analysis stages. Based on the initial observations that were made during the lesson, information was obtained that the learning for Class XI MA Madani Alauddin went quite well, but there were still some obstacles, such as the use of less diverse learning media. The media used so far was simple media in the form of printed images, which were distributed to students, and occasionally an LCD projector. The teacher explained biology material using the blackboard and the lecture method. The biology learning that took place at Madani Alauddin MA was more centered on educators, so it seemed less attractive, which affected students' interest in the learning process.

Planning Stage (Designed)

This stage contained product design in the form of the prototype I for animated-based crossword learning media. There were two steps in formulating the design stage: the selection of learning material topics and the initial design. Selection of animated-based crossword design topics related to reproductive system material. In addition, the initial design that became the benchmark for media creation was the design of animated-based crossword puzzle media. It started with designing the image by determining the type of writing, size, color, and shape of the image.

Development Stage

The product, in the form of a prototype, was then validated by experts to assess the media. Suggestions from the validator are then used for revising the product. After revising the product, a valid prototype II was then tested. The results of prototype II can be seen in Table 4.

Table 4. Prototype II

Stage of Dissemination

The fourth stage was the spread dissemination, where media tested in Class XI MA Madani Alauddin. The trials were conducted to gather information about the extent to of animate-based crossword learning media can be utilized.

Media Validity

The validity of the picture puzzle learning media is at an average value of 3.49. The criteria used in determining that the media has a good validity if it reaches an average value of 1.5 ≤ M ≤ 2.5 (Arifin, 2017). The media is also very valid if it gets a good assessment of the material and media aspects (Listiani & Prihatnani, 2018). In addition, there are several considerations in validation, such as content or material, linguistic aspects, usability aspects, effects on learning strategies, and overall appearance (Mustami, Suyuti & Maryam, 2017). The validator's assessment is shown in Table 5.

Table 5. Average Validator Rating

Assessment Aspects	Rating result	Category
Display Aspect	3,66	Very Valid
Audio Aspect	3,50	Very Valid
Language Aspect	4	Very Valid
Usability Aspect	3,49	Very Valid
Average	**3,66**	**Very Valid**

Media Practicality

The practicality of learning media equipped with animated-based crosswords can be assessed through student and teacher-response questionnaires. Table 6 displays the results of the responses from both students and teachers.

Table 6. Student and Teacher Responses

Rating type	Average
Teacher Response	3, 93
Student Response	3,30
Total Average	**3,61**
Assessment criteria	**Very Practical**

Media Effectiveness

We can determine the effectiveness of learning media equipped with Animate-based crosswords by evaluating the student learning outcomes through multiple-choice tests. These tests were conducted after using the learning media, which has been adjusted based on the frequency of its effectiveness. The material contained in the Learning Outcomes Test is intended to test the completeness of student learning outcomes under basic competencies and indicators. The percentage of completeness among students reached 93%. So, it can be concluded that the number of students who obtained mastery of learning above the KKM was 31 with a KKM standard of 75. Meanwhile, students who obtained completeness under the KKM included as many as two people.

Based on the obtained data, the developed product, in the form of an animated crossword puzzle learning media, can be considered effective. This is in line with Van den Akker's opinion, as cited in Haviz, stating that a development product is deemed effective if it yields results that align with the learning objectives indicated by students'

learning outcome assessments. The statement is also supported by Nana (2009), who suggests that learning media with clear images and colors are easier for students to comprehend, thus enabling the achievement of learning objectives. According to Apri Bayu Saputra (2017), educational games help motivate students to learn, and one form of such game is the application of crossword puzzles with various questions. Research conducted by Klemen Wahyu Kurniadi (2020) indicates that educational games assist in motivating students to learn, with one form being the use of crossword puzzles. The significant improvement in student learning outcomes after utilizing the animated crossword puzzle learning medium is linked to the advantages of crossword puzzles as a learning medium that is easily understood. This assumption is supported by research conducted by Apri Bayu Saputra (2017), where Educational Play Tools (APE) or educational games used as learning media are intended to motivate students and aid in understanding and mastering the subject matter.

CONCLUSION

The research concludes that Animate-based crossword learning media has a high validity of 3.66, indicating that it is highly valid and suitable for use. The media also shows a practicality level of 3.61, meaning it is highly practical. In terms of effectiveness, the learning media falls under the positive category with a percentage score of 93%. The benefits of using Animate-based crossword learning media include providing engaging information and enhancing student learning processes and outcomes.

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