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## Development of Plant-Puzzle Games (PPG) based on the Learning Styles of Junior High School Students to Increase Learning Motivation in Plant Classification Materials

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### ABSTRACT

Plant classification material is one of the materials listed in the basic competence of the curriculum applied in Indonesia and is less attractive to students because the characteristics of plants are quite difficult to identify so that the classification is complicated. It is known that most middle-level students really like games which are integrated in learning activities. Therefore, this study aims to develop a media called Plant-Puzzle Games (PPG) which is expected to have a positive effect in the form of increasing the learning motivation of junior high school students in studying plant classification material. The research method used in this study is a research and development method with the ASSURE model as the research design. Based on the results of the media validation test by experts, an average value of 3.25 was obtained, which indicates that the media was included in the valid category. Based on the results of the effectiveness test with the calculation of N-Gain, the average value is 0.49. This shows that, after using PPG media, the learning motivation of students has increased which is in the sufficient category.

## 1. Introduction

Education is the main asset for every human being to be able to survive the various problems that arise in life. Every human being can solve various problems through the knowledge they have. Sources of knowledge and ways of transferring knowledge need to be considered by every education unit. One example is the use of media that can support students in learning activities. Media is an intermediary that can be used in conveying information from one person to another (Susanto and Akmal, 2019). In the context of learning, media can be interpreted as a tool that can help the teaching and learning process. Learning media can be defined as

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a tool that can support students to learn material easily (Kustandi and Sutjipto, 2016).

At the junior high school level, it is known that grade VII students have an average age of 12 years. According to Rosseau, 12 year olds are at a stage where they are more likely to do sensory exercise (Yaumi, 2018), and based on the results of previous research it is known that 12 year olds have a good response to learning that integrates games as a medium (Purba, 2020) . The types of games that are integrated in learning can be developed based on the needs of students, one of which is feeling happy in carrying out learning. A pleasant atmosphere can create an effective learning process (De Porter, 1992; Jacquemart, 2016). In line with this opinion, many researchers argue that digital games have the potential to help students learn (Gee, 2003; Young, 2017).

Biology is a branch of science that studies living things including plants. Plants are one of the living things that students need to know about their benefits in life, such as their role in producing oxygen and food in the form of carbohydrates. Students need to know the characteristics that indicate that living things are included in the plant kingdom and what kind of plants are included, so that students can know how to cultivate plants properly and correctly according to their way of life. Plants are one of the living things whose body structure has very different characteristics from humans, therefore many of the junior secondary students have quite a hard time learning this material. This is known through the results of the analysis of students which show that many of the students are less interested in plant material.

The education curriculum in Indonesia contains material on plant classification as a competency that needs to be achieved by junior secondary level students. Therefore, with this demand, a way is needed that can support students to achieve the expected competencies. The material for plant classification contains biological terms which are quite difficult to understand, therefore a medium is needed to provide the material with fairly concise, concise, and clear sentences. This material also needs to display the characteristics of plants that show the characteristics of these types of plants, therefore it requires visual media by displaying some real pictures or photos that support the material.

Based on the description above, the researcher aims to develop a medium called the Plant-Puzzle Game which contains pieces of plant images with specific characteristics to represent the material being studied by students through clues that appear in the game display. The purpose of developing this media is to increase the learning motivation of junior high school students on plant classification material according to their learning style, namely visual learning styles. This is supported by the statements of students in the questionnaire analysis of students' characteristics which show that most of them feel happy when playing games and agree to use games as a tool in learning.

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## 2. Methodology

The method used in this study is the research and development method described by Richey and Klein (2014), where the design of this study refers to the ASSURE research design. The ASSURE model is very suitable for developing learning media and technology (Yaumi, 2018). The stages in the ASSURE research design are: (1) analyzing the characteristics of students; (2) Determining goals; (3) Selecting or modifying media; (4) Utilizing the media; (5) Involving students to respond; and (6) Evaluating (Figure.1).

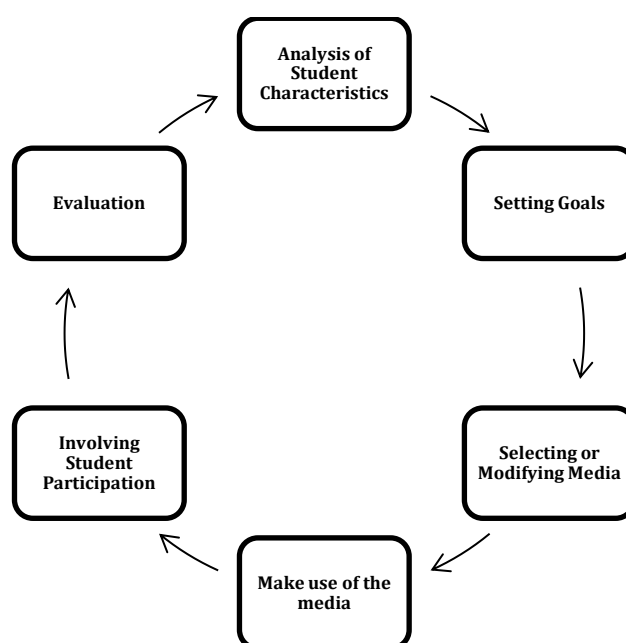


Figure 1. Schematic of the ASSURE Model Stage

In the first stage, an analysis of the characteristics of students was carried out by looking at their learning styles. Then in the second stage, namely determining research objectives by looking at the demands of the curriculum that is being applied by the Indonesian state and the needs of students to be able to understand the material through fun learning. In the third stage, the selection or modification of learning media is carried out which is expected to support the achievement of goals. In the fourth stage, a media validation test was carried out with the help of validators who are experts in their fields. After that, applying the media to 28 students in class 7.5 of SMPN 5 Curug in the learning process. Before applying the media, the instruments were distributed to see the level of learning motivation of students before using the Plant-Puzzle Game media.

In the fifth stage, the distribution of instruments was carried out to 28 students in grade 7.5 of SMPN 5 Curug to determine the level of learning motivation of students after using Plant-Puzzle Games media in learning. The last stage is conducting an evaluation by collecting data from the media validation test and testing the effectiveness of the media in increasing students' learning motivation,

then seeing the results as an illustration of the feasibility of the media that has been developed in increasing students' learning motivation.

The effectiveness test is carried out by calculating N-Gain using the following formula (Meltzer, 2002):

$$\text{N-Gain} = \frac{\text{skor posttest} - \text{skor pretest}}{\text{skor ideal} - \text{skor pretest}}$$

The N-Gain category can be seen in the following table:

Table 1. Category of N-Gain Acquisition

Range	Category
$(\langle g \rangle) \geq 0.7$	High
$0.7 > (\langle g \rangle) \geq 0.3$	Enough
$(\langle g \rangle) < 0.3$	Low

Richard R. Hake (1998)

Table 2. Expert Validation Categories

Range	Category
$3.25 < x < 4.00$	Very Valid
$2.50 \leq x \leq 3.25$	Valid
$1.75 < x < 2.50$	Less Valid
$1.00 < x < 1.75$	Invalid

Ratumanan & Laurens in Ichsan (2019)

### 3. Results and Discussion

The following research results will be presented and discussed based on the research stages that have been carried out with the ASSURE model:

#### *Analysis of Student Characteristics*

Based on the results of the analysis of the characteristics of students, it is known that most students feel happy when playing games, the intensity of playing games of students is quite high, most students like visual learning styles, and are less interested in plant classification material (Figure 2).

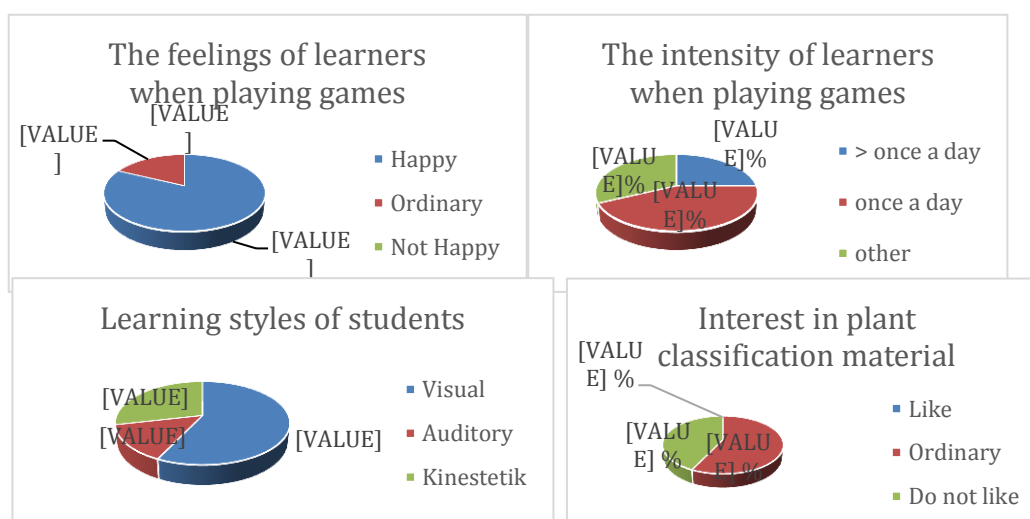


Figure 2. The results of the analysis of the characteristics of students

### Setting Goals

Based on the results of the analysis of the curriculum that is being implemented by Indonesia, it is known that there are 3.2 basic competencies that expect class VII students to be able to observe the characteristics of living things and then classify them. Plant classification material is the main focus because quite a lot of students are less interested in this material because of the many Latin languages that are difficult to pronounce and some concepts that are difficult to understand. It is also known that junior secondary students really like games that are integrated in learning. In accordance with this, the researcher focused on this research aimed at developing Plant-Puzzle Games media which contained classification material on plants based on observed characteristics to increase the learning motivation of junior high school students.

### Selecting or Modifying Media

*Plant-Puzzle Game* is a game to guess the term biology through fragments of pictures and several statements as keywords. Keywords contain sentences that state the characteristics of plants and images are used as tools that represent the sentences mentioned in the keywords. After completing the cut, the answer will appear in the Games display (Figure 3). At the time of applying the media, the teacher is directed to guide students to guess each puzzle by mentioning biological terms related to plants through the keywords displayed. Students who can guess quickly can be given points as a reward. *Plant-Puzzle games* this only serves as a provider of information related to plant classification that can stimulate students to carry out the problem-solving process. *Plant-Puzzle games* still have shortcomings, namely their function is less than optimal without the help of a teacher as a guide, and because it is only a provider of information, so this media is called less interactive.

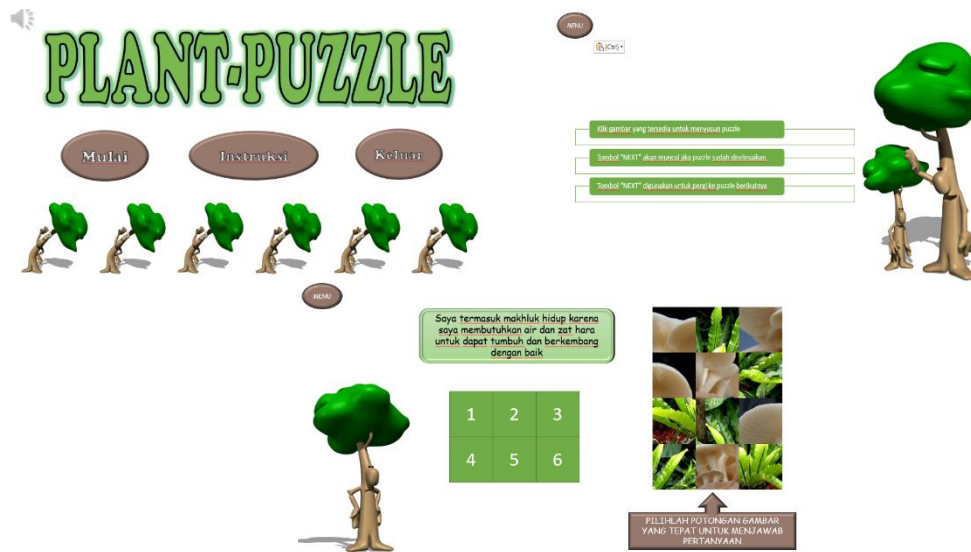


Figure 3.Plant-Puzzle Game media view

**Make use of the Media**

At this stage, the media validation test was carried out on 2 validators who were experts in their fields. The validation test was carried out twice because in the first validation test results were low and received revisions that the media developed did not contain material components systematically, and some sentences were poorly understood. Then, based on the final results of the media validity test, an average value of 3.25 was obtained (Figure. 4), this indicates that the media is categorized as valid or quite suitable for use in learning plant classification materials.

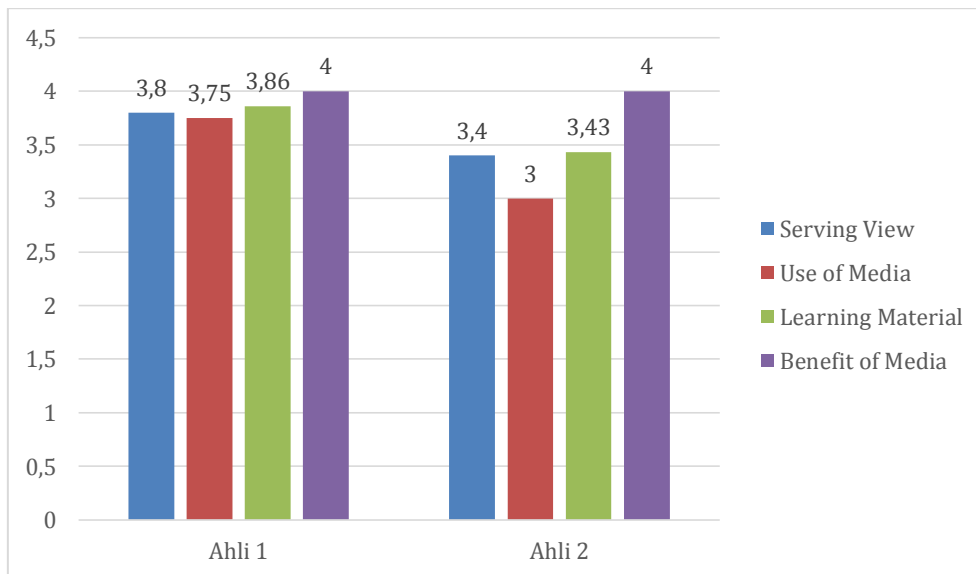


Figure 4. Expert Test Results

Table 3. Expert Test Results

Aspect	Statement	Validation Results		Average
		A1	A2	
Serving View	The use of text color in the media contrasts with the background display so that the writing can be read properly	4	4	4
	Selection of fonts or letters in the media display is correct	4	4	4
	The size of the letters used in the media is not too large but it is still legible	4	3	3.5
	The image displayed on the media can be seen clearly	4	3	3.5
	The selection of accompaniment music used on the media is unobtrusive	3	3	3
Use of Media	This medium is easy to use	4	3	3.5
	This media can be used independently by students	3	3	3
	This media is very light so that it does not burden the storage space on student and teacher gadgets	4	3	3.5
	This media is easy to store	4	3	3.5
Learning materials	The material presented is in accordance with the learning objectives.	4	4	4
	The material presented in the learning media is correct.	4	4	4
	The material in the learning media has been arranged systematically	4	3	3.5
	The material presented in the learning media is clear and easy to understand.	4	3	3.5
	The language used in presenting the material is clear, communicative and easy to understand.	3	3	3
	Presentation of images in learning media is in accordance with the material.	4	4	4
	Presentation of images in learning media can clarify the material	4	3	3.5
Benefits of Media	The process of learning activities with this media becomes more interesting and fun	4	4	4
	The use of this media makes it easier for teachers to provide material to students	4	4	4
	Make it easier for teachers to deliver material to students	4	4	4

After the media was declared valid, the instruments were distributed to measure the learning motivation of students before using the developed media. Based on the results that have been obtained, it is known that the learning motivation of students before using PPG media is an average of 73.60. This shows that the level of motivation of students is in the medium category. After that, the application of learning using PPG media was carried out on plant classification material. Learning using PPG media is guided by the teacher from the beginning to the end of the lesson.

### ***Involving Student Participation***

After learning plant classification using PPG media, the instruments were distributed again to determine the level of learning motivation of students after using PPG media. Based on the results that have been obtained, it is known that

the learning motivation of students after using PPG media is an average of 86.61. This shows that the level of motivation of students is in the high category (Suharsimi, 2009). In addition, the calculation of N-Gain is also carried out to determine the category of increase that occurred. Based on the results of the N-gain calculation, the average value is 0.49. This shows that the learning motivation of students after using the Plant-Puzzle Games media in learning has increased in the Enough category (Table 4).

Table 4. The Average Value of Students' Learning Motivation

Learning Motivation Indicator	Value Before	Value After
There is desire and desire to succeed	74.11	83.63
There is an encouragement and need in learning	71.43	88.17
The existence of hopes or dreams for the future	78.57	86.16
There is an appreciation in learning	75.89	83.93
There are activities that are interesting in learning	72.32	89.29
The existence of a conducive learning environment, allowing students to learn well	72.32	84.82

Table 5. N-Gain Calculation Results

	Value Before	Value After
Average	73.60	86.61
N-Gain		0.49

### ***Evaluation***

The final stage of this research is to evaluate based on the results of the tests that have been carried out. Media that has been developed is still included in the sufficient criteria. So that according to researchers, optimization is still needed by making some modifications so that in the future it is hoped that the media can have an effect on increasing the learning motivation of students even higher.

### **4. Conclusion**

The results of the research that have been obtained indicate that the PPG (Plant-Puzzle Games) media that has been developed can be used as a medium that can support students in studying plant classification material. This media is sufficient to increase the learning motivation of junior secondary students in studying plant classification material. In line with previous research that visual learning media can increase the learning motivation of middle-level students in learning plant material (Purba, 2020). This media can help students learn on plant classification



material by stimulating students to solve a problem through the available clues. Clue contains short sentences that are easy to understand and are assisted by snippets of pictures that are often seen in everyday life.

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