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# Student creativity in creating cell organelles as media for learning

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**Abstract.** Creativity is not formed by itself but it is influenced by some others factors. Creativity is a . person's ability to create / generate an idea embodied in the form of a product to solve problems which is accepted socially, spiritually, artificially, scientifically, and technologically. Learning media is a means of communication to deliver learning materials. There are three kinds of learning media produced by students such as books story, playdough, and the utilization of inorganic waste. The focus of this research is to know the students' creativity in producing learning media to understand an abstract material especially on topic of cell organelles of animal and plant cell. Data analysis is using two ways that calculate the score of mastery in terms of concepts and creativity. The results showed the score of students' understanding was increasing from 15 (average score of pre-test) to 31.1 (average score of post-test). It was categorized into three level, that are, high level with 21.4% of participants, medium with 64.3%, and low with 14.3%). Seven groups of students make learning media made of waste, playdough, and waste made in story form. The assessment of creativity involved four aspects, namely, color combinations, stringing, tidiness, and make (the accuracy of the concept with the form). Thus, it can be argued that self-created learning media helps in understanding the abstract concepts of cell organelles.

## 1. Introduction

Preparing a qualified human resources means empowering the whole person both the physical and the way of thinking. Indonesia's young generation needs to be prepared the global competition in this globalization. They should be critical and have an awareness of the importance of preserving the function of the environment for the needs of their generation and future generations in managing biological natural resources [1].

The low level of creativity development is assumed as the result of learning that is only focus on building the knowledge, memory / memorizing, and convergent thinking skills. In addition, the methods applied in teaching are still dominated by teacher centered learning, and question and answer discussion. Lecturers seldomly apply a method that can construct learners' knowledge, leads learners to be more creative/explore the material independently to make the concept learned becomes more meaningful.

To be more meaningful, the learning process used was begun with challenging questions about a phenomenon, assigning tasks to learners to do an activity focuses on the collection and the use of evidence, rather than simply delivering information directly and emphasis on memorizing [2]. Learning with learning media allows students to learn happily and motivated. Exciting learning for students can be promoted by learning while playing (learning by doing), and can stimulate memory and express yourself. Moeslichatoen [3] suggests play activities can develop children's creativity containing flexibility, utilizing imagination / self-expression, problem-solving activities, and looking for new ways. Playing activities in question is an activity of making learning media from materials and tools that can be utilized around the environment, not learning activities with role play. By learning while playing, it is expected that the learning experience gained a meaningful and unforgettable learning for the students.



The term creativity is already widely known by people whether among ordinary people, academician, as well as experts of psychology and education. Creativity is often called as a creative thinking or innovative thinking (*innovative thinking*). When it is associated to one's ability, creativity is often referred to a creativity such as composing songs, painting, creating new products or technologies, and crafting new theories. In the context of problem-solving, creativity can also be called creative intelligence; the ability to generate interesting and valuable new ideas for solving a problem [4].

Fasko D [5] reported that, in the schools, most training for creativity was aimed at enhancing divergent thinking and production abilities. Why is creative learning important? Some empirical studies include in the review demonstrated that creative learning led to improve academic achievement; increase confidence and resilience; enhance motivation and engagement; develop social, emotional and thinking skill; as well as improve school attendance [6] & [7].

Creativity can be taught in all fields of science, one of which is the deepening of science. This course is the elective course for the students of the sixth semester of Madrasah Ibtida'iyah Islamic University of Mataram State Islamic Education. One of the materials of IPA deepening courses is about the introduction of organelles of animal and plant cell and this material is quite abstract to be understood by the students. From the observations during the course, the students seemed confused with the material. They said that the students only know the general of the book, but do not know yet in detail both the shape and function of the organelles of animal and plant cells. Based on these findings, researchers are trying to assign tasks in the form of projects to students for a better understanding in terms of structure and function of organelles for animal and plant cell. Its main task is to make a learning media about cell organelles from various tools and materials that they create by themselves around them, the goal is to explore the creativity of students in making the organelles of animal and plant cell organelles to help them understand material easily.

Based on the description, the focuses of this research are to describe 1) whether by making learning media about cell organelles help them to understand the concept of cell, and 2) whether during making media of learning about organel creativity improve their creativity.

## 2. Research method

This research is a descriptive research with pre-experimental method with single-group design that is One-Group Pretest-Posttest Design [8]. This method is used to evaluate the understanding concepts and creativity of students. The subjects of the study were the sixth semester students of Madrasah Ibtida'iyah Islamic University of Mataram State Islamic University academic year of 2016/2017.

The research procedure was conducted before the students made the media about the organelles cell involving 1) giving pretest; the test forms are images of plant and animal organelles, 2) checking together the test results and discuss the material that have not been understood, 3) asking the students to make a learning media about the cell organelle from various materials available in the vicinity to explore their creativity in making the media and support for strengthening the concept. 3 types of media proposed by students to make the cell organel media namely; 1) playdough, 2) organic and inorganic waste, 3) used papers arranged in story books. The next meeting, making the media in the classroom during class time.

Data analysis techniques used to find out the concept understanding is using the gain formula (d) and the criteria from [9] as follows:

**Ket:**  $g$  = improvement score

$$g = \frac{(sp - sp)}{(sm - sp)}$$

$S_{post}$  = post test score

$S_{pre}$  = pre test score

$S_{max}$  = maximum score

Based on the Gain score result, it categorised into the following criteria :

| No | Score Gain            | Category |
|----|-----------------------|----------|
| 1  | $g < 0,3$             | low      |
| 2  | $0,3 \leq g \leq 0,7$ | Middle   |
| 3  | $g > 0,7$             | High     |

For assessing the criteria for each product made by the students, the score was given based the following aspects:

**Table 1.** Assessing the Creativity Product of Learning Media

| Aspects                                    | Indicator                                    | Score | Group |   |   |     |
|--------------------------------------------|----------------------------------------------|-------|-------|---|---|-----|
|                                            |                                              |       | 1     | 2 | 3 | dst |
| <b>Colour Combination</b>                  | Using colour combination more than 3 colours | 3     |       |   |   |     |
|                                            | Using 3 Colors Combination                   | 2     |       |   |   |     |
|                                            | Using less than 3 combination of colours     | 1     |       |   |   |     |
| <b>Arranging</b>                           | Arranging Organel Cell appropriately         | 3     |       |   |   |     |
|                                            | Arranging Organel Cell less appropriately    | 2     |       |   |   |     |
|                                            | Arranging Organel Cell inappropriately       | 1     |       |   |   |     |
| <b>Neatness</b>                            | Arranging tidy and neat                      | 3     |       |   |   |     |
|                                            | Arranging less Tidy and Neat                 | 2     |       |   |   |     |
|                                            | Not arranging neatly                         | 1     |       |   |   |     |
| <b>Making (accuracy concept and shape)</b> | Fit to the name and shape                    | 3     |       |   |   |     |
|                                            | Name is fit and the shape is less            | 2     |       |   |   |     |
|                                            | Name and shape is different                  | 1     |       |   |   |     |

Source (observation document of learning using playdough)

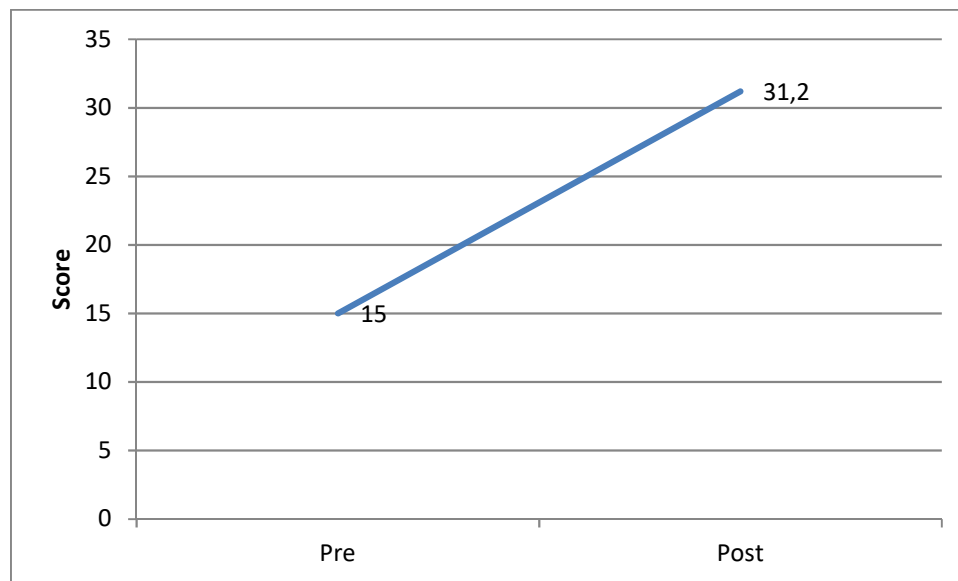
### 3. Result and discussion

#### 3.1. Concept understanding

The process of gaining insight into knowledge occurs through human interaction with objects and the environment using its senses, for example by seeing, hearing, touching, smelling, or feeling, one can know something. Knowledge is not determined, but a process of formation [10]. Mastery of the concept refers to the ability of students in understanding a concept that includes knowledge and understanding of organelles of animal and plant cells. Gayatri Y et al [11] reveals that mastery of the concept is the ability to express the meaning of objects or events gained through experience to make decisions in problem solving. To know the students' understanding in concept about cell organel, they were given pre-test to know the prior-knowledge of students about cell organel.

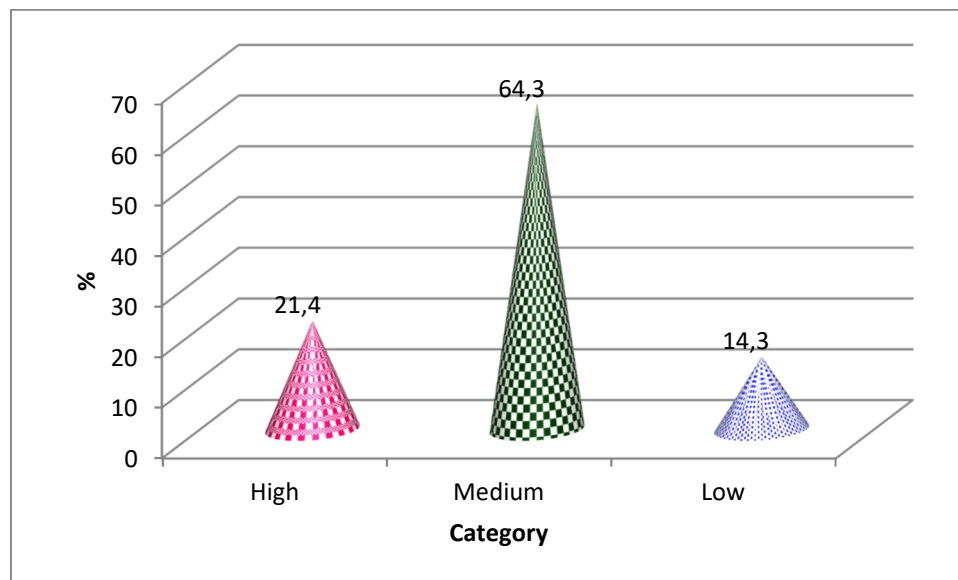
Furthermore, teachers ask the students to make a product about organel-organel cell that will be used as media of learning, also to make student more understand and comprehend the form of organel-organel studied. The media created must show the colorfulness of its color in every form of organelle made cell, its purpose is to help the students' memory work easily. The use of color can improve the child's memory in learning because according to [12] color therapy can be used to stimulate the brain and the body in order to remember or save memory in longer period.

After making the organel-organel cells media, the students are given post-test with the same problem as in the pre test. The purpose of this post test is to determine whether or not the role of instructional media has been made in understanding the concept of cell organelles (see Figure 1). The scores are categorized into 3 categories to determine the students who score low, medium and high (see Figure 2). The categorization is intended to know the students who understand the concept of organel-organel cells.



**Figure 1.** The average score gained in organelles' concept and understanding.

There are some interesting things that researchers found from the results of concept mastering test, two students get higher results in the pretest, but lower results in the posttest even though the media was made very interesting and good. The results of interviews obtained information that at the time of post-test implementation, there are family problems that interfere their concentration during learning, it indicates that the children do not learn apart from external factors.



**Figure 2.** Test result category for students about the organelles cell.

Teaching media has a very important meaning in the learning process since it is one way for teaching more contextual. According to [13] the teaching medium is defined as everything to share the message or the content of the lesson, stimulating the mind, the feeling, the attention and the ability of learners to encourage the teaching and learning process. The teaching media can give meaning to the message content of the actual state or meaning of the lesson.

Fatmawati B [14] in the results of her research revealed that there was a role of learning media during the student's test of concept about cell organel with pre-test and post-test score that is pre-test score

(15,1), and post-test (36,2) with high category ( 0%), Medium (67,7%) and High (32,3%). Suprpto P K et al [15] who have done research with 3D methods in which students make the structure of plant tissue using playdough, stated that by using playdough cognitive abilities that emerged (seen from cognitive version of taxonomy Bloom) is to remember, evaluate, and make. The same thing is also expressed by [16] through playdough activities can improve the cognitive abilities of children in recognizing the concept of shape, size and color.

### 3.2. Students' creativity

An educator who is mastering their fields should be able to develop the students' creativity in their learning process since the creativity can be developed from the classroom activity. There are two ways to think about teching creativity; the first involves teaching the generic skills of creative thinking and the second to identify the personal aptitude and passion of the students and foster the connection within that domain [17]. Fasko D [18] said that the purpose of creative teaching is to create a "responsible environment" through high teacher enthusiasm, appreciation of individual differences, and so on.

Starko A J [19] said that creativity is an attempt to make work become more meaningful and become better. In learning, creativity is directly related to poductivity and it is an essential part of problem solving [20]. Creativity as a process, reflecting fluency, flexibility (flexibility) and originality (in authenticity) in thinking and behaving. In this regard, sixth semester students majoring in PGMI have tried to make a learning media about cell organelles with all their efforts to produce a creativity that is poured in various shapes and colors as seen in Figure 3.



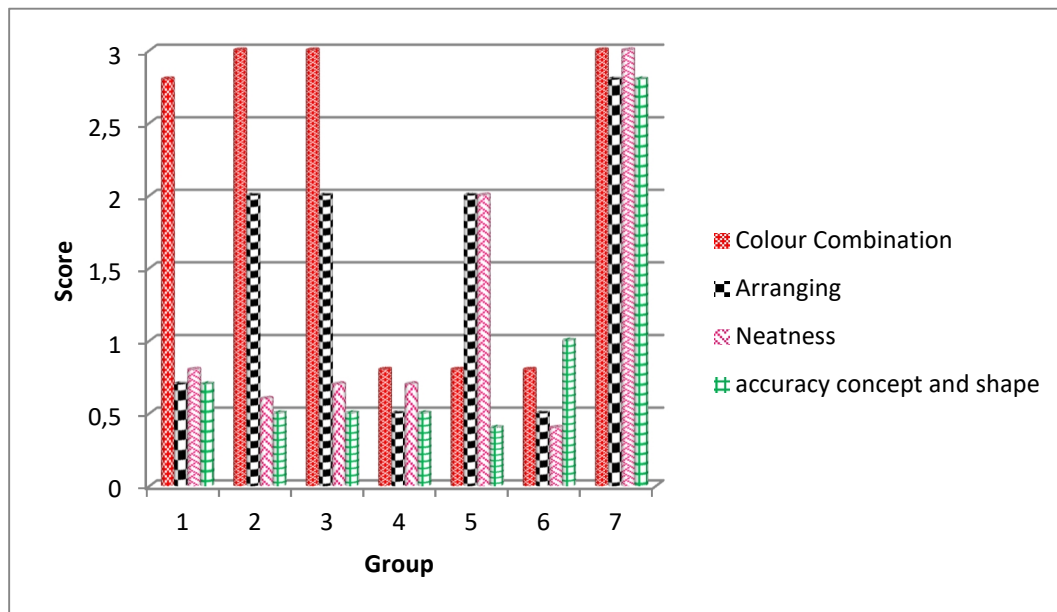
**Figure 3.** Students' productivity for organels cell learning

Basically, everybody born in the world with a creative potential. Creativity can be identified and fostered through a proper education creativity in its development is closely related to four aspects, namely personal, supports, processes, and products aspects [21]. Creativity is the ability of students to make a learning media from various tools and materials around them to understand the concept of organelles.

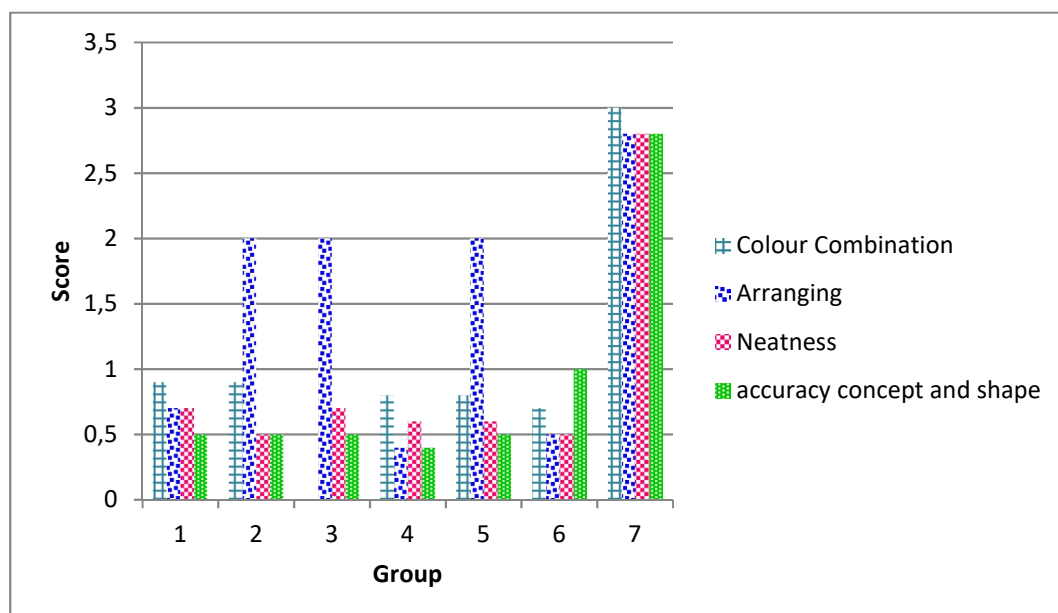
In the process of making the learning media for cell organelles, it appears that there are some students having constraints/difficulties in making the cell organelles, this is because the concept does still not adhere in their memory. [22] during manufacturing of cell organelles, the students have difficulty in

producing a replica for each cell organelle (lack of motoric skills), the shape of organelles almost does not have differences between animal and plant cells.

The learning media that has been made is assessed by five observers, then scored based on the creativity aspect of the assessment sample presented in the form of drawings (see Figure 4). Creativity assessment includes product assessment in terms of color combinations, stringing, tidiness, and conceptual accuracy. The results of the assessment of learning creativity media of organelles are presented in graphical form (see Figure 4 and 5).



**Figure 4.** The average score of students' creativity in making cell organelles of animal as a learning media



**Figure 5.** The average score of students' creativity in making cell organelles of plants as a learning media

**Description:**

Group 1-3 Making Learning Media from Waste

Group 4-5 Making Learning Media from Playdough

Group 6-7 Making Learning Media from Story Book

Looking the Figure 4 and 5. It appears that group 7 approaches score 3 for all aspects of the assessment. During the observation, each person in this group looks active and creative in expressing their ideas with their group, therefore, it could create an authentic cell organel learning media with the high accuracy of the concept.

Munandar U [23] said that creativity is the ability to produce work that is both novel (i.e useful, adaptive, concerning task constraints and appropriate). Creative learning is a paradigm for teaching and learning that calls upon the creative thinking skills of students as they engage in core academic subject. The 21<sup>st</sup> skills: creativity, critical thinking, problem solving, communication, and collaboration [24]. The process of creativity includes the ability to change one's approach to a problem, to produce ideas that are both relevant and unusual, to see beyond the immediate situation, and to redefine the problem or some aspect of it [25]. Kneller G F [26] said that six resources have been identified as facilitating creativity in children and adults: (a) intelligence, (b) knowledge, (c) intellectual style, (d) personality, (e) motivation, and (f) environmental context.

Creativity can be categorized into two levels: 1) **The Creativity of Products**. The creativity of products is typically the focus of experimental paradigms that vary the conditions under which one or more individual's creativity is assessed. Here creativity is seen as a fleeting and largely situation-dependent state (rather than a relatively stable and enduring personality trait). 2) **The Creativity of Persons**. The creativity of persons is typically the focus of experimental paradigms, case studies, or questionnaire-based investigations that operationalize creativity as a relatively enduring and largely stable personality trait [27].

In this study, a person is called creative if she/he is able to solve the problems by bringing up unusual ideas and show a product based on fluency, flexibility, originality and also able to elaborate the results of his thinking.

**4. Conclusion**

Learning media are helpful for understanding the abstract material, the results of this study describes that the average value of pre-test was 15 and increases to 31.1 at the post-test. The categories are high (21.4%), moderate (64.3%), and low (14.3%). The assessment of creativity includes product assessment in terms of color combinations, stringing, tidiness, and conceptual accuracy. Among 7 groups of students who make learning media, group 7 which makes learning media in the form of books story show creativity that almost shows score of 3 in all aspects of assessment. Four skills, a person must have to generate creativity, that is fluency, flexibility, originality and elaboration. Creative learning seems to solve many of the problems and it is integrated with academic content teaching and learning.

**Acknowledgements**

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