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An Implementation of Guided Discovery Learning on Bioprocess in Cells Material to Improve Learning Outcomes

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Article Info	Abstract
	Bioprocess in cells consists of membrane transport, protein synthesis and cell reproduction. Material cannot be understood if only looking at pictures because the material is about a complex process contained in a cell. Practicum and animation video are learning media that can be used to help students visualize the material. Guided discovery learning helps students to construct their own knowledge gained by being actively involved in the learning process of practicum and animation video. This study aims to determine the effectiveness of guided discovery learning of bioprocess material in cells on student learning outcomes. Research methods is Pre-Experimental Design using One-Group Pretest Posttest. The results showed that 100% of students 'psychomotor learning outcomes were good, students' cognitive learning outcomes> 80% of students obtained grades score 70 and N gains were in the medium category. It can be concluded that learning bioprocess material in cells using guided discovery learning is an effective way to improve student learning outcomes.

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INTRODUCTION

A common problem in the learning process at schools lately is the students low understanding that shown by students learning outcomes who are still under the KKM (Adiba *et al.*, 2018). The National Education Standards Agency (BNSP) categorizes the National Examination Certificate (SHUN) into four categories: very good (85-100), good (70-85), sufficient (55-70) and less (<55). The report on the results of the 2018 National Examination shows the percentage of cognitive absorption of cell matter and bioprocess in cells in senior high schools in Pemalang Regency has decreased for three years, there are 63.44% in 2016; 53.12% in 2017; and 41.63% in 2018 (Balitbang Kemendikbud, 2018). Based on the BNSP category, the level of understanding of the concept of cell matter and bioprocess in cells is still low.

Based on the results of preliminary observations with biology subject teachers at SMA Negeri 1 Pemalang it is known that in learning biology, teachers still teach using the lecture and discussion methods. However, this is not enough to make students active when learning. In this method it was found that students only silently paid attention to the material explained by the teacher, but did not actively ask questions, express opinions or refute. This makes cell and bioprocess material still considered material that is difficult for students to understand because this material examines biology at the cellular level which cannot be observed directly without assistive devices. In addition, rarely carried out activities that make students construct their own knowledge with learning experiences in accordance with the material.

The method of group discussion that has been carried out has not been maximized in the implementation of learning biprocess material in cells. Learning using group discussions makes it difficult for students to find material concepts independently and students do not yet have a real learning experience. One learning model that can make students discover their own knowledge concepts with learning experiences is by applying guided discovery learning learning models. In the application of guided discovery learning models the teacher acts to guide and supervise, while students are active in the learning process (Adhim & Budi, 2015). Guided discovery learning is a learning model that can require students to understand biological concepts appropriately (Sumiadi *et al.*, 2016).

In learning bioprocess material in cells consisting of membrane transport, protein synthesis and cell reproduction cannot be understood if only looking at pictures because the material is material about a process contained in cells. Practicum and video animation are learning media that can be used to help students visualize the material. So students have the opportunity to develop curiosity with their own learning experiences. In fostering curiosity, students find various answers to questions with the teacher as a guide. The discovery process with the help of teachers will be more beneficial in enhancing students' concept discovery rather than pure discovery (Alfieri *et al.*, 2011).
Through this learning is expected to improve student learning outcomes because with guided discovery learning students are trained to construct their own knowledge gained by being actively involved in complex learning processes.

RESEARCH METHOD

This research is Pre-Experimental design using the One-Group Pretest Posttest type. The population in this study is students in class XI MIPA 3, XI MIPA 4 and XI MIPA 5 SMA Negeri 1 Pemalang 2019/2020 academic year. The sample is determined by purposive sampling and 3 classes are selected as the experimental class using Guided Discovery Learning on Bioprocess Material in Cells. The considerations used were the final score of the biology subject in bioprocess material for class XI 2017/2018, the average percentage of UN scores regarding bioprocess in cells for 3 consecutive years and the consideration of biology teachers at SMA Negeri 1 Pemalang. The consideration in question is the hope that if students are taught by the same teacher, they will get an understanding of the same initial material. The data taken in the form of psychomotor values with observation sheets and student cognitive learning outcomes with test questions. Student responses were also measured by a student response questionnaire. Guided Discovery Learning Bioprocess material is said to be successful with the following indicators, (1) Psychomotor student learning outcomes are good, (2) student learning outcomes ≥ 75%

achieve completeness criteria of at least 70, (3) increase in student learning outcomes (N-gain) categories moderate to high. The N-gain test is used to see all improvements in student learning outcomes before being treated and after receiving treatment.

RESULTS AND DISCUSSION

Each percentage of students' psychomotor learning outcomes showed that Guided Discovery Learning on bioprocess material achieved an indicator of success, which was a good category with an average grade of 97.5; 97.3 and 97.7. This is due to students feeling comfortable learning so students are more brave and active in the learning process. In addition to feeling comfortable, students also feel happy and have a curiosity about the problems of learning material obtained so that it encourages students to study harder. Guided discovery learning emphasizes student activity as the main subject of an active role to ask questions, demonstrations, practical activities, observations and discussion activities in class (Oloyede & Adeoye, 2010). The complete data is presented in Table 1.

Table 1. Student Psychomotor Learning Outcomes

Class	Average Psychomotor Value				Average	Classical completeness
	Difusi	Osmosis	Plasmolisis	Mitosis		
XI MIPA 3	97,7	97,0	96,6	98,7	97,5	100%
XI MIPA 4	96,6	95,4	98,3	99,1	97,3	100%
XI MIPA 5	97,7	97,7	97,7	97,6	97,7	100%

The learning model that presented in the form of Guided Discovery Learning consist of practicum and video animation. Practicum provides greater opportunities for students to be more active in learning activities so as to increase students' psychomotor activities. The appearance of animatetion video also makes it easier for students to understand the material being studied because they get clear visualizations. This is in agreement with Sakti *et al.* (2012) which states that enjoyable learning by using media can improve students' understanding of concepts. Supported by the opinion of Marwiyah (2013) which states that learning by using visualization can help students collect and process information from the environment and shape the concept. This shows that guided discovery learning can facilitate students in understanding the material. In line with Destrini *et al.* (2013) that guided discovery learning can improves learning outcomes, science process skills and student learning activities.

Classical mastery learning Guided Discovery Learning bioprocess materials for the three classes in a row were 88.9%, 80.5%, and 83.3%. Students get posttest learning outcomes ≥ 70 in accordance with the completeness of learning biology in SMA Negeri 1 Pemalang. The data shows that learning Guided Discovery Learning provides students with a good ability to understand bioprocess material in cells. This is due to social interaction and active involvement of students in learning Guided Discovery Learning that allows for better memory. Good memory because bioprocess material is packaged in interesting practical learning. According to Zaini *et al.* (2008) the ability to remember by finding one's own concepts can last longer than listening to others. The complete data is presented in Table 2.

Table 2. The Results of Analysis of Cognitive Learning Outcomes of Students

Category	Pre-test		
	XI MIPA 3	XI MIPA 4	XI MIPA 5
Total students	36	36	36
The highest score	92	92	92
The lowest score	56	64	56
Average score	79	78	76
Number of Students Completed	32	29	30
Number of Students Not Completed	4	7	6
Classical completeness (%)	88,9%	80,5%	83,3%

The Guided Discovery Learning model creates learning situations that involve students learning actively and independently in finding a concept or theory, understanding, and problem solving. The ability to remember by finding our own concepts can last longer than listening to others. The guided discovery learning approach will make learning that was initially dominated by the teacher become student-centered learning. This learning approach helps students find directed knowledge. The discovery process requires the teacher as a facilitator and supervisor. Teacher guidance in the learning process can improve student learning outcomes (Akanmu et al., 2013).

There were a total of 17 out of 108 students who did not complete after the implementation of guided discovery learning. The incompleteness of student learning outcomes is influenced by many factors. According to Purwanto (2011), student learning outcomes are influenced by external factors and internal factors. Internal factors include physical conditions, five senses, talents, interests, intelligence, motivation, and cognitive abilities. External factors include the natural environment, social environment, curriculum / learning materials, teacher / instructor, facilities and facilities, administration / management.
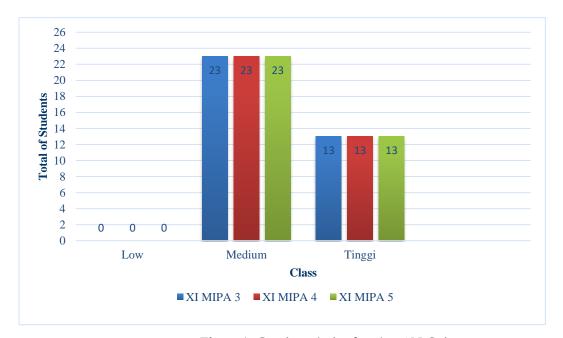

Figure 1. Graph analysis of students' N-Gain

Improved learning outcomes analyzed using the N-Gain test showed that the N-Gain on the Guided Discovery Learning model was on the average in the medium category (figure 1). Improved learning outcomes Guided Discovery Learning is influenced by active student involvement. Social interaction and active student involvement contribute to psychological readiness and an attitude of respect for students so that it affects cognitive intelligence. Cognitive intelligence is the ability to receive material, remember and solve problems related to the subject being studied (Wilke, 2003).

Guided discovery learning helps students on two important criteria, namely the activation or construction of available knowledge for use in creating new knowledge and integrating new information with information already possessed. Guided discovery makes learning more directed, making it easier for students to find concepts.

The steps of the guided discovery learning model of bioprocess material can create an atmosphere of student learning independently. Not only the collection of knowledge gained by students, but the direct learning experience carried out by the discovery process that involves scientific processes through practicum. Guided discovery learning makes it easy for students to find learning concepts by constructing knowledge through the direction of the teacher (Achera, 2015). The successful implementation of guided

discovery learning in bioprocess material in improving student learning outcomes occurs because learning makes students actively carry out scientific processes during the learning process.

The advantages of the Guided Discovery Learning model of bioprocess material can already be felt by students. The strengths of the Guided Discovery Learning model in bioprocess material make students more interested in participating in learning, helping to make it easier to learn bioprocess material in cells, increase collaboration, and increase activities in learning activities.

Based on the results of interviews with students, students give a good impression of the learning process with Guided Discovery Learning bioprocess material. Student responses stated that the strengths of the Guided Discovery Learning model of bioprocess material were that students were more active in participating in learning, students were eager to learn to solve problems, student-centered learning, and trained students to work together.

CONCLUSION

Based on the result of research it can be concluded that learning by applying the Guided Discovery Learning model can improve the psychomotor and cognitive learning outcomes of students bioprocess material in cells.

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