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The Effect of Application of Module Based-Circuit Learning Model on Cognitive Students' Learning Outcomes and Concept Mapping Ability on Excretion System Materials At Sman 2 Samalanga

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Abstract
The low cognitive learning outcomes and concept mapping abilities of students were caused by teacher-centered learning. This study aimed to determine the effect of the application of the module-based-circuit learning model on cognitive learning outcomes and concept mapping abilities of students on the human excretory system material at SMAN 2 Samalanga. This is a quantitative research with an experimental approach. This study used a one-group pretest-posttest design. The population of this study was 85 XI grade MIA students of SMA Negeri 2 Samalanga.This study used a total sampling technique on 85 students. The students' cognitive learning outcomes were measured using multiple choice test questions (Pretest and Posttest), while concept mapping skills were measured using concept maps (Pretest and Posttest). The data were analyzed using the paired sample t-test, at a significant level of 0.05. The results showed: 1) there was an effect of the application of the module-based-circuit learning model on the students' cognitive learning outcomes on the human excretory system material and 2) there was an effect of the application of the module-based-circuit learning model on the students' concept mapping abilities on the human excretory system. The conclusion of this study shows the effect of the application of the module-based-circuit learning model on cognitive learning outcomes and concept mapping abilities of students of SMAN 2 Samalanga on the material of the human excretory system.

Keywords*:Circuit Learning Model, Learning Module, Cognitive Learning Outcomes, Concept Mapping Ability*

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I. Introduction

In the learning process, learning outcomes are benchmarks for students' self-change after receiving a learning experience that can be observed and measured through knowledge, attitudes, and skills. Learning outcomes are several experiences gained by students covering the cognitive, affective, and psychomotor domains (Rusman, 2015).

The results of a preliminary study conducted at SMA Negeri 2 Samalanga showed several learning problems, such as (1) teacher-centered learning; (2) students are less active in learning; (3) the learning process is boring due to the lack of use of learning models. Situations like this create boredom, decreased interest, and low understanding of concepts in learning materials that affect learning outcomes.

The results of interviews with Biology teachers at SMA Negeri 2 Samalanga showed that many students' scores have not met the KKM. The Minimum Completeness Criteria (KKM) for Biology learning at SMA Negeri 2 Samalanga is 70. The teacher said that only 11 out of 30 students reached the KKM without taking remedial courses.

In addition, the teacher said that many students find it difficult to understand biology learning material, one of which is the excretory system material. Excretory system material covers many things and cannot be explained by just taking notes, lectures, or reading textbooks. Students need concepts that are following the material so that they know for sure the shape and structure of the organs in the excretory system. The use of appropriate concepts increases the focus of students to improve their learning outcomes. Teachers must be able to develop an effective and efficient teaching system in developing biological concepts to make it easier for students to absorb scientific information. One of the things that teachers can do to achieve these learning objectives is to use learning modules and models.

A module is a complete and systematic teaching material that contains a set of learning experiences that are planned and designed to assist students in mastering specific learning objectives (Parmin, 2012). The use of modules can make it easier for teachers to deliver teaching materials. In addition, students can reason and find their own creativity to connect learning with the surrounding environment. This will increase students' activity

and independence both in learning and in their daily lives. In addition to modules, Circuit learning models can also be used to support the learning process.

Circuit learning is a learning model that maximizes the empowerment of thoughts and feelings by adding and repeating patterns. This model usually starts from questions and answers about the topics studied, presentation of concept maps, explanations of concept maps, grouping, filling in student worksheets accompanied by concept maps, explanations of procedures for filling out, conducting group presentations, and giving rewards or praise (Huda, 2010). 2013). The Circuit Learning model is expected to improve the achievement of learning outcomes through the concept mapping ability of students. Concept mapping aims to make it easier for students to record personal thoughts and conclusions according to the key material provided.

In addition, the Circuit Learning model can improve students' memory of the material they are working on. Syahrial (2017) revealed the influence of the implementation of circuit learning strategies on mathematics learning outcomes. Fitri & Agus Fitriani (2018) also revealed that the mathematical communication skills of students who were taught using the circuit learning model were better than those who studied conventionally. Another study on the use of circuit learning models was also conducted by Pramita et al. (2019); Putra & Setiawan (2019). The results of this study indicated that the circuit learning model affected student learning outcomes. However, research on the effect of implementing a module-based-circuit learning model on concept mapping abilities and learning outcomes is still very limited. This study was conducted to determine the effect of using a module-based-circuit learning model on learning outcomes and concept mapping abilities of SMAN 2 Samalanga students on the human excretory system.

II. Method

This research was conducted at SMAN 2 Samalanga, Bireuen Regency. In March-April, the research was carried out in the even semester of the 2019/2020 academic year at XI grade. This study uses a quantitative approach. This is applied research with an experimental method. This study used the One Group Pretest-Posttest design (Table-1).

Table-1 ***One Group Pretest-Posttest Design***

Pre-test	**Treatment**	***Post-tes***
0_1	X_1	0_1

Source: Sugiyono,(2013)

Descriptions:
O_1 : *Pretest scores* (before treatment) of the experimental group
O_2 : *Posttest scores* (after treatment) of the experimental group
X : Module-based-circuit learning model

The population in this study was 85 XI grade MIA students of SMA Negeri 2 Samalanga who came from three classes. The school was chosen based on the average score of the final Biology exam at SMA Negeri 2 Samalanga which was at the intermediate level. Sampling was carried out through a total sampling technique which took samples from the entire homogeneous population. The sample of this study was all (85) XI grade MIA students of SMA Negeri 2 Samalanga who came from 3 classes.

The instruments used in this study consisted of 1) supporting instruments for the research implementation process such as lesson plans, LKPD, learning media, and learning modules; 2) data collection instruments which include test instruments. The test instrument is a learning outcome test device. The parameters of the study are cognitive learning outcomes which were measured using an initial understanding test (Pretest) and final understanding (posttest) while the concept mapping ability test was guided by a standard concept map with assessment criteria according to Novak and Gowin (1985).

III. Result And Discussion

1. Learning outcomes

The score of student learning outcomes in this study was the pretest and posttest scores after the application of the excretory system material. The mean of students' pretest and posttest scores with the application of the module-based-circuit learning model is presented in Figure 1.

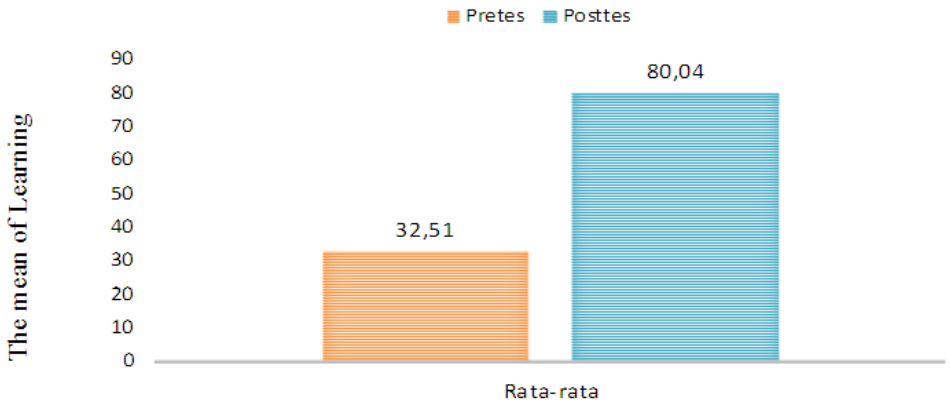

Figure1. The Mean Scores of Pretest and Posttest Learning Outcomes

Paired sample t-test was used to determine the effect of the application of the module-based-circuit learning model on the cognitive learning outcomes of students on the excretory system material at SMAN 2 Samalanga. The test results are presented in Table-2.

Table-2. Paired Sample t-test on Student Learning Outcomes

Scores	N	Mean	Normality test *)	Significance **)
Pretest	85	32,51	Sig (0,200)	Sig (0,000)
Posttest	85	80,04		

Description:

*) = *Kolmogorov-Smirnov Test* (Normal, Sig >α 0,05)

**) = *Paired Sample t-tes* (*Ha* accepted, Sig <α 0,05

Table-2 shows that the application of the module-based-circuit learning model affects the cognitive learning outcomes of students on the excretory system material at SMAN 2 Samalanga. This is evidenced by the lower pretest score (initial ability) compared to the posttest score (final ability).

Learning process activities with the application of a module-based-circuit learning model allow students to read and look for the main idea of each paragraph to find keywords and creative words in the excretory system material text consisting of liver, skin, lungs, and kidneys based on the moduleshared by the teacher. Next, students make concept maps contained in the LKS and analyze the data based on the answers to the concept maps and compare between the students' concept maps and the one made by the teacher. Finally, students present their part of the concept map.

The application of the module based-circuit learning model provides maximum learning outcomes because the model allows students to strengthen their memory and map their thoughts by adding small notes. In addition, students also have the opportunity to repeat or re-learn their concept maps so that they can rearrange the same concept maps to test their memory. The students focused their full attention on completing the concept map. Re-mapping and adding information can also increase students' concentration so that it will be easier for them to remember all the information they have obtained.

The circuit learning model maximizes the empowerment of thoughts and feelings by adding and repeating patterns (Dewi, et al., 2014). This model usually begins with questions and answers about the topics studied, presentation of concept maps, explanations of concept maps, grouping students in filling out student worksheets and concept mapping, explanations about the procedures for filling out group presentations, and giving rewards or praise.

Instruction theory must include elements of organizing knowledge, sequencing knowledge, and motivating. The motivating element in the Circuit Learning model appears in the Visualization and Affirmation stages at the beginning of learning. Visualizations and Affirmations help students to focus and remember their learning goal, which is to acquire knowledge. The use of affirmation or affirmation sentences, affirmation activities can also increase their confidence in their own abilities (Bruner in Seifert, 2012).

The application of the circuit learning model with the aid of image media has been shown to improve student learning outcomes (Milda et al., 2017). Putra and Andi's research (2019) also shows that the application of the Circuit Learning learning model assisted by Microsoft PowerPoint media can improve social studies learning outcomes (seen through the posttest average of 80 and the percentage of classical completeness of students is 100%, from the KKM of 65 and classical completeness criteria 85%). The implication of this research is that the use of audio-visual multimedia can increase students' interest in learning.

2. Concept Mapping Ability

The pretest and posttest scores of students' concept mapping abilities by applying the module-based-circuit learning model to the excretory system material in the excretory system material at SMAN 2 Samalanga, are presented in Figure 2.

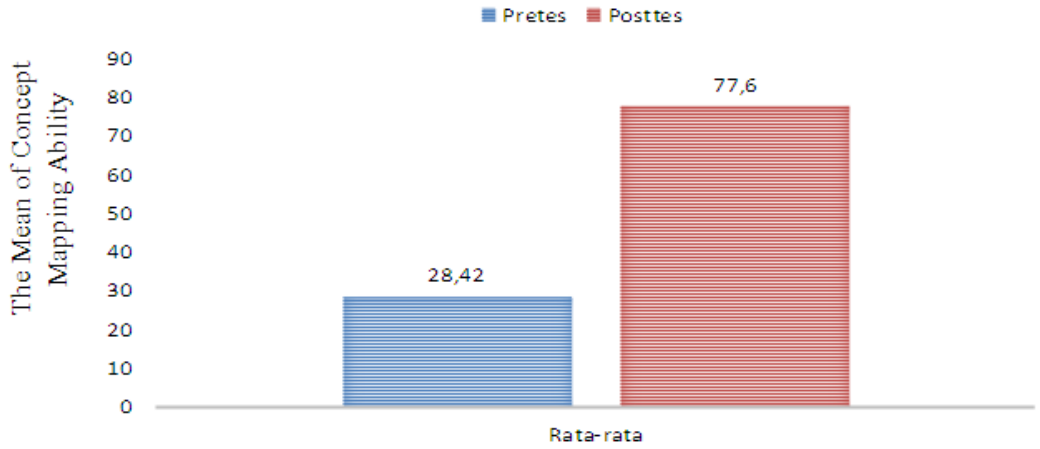

Figure2.The mean of Pretest and Posttest Scores of Students' Concept Mapping Ability

The paired sample t-test was used to determine the effect of applying the module-based-circuit learning model on the concept mapping ability of students in the excretory system material at SMAN 2 Samalanga. The results of the paired sample t-test are presented in Table-3.

Table-3 Paired Sample t-test of the Students' Concept Mapping Abilities

Scores	N	Mean	Normality *)	Significance **)
Pretest	85	28,42	Sig (0,200)	Sig (0,000)
Posttest	85	77,60		

Description:

*) = *Kolmogorov-Smirnov Test* (Normal, Sig >α 0,05)

**) = *Paired Sample t-tes* (Ha accepted, Sig <α 0,05)

Table-3 shows the effect of implementing a module-based-circuit learning model on students' concept mapping skills on excretory system material at SMAN 2 Samalanga. The learning process activity with the module-based-circuit learning model allows students to map out concepts about the excretory system material consisting of liver, skin, lungs, and kidneys so that they can train students' abilities in filling out concept maps. Furthermore, the students made concept maps contained in the LKS and analyze data based on the answers to the concept maps, and compared their concept maps with the one made by the teacher. In the final stage, the students presented the part of the concept map they had worked on.

The application of the module-based-circuit learning model allows students to strengthen their memories and write them down in a mind map that has been supplemented with small notes. In addition, students can also remap or re-learn their concept maps to test their memory. By making a concept map, students focus their full attention on completing the concept map. Furthermore, remapping and adding information makes students devote their concentration so that it is easier for them to remember the knowledge they have learned.

One of the dimensions of learning outcomes is the attitude, which can be seen from the attention to lessons and study habits. In the Circuit Learning model, students are required to focus during learning because students have to record important things that they will add to their concept maps. This is a short-term advantage, while the long-term advantage is that the creation of concept maps and short notes will become good study habits. This learning pattern will really help them in facing the exam (Sudjana, 2013).

The circuit learning model provides the same pattern of information delivery every day. The teacher allows students to acquire their own knowledge and then organize it in a releasable circuit. Repetition of material independently is expected to provide lasting understanding. Based on this, the researcher wants to know the effect of using the Circuit Learning model on student learning outcomes (De Porter, 2010).

Model *Circuit Learning* merupakan model pembelajaran yang memaksimalkan pemberdayaan pikiran dan perasaaan dengan pola penambahan dan pengurangan. Penggunaan model *Circuit Learning* diharapkan dapat memaksimalkan proses pemerolehan dan pengolaan pengetahuan yang di dapat siswa. Selain itu, menurut

Shoimin (2014) salah satu kelebihan *Circuit Learning* adalah meningkatkan kreativitas siswa dalam merangkai kata dan menyusun peta pikiran sendiri. Sehingga diharapkan bahwa *Circuit Learning* berpengaruh pula pada hasil belajar sikap dan keterampilan (Huda, 2013).

The application of the circuit learning model has a significant effect on increasing student achievement. Therefore, the circuit learning model can be alternative learning in overcoming students' learning difficulties (Dewi, et al., 2014). The application of the circuit learning model can provide a significant difference in improving student achievement (Hakim and Mintohari, 2015). The application of the circuit learning model assisted by the question card media affects student learning outcomes and is effective for improving learning outcomes (Rosyida, et al., 2018). The application of the circuit learning model assisted by audio-visual media significantly affects student learning outcomes (Dewi, et al., 2014). This study also shows that the application of the module-based-circuit learning model affects students' cognitive learning outcomes and concept mapping abilities to achieve an effective and efficient learning process.

IV. Conclusion

The results showed that the application of the module-based-circuit learning model had an effect on cognitive learning outcomes and concept mapping abilities of students on the human excretory system at SMAN 2 Samalanga.

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