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Research-Based Learning to Foster Students' Creative Thinking and Independence

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Abstract. The purpose of this study is to describe a research-based learning model to foster students' creative thinking skills and independence. A Systematic Literature Review (SLR) is used as a method of analyzing of various articles and literature obtained by searching for data sources. The results of the analysis from these various sources are translated detailed review. Creative thinking skills in mathematics are needed to create (formulate), complete, and complete a model or problem-solving plan. The ability to think creatively needs to be developed as the main provision to face life. The importance of independent learning in schema thinking helps build components of a schema that are connected in a network of creative thinking abilities. To develop these two goals, namely the ability to think creatively mathematically and independent learning, it is necessary to pursue a learning activity that further explores the ability of students to solve problems creatively, and in the process helps to develop independent learning. The learning model that leads to these benefits is Research-Based Learning.

Keywords: Research-Based Learning, Students' Creative Thinking, Independence

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INTRODUCTION

Human quality is one component in the development of a nation. A nation will develop rapidly if it is supported by adequate human resources, but on the contrary, if the quality of its human resources is low, then the development of the nation will be hampered. Therefore, it is necessary to improve the quality of human resources in line with the times. Improving the quality of human resources can be done in various ways, including through education. Humans can develop their potential intelligence through education so that their quality of life can increase. The government makes national education in human life part of the mission for the welfare of society.

One of the goals of education is to develop students' potential to become creative individuals. Creative personal formation is done through the development of creative thinking skills. Creative thinking is a basic ability that must be possessed by students so that it becomes one of the thinking patterns that must be included in the educational curriculum (Özdas & Batdi, 2017: 13). Creative thinking skills in mathematics are needed to create (formulate), complete, and complete a model or problem-solving plan. The series of creative thinking activities in mathematics is intended to equip students in dealing with various problems.

The ability to think creatively needs to be developed as the main provision to face life. Shute & Becker (2010: 10) explain that in dealing with the development of knowledge, humans are required to have the ability to think critically, think creatively, and collaboratively and be able to communicate effectively to be a solution and be able to survive. This is a challenge for education today in preparing the nation's generation.

Education today is not enough to only provide access to information for students but is required to form a generation that is can act effectively and creatively in the face of the rapid and complex development of the world of work (Heppell et al., 2004). Students must have the ability to think creatively as a provision to face the rapidly changing world. The development of the world is marked by several things, including advances in information technology. Advances in information technology are accompanied by advances in the world of education because all innovations in education between countries can be accessed through information technology. Education must provide a new experience, unique and creative ideas, and develop a collaborative attitude as a provision for students to face life in the world of work, society, and everyday life (Kuhlthau *et al*, 2007: 30). This is a reason that students should have the ability to think creatively as a provision to face life today.

Creative thinking skills in mathematics are obtained through observing, asking, trying, reasoning, presenting, and creating activities. The

characteristics of creative thinking skills and their acquisition process affect the standard of content. Content standards are criteria regarding the scope of the material and the level of competence to achieve graduate competence at certain levels and types of education. The scope of the material is formulated based on the mandatory content criteria determined accordance with the provisions of laws and regulations, scientific concepts, and characteristics of educational units and educational programs.

One of the creative thinking skills occurs when someone solves a problem. Siswono (2004: 6) states that creative thinking is a process that combines logical thinking and divergent thinking. Logical thinking is a person's way of thinking that can be accepted by reason, rational, and in accordance logic or can be judged correct based on reasoning. Divergent thinking is a form of skill that can elaborate ideas creatively (Subali, 2011: 39). An example of someone thinking creatively when solving a math problem with multiple solutions or more than one correct answer. Multisolution can be interpreted as a variety of solutions but the final result is equivalent or the final result is more than one. Someone uses divergent thinking when solving problems through multiple solutions or multiple solutions. For someone who applies creative thinking in a problem-solving practice, divergent thinking occurs in the form of a variety of useful ideas. Logical thinking plays a role in verifying the suitability of the solutions used to solve the problems at hand.

Airasian, et.al (2001) developed a taxonomy for learning and assessment based on the dimensions of knowledge and cognitive processes that revised Bloom's taxonomy. Dimensions of knowledge include factual, conceptual, procedural, and metacognitive knowledge. Cognitive processes include remembering, understanding, applying, analyzing, evaluating, and creating. The highest category of cognitive processes in the form of creation is related to the creative process. To create means to put elements together to form a coherent and functional whole or to rearrange (reorganize) elements into new structures or patterns. Individuals or students who have different levels of ability, and economic socio-cultural backgrounds, will of course have different qualities of the creative process.

In the idea-building stage, you will see novelty, fluency, and individual flexibility in completing tasks in the creative thinking process, individuals or students having different levels of ability, economic and socio-cultural backgrounds, learning styles, and independence will certainly have different qualities of the creative process. Because the differences are generally tiered/tiered, it can be said that there are levels or levels of ability in creative thinking as described above.

From these differences, the researchers discussed the differences in the level of independence. By looking at empirical data, it is difficult that some students who have not shown independence in learning, which means students are still dependent on the teaching of lecturers. According to Adams, et.al. (2012) the lack of independence in learning mathematics makes a lack of mathematical knowledge that affects the mathematical experience less and often produces anxiety when solving mathematical problems. In this study, independence will be studied and traced through a learning model that encourages student growth to think creatively.

METHODS

The method used in this study was Systematic Literature Review (SLR). This method is considered right to produce a synthesis or various fusion of reliable academic literature and accurate (Chalkiadaki, 2018). Data collection is done using google scholar, Scopus, and ERIC in the forms of article journals, books, reports, and article seminar proceedings. All data obtained is analyzed for present in a review of this article thorough and structured.

RESULTS AND DISCUSSION

The importance of independent learning in schema thinking helps build components of a schema that are connected in a network of creative thinking abilities. Based on research (Huda, Mulyono, & Rosyida, 2019) mathematical creative thinking skills affect the learning independence of students if they use the selection of the right learning model in the learning process. As described by Sagala (2006) and Maulana (2016), that learning must be defined as a process of interaction between students, educators, teaching materials, and their environment, to develop creative thinking skills, which can improve their ability to construct knowledge. new independently. Formally constitutional, the curriculum in Indonesia has always mandated mathematical creative thinking skills as one of the higher-order thinking skills that must be developed through learning in

schools, given that creative thinking is a person's self-actualization, through the ability to solve problems in a unique way, full of benefits, and of course enhance self-quality (Munandar, 1999). Meanwhile, the learning independence of students also inevitably has to be a part that must be developed by a teacher. Because students who have independent learning, of course, will try to continue to learn so that they get satisfaction in the learning process.

According to Nanang (2016), to develop the two goals, namely the ability to think creatively mathematically and independent learning, it is necessary to pursue a learning activity that further explores the ability of students to solve problems creatively, and in the process helps to develop independent learning. One of the learning approaches that can develop students' mathematical creative thinking skills and independent learning is learning that accommodates student learning goals in higher education. According to Mukaromah's research (2020), education at the tertiary level should provide benefits, including 1) incorporating students into the values, practices, and ethics of their chosen discipline, 2) ensuring lesson content includes the latest research findings, 3) improving students' understanding of how their chosen discipline makes a positive contribution to society, 4) develop and improve skills, namely generic (critical and analytical thinking, information seeking and evaluation of problem-solving) and skills in conducting and evaluating research that is beneficial to the personal and professional lives of participants students, and 5) provide opportunities to improve learning methods that have been associated with positive student learning outcomes.

Based on Mukaromah (2020), the learning model that leads to these benefits is Research-Based Learning. Poonpan & Suwanmankha (2005) and Dafik (2015: 6) explains that Research Based Learning is a learning system that uses authentic learning (learning using real examples), problem-solving (problem-solving), cooperative learning (cooperative learning), contextual learning (hand on and mind on) and inquiry approach (determining something) which is based on the philosophy of constructivism. Linguistically, the term Research Based Learning uses English which means research-based learning or research. Research-Based Learning is one of the learning models developed by constructivism. Research-Based Learning is a learning model that leads to activities of analysis, synthesis, and evaluation as well as improving the ability of students and lecturers in terms of assimilation and application of knowledge (Widyawati, 2010). Basically, according to Mukaromah (2020), the application of RBL has the main target of encouraging the creation of higher-order thinking skills and encouraging students to be creating. This theory is very suitable in that at the level of creating thinking there is a creative thinking process in it.

Reviewing the six stages of higher-order thinking skills that have been discussed previously. It takes a systematic plan to implement it, involvement of several related elements is important, these elements are lecturers, lecture classes, and research groups. The three elements are seen as an inseparable triple helix relation as shown in Figure 1.

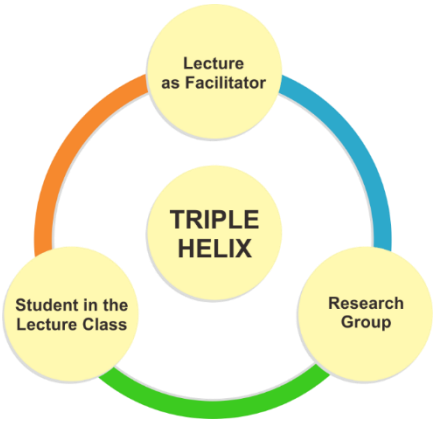

Figure 1. Triple Helix Connection

In general, the triple helix relation above is the basis for implementing Research Based Learning (RBL) research-based learning. RBL is a learning model that makes problems in the research group the main discussion in lectures. A lecturer in lectures does not only present old concepts, concepts that are not phenomenal or not contextual with the times or science itself, but a lecturer must present studies with the findings that the latest developments in science in the study group. The implementation of learning is based on the philosophy of constructivism which is characterized by the application of contextual teaching and learning approaches, discovery learning, and project-based learning, and also includes four aspects, namely: problem posing-based learning (problems are proposed based on research developed by lecturers in the study group), learning based on recently prior knowledge, namely based on the results of the new and latest research, establishing problem-solving procedures with modern research

methodologies, and finally analyzing and testing the validity of the data.

Sugandi (2013) also emphasized that the existence of independent learning will also determine success in implementing problem-based learning. RBL learning also contains problem-based learning in it (Dafik, 2015). Student learning independence is also influenced by learning creativity and learning motivation, this is evident from the research results of Isnawati and Samian (2011) that student learning creativity has a positive effect on student learning independence, and student learning motivation has a positive effect on student learning independence.

A person's creative thinking ability can be improved by understanding the creative thinking process and various influencing factors, in this case, independent learning through Research-Based Learning. This understanding shows that a person's creative abilities are tiered (tiered) and can be increased from one level to a higher level. The way to improve is by understanding the creative thinking process and the factors mentioned above.

CONCLUSION

Creative thinking skills in mathematics are needed to create (formulate), complete, and complete a model or problem-solving plan. The ability to think creatively needs to be developed as the main provision to face life. The importance of independent learning in schema thinking helps build components of a schema that are connected in a network of creative thinking abilities. To develop these two goals, namely the ability to think creatively mathematically and independent learning, it is necessary to pursue a learning activity that further explores the ability of students to solve problems creatively, and in the process helps to develop independent learning. The learning model that leads to these benefits is Research-Based Learning.

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