Literature study: the role of abstraction ability to strengthen students early knowledge in mathematics learning

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Abstract. This study aims to determine the extent of the role of the ability of abstraction to strengthen students early knowledge in learning mathematics. This type of research is a literature study. The type of data used is secondary data from articles related to the study. Data collection methods are by reading the appropriate arithmetic study, then classified more specifically. Next identify the role of the ability of abstraction to strengthen students early knowledge in learning mathematics. From the results of identification then analyzed through the process of categorizing and classifying. The final step is to describe the results of the literature review and conclude it. The results of this paper indicate that the ability of abstraction is very important because it is closely related to the inculcation of basic mathematical concepts that are used as early knowledge or prerequisites of students in learning new material in mathematics learning and students can demonstrate their mathematical ideas, make connections between concepts and can manipulate objects that are abstract.

1. Introduction
The presentation of mathematical material that is sequentially and systematically starts from simple material to complex describing mathematical concepts that are arranged regularly [1]. The regularity shows that there is a relationship between one material with another material, so that in mathematics learning it is necessary to have prerequisite material or early knowledge that supports the concept of new knowledge obtained. Early knowledge is the most important part in the learning process, so teachers need to know the level of early knowledge students have. In understanding the material, early knowledge is a major factor that will influence the learning experience for students [2].

From the early knowledge that students have previously will form a concept. The concepts obtained by students are related to experiences that have been formed before, so the formation of new concepts related to experiences or schemes that have been owned by students is called the mathematical abstraction process. In other words, mathematical abstraction is a fundamental and supportive ability for the formation of mathematical concepts.

Therefore, it is very important apperception activities carried out by the teacher before learning takes place. Apperception activities become one of the efforts to strengthen the concepts that have been obtained by students before to be used or utilized in new material. Russefendi [1] states that students can connect the new knowledge they have acquired with the early knowledge they have. This is certainly
the ability of abstraction can strengthen students early knowledge in learning mathematics.

The ability of mathematical abstraction is an internal factor in learning that still escapes the attention of educators. The internal factor in question is a factor that supports learning originating from the students themselves. One of the supporting factors is the early knowledge students have. That is because most educators are less focused on efforts to improve various mathematical abilities that must be possessed by students. In this case the teacher's role as an educator is very important to align the target learning material with the abilities that students must master [3]. Abstraction ability in mathematics is an ability to obtain basic points or essence of mathematical concepts that eliminate dependence on objects in the real world that are applied more broadly or in accordance with abstract explanations for the same phenomena [4].

For example, earning a function derivative application, one of the prerequisite materials from a function derivative application is a function derivative. If students do not understand the prerequisite material, surely students will experience difficulty in solving problems because there is not enough to solve the problem of derived function applications. Thus, students must have the ability to abstraction in learning to be able to strengthen the students early knowledge.

Based on the description above, the formulation of the problem in this paper is "how is the role of the ability of abstraction to strengthen students early knowledge in learning mathematics?". While the purpose of this paper is to determine the extent of the role of the ability of abstraction to strengthen students early knowledge in learning mathematics. The benefit of this writing is to be able to remind mathematics teachers to always check and assist students in mastering and strengthening students early knowledge so they can learn new material better in learning mathematics.

2. Methods
This type of research is a literature study. By examining through a book, articles in international and national journals, as well as several other sources. This study aims to show that the ability of abstraction is very important because it relates to the inculcation of basic mathematical concepts that are used as early knowledge or prerequisites of students in learning new material in learning mathematics.

The type of data used is secondary data from articles related to the study. Data collection methods are by reading the appropriate arithmetic study, then classified more specifically. Next identify the role of the ability of abstraction to strengthen students early knowledge in learning mathematics. From the results of identification then analyzed through the process of categorizing and classifying. The final step is to describe the results of the literature review and conclude it.

3. Result & Discussion
3.1 Abstraction Ability
Mathematics is an abstract science. When someone learns mathematics means that someone is learning abstractly. This is in accordance with the opinion expressed by Nurhasanah that mathematics is a science with abstract study objects [5]. Mathematics is said to be abstract because objects or symbols in mathematics do not exist in real life. This means that mathematics consists of mental objects through mind objects. Among them are facts, concepts, principles and operations which are all abstract in nature.

In Kamus Besar Bahasa Indonesia the word "abstract" is interpreted as an intangible or something that is not shaped [6]. The word abstract is something that does not exist in concrete or tangible form, can only be imagined in the mind alone. So that concepts in abstract mathematics cannot be conveyed in the form of a collection of information, but must be able to direct students to understand concepts without the presence of an object [5]. Therefore, we need a process in learning activities that can help students understand abstract study objects in mathematics. The learning process is a process that can lead students to carry out and experience activities towards the formation of abstract concepts. This process is called the abstraction process [7].

Abstraction is inseparable from knowledge of concepts, because abstraction requires the ability to imagine or describe objects and events that physically do not always exist. This ability is the ability of mathematical abstraction. So, Abstraction is the process of constructing new knowledge by utilizing the
schema or previous knowledge that has been obtained [8]. The aspect emphasized in the ability of abstraction is the effective use of concepts and symbols in dealing with various special situations in solving a problem.

Therefore, in mathematics it is very important because it is a thought process to describe mathematical concepts in a mathematical problem or in other words abstraction can build a model of a problem. The process of abstraction is very important in learning mathematics, because the process of abstraction plays an important role in the formation of mathematical concepts [7]. Abstraction is also a basic process in mathematics and material education [9]. In line with the importance of abstraction in mathematics, abstraction is also an important skill in mathematics education in this regard related to the process of learning mathematics [10]. Abstraction is also one of the important things that students must have so students can have meaningful involvement in mathematics [11].

Abstraction ability of learning mathematics, students are directed to use contextual problems such as two-dimensional images (manipulative stages) to represent the same concept. In the abstract stage, students are taught how to translate two-dimensional images into conventional mathematical notation to solve problems [12]. Manipulation in the concrete, semi-concrete & semi-abstract stages allows students to rationalize conceptual mathematical procedures into logical steps and definitions that are understood [13]. When students face difficult mathematical problems, they are able to build representations to help in finding solutions [14].

Gray and Tall revealed that abstraction is a process to describe the situation of a particular object, then the results of the process will form a concept [15]. According to Skemp, the process of abstraction is an activity when a person becomes sensitive to the same characteristics in the experiences he gets, then the similarity of these characteristics is used as the basis for doing a classification so that someone can recognize a new experience by comparing it to the class that has been formed in his mind. first, to distinguish abstraction as activity and abstraction as the final result, the results of the process will form a concept [9].

So, based on the description above the ability of abstraction in mathematics learning students can be given the opportunity to show abstract ideas, link between concepts related to problems faced in everyday life, and can manipulate problems into mathematical form in solving mathematical problems through experience or knowledge that is already owned.

3.2 Students Early Knowledge

Early knowledge is a prerequisite for following further learning so that it can carry out the learning process well. Rebber [16] said that "the initial ability is an initial prerequisite for knowing change." Early knowledge" is also called prior knowledge (PK) or known as early knowledge. This is the same as the statement "Prior knowledge can be defined as the whole of declarative ('knowing that') and procedural knowledge ('knowing how'), structured in schemata, which a person has available when starting a task", meaning knowledge the beginning is knowing about something and knowing how to react to it, structured in a scheme, and that has been owned by students before when they were learning [17]. The theory of constructivism states that knowledge will build up in the minds of students themselves when he seeks to organize his new experiences based on the cognitive framework that is already in his mind [18]. As Bodner stated "knowledge is constructed as the learner strives to organize his or her experience in terms of pre-existing mental structures". Thus, knowledge cannot be transferred from the teacher's brain to the students brain. Each students must build that knowledge in his own brain based on old knowledge or experience students have had or have experienced.

This is in line with Piaget's learning theory states that the process of simulation will occur if a new information or experience can be adjusted to the cognitive framework that is already in the minds of students; whereas accommodation will occur if changes or development of cognitive frameworks that are already in the minds of students to fit the experiences that have just been experienced [19].

Ausebel [20] also believes that there are two types of learning “rote learning and meaningful learning”. According to Ausebel, if the purpose of learning in a child is only to remember precisely and precisely, namely by considering as words that are not related to one another, then both the process and
the results are not stated as meaningful learning (as memorization). However, meaningful learning intended by Ausubel occurs when new knowledge or experience gained by students can be related to old knowledge that is already known or possessed by students [20].

Based on the description of some of the experts above, it can be concluded that early knowledge is the most important part in the learning process, so teachers need to know the level of early knowledge students have. In understanding the material, early knowledge is a major factor that will influence the learning experience for students.

What's more, early knowledge plays an important role in learning mathematics. The ability that must be possessed so that students are able to solve mathematical problems is the ability to understand and master the material that exists in mathematics lessons [21]. The stage of understanding the problem will be mastered by students if students can connect all the information they have learned, because solving mathematical problems involves the knowledge and skills they have to apply to new situations. This is where the importance of students initial mathematical knowledge. This is in line with the study [22] that early knowledge is used to be selected, organized, and integrated with other mathematical material so that new knowledge arises as a result of cognitive processes.

3.3 Abstraction Ability to Strengthen Students Early knowledge in Mathematics
Mathematics is knowledge which has an abstract basic object, which is based on truth consistency, arranged hierarchically and in accordance with the rules of logical reasoning. The material in mathematics is hierarchically arranged and mathematical concepts are correlated with each other to form new concepts that are more complex. This means that mathematical knowledge that students know beforehand becomes the basis of understanding to learn further material.

Understanding relates to the process of forming a concept. In mathematics and other learning, concept formation occurs whenever someone learns about something new. Skemp mentioned two meanings of "concepts" including 1) the concept is a classification of things based on experiences that have been obtained previously; 2) installation of experiences that have been gained or gained by someone in a new group [2]. The process of forming concepts obtained by students is related to experiences that have been formed before, so the formation of new concepts related to experiences or schemes that have been owned by students is called the mathematical abstraction process [7].

Mathematics can also be seen as a structure of relations that connect symbols. This view is based on thinking about how mathematics formed. The ability of abstraction can be described as an activity of reorganizing mathematical concepts that have been constructed previously through a new mathematical structure. The new mathematical structure is based on previous models that have a relationship with contextual problems in everyday life to find new generalizations, evidence, or strategies for problem solving [23]. In other words, mathematical abstraction is a fundamental and supportive ability for the formation of mathematical concepts.

It has been mentioned earlier that mathematics is arranged hierarchically, one concept being the basis for learning the next concept [1]. This trait causes the students mastery of mathematics in the learning process is influenced by their ability to master previous mathematical concepts. This results in the early knowledge of mathematics students have before learning affects the mastery of learning further mathematical concepts. Students mathematical mastery can be measured using a mathematical test kit. Basically, the test used to determine students mathematical mastery consists of understanding mathematical concepts, applying mathematical concepts in a particular model / context, and also applying mathematics related to mathematical problems in the real world [24].

The ability of mathematical abstraction is one of the internal factors in learning that still escapes the attention of educators [3]. The internal factor in question is a factor that supports learning originating from students themselves, namely the lack of students early knowledge is one of the factors causing difficulties faced by students in the learning process. This is because most of the educators are less focused on efforts to improve various abilities mathematical that students must have.

In this case the teacher's role as an educator is very important to align the target learning material with the abilities that students must master. As well as the teacher should examine and help students
to master the early knowledge of mathematics that is abstract through the ability of abstraction so that the early knowledge that is a prerequisite knowledge is owned by students to assist them in learning new material well. It aims to increase the achievement of students' learning outcomes.

4. Conclusion
Abstraction ability plays an important role because it is closely related to the planting of basic mathematical concepts that can be used as preliminary knowledge or prerequisites in learning new material in mathematics learning, as well as students having the ability to do to identify problems and provide solutions in accordance with previously known knowledge. The early knowledge students have beforehand can demonstrate their mathematical ideas, make connections between concepts and can manipulate abstract objects.

To the mathematics subject teacher to pay attention to how the abilities and processes of students abstraction in the learning process so that students can understand the basic concepts that they can use as prerequisite knowledge or basic knowledge.

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