The influence of realistic mathematics education toward students’ mathematical habit of mind enhancement in elementary school

S Nisa\(^1\)*, Turmudi\(^2\) and S Saragih\(^3\)

\(^1\)Sekolah Pascasarjana, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia
\(^2\)Departemen Pendidikan Matematika, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia
\(^3\)Program Studi Pendidikan Matematika, FKIP, Universitas Riau, Kampus Bina Widya KM 12.5, Simpang Baru, Kec. Tampan, Kota Pekanbaru, Riau 28293

*Corresponding author’s email: sahrun@upi.edu

Abstract. The importance of students having a mathematical habit of mind makes this soft skill need to be trained and developed since primary education. The low elementary school students’ habit of mind underlies the need for action in learning that can facilitate the growth of the habit. The researcher examines the effect of applying realistic mathematics on students’ habit of mind. The population of this study was fourth-grade elementary school students by taking a sample of 3 schools, where each sample consisted of two classes with a total of 144 students. The results of the study show that realistic mathematical approaches have a significant impact on increasing habit of mind of elementary school students.

1. Introduction
Mathematics is a knowledge that is gained by emphasizing activities in a world of ratios, formed from human thoughts and related to ideas, processes, and reasoning. Mathematics is formed from empirical world experience, then processed in a world of ratios in an analytical and systematic way so that mathematical concepts can be manipulated precisely using mathematical language that has universal value [1]. Because it is the result of thinking, the abstract mathematical objects and loaded with mathematical symbols and terms often make it difficult for students to learn mathematics. [2] According to Piaget, those in elementary school age (7-12 years) are still in the concrete operational thinking phase. The ability that appears in this phase is the ability in the thinking process to operate logic rules, even though they are still bound by concrete objects [3]. Because mathematics is abstract, the process of abstraction in solving mathematical problems is very necessary.

The paradigm of learning mathematics, especially in Indonesia, has now changed. If in the past the purpose of mathematics learning was to understand abstract concepts, especially for elementary school students, then at this time, mathematics learning also tended to aim so that students were able to think mathematically about the reality they faced.

For example, students see a discount on a supermarket/convenience store, they who have good mathematics will understand that a 50% + 20% discount is not 70% but 60%. By getting used to thinking mathematically students are expected to be able to make decisions objectively and
logically. One disposition that supports students' mathematical activities in daily activities is math habit of mind. The concept of the habit of mind is emergent from the brain research and education field. This the concept of using it as the behavior that could be appropriate without pain attention, or requiring some brain activity that was not initially adopted [4]. The habits defined here are not something that is taught explicitly to students but is something that is internalized into students as they do mathematical activities. An important element is that students are given the opportunity to build mathematical understanding through problem solving. Problems can be not difficult, but challenge students to think and reason. Reflection of the solution to the problem can also be an important point. In short, the class that is taught through mathematical problem solving is a very good order to build thinking habits [4].

In simple terms, the habit of mind is defined as thinking habits (in this case mathematical thinking) so that someone who has this habit will be able to think flexibly and systematically. Habits of mind can be related to one's intelligence in acting [5]. This habit, is not about certain definitions, theorems, or algorithms that might be found in textbooks; instead, they are about thinking, mental habits, and research techniques used by mathematicians to develop these definitions, theorems, or algorithms [5]. "Habits of Thinking" means having a tendency to behave intelligently when faced with problems, answers that are not immediately known [6]. Thinking habits can be defined as applying past knowledge to new situations through meaning and communication. This activity will form patterns of intellectual behavior that can encourage individual success [7].

From some of these opinions, it can be said that the habit of mind is a response to a condition that is based on experience. Given that thinking habits are influenced by the experience they have in developing the habit of mind can be done with learners who emphasize the importance of students' real experiences as learning resources. On the other hand, because thinking habits are characterized by a response, if the connection between the experience of students and the conditions or conditions faced stronger so that the motivation to face these conditions will higher. Therefore, in the habit of mind, there is motivation, perseverance, the strength of attitude and flexibility of thinking.

Related to this, identifies sixteen thinking habits[5], when individuals respond intelligently to problems, namely: (1) Motivation including survive or never give up, creating, fantasizing and innovating and eager to respond; (2) Perseverance including regulate his/her heart, trying to work carefully and precisely and use the senses in collecting and processing data; (3) The strength of attitude including listen to the opinions of others with empathy, dare to be responsible and face risks, humorous and thinking is interdependent; (4) The flexibility of thinking including think flexible, metacognitive thinking, ask questions and raise problems effectively, think and communicate clearly and precisely, use old experiences to shape new knowledge, and continuous learning

Traditional learning tends to start from linkage learning from the characteristics of a mathematical concept, while the child's thinking stage is still concrete so that it has not been able to fully facilitate this activity. This gap can be overcome by learning to start in the real world. The learning objective is to bring up the ability to think step by step during the learning process. Freudenthal didactic phenomenology explains that what didactic phenomenology can do is preparing for the following approach: starting from the phenomenon that is asked to be organized and from that starting point it teaches students to manipulate this organizing method). To carry out this development process, a theoretical framework based on the real world was arranged so that the thinking process began in the first stage. The theoretical framework is Realistic Mathematics Education (RME) [8].

RME was introduced as one of the didactic phenomenology methods by describing mathematical concepts, structures, and ideas into everyday phenomena so that students reflect on mental objects of mathematics during the learning process [9, 10]. The term "realistic" comes from the Dutch term "zichREALISeren" which means "imaginable". Thus, the word "realistic" can be meaningful: (1) the real context that exists in everyday life; (2) formal mathematical context in the world of mathematics; or (3) an illusion context that is not in reality but can be imagined. These three meanings are seen as meanings of the term "realistic" provided that these contexts can be imagined in the minds of students who are studying mathematics [10,11]
The application of the RME approach in learning begins with presenting problems that can be imagined by students or is a student's experience. Learning the RME approach has several principles [11]. These principles can be drawn from learning planning and teaching materials include; (1) The principle of reality, this can mean two directions. First, this shows the importance of achieving the goal of mathematics learning in solving real problems. Second, this means that mathematics learning must start from a problem situation that is meaningful to students, which gives them the opportunity to gain an understanding of being mathematically constructed while they are solving problems; (2) The principle of level means that in the process of learning mathematics students should pass through the stages of mathematical understanding: from understanding informal contexts, through various stages of understanding and schematization, to obtain how concepts and strategies can relate; (3) The principle of interrelation is defined as topics of mathematics, such as numbers, algebra, and geometry are not seen as separate topics, but as topics that are interrelated and integrated.

While the principles described in the learning process/activities include: (1) The principle of activity is that students are treated as active participants in the learning process of mathematics; (2) The principle of interactivity views that learning mathematics is not just an individual activity, but a social activity involving other individuals; (3) The principle of teacher guidance is required to play an active role in guiding students in the learning process so that students can pass the stages of mathematical understanding from the informal to the formal.

2. Methods
This research is quantitative research with a quasi-experimental method. The design used is the one group pretest-posttest design [12]. The number of samples in this study was 144 grade IV students in Minas Subdistrict, Siak Regency, Riau Province consisting of 73 experimental group samples and 71 control group samples.

3. Results and Discussion
3.1. Result
Based on the results of data analysis, it can be described as increasing the habit of mind of students as shown in the Figure 1.

![Figure 1. N Gain Score of Mathematical Habit of Mind](image)

Based on the diagram on the Figure 1, it is shown that students who were treated with learning with RME showed the improved habit of mid mathematics. This shows that the application of the RME approach contributes positively to the improvement of students' habit of mind. In connection with that, it is necessary to analysis inferentially to see whether the increase in habit of mid in question is significant or not. By using t-test analysis, the calculation results can be described as shown in the Table 1.
Table 1. Result of comparing mean test of a mathematical habit of mind

| SV | N  | N Gain Average | S  | Sig. | Sig. (2-tailed) | Decision   |
|----|----|----------------|----|------|----------------|------------|
| Ex | 73 | 0.3816         | 22.576 | 0.05 | .000           | Rejected H₀ |
| Con| 71 | 0.1545         | 24.809 |      |                |            |

From the data in Table 1, it can be seen that sig <0.05, meaning that there is a significant difference in the increase in the habit of mid students between the experimental class and the control class. By looking at the habitof midN-Gain average of the two groups of research samples, it can be concluded that the implementation of the RME approach can provide a significant increase in the habit of mind students.

3.2. Discussion

As can be seen in the Figure 1 that students who learnt using RME has higher score of mathematical habit of mind. It related that teaching materials with the RME approach can improve the habit of mind [13]. Students who learnt by RME are used to see a context of problem and the most important, what the result say is. Student also used to think why they took every step of problem solving. This process indirectly and contiously train them to have strong mathematical habit of mind.

At the beginning of the test given, all of students have the same habit of mind ability. During the initial treatment, it was seen that initially, students had discomfort with mathematics learning, indicated by a timid attitude to give an opinion, even when it was true. In addition, students tend to guess the questions that is given by the teacher. When the researcher asks for the reason for the student's answer, the student is unable to provide a clear or reasonable reason for the question. If this happens, the students are embarrassed to express their opinions again.

When the treatment had entered the third meeting, the enhancement of several students in flexibility of thinking and strength of attitude already increase. They began to be able to give their opinions, and when asked to give reasons, students began to be able to give the reason for the answer based on their experience. Because the RME approach prioritizes is closeness to the surrounding world, so even though children are not able to give reasons verbally, students will be helped by their friends to try to give reasons visually such as demonstrating and drawing in front of their friends, even though that is not right. This process, if is done continuously, will provide comfort to students to learn mathematics.

Student also have a joy time to learn math. They can see their environment in math such as shape, data, angles, etc. Cognitive style based RME can increase the habit of striving for accuracy and precision [14]. They motivates and perseverance to learn math also increase. It is showed by their attitude and readiness to learn math is getting better and better. They also challenge to solve the given problem, individual or in groups. In group discussion, they support each other until they can finish the project they have every meeting. They are not shy to asked if they confuse, not only to teacher but also to other group. This situation make last step in learning, make conclusion of what they learn, easier because they have same perception and understanding already.

Several discussion group in learn mathematics has different perspectve and visualization of problem, eventhough they have same meaning. Cooperation among students also improved. At first, some students tend to separate themselves from their group friends, but after the fourth meeting, students begin to discuss with their respective groups. Using the RME approach as well, children find learning mathematics can be a fun activity because it can be done outdoors. In addition, children also better understand the concepts that are asked to be mastered.

At the end of the action, it was seen that there were significant differences between students in the control class and the experimental class. The average’s increase in habit of mind in the experimental class is higher than students in the control class. This shows that RME can be used as a learning model to improve the habit of mind of elementary school students. This result is in line with some research
before like [12] state that habit of mind has 40% impact to mathematical ability. So, If teachers can develop their students' knowledge, attitude and skills holistically, as expectation, then the potential of students to acquire knowledge in mathematics will be higher or better.

4. Conclusion

From the explanation above, it can be concluded that the RME approach can improve the mathematical habit of mind of elementary school students significantly. In this study, it was marked by the children starting to feel comfortable learning mathematics, being able to ask and answer questions from/to the teacher. In addition, students began to dare to discuss among their friends for building their knowledge and it was hoped that RME would become one of the learning approaches that could be developed in schools in addition to the scientific approach which is the most used approach in the Indonesian Curriculum now.

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