Analysis of secondary school mathematics teachers’ pedagogical content knowledge and intended teaching in curriculum reformation

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Abstract. This study was conducted in response to the curriculum reform in Indonesia which have encouraged a different approach to teach the mathematics content employing innovative methodology or model in teaching and learning. This study aimed to understand the secondary school mathematics teachers’ Pedagogical Content Knowledge (PCK) towards curriculum reformation. Every participant was interviewed in relation to the domain of PCK, and some intended teaching practice in K-13. The result shows that each teacher has a unique approach to teaching system of linear equations of three variables (SLETV) in curriculum reform. Though the content structures are different, the patterns for teaching two variables to three variables of SLETV are similar. Some intended teaching may still not be implemented regarding students’ and classroom teaching/practices condition which in the end makes the teachers return to the old paradigm of teaching. Hence, although the government has provided good efforts in suggesting some innovative teaching practices to increase the achievement of students, those ideas may still not be executed in the classroom practice.

1. Introduction

Mathematics has become one of the compulsory subjects in the Indonesian school system. As a compulsory subject, mathematics has been implemented into formal Indonesian curriculum after the colonialism era [1]. Before 1975, the practice of mathematics learning in Indonesia was much related to traditional mathematics, which had more tendency towards memorizing concepts, numeracy skills, and understanding fundamental mathematics operation and symbol [2]. However, the orientation of mathematics learning in Indonesia has reformed since 2013. The Indonesian government began to change the focus of mathematics learning into content-based learning oriented through the development of competency-based curriculum [3]. The goal of mathematics learning not only concerns on transferring knowledge of mathematics, but also focusing on developing students’ competencies needed in 21st centuries, such as critical thinking, creativity, collaboration, communication, and solid basic literacy in reading, numeracy and science [4].

The current reformation of the Indonesian national curriculum is Kurikulum 2013 (K-13), which changed the Kurikulum Tingkat Satuan Pendidikan (KTSP) [5]. The transformation of KTSP to K-13 is an effort made by the Ministry of Education and Culture of Indonesia (MoEC) to improve the quality of education in Indonesia. Internally, K-13 is expected to empower teachers in conducting meaningful mathematics learning for students by implementing an innovative method or model in the teaching process and developing students’ skills and competencies through the integration of character
building [6]. Externally, K-13 is expected to increase the achievement of Indonesian students in international assessment, Program for International Student Assessment (PISA) and Trends in International Math and Science Study (TIMMS), where Indonesian students always achieve disappointing results [5]. According to [7], the result of 2011 TIMMS shows that Indonesia is ranked 38th out of 42 countries and had an average score below 400 (Low International Benchmark). Meanwhile, reports from the Organization for Economic Cooperation and Development (OECD) about the PISA assessment in 2009 and 2012 revealed that most of the Indonesian students did not reach level 2 which indicates that most of Indonesian students can only interpret and recognize situations in contexts that require no more than a direct inference [8][9]. Unlike KTSP, there are some differences between KTSP and K-13 (see in Table 1).

**Table 1. The Differences of K-13 and KTSP for Mathematics Learning**

|                      | KTSP                                      | K-13                                      |
|----------------------|-------------------------------------------|-------------------------------------------|
| Direct to abstract material | Starting from concrete problems before abstract problems |
| The formula is often memorized to solve the problems | Students derive the formula |
| Mathematics problems often associated with numbers | Balance between mathematics with numbers and no numbers |
| Does not encourage students to do critical thinking | Designed for students to think critically |
| The problem solving is not structured | Familiarize students with algorithmic thinking |

The learning orientation in K-13 shall start with concrete problems rather than direct abstract material. Teachers shall not explain about the general form of mathematics, but it should start with the general knowledge known by students. For this matter, the use of real-life or concrete mathematics problem works as an inspiration to construct abstract mathematical models [10]. For example, on the topics of the system of linear equations of three variables (SLETV), the discussion of the learning is started from concrete problems about an Indonesian farmer who is going to choose the type of fertilization for their field (see in Figure 1(a)). Meanwhile, in KTSP, the material of SLETV has directly discussed the general form of SLETV formula and its component and continued with mathematical problems related to SLETV (see in Figure 1(b)). Hence, K-13 requires different knowledge about teaching the topics and different approach to make the students be able to understand the topics.
The differences between the structure of content and approach, especially the use of concrete context of teaching mathematics content can lead to a different decision about teachers’ pedagogical practice related to the material itself. For example, [11] said that many mathematics educators believe that mathematics should be taught from concrete to abstract since it can “facilitate students’ understanding of an underlying, or more general, mathematical ideas” (p. 110). Meanwhile, Kaminski [12] believed that it depends on the goal of the mathematics teaching. They underlined that Concrete contexts can potentially limit its applicability. Students might be better able to generalize mathematical concepts to various situations if the concepts have been introduced with the use of generic instantiations (p. 455). The opposite opinion above shows that the use of concrete context is still debatable to be used in mathematics learning. Thus, the teaching strategies used by Indonesian teachers in teaching mathematics may not follow the teaching and learning instruction suggested in the curriculum. Hence, the different understanding about the beneficial of using teaching component such as concrete context in teaching mathematics can influence the strategies made by the teachers in the teaching process.

Teachers’ decision to implement certain methods of teaching and learning will have an impact towards the learning result. In making students successful in learning mathematics teachers shall cleverly choose the precise teaching method according to the students’ need [13]. With their experience, every teacher may have different views and consideration in determining the effective mathematics teaching practice to help their students learn mathematics. Teachers’ consideration about effective teaching practice may remain the same or may be changed, depending on the situation which is suitable for students’ needs. The consideration of the teacher related to the goal of learning of the objectivity of the curriculum may alternate their views about the effectiveness of certain teaching to achieve the learning goal. Hence, it is necessary to see the perspective of Indonesian secondary school mathematics teachers about the effectiveness of mathematics teaching practice suggested in curriculum reform.

The massive changes in the Indonesian curriculum, which has a different approach towards teaching and learning and different types of content compared to the previous curriculum, have attracted the researcher interest. This the analysis of mathematics teachers regarding their knowledge about teaching mathematics content (pedagogical content knowledge) and intended teaching in curriculum reformation should be conducted to understand how the curriculum transformation influenced the teacher.

2. Method
To investigate the phenomena in this study, the design of this research was qualitative research approach which uses background and method to interpret some phenomena [40]. Qualitative research is flexible and able to change from the plan based on phenomena that are uncovered during the research process [41]. Through qualitative research, the researcher could explore and analyze any
possible factors from the issue related to the teachers’ beliefs, opinion, respond, and reaction more comprehensive [42]. Since this research tried to seek the perspectives of teachers about effective mathematics teaching and pedagogical content knowledge in the curriculum reform, the qualitative approach was prominent to be used to address the problems in this research. The design of the research captured in Figure 2.

![Figure 2. Research Design](image)

The first step was selecting the participants. The researcher selected the teachers based on criteria that captured in demographic information. To have different data, researcher selected teachers upon some criteria such as teaching experiences, curriculum experiences, teaching classes, and professional development program experiences. If teachers fulfilled the criteria, then they were to be interviewed in a two-phase strategy. The first phase focused on the teachers’ PCK, while the second phase focused on the teachers’ view of effective mathematics. After the interview, the researcher undertook analysis and interpretation. The information about the subjects of this research are classified in Table 2.

### Table 2. Subjects Information

| Subject | Latest Education | Teaching experience (years) | Experience with curriculum | Professional development related to K-13 |
|---------|-----------------|----------------------------|---------------------------|----------------------------------------|
| T1      | Magister in Management | >20 | KTSP & K-13 | Training of prospective instructor K-13 - (2016) |
|         |                 |     |              | Training of instructor K-13 - (2017) |
|         |                 |     |              | Training of K-13 – (2013) |
|         |                 |     |              | Training of making learning material based on communication, information and technology) - (2017) |
| T2      | Bachelor        | 10-20 | KTSP & K-13 | Training of K-13 – (2017) |
| T3      | Bachelor        | <5   | KTSP & K-13 | Implementation of K-13 – (2017) |
3. Results and discussion
3.1 Teachers’ Pedagogical Content Knowledge

3.1.1 Teachers’ Knowledge about Mathematics Content

To explore the teachers’ PCK each participant was asked about their views of the structure and characteristics of mathematical content in K-13. This question was addressed to capture teachers’ understanding about the changes of mathematics in secondary school under the curriculum reform. In general, the teachers found that there were slight changes regarding the structure and the characteristic of the mathematics topics in the current curriculum. For example, T3 mentioned that, “in terms of structure, it changed. For example, in the previous curriculum for linear equation system the step started from two variables, but now it is started from three variables.”

Not only on structure, but the teachers also understand that the character of mathematical content in K-13 is different with KTSP. T2 explained that the content of K-13 was much likely contextual, related to the real life, and then the development of material was more extensive. T1, also said that in K-13, the material was expected to be contextual. Furthermore, the contextual must be related to the surrounding environment. The teachers used the real context to encourage students’ in developing their understanding of SLETV and creating a mathematical model from word contextual problems instead of giving general form of SLETV independently. For example, T1 used a real-life context, such as the type of fertilization in rice field, as a bridge to find the general form of SLETV. Meanwhile, In the process of defining and operating the properties of SLETV, T2 used the context of buying the item in the online store. It is opposite to what the teachers did in the previous curriculum, where the teachers directly taught students about the general form of SLETV. According to T1.

In the previous curriculum, explanation of two variables used general form. Unfortunately, in K-13 the learning is not intended to start with a general form, but it comes through word problems/story problems and then continues with modelling the problems into mathematics model in the form of SLETV (see in Figure 3).

![Figure 3. Comparison of material](image)

3.1.2 Teachers’ Knowledge about Mathematics Content and Student

Even though the current structure of topics about SLETV had changed, omitting discussion about system linear of two equations, the teacher indicated that they still used two variables before moving to SLETV. The teachers implemented it due to the importance of two variables as the perceptual knowledge of student before going to three variables. T3 explained that although the student had learned about two variables in junior high school, some of them were still having difficulties to understand about it. T1 described that SLETV is the advance of the system of linear equation two variables; hence when the students are familiar with two variables, then it will be easier to enter the topic. Furthermore, T2 said that in the process of defining and operating the properties of SLETV, through discovery learning, an explanation about two variables was considered as the part of perception process. Teachers found that that students often had difficulties in constructing mathematical model from contextual word or story problems. When students had a story problem, they could not determine which one is variable X, Y, Z.

3.1.3 Teachers’ Knowledge about Teaching and Curriculum

In K-13 the teachers used cooperative learning or discovery learning model. T1 and T3 used cooperative learning as the approach in teaching mathematics for his classroom in K-13, while T2 used discovery learning. In both discovery and cooperative learning model, there was a section for
students to make a group and do discussion, question and answer, and presentation. Although, it requires longer time to conduct, those activities were essential to enhance the development of skills intended in K-13 such as communication, collaboration, creativity, and critical thinking. The teachers’ understanding about this innovative approach was developed during the PDP.

In the comparison of teaching strategies of the teachers in KTSP, the strategies of the teacher in KTSP was often teacher-centered such as explanatory or lecture. According to T2, the factors behind it was the demand of KTSP which only focused on making students understand about mathematics without actualizing their understanding in daily life.

3.2 Teachers’ Intended Teaching

The intended teaching are asses on the effectiveness of teaching expected by the curriculum and teacher’s opinion related to it. The opinions than relates to teacher’s implementation in the classroom.

Each teacher has different perspective about the definition of effective teaching. T3 defined effective mathematics teaching when it can make the students able to solve mathematics problems and explain about the mathematical concept, and it can achieve the aim of learning. For T2, it can achieve the aim of learning, the knowledge transferred to students, and could minimize the proses of analysis of mathematics under given conditions. Meanwhile, T1 described it when it can provide effective learning.

3.2.1 Effectiveness of Real Context

The recommendation on the teaching process in K-13 is that teachers should start the learning process with a real context and enhance the students’ concrete experience of mathematics learning. Regarding this matter, the teachers found that this practice is effective to help students learn the abstractness of mathematics and recognize the functionality of mathematics in daily life.

One of the common problems that make the students deal with difficulties in learning mathematics, especially in secondary school, is due to containing the abstract concept or formula. To cope with the abstractness of mathematics, each teacher has a different solution. Each participant believed that simplifying the abstract concept and using the concrete representative could help students to understand the material. For example, T2 and T3 addressed this problem by simplifying the equation or formula and using the contextual thing to make the students more easily understand the topics. In another side, T1 explained that concrete representational works as a bridge to help students understand abstract concept since not all of the mathematics topics can be related to real contexts. Thus, when the students are still unable to understand the abstract concept, teachers should directly explain it, although K-13 expect that the use of lecture should be decreased.

Furthermore, the teachers found that that associating a real context and concrete experience in learning mathematics is effective regarding building students’ interest and motivation. First, their students become more interested in learning mathematics because they see the benefit form their learning. The fact that in the previous curriculum students were not interested in learning mathematics influenced by their unfamiliarity of the benefits of mathematics in daily life. Second, connecting the learning with a real context or a concrete experience can increase students’ understanding of the benefits of learning mathematics topics in their daily life and senses of love with mathematics. Unfortunately, one of teachers found that it is not effective because it is time consuming and it is limited on context. T1 said that if every topic must be linked to real context, the goal of learning will not be achieved. In addition, T3 found that it was not easy to contextualize the real world in all mathematics topics. T3 said that in topics such as exponential, logarithms, or vector, it is difficult to contextualize this topic. Hence, T3 expect that the PDP can enhance the teachers’ knowledge regarding this issue.

3.2.2 Effectiveness of Giving Significant Role for Student

Giving significant role for students is one of the ideas in the learning process in K-13. Teachers are expected to setting-up their teaching to accommodate it. The aim of giving students significant role
rather than the teacher was meant to encourage students to be more active in constructing mathematical knowledge or formula rather than listening to the teacher’s explanation and memorize it. In this situation, there were some differences in the perception and beliefs of its effectiveness. For example, T1 explained that “theoretically students should be given more opportunities, but I still consider the condition of the classroom and the material”. T1 believed in a particular material, the percentage of teachers’ participation could be 80%, while in the material which may be difficult for students, the teacher may still dominate the learning activity. T2 believed that the effectiveness of giving significant role is related to its function to increase students’ responsibility, motivation, and willingness in learning mathematics. For T3, this situation has made the learning more enjoyable and less threatening, and gives freedom for students to comment and share their ideas without dealing with the fear.

3.2.3 Effectiveness of Self-Constructing Mathematics Concept

One of aspect in giving a significant role for students in K-13 is related to self-constructing mathematics concept or formula. It is suggested that teachers in their teaching practice should accommodate students in constructing mathematical concept or formula. Regarding this situation, all teachers believed that it is useful to increase the students’ understanding and memory of the concept and formula. The teacher stated that students’ understanding and memory about mathematics concept or formula would be more decent when they construct the concept or formula rather than directly obtain the knowledge from the teachers. Also, by giving students opportunities to construct their knowledge will give another perspective or ideas about the method in solving mathematics problems.

Unfortunately, a situation where the students do not have any underlying understanding of the topic, the process of self-constructing of mathematical concept may not be useful. Hence, the teachers should directly explain and demonstrate the procedure and rule of mathematics to the student in the process to understand about the formula or concept of mathematics. Although in K-13 teachers should not directly explain the concept when the material is relatively new for students, it becomes effective. For example, in topics about exponential, which is new for students, students may not be able to learn it independently. Conversely, in other materials which is well-known by students such as SLETV teachers does not need to explain it.

3.2.4 Effectiveness of Group Discussion and Mathematical Reasoning Task

In the Indonesian classroom paradigm, the communication between students and teachers rarely happens because the students are commonly afraid to communicate their ideas directly to the teachers. This situation was admitted by the teacher who found that students are often silent because they were afraid to communicate and share their ideas with the teachers. The teacher often found that the communication that happened during the learning process is one way, from teacher to students. It made teachers unable to identify either student have understood what they learn or not.

The teacher saw that an idea of making group discussion in K-13 had become the effective solution to increase the communication between students and teacher or among the students. All teachers believed that group discussion could be placed for students to share their ideas in the discussion without being afraid of being wrong or right. Moreover, group discussion can support the students in the process of self-constructing mathematical knowledge which is mandated by K-13. According to the teachers, during group discussion, each student can share their ideas with other students who are able or unable to construct mathematical ideas from discussion topics. Hence, every student in the group will get some enlightenment about ideas related to the discussion context.

To make the group discussion become more effective, teachers believe that the use of mathematical reasoning task is necessary and effective. The teachers believe that providing reasoning problems in the discussion section is essential for students. Mathematical reasoning task is essential in group discussion because it requires higher order thinking skill. Embedding mathematical reasoning
problems in group discussion will expand students’ knowledge about a variety of mathematics problem solving as it requires more ideas instead of regular problems.

4. Discussion

4.1. Teachers’ Pedagogical Content Knowledge

The understanding of teachers related to the changes of content in curriculum reform has created different strategies for teaching mathematics. The transformation of the teachers’ way of teaching is influenced by the knowledge of teachers about the mathematical content itself combined with knowledge of the students, teaching, and curriculum. The knowledge of teachers regarding that aspect is influenced by their teaching experience, understanding about students, and understanding about teaching intended and learning objectives in the curriculum.

The first aspect in PCK is teachers’ knowledge of content and students. In this aspect, the teachers’ decision about strategies in teaching mathematics content is not only restricted by their understanding about the characteristic of the material itself, but also considering the condition of the teachers and aspect related to the content which is vital for students. For example, the reformation of curricula such as the removal of one and two variables before three variables in the topics of the linear equation has not affected the teachers’ way in teaching SLETV topics. In the findings, the teachers still need to regain students’ prior understanding of linear equations of one variable or two variables instead directly discuss three variables to help the students understand the mathematics content. Even though teachers realize that students had learned one and two variables in prior education, teachers believe that those topics are essential because students may obtain a different understanding about those topics. The heterogeneity of students’ prior knowledge determined the instructional choices of the teacher, where the teachers should re-explain the information to strengthen the prior knowledge of students, especially for the non-expert students [43].

The decision of teachers to re-explain topics that had been introduced is to make sure that the students achieve a better result in learning. Prior knowledge, alongside with academic self-beliefs, can be used as an accurate predictor of students’ achievement in mathematics [44]. Hence, one of aspect in teachers’ PCK has produced a better decision towards initiation of teachers in teaching mathematics topics and situations or conditions that will be encountered by students. Another aspect in teachers’ PCK is a combination of teachers’ understanding about the content and their understanding about the curriculum. From an examination towards this aspect, the teachers’ understanding about the differences in curriculum objectives and approach towards mathematics content has changed the teachers’ approaches in teaching the content. Identified this situation as teachers’ action related to their knowledge about the curriculum. Teachers who knew the specific curriculum will work based on the notion of the curriculum itself. In this study, the teachers understand that the objectivities of mathematics in KTSP curriculum does not intend the teachers to relate their teaching content with real-life context and asked the students to construct a mathematics concept from real-life context. Hence, in their teaching and instruction, teachers did not include them in their teaching. Teachers now more often commence the learning process by directly explaining about the general form of definition, formula and properties of mathematics. Nonetheless, the ideas of K-13 which is different from KTSP has encouraged the teachers to adopt another approach of teaching. The orientation of the teacher changes from explaining the general form of mathematics to the construction of a general form of mathematics by actualizing real-life context to the mathematics topics.

The different example of a real-life context used by teachers in teaching and constructing mathematics knowledge may be different. It shows that teachers’ PCK is unique. Comparing with the example generated by the teachers using mathematics textbooks in K-13, some teachers generate the real-life context directly from the books, while the others use context which is currently popular among students. Even though the example of each teacher is different, the intended goal of the teachers is similar. At this point, the teacher has optimized their understanding of the curriculum and
transferring their understanding about it in the teaching mathematics topics. Moreover, the use of real-life context has decreased the students’ challenge in learning mathematics.

The role of teachers’ PCK in the aspect of knowledge of content and knowledge of students are able to help teachers in selecting the strategies to encounter the students’ problems. This research had shown that teachers understand about the problems that appeared during the learning which has influenced their teaching strategies to cope with the situation. For example, in SLETV topics, students have difficulties in determining the modelling and solving the problems. To handle this problem, teachers adopt different strategies such as implementing several steps of thinking. In this situation, teachers have recognized that mathematics has a pattern. The pattern is fundamental in mathematics because the rules in math are based upon patterns. Hence, students should learn to recognize the patterns and rules in different math situations.

From the research findings, the researcher found that there is no significant impact of teaching experience related to PCK. However, professional development program has developed teachers’ PCK. PDP develops teachers’ knowledge regarding content knowledge, teaching knowledge, and curriculum knowledge. It is coherent that PDD could develop teachers PCK because of PDD beside teaching experience, and teachers’ education.

4.2. Teachers’ Views of Effective Mathematics Teaching

The views of effective mathematics teaching vary among the teachers. At some points teachers believe that some teaching practices are effective. Some of them are effective with exceptions. The main frame of teachers about effective mathematics teaching is a teaching practice that can achieve the aim of learning based on curriculum during the allocated time. Furthermore, effective teaching refers to teaching practice that can create effective learning.

In the practical level, the Indonesian mathematics teachers believe that real context and concrete experience, one of teaching orientation in K-13, is effective in helping students learn mathematics. The effectiveness of real context and concrete experience can be seen from two perspectives. First, it can increase students’ motivation to learn mathematics. Second, it works as a bridge to help students understand about the abstractness of mathematical concepts. However, it also becomes ineffective for teaching because it consumes more time than regular teaching.

Embedding concrete/real context and bring in concrete experience on the teaching and learning can increase students’ motivation and love of mathematics and decrease the avoidance of mathematics [31] [45]. The positive perception that occurs from students is influenced by their ability to see the benefits of learning mathematics for their daily life. The understanding of the function of mathematics in daily life fosters greater motivation for students. Compared to the teaching and learning that happened in KTSP, the knowledge about the relation of learning topics and its function was not much explained to the students. This situation then creates a negative paradigm about students’ attitude. Students become less interested in engaging with the topics.

The use of real context is also considered sufficient to assist students understanding about the abstractness of mathematics which often problematic to be understood by students. The capacity of real context is not directly able to make the students understand about the abstractness of mathematics itself, but it works as a bridge to assist the students’ understanding about the abstract knowledge of mathematics with anything that's familiar to the students. It makes the argument about the necessity of real context and concrete experience to be brought into teaching still debatable. It is in line with research finding of [33] which found that concrete experience is not necessary to help students understand about the abstract concept, as it only works as media to give a better understanding. The main focus to handle the abstract mathematical concept is to lead students’ perception that abstract concept can be understood through some aspect that is already known by students. Thus, it can influence the students’ beliefs that abstract knowledge which is difficult to learn can be answered.

Giving significant role for students is not always considered useful to help the students learn mathematics in K-13. Even though K-13 encourages teachers to design learning that can optimize the role of teachers in learning, there is some condition where the teachers become more dominant than
the children. Some barriers such as students’ different ability, the difficulties of problems, students understanding about the material, students’ prior knowledge related to the content will make the teachers reuse the old paradigm of mathematics teachings such as a lecture or explanatory method. The positive side of giving students greater opportunities can develop students’ motivation in learning mathematics [46] Giving students opportunities in the learning process are a teachers’ effort to motivate that students can learn mathematics independently with the guidance of teachers. Giving the students opportunities in learning increase freedom and the tendency of students to explore some mathematical concept and share their ideas related to mathematics topics. In this situation, students can produce different variations of mathematics solving mode, which may beyond the regular pattern and teachers’ expectation. Furthermore, by giving students trust motivation will lead to increase students’ motivation which can affect the willingness and the level of students’ engagement to learn mathematics [47]. They also explained that motivation from the teachers would have a positive effect on students’ psychology such as will have a positive effect on student psychology such as decreasing students' anxiety in solving the problem and low negative criticism when students experience deadlock in problem solving.

Mathematics teaching which gives students significant portion in the learning process through the provision of opportunities for students to construct concepts or formulae of mathematics is effective for Indonesian mathematics secondary school teachers. Putting students in conditions where they must build their knowledge with the guidance of the teacher will have a positive impact towards students' knowledge and memory. Students who actively constructs the mathematics knowledge rather than receives the knowledge from the teachers will remember more about what they learn. Construction of mathematical knowledge produces the different conception and understanding among the students. Construction of mathematical knowledge based on whatever knowledge that is available and relevant for students to the task and it reflects the students’ mathematical understanding. Thus, through construction, teachers can identify how far the level of students’ comprehension about the mathematics itself.

Although the current Indonesian curriculum has prohibited direct teaching, explaining about the procedure and rule in learning mathematics, from teachers to students who also found to be ineffective to make students learn mathematics. Indonesian secondary school teachers believe this practice is still essential. The condition where Indonesian teachers still need to demonstrate the rule and procedure in mathematics learning directly of material that relatively unknown or new for students. When students learn something that they never encountered before they may not intuitively know how to learn it. However, in the material that was already known by the students, teachers do not need to demonstrate the rules, and the procedure as a student can actualize their previous knowledge to help them learn the mathematics concept independently or in the group.

Group discussion is useful to help students learn mathematics because there is an interactive communication happened between students and teachers. Group discussion can close the gap between the relation of teacher and student, and increase the responsiveness of asking questions and participate in group discussion without being afraid of being incorrect When students found difficulties towards the problems they do, teachers can identify students’ errors students and followed by clarifying misleading information or knowledge performed by students with the correct answer. Hence, more communication between students and teachers can portray a clear description about students real understanding about the topics

Group discussion is also effective because of the group discussion, collaboration among the students will be intertwined. When a student does not understand about the concept, the leader or other members in a group, who is deemed capable in the topics, can explain to the other students about the lack of error in their explanation. The consideration about the students’ potential may still have some difficulties in constructing the concept and problems of mathematics, they are not able to construct their knowledge. The fact that the difficulties that encountered by students will be handled much better if the students work in group discussion rather than working individually [48]. The use of group discussion can create a situation where students can collect the opinion, generating a conclusion. Thus,
each can deliver their understanding, perception, information to decrease any misunderstanding towards the material.

In the teaching process, fostering students’ understanding about mathematics by giving students some task that contains mathematical reasoning to be discussed is effective [49]. Reasoning task is vital for students since through reasoning task students logical reasoning can be developed. reasoning is critical to be taught because the foundation of mathematics is the reasoning. Students whom does not develop their logical reasoning will see mathematics only as procedure without knowing the sense of mathematics for them. Giving mathematical reasoning task in the discussion can encourage students to develop different ideas to solve the problems. With different ideas captured, it means that the students will have a different perspective or other alternative ways of solving problems. Furthermore, students can give different argumentation and respond to other students’ argument if they think their argument is not proper enough. Hence, students can select which approach that easier and correct to be used to cope with mathematics problems effectively.

5. Conclusion

Based on the result of the research, it can be concluded that strategies of teachers in secondary school mathematics teachers in Indonesia had been influenced by teachers’ understanding about the content, problems of students, and aims of the curriculum. Each teacher has a unique approach to overcome the situation. In curriculum reform, teachers cannot adequately activate their strategies which are expected in K-13 because the classroom condition in Indonesia has not met the ideal situation for K-13. In that condition, teachers are directly changing their strategies to help the students to learn mathematics and achieve the goal of learning.

Even though the structure of the mathematics content has changed, teachers still consider the pattern of teaching the content itself. It is reflected from the decision of teachers to keep discussing the two variables instead directly go to three variables in SLETV topics although it is not stated in the current curriculum. The knowledge of Indonesian secondary school teachers, about the importance of prior knowledge as a bridge before going to advance/next material, influences the teachers’ teaching strategies in teaching SLETV. It shows that the teacher has understood about the one essential aspect of teaching such as prior subject content knowledge is demanding to help students achieve better learning result.

The study also shows that teachers teaching strategies related to the content of mathematics can be different or similar in the different context of the curriculum. It is influenced by teachers’ understanding about the content, especially the aim of the content and the objectives of the curriculum. In KTSP, teachers often directly give the students information about general formula followed by related problems. Meanwhile, in K-13, teachers follow up the beginning of the learning with the real context before guiding students to find the general formula of the topics. Each teacher has different example types of real-life context as the starting point of the self-modelling process. It is designed based on the context that considers closed to students’ daily life. For example, one teacher relates the real word problems using the context of a farmer who needs to determine the amount of fertilization while another teacher relates the problems to the online shopping. By making an example which is close to students’ daily life, teachers expect that students’ motivation to learn will be increased and they are able to recognize the relation between the topics they learn and its functionality in their daily life.

The views about effective mathematics teaching among the teachers are based on the ability of the teaching to achieve the goal of the learning effectively. From the study, the secondary school mathematics teachers in Indonesian may have different and analogous perspective on the effectiveness of teaching practice in K-13. At some points such as the use group discussion, reasoning problems, and self-constructing knowledge, each teacher has a similar agreement about the effectiveness those teaching strategies to obtain the goal of the learning effectively. However, the effectiveness of real context, directly procedure demonstration, and the significant role of students still have different opinions among the teachers. The different view is influenced by several factors such as the students’
ability, teachers’ ability, classroom condition, the demand for curriculum, and level of problems. This situation, in the end, shows that the intended teaching and learning in K-13 may not 100% be implemented by Indonesian secondary school teachers because it is not always effective in their teaching classroom. Hence, it is affecting that teacher does not always shift their way of teaching under some order or intention.

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