ENHANCING MATHEMATICS KNOWLEDGE AND PROCESS SKILLS OF STUDENTS WITH LEARNING DIFFICULTIES

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Abstract: *Explicit instruction is commonly used for helping students with mathematics learning difficulties. However, some research findings indicate that students' mastery of conceptual understanding and mathematical process skills was often ignored if this approach was used solely. This research was aimed to investigate the teaching and learning processes during a remedial intervention The intervention was carried out using a mixed instructional approach which combined the perspective of the behaviorists and constructivists. It was expected to enhance the mathematical knowledge and process skills of students. A case study research design was employed. Data was collected and analyzed using a qualitative approach. Results showed that the students were able to improve their mathematics conceptual and procedural knowledge, and mathematical process skills through active interaction and mind-on activities. During the intervention, the teacher used explicit instruction for introduction and followed by student hands-on activities and reflection. The students were actively involved in mathematical processes to make sense and interact with their peers and teacher. However, they still experienced stress when they were required to perform active thinking and demonstration using manipulative and drawing. Wait time and continous support from teacher were needed for them to complete the task. In short, students with mathematics learning difficulties could enhance their mathematics knowledge and process skills through a mixed instructional approach.*

Keywords: Mathematical process skills, Mathematics Remedial Intervention, Mixed Instructional Approach

INTRODUCTION

Many researchers suggested that students with learning difficulties in mathematics should be provided with diagnostic and remediation approaches to instruction (Flores, 2009; Bryant et al., 2008; Fuchs et al., 2008; Tournaki, 2003; Fuchs and Fuchs, 2001; Mercer and Miller, 1992). Through practices such as drill-and-practice and explicit instruction, mathematics intervention was found effective in improving arithmetic skills of these students. However, these approaches might involve students in learning activities that foster over-reliance on prescriptive pedagogies that prevent them from acquistion of conceptual understanding and mathematical process skills (Moscardini, 2009; Ketterlin-Geller et al., 2008). Lacking of experiences in active sense-making might cause them to continue encountering difficulties in mathematics learning.

Mathematics remediation programs in Malaysia aim to develop automacy among students with learning difficulties so that they can solve problems and continue their study in regular classroom (Jabatan Pendidikan Khas, 2003). Although conceptual understanding is emphasized, teaching and learning materials are separated from authentic mathematical processes which are emphasized by the national mathematics curriculum (Malaysia Ministry of Education, 2010). To learn knowledge and skills of mathematics at higher level, apart from strong conceptual understanding and procedural knowledge, students should also master mathematical process skills before they are confident and fluent in application of their mathematical knowledge.

Instructional practices in the mathematics remediation classrooms were mainly focused on

acquisition of basic facts and arithmatic skills (Poon et al., 2012; Gan and Poon, 2008). Research findings show that teachers usually practice explicit instruction and drill-and-practice approach based on text-book problems. Obviously, emphasis on procedural knowledge influenced the purpose and use of instructional practices.

Research Purpose

This research was intended to investigate a coherent instructional approach which is based on individual learner needs and contextual circumstances for effective learning in the mathematics remediation classrooms. It was based on the perspective of a teacher's instructional approach rather than the perspective of students towards learning.

As indicated by research findings, some students are used to learning in a structured and teacher-directed environment (Poon et al., 2012; Gan and Poon, 2008; Flores, 2009a; Bryant et al., 2008; Fuchs et al., 2008; Tournaki, 2003; Fuchs and Fuchs, 2001; Mercer and Miller, 1992). According to Moscardini (2009), some students might show improvement in arithmetic skills but they persist with primitive strategy in solving arithmetic problems at the expense of development in their mathematical thinking (Moscardini, 2009). In an effort to change the mathematics remediation classroom which is dominated by rules, formulae and computation, to one that focuses on sense-making of mathematical concepts and procedures, the researchers investigated the teaching and learning process during usual mathematics remediation classroom. Through careful observations and interviews with the participating teacher and students, the researchers developed activities for remedial intervention. The researchers continued investigation on learning of mathematical knowledge and process skills through a mixed instructional approach in a remedial intervention. The instructional approach included the behaviorist and constructivist approaches.

In short, the researchers sought to understand the current instructional practice, and subsequently develop a model of instruction, and carry it out in mathematics remedial intervention. The objectives of this research are as follow:

(i) investigate the usual practice in mathematics remediation classroom
(ii) develop an instructional model for mathematics remedial intervention, and
(iii) explore the enhancement of students' mathematical knowledge and process skills, based on the instructional model developed in this research.

In order to understand the teaching and learning process during usual practice and remedial intervention, the researchers applied a qualitative research approach (Creswell, 2008). The researchers planned instructional activities together with the participating teacher in an effort to enhance teaching and learning of mathematics using a mixed instructional approach. This research method enabled the researchers to explore how a teacher could enhance the teaching and learning in mathematics remediation classroom, and thus construct a model for instruction in mathematics remedial intervention.

Instructional Approach

For the remedial intervention of this research, the researcher proposed the use of two different instructional approaches in a mixed mode. Teachers could adjust their instructional approach according to the existing knowledge and experiences of their students. Usually, instruction in the remediation classroom is based on the behaviourist framework of learning (Bryant et al., 2008; Fuchs and Fuchs, 2001; Mercer and Miller, 1992). To help students acquire mathematical process skills, teacher may have to change this approach to a constructivist approach to instruction (Cawley and Parmar, 1992).

Behavioural learning theory was found effective in helping students mastering basic knowledge and skills in mathematics. For this research, the researchers referred to 'operant learning' which assumes a more active learner (O'Donnell et al., 2007). It is commonly used in classroom teaching and learning in order to produce meaningful behavioural changes. Explicit and direct instruction is usually used in remedation of mathematics (Joyce et al., 2009) on the development of arithmetic skills. It is a model of teaching which emphasizes teachers' control in classroom activities. The activities are structured and consist of explanation and demonstration by a teacher, structured practice, and guided practice. After a teacher presents a particular concept or skill, students are expected to carry out practices by following the steps shown by their teacher. This model is found effective in teaching basic skills such as reading, writing and arithmetic to students with learning difficulties (Joyce et al., 2009; Gurganus, 2007).

On the other hand, constructivist approach of teaching and learning is greatly influenced by the ideas of Piaget and Vygotsky (Slavin, 2009). Piaget proposed the theory of cognitive development and stages of development to explain human cognitive development and learning while Vygotsky suggested 'zone of proximal development' to explain that. Mathematics learning is particularly related to the constructivist philosophy which promotes hands-on activities and active student interactions in a meaningful context with scaffolding of understanding. For

mathematics instruction in the primary grades, Slavin (2009) suggested student working together in small groups to solve real-life problems. In the problem-solving process, a teacher facilitates the discussion of strategies in finding the solution. Students are encouraged to reflect on the problem and think about several alternative solutions before deciding the final solution.

Both behavioural and constructivist learning theories bring implications to teaching and learning practices in the mathematics classrooms. As mentioned by Gurganus (2007), students with learning difficulties might have problems with indirect approaches such as the constructivist approach. Systematic and explicit instruction could be used to support the limitation of constructivist approach. For gaining conceptual and procedural knowledge, a constructivist approach to instruction is appropriate. However, explicit instruction might help students o become fluent with knowledge and skills. Students come into the classroom with a variety of previous experiences and knowledge. They need different instructional approaches in the process of constructing understanding. Some might learn mathematics through an indirect approach while others might need more explicit and systematic instruction. Thus, the main challenge in this research was to help students with learning difficulties improve their conceptual understanding and process skills without ignoring their individual differences and needs.

Mathematical Knowledge

For proficiency in mathematics, delivery of conceptual and procedural knowlege should be emphasized. These two types of knowledge are intertwined. Thus, students with learning difficulties should learn the meaningful connections between them (Reys et al,, 2007; Van de Walle, 2001). Conceptual knowledge consists of logical and inter-related relations that exist as part of a network of ideas and connected meanings in a person's mind. It is found that understanding of conceptual knowledge can enhance students' proficiency in mathematical procedures. Mathematics procedural knowledge is understanding about rules and procedures in doing mathematical tasks (Van de Walle, 2001).

Rittle-Johnson and Koedinger (2009) affirmed the interactive relationship between the two types of knowledge. These two types of knowledge develops optimally if both are emphasized during teaching and learning process. Acquisition of conceptual knowledge can facilitate learning of mathematical symbols and procedures. Likewise, when students become proficient in their procedural knowledge, they have more cognitive resources to help them in construction of conceptual understanding. Reys et al. (2007) suggested that students should be involved in active thinking during problem solving process, not merely memorizing standard procedures or learning through rote learning.

Mathematical Process Skills

As intended in the national mathematics curriculum (Malaysia Ministry of Education, 2010), mathematical processes include communication, reasoning, making connection, problem solving, and making representation. National Council of Teachers of Mathematics (2000) highlights the active vision of learning and doing mathematics through these processes as they are fundamental in engaging students actively to make sense of mathematics. These processes also provide a philosophical base for our mathematics teachers in approaching teaching of mathematics.

Polya's model of problem solving forms the basis for solving mathematical problems in the national curriculum (Malaysia Ministry of Education, 2010). Using this model, students are expected to carry out the steps in the sequence of interpreting the problem, planning a strategy, implementing the strategy, and examining the solution. Though, this model alone will not help the students to solve a problem if they could not apply any problem solving strategy to execute the steps. Students should make a decision in choosing from a list of problem solving strategies such as trying a simple case, trial and improvement, drawing a diagram, and constructing a table.

Generally, reasoning consists of inductive approach and deductive approach (Reys et al., 2007). Inductive reasoning involves generating general rules based on specific examples. On the contrary, deductive reasoning requires students to apply a general rule to specific examples. As inductive reasoning is emphasized in the view of constructivist approach, teachers could guide students to develop their own rules and generalizations which they will use to solve other problems.

Communication in mathematics can occur through listening, reading, and visualization (Malaysia Ministry of Education, 2003). Students are expected to respond to what they hear, collect information and reorganize the relationship between mathematical ideas, and transforming the information into graphic forms. According to the national curriculum (Malaysia Ministry of Education, 2003), students should be involved in oral and written communication during instructional activities. Apart from that, students also should learn to represent mathematical ideas in various forms. Hence, these modes of communication should be emphasized in planning mathematics remedial intervention.

According to Reys et al. (2007), students should learn to make connections among

mathematical ideas. Students also should learn the relations among mathematical symbols and procedures, and the related conceptual ideas. Apart from that, students could explore the relations between mathematics and its application in real world or other school subjects. During problem solving activities, students could become more conscious in the application of mathematics in their real life.

Mathematics offers a rich repertoire in representing and communicating ideas (Reys et al., 2007). Through making representation of a mathematical idea, students are led to think in various ways. They could invent their own ways to communicate ideas beside working with conventional representations. Generally, students could represent mathematical ideas in the form of written symbol, spoken language, real-world situation, manipulative, and picture. To understand a mathematical idea, students should learn to select, apply, and translate among representations.

In this research, the researchers investigated how students who were assigned to the mathematics remediation program could be helped to learn the above mathematical process skills. If remediation programs aim at helping students to continue learning mathematics in the regular classroom and at the higher level, acquisition of these skills should not be ignored.

RESEARCH METHOD

This research was aimed at seeking understanding of the teaching process of a teacher who intended to practice an instructional approach which is based on the constructivist learning theories. It was not aimed at testing the effectiveness of the instruction towards mathematics learning. Hence, a case study research design (Creswell, 2008) was used to understand the process of teaching and learning. Besides obtaining an in-depth understanding of the effect of intervention designed by the researchers, it also enabled the researchers to reflect on that process.

Participants of this research were selected from a school located at the suburban area. Most of the students in this school were native and weak in mathematics. The researchers involved a remediation teacher, Mr. Harris, who was assigned to the mathematics remediation program of that school. To select participating students, the researchers designed a screening test that includes knowledge and skills in addition and subtraction. This test was adminstered among all the students in Year 3 of the school. As a result, five students who failed in the screening test were chosen as research participants. A better understanding of the students was carried out before planning instructional activities for the remediation intervention. They went through diagnostic procedures to enable the researchers obtain knowledge of their strength and weaknesses.

Five instructional sessions were planned and implemented during the project. To help students in acquiring knowledge of addition of whole numbers, the researchers planned instructional activities for students to learn the critical skills in the sequence of 'meaning of addition', 'basic addition facts', and 'computation and algorithm'. It is important to learn the knowledge and skills in sequence as mathematical knowledge consists of an inter-related system of concepts and operations that are hierarchically organized (Van de Walle, 2001). The remedial intervention discussed in this article, one of activities in the fifth session, is a part of a research project. In this activity, the researchers focused on the teaching and learning of 'addition with regrouping' using straws.

All the sessions were aimed at improving knowledge and skills in addition of whole numbers for students who were chosen as participants of this research. Every session of the remedial lesson was recorded using video camera. Data collected through observation was analyzed to enable the researchers understand the behaviours of the research participants (Creswell, 2008). The product of observation during the remedial intervention was focused at the instructional approaches used by the teacher. The researchers also collected data from the students to understand their learning of mathematical knowledge and process skills. Semi structured interviews with remedial teacher and students after instruction were carried out by researchers. The researchers interviewed the participants in order to understand their perceptions and thought (Creswell, 2008). This instrument also enabled the researchers to further understand the behaviours of these participants.

Creswell (2008) suggested that researchers should find information from documents to help them understand the central phenomena in their qualitative studies. The documents used in this research included students' work and school documents such as attendance report and students' personal record. Students' work which was examined includes their drawing and work sheets. It helped the researchers to obtain understanding on their learning process and acquisition of mathematical knowledge as well as process skills. The researchers could understand their responses to the content delivered, the use of instructional strategy and approach during the remedial intervention. The researchers identified the video clips taken during observation and also related interview session in order to gain a clearer picture of the context under which the work was produced.

In this research, three analysis strategies were applied. The first strategy was to do coding for the whole teaching and learning process. In

order to understand this process, transcripts of video and interview were coded using the coding scheme developed from literature review of this research. A big quantity of data was obtained. The analysis process was conducted based on the principles suggested by Creswell (2008). It involved transcribing, segmenting, coding, creating themes, and inter-relating themes.

After every segment in the transcript was labeled with a code, the related video clip was identified. Analysis towards the conversation in the video clips was carried out at the micro level. This stategy was meant for investigating interaction between two or more samples. It enabled the researchers to identify contexts, important matters related to the research objectives, and the sample's facial expression, behavior or gesture.

To obtain a holistic understanding of the students' work such as drawings and work sheets, the researchers compared the students' work with the related video clips of classroom observation. It enabled the researchers to understand the conditions under which the students produce their work.

Results

Usual remediation classroom

The participating teacher, Mr. Harris, planned his teaching and learning activities by referring to the guidebook provided by the Malaysia Ministry of Education. To explain and demonstrate steps in solving arithmetic problems involving addition, he used questions from reference books. After his explicit demonstration, he asked his students to solve routine problems by following the steps he had demonstrated. In average, for every one-hour lesson, his students were required to finish four sets of worksheet where there were six questions in each set. During student-practice, Mr. Harris provided explicit explanation to students who encountered difficulties. His explanation was explicit and fast as he wanted to attend to every student who asked for his help.

There were five students who needed help to improve their knowledge and skills in addition of whole number. During the usual classroom, they were quiet observing their teacher's explanation and demonstration. However, when they were required to finish their exercise questions, some of them often sought guidance from Mr. Harris as they were not confident of their answers or encountered difficulties. The students often failed to identify their error and make correction. In guiding the students who encountered difficulties, Mr. Harris asked them to use their fingers, straws or drawing segments to show the value of the addends. All the students counted the objects one by one to find the sum. Afterward, when the researchers asked the students to explain the math sentence they had completed, they still faced difficulties in representing the math sentence by using objects or story. Others preferred to copy answers from their 'brighter peers'.

Remedial intervention

In learning the concepts and procedures for addition with regrouping, the students solved problems using concrete materials. To start the activity, Mr. Harris explained to the students that each straw represent a can of drink and on how to use straws to represent concept of place value. For example, to represent '17', he showed a bundle of ten straws, and seven units of straws. After his explanation, each student was required to use straws in representing an arithmetic problem, and thus solving it. All the problems involved addition of a two-digit number and another two-digit number, with regrouping. As this process involved regrouping, Mr. Harris explained how to regroup the straws by drawing segments for '17 + 5', and drawing a big circle for the first ten segments. He explained that the big circle represented the action of tying ten straws into a bundle.

After each demonstration, the students represented the problem by writing a math sentence in horizontal form and its standard written form. Mr. Harris also posed questions to challenge each student make connection between every numeral in the standard written form and their demonstration.

Nasrah prepared two bundles and nine pink straws to represent '29', and a bundle plus nine green straws to represent '19'. After she stopped and thought for a while, she continued to count ten straws and exhanged that for a bundle of straws from Mr. Harris. Finally, she showed 4 bundles and 8 units of straws as the total. The researchers noticed that she was confident in using count-on in twos technique that she learned from previous sessions. During the whole demonstration, Nasrah was quiet and did not explain her actions although Mr. Harris asked her to. Later, Nasrah represented '29 + 19' in standard written form and computed the answer correctly by retrieving the related basic addition facts that she had learned. She checked her answer by comparing it with the total number of straws on the table although she was not required to. Afterward, Mr. Harris challenged Nasrah to identify the straws that represented '20 of 29', '10 of 19', and the '10 of regrouping' by referring to her answer in the standard written form. Nasrah managed to answer correctly although she found this activity challenging for her. According to her, she was quiet because she wanted to concentrate on her demonstration.

Like Nasrah, Hafiz also managed to perform his demonstration and computation correctly and quietly. Hafiz used count-on technique in his demonstration. He also answered correctly all the

questions from Mr. Harris that required him to make connections between his demonstration and computation. He explained to the researchers that he could not explain during his demonstration because he needed to concentrate and think. He also found that solving the problem through computation was easier than that of demonstration because he only needed to follow fixed procedure in completing his computation. For demonstration, he needed to plan and think carefully.

Farib completed his demonstration for '17 + 16' correctly but made a mistake in his computation. He retrieved the basic addition fact of '7 + 6 = 13' from his memory but wrote '1' at the ones and carried '30' to the tens. Thus, his final answer was '51'. Obviously, he had performed a wrong procedure as he did not relate it to the concept of place value and regrouping. Without any reminder from Mr. Harris, Farib compared his written answer and the total number of straws, and thus realized that the two answers were different. After checking his answer by repeating the demonstration of straws, he checked his written answer but failed to identify his error.

To help Farib, Mr. Harris guided him to create a 'place value board' on the table by putting a pencil box as a divider between the place value of tens and of ones. After that, Farib arranged a bundle and seven pink straws, and a bundle and six green straws, according to their place value correctly on the 'place value board'. Farib continued to take all the seven green straws and three of the pink straws in order to tie them together. When he put this bundle of straws at the tens, Mr. Harris asked Farib to compute '7 + 6' again. Farib compared his work in standard written form and the arrangement of the straws. He thought for a while and finally wrote the '1 of 13' at the tens and the '3 of 13' at the ones. Thus, he managed to correct his mistake.

After Mr. Harris showed '19 + 14' to Fatimah, she completed the computation correctly. She told the researchers that she did it based on her observations of the work of Nasrah, Hafiz and Farib. Next, she was asked to perform her demonstration. After preparing two groups of straws for the addends, she waited for instruction from Mr. Harris as she could not perform the regrouping and trading process. Mr. Harris immediately guided her explicitly to complete the demonstration as this was the 'usual practice of him and Fatimah'. He assumed that Fatimah was a weak student. Afterward, Fatimah failed to identify the numeral in her standard written form for the straws that represented the bundle she got from regrouping and trading. In view of her problem, Mr. Harris immediately and explicitly explained the connection between the regrouping of the straws and her computation to her. She was unable to perform the regrouping process by using straws for the subsequent question. In fact, Fatimah only managed to acquire this skill when she was given chance to think and play with the straws herself after the activity.

Najib was given the question, '16 + 9', and managed to complete the computation immediately but he failed to perform the demonstration. To help him, Mr. Harris gave him explicit instruction as he thought Najib was a weak student. Afterward, Najib managed to identify the related straws and explain for every numeral in the standard written form without any difficulty. He explained to the researchers that he understood the concepts and procedures after Mr. Harris had given explicit demonstration and explanation.

Both Fatimah and Najib liked learning by using manipulative because the activities were fun. However, they were confused and stressed because they could not observe or perform any demonstration and think concurrently. Fatimah said she could not think of any related concept and procedure when she was observing or performing any demonstration. Najib thought the demonstration by Mr. Harris helped him to understand problem-contexts and thus make connections to related concepts. However, performing demonstration and thinkig concurrently was difficult for him because he got mentally tired easily.

Discussion

Instructional approach

For usual practice, Mr. Harris used explicit demonstration and guided practice for students to improve their procedural skills in addition of whole number with regrouping in his mathematics remediation classroom. During remedial intervention, Mr. Harris used explicit instruction to explain the concept of place value initially and gradually changed to a more student-centered approach when he asked the students to demonstrate and compute for questions involving addition with regrouping. Regarding response to students who encountered difficulties in a task, Mr. Harris gave explicit instruction to the less-able students immediately but he let the more-able student such as Farib to explore and make sense.

Although Mr. Harris intended to change his instructional approach and assumed that students with learning difficulties could explore and make sense, he still employed a more teacher-centered approach when the less-able students encountered difficulties or made mistakes. As Mr. Harris and his students were used to the behaviourist framework of learning (Bryant et al., 2008; Fuchs and Fuchs, 2001; Mercer and Miller, 1992), the teacher and the students needed more time to get used to constructivist approach.

Acquisition of mathematical knowledge

The findings indicated that the more-able students such as Nasrah and Hafiz had shown improvement in understanding of concepts such as the meaning and mathematical relations in addition with regrouping, and acquired computational skills, after participating in the remedial intervention. Before the intervention, they relied on counting all the objects one by one in order to find the sum. During the diagnostic test, they failed to solve arithmetic problems as they were not provided with any concrete objects.

From the observations of their more-able peers, Farib, Fatimah and Najib managed to learn the computational skills by following the procedures but they still encountered difficulties in performing either the demonstration or computation. In Farib's case, initially he did not think about the concepts, and hence failed to identify his mistake, particularly regarding the place value concept. Guidance from Mr. Harris to use the 'place value board' was a hint for Farib. It helped Farib to see the connections between the concept illustrated by the straws and his computation in standard written form. Mr. Harris assumed that Farib was a more-able student and thus he allowed him to think and correct his answer himself.

Fatimah and Najib were able to complete the computation task by simply following the steps performed by their peers but that did not mean they understood the related concepts. By merely observing demonstrations of their peers, they still failed to represent the concept of regrouping through manipulation of straws. In fact, these students needed to understand why and how the straws were regrouped.

Farib was given more opportunity to find out the concepts if compared to Fatimah and Najib who were given explicit instruction. When Fatimah and Najib failed to perform a task, Mr. Harris tended to explain the concepts and steps to them explicitly without giving them sufficient time to think and try again. After his explicit instruction, Najib understood the related concepts and was able to use his understanding in making connection between the demonstration and computation. However, Fatimah still failed to understand the demonstration as she experienced difficulties in listening to explanation and thinking at the same time. It might be a cognitive burden (Mayer, 2008) to her. Furthermore, she was pushed to understand in a limited period of time, and this might be a pressure for her.

In this remedial intervention, students were given opportunities to understand the meaning of addition and regrouping based on their understanding of the set model for addition. They applied their knowledge of the part-part-whole relation in addition, and learned about the relation between the ones and the tens, and the trading processes, in place value. Apart from that, they were given the opportunity to learn about the symbols, the horizontal and vertical forms of math sentence. In performing their computation, the students had to retrieve basic addition facts from their memory or by using their fact-retrieval strategy. Generally, they needed to perform the algorithm for addition with regrouping. Therefore, their learning of concepts and procedures of addition with regrouping involved conceptual knowledge and procedural knowledge concurrently. Their learning of math knowledge was different from that of the usual practice where they merely perform a procedure demonstrated by their teacher without sufficient understanding. This finding is consistent with the affirmation from Rittle-Johnson and Koedinger (2009) that the interactive relationship between the two types of knowledge would help each other to develops optimally if both are emphasized during teaching and learning process

Acquisition of mathematical process skills

During the explicit explanation in the usual classroom and the intervention, the students only observed and listened. They were not required to practice any of the process skills. Their responses in answering practice questions during usual practice showed that there was a lack of understanding in their learning. Even if they were using objects in helping their computation, they were not required to make sense. For instance, they merely followed the steps explained by their teacher to find the sum. When they made mistakes, they immediately sought help from their teacher for correction without trying to check their answer and identify the error. They also failed to explain the relation between their written work and the regrouping of the objects.

However, when Mr. Harris used a more student-centered approach in the remedial intervention, the students were offered more opportunities to practice their process skills. Obviously, Nasrah, Hafiz and Farib were required to think when they performed their demonstration to solve the arithmetic problem. Post intervention interviews with these students showed that they actually planned before they carried out the demonstration. Thus, the demonstration was more challenging for the students. The researchers also observed that they checked and compared their answers from demonstration and computation. Through their answers to questions posed by Mr. Harris afterward, the researchers found that the students understood the connections between the steps in their demonstration and that of their computation. They also understood the reason of doing regrouping in both processes. In terms of making representation, they were able to transform

the math sentence into a concrete representation through action. However, they did not show their oral communication skill during the demonstration as they needed to focus on thinking. In answering questions from Mr. Harris, they tended to point to the numerals in their written work or the straws without any oral explanation.

Fatimah and Najib were not active in making sense if compare to their peers. Immediate and explicit instruction offered by Mr. Harris seemed to demotivate them from sense making. Najib could understand the concepts from his teacher's explanation but he still might fail to demonstrate and explain the regrouping process. Questions after explicit explanation managed to trigger his thinking process and thus helped him to understand the related mathematical ideas. For Fatimah, obviously she needed sufficient time to think and learn, and a lot of opportunities and support to solve problems independently.

The learning processes of Nasrah, Hafiz and Farib were found consistent with the suggestion of Gurganus (2007) that students with learning difficulties might have problems with indirect approaches such as the constructivist approach. However, explicit instruction could be used to support the limitation of constructivist approach. In comparison to these students, Fatimah and Najib were not offered the opportunity to learn in a constructivist environment. Thus, they were limited from making sense of mathematics and learning the process skills.

CONCLUSION

Through investigation in the usual classroom and remedial intervention, obviously the students with math learning difficulties had shown their ability to understand mathematics conceptual and procedural knowledge if they were supported to make sense. Explicit instruction was needed for the students to understand prerequisite knowledge such as place value before the students could use it to solve problems involving regrouping. When the students had the prerequisite knowledge, they could use it to make sense of mathematics and thus practice their process skills in an environment supported by the constructivist perspective. Teacher's support and trust were crucial. In cases where the students experienced cognitive burden, they actually needed more time to think and make sense. Immediate instruction from their teacher hampered them from thinking and doing mathematics.

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