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INTEGRATING HOTS USING SPIDER WEB MULTIPLICATION IN BASIC MULTIPLICATION FACTS

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Abstract

The traditional methods are commonly practiced in the learning of basic multiplication facts in schools. These kinds of learning usually emphasizing on memorization and repetition. These methods do not encourage pupils' to think and do not improve their thinking skills. This action research was conducted to study whether the integration of HOTS by using Spider Web Multiplication model improve the primary school basic multiplication facts ability among the School In Hospital (SIH) pupils in Sultanah Fatimah Specialist Hospital in Muar, Johor, Malaysia. The study is also carried out to study whether the integration of HOTS in the model improve the pupils' interest and motivation to learn basic multiplication facts. Five pupils ranging from lower to upper primary pupils are selected randomly. The pre and post-test were used to determine the pupils' skill in basic multiplication facts. Meanwhile observations were carried out to gather information of the learning process. Furthermore informal interviews were carried out to know the pupils' interest and motivation in learning basic multiplication facts after the learning sessions. The result of the pre and the post test revealed that the pupils' ability in basics multiplication facts improved after the learning session. The observations showed that the integration of HOTS in the learning activities involving analyzing, designing, combining, identifying and creating in the learning process help the pupils a lot in the learning of basic multiplication facts. The pupils' interest and motivation in learning basic

multiplication facts also improved. Based on the findings, the integration of HOTS which was used in Spider Web Multiplication is recommended in teaching of basic mathematical facts.

Keywords

Spider Web Multiplication, Basic Multiplication Facts, Learning Process, Ability, Interest, Motivation, HOTS

1. Introduction

1.1 Background of the Study and Reflections

There are many traditional methods could be used in the learning basic multiplication facts. Some of the methods are adding groups of numbers, drawing models and finger techniques. Normally, the basic multiplication facts built are written in the multiplication table. These kinds of learning usually emphasize on memorization and repetition.

As Mathematics teacher from School In Hospital (SIH), Sultanah Fatimah Specialist Hospital, Muar, Johor, Malaysia. I used to focus on traditional method in my multiplication lessons with my pupils. However at the end, I found that my pupils feel bored and become passive in learning Mathematics. I also used static teaching and learning aids. Thus my teaching and learning approaches did not develop pupils' curiosity and help in increasing pupils' thinking level. Pupils only used their lower order thinking skill (LOTS) to memorize.

From my experience conducting the teaching and learning sessions and my interaction with my pupils, I noticed that they had major problems in their basic multiplication facts. Pupils were not able to memorize them and did not master the use of basic multiplication facts between fact for 1 and 12. Pupils made the perceptions, if they could memorize the basic multiplication facts they were not able to finish the tasks related to multiply and division questions. Pupils tend to easily doing mistakes in their calculations and exercisers. These problems reduced my pupils interest and motivation in learning Mathematics.

So how can basic multiplication facts be taught better in ways more interesting, fun learning activity and more relevant to the needs of the pupils? Boaler (2015) suggest that teachers should help students develop mathematic facts, not by emphasizing facts for the sake of facts or using 'timed tests' but by encouraging students to use, work with and explore numbers. As students work on meaningful number activities they will commit mathematic facts to heart at the same time as to understand numbers and mathematic. They will enjoy and learn mathematics rather than memorizing

facts and fear mathematics. Furthermore, teachers can create a fun learning process and feel easy to encourage students to be engaged with their learning process (Hibatullah & Ardlillah, 2019).

According to Heri Retnawati et al. (2018), the higher order thinking skills (HOTS) is one of the students' abilities that should be developed through 21st teaching and learning process. Teachers' knowledge about HOTS and its teaching and learning tactics is the key to successful education. Students should improve their thinking skills from LOTS to HOTS. Parker (2015) mentions that the knowledge of mathematic facts is important in learning mathematic. The best way for students to know mathematic facts is by using them regularly and developing understanding in numerical relations. Memorization, speed and test pressure can be damaging. Furthermore, Sulastri et al. (2016) describes that HOTS is some skills that required someone not only to remember what they have learnt but also to be able to analyze and evaluate the information, and later to create, use, and maximize the information in their future life.

Subsequently, I used Spider Web Multiplication in the teaching and learning process in helping my pupils to experience fun learning activity, learn actively and get involved directly with inquiry and discovery activities. The pupils were also encouraged to construct basic multiplication facts in the fastest and easiest ways. The pupils were not in pressure to memorize basic multiplication facts. But they can build basic multiplication facts. Hopefully the learning experience would improve their skill in basic multiplication, their interest and motivation in learning basic multiplication facts.

This research report described my teaching experience using Spider Web Multiplication with five pupils from SIH in integrating HOTS to improve the pupils' ability, interest and motivation in the learning of basic multiplication facts.

1.2 Introduction to Spider Web Multiplication

Figure 1: *Examples of Spider Web Multiplication*

Spider Web Multiplication is the combination of analog clock and spider web. It is a transformation of calculating multiplication facts towards using analog clock and spider web. It helps pupils to construct basic multiplication facts in faster and easier by using analog clock. It is also

learnt in fun way as pupils are not in pressure to memorize the multiplication facts. Analog clock is used as a fast multiplication tracks to produce unlimited basic multiplication facts. Spider web is used as a new transformation table for multiplication. It differs from using the traditional multiplication table that teacher always used in school. The main difference is that pupils can relate easily the different multiplication facts using the web while the tradisional multiplication is not to do so.

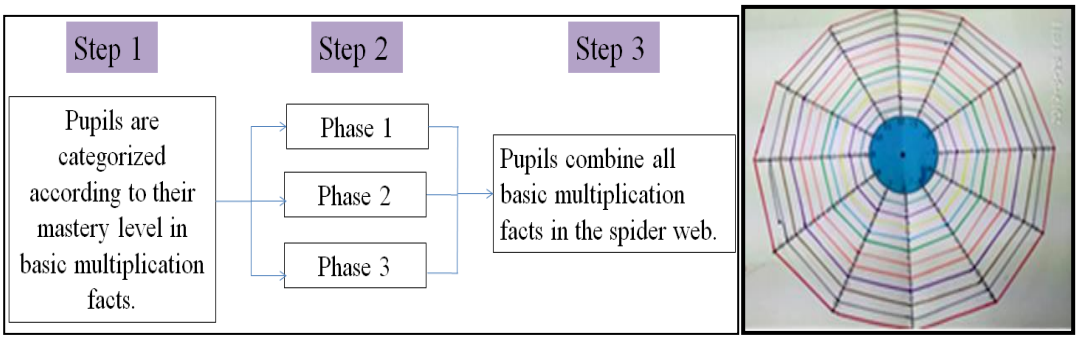
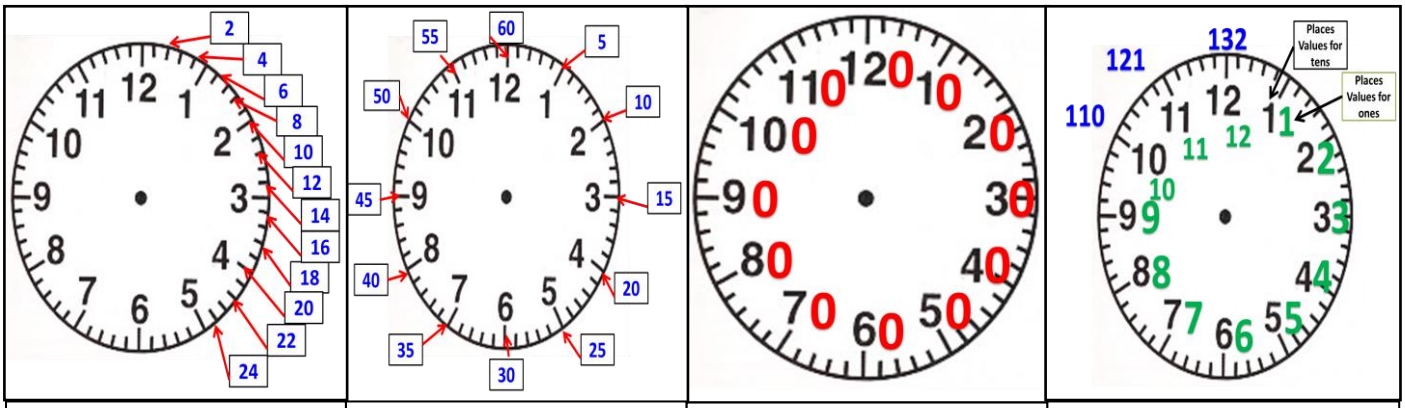


Figure 2: *Guidelines in Using the Spider Web Multiplication Innovation*

In Phase 1, pupils construct basic multiplication facts of 1, 2, 5, 10 and 11. This phase is known as basic multiplication facts.



Basic Multiplication Facts of 2	Basic Multiplication Facts of 5	Basic Multiplication Facts of 10	Basic Multiplication Facts of 11

Figure 3: *Phase 1*

In Phase 2, pupils construct basic multiplication facts of 3, 4, 6, 7 and 8. If pupils want to construct a list of bigger fact numbers, they need to add basic multiplication facts with the hour digit from the analog clock. If pupils want to construct a list of smaller fact numbers, they need to subtract basic multiplication facts with the hour's digit from analog clock.

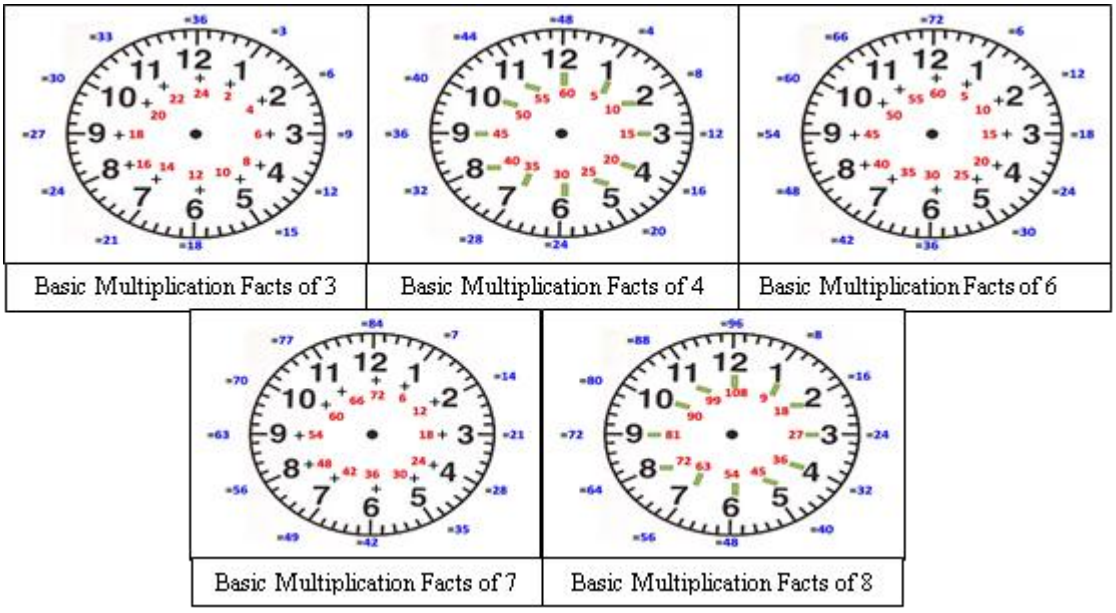


Figure 4: *Phase 2*

In Phase 3, pupils construct basic multiplication facts of 9, 12, two digit numbers, three digit numbers and so on. Pupils only need to use place value and depend on analog clock.

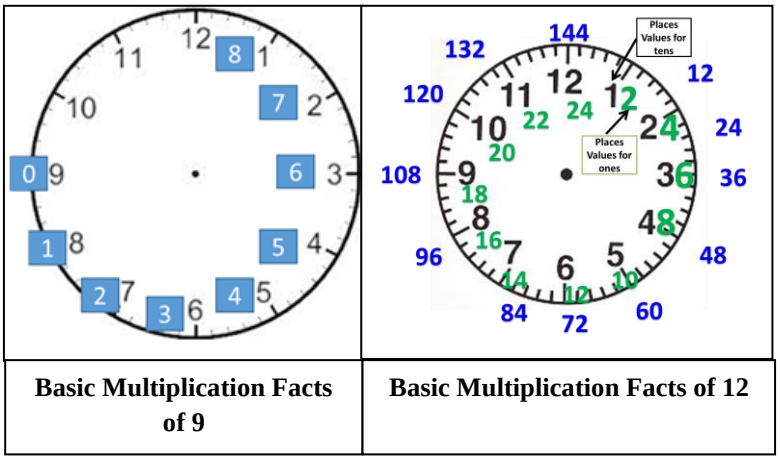


Figure 5: *Phase 3*

1.3 Objectives of the Research

1.3.1 General Objective

This research was conducted to study whether the integration of HOTS by using Spider Web Multiplication improve the pupils' learning of primary school basic multiplication facts.

1.3.2 Specific Objectives

Specifically this research was conducted to study whether the integration of HOTS by using Spider Web Multiplication improves the pupils':

(a) ability in primary school basic multiplication facts.

(b) interest in learning primary basic multiplication facts.

(c) motivation in learning primary basic multiplication facts.

2. Methodology

2.1 Research Design

This research is an action research design involving the effect of intervention towards pupils' learning. The pupils' learning was based to their ability before and after the intervention and their interest and motivation after the intervention.

2.2 The Research Participants

Five pupils ranging from lower to upper primary pupils from SIH are selected randomly. According to Malaysian Ministry of Education (2016), pupils start to learn basic multiplication facts from standard 2 to standard 6 in primary school. Based on Malaysian Ministry of Education (2014), pupils who were the participants of this research were selected randomly as they were patients in hospital. Pupils, who attend the class at SIH, are differing from day to day as it depends on their health condition and they may be discharge from the hospital as well.

2.3 Data Collection and Analysis

The pre-test and the post-test were used to determine the pupils' abilities in solving multiplication tasks before and after teaching and learning process using the Spider Web Multiplication. The score of the tests was analyzed in the form of percentage. The difference of the score between the two tests was used to study their improvement in ability before and after the teaching and learning process. Observations was carried out during the teaching and learning process to study the pupils' activities and how the activities help them improve them in the learning of basic multiplication facts using Spider Web Multiplication. Furthermore an informal interview was conducted with the pupils to gather information on their interest and motivation to learn basic multiplication facts after the teaching and learning sessions. Content analysis approach was used in analyzing the information gathered from the observation and interviews.

2.4 The Application of the basic Multiplication Facts using Spider Web Multiplication in Teaching and Learning Process

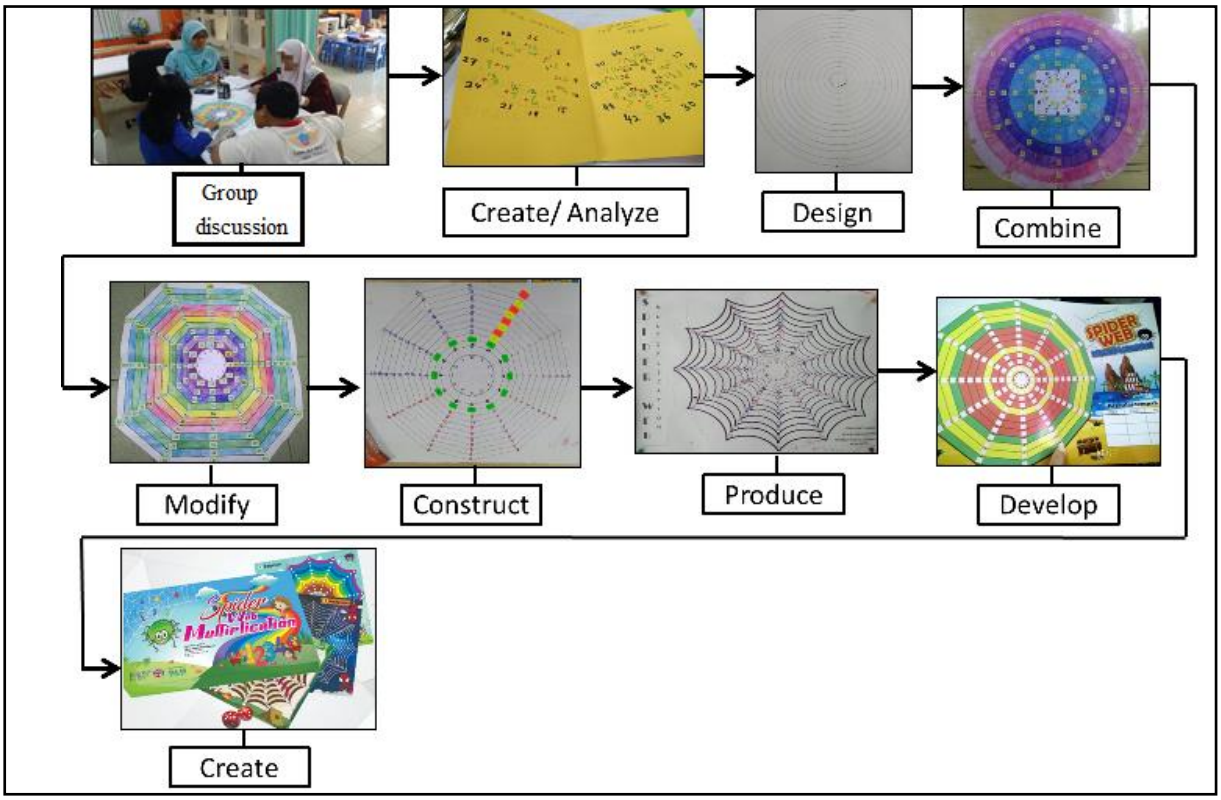


Figure 6: *The Learning Process of Pupils*

Teacher divided pupils into groups of 3. Pupils are asked to create a multiplication log book. Pupils analyze the analog clock to create the basic multiplication facts. Pupils design 11 circles together around the analog clock. Pupils combined all the basic multiplication facts that have been created into the circles. Pupils modify the shape of circles into an 8-sided polygon. Pupils construct a 12-sided polygon. Pupils produce spiders' shapes using Microsoft Excel. Teacher develops A3 Spider Web Multiplication prints and games.

3. Results and Discussion

3.1 The Pre and Post Test Results

Table 1 shows that 4 out 5 pupils have improved in their post-test results compare to pre-test results. One pupil gets the same results both pre and post-test. This implies that all five pupils have improved their abilities in solving multiplication tasks after using the Spider Web Multiplication. They also improve their mastery in multiplication basic facts compared to pre-test results. It is proven that the integration of HOTS in the teaching and learning using Spider Web Multiplication improve

the pupils' abilities. This finding align with Benidiktus, Jeinne and Gaguk (2017). They found that the integration of HOTS help students learning better, improve their performance and reduced their weaknesses.

Table 1: *Pre and Post-Test Scores Before and After Learning seSsion*

Pupil	Before learning session				After learning session	Increasing (+)/ Decreasing (-)
	Male (M)/ Female (F)	Standard	Types of Basic Multiplication Facts do not master	Pre test	Post test	
Pupil 1	F	2	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	100%	100%	0
Pupil 2	F	4	3, 4, 6, 7, 8, 9, 10, 11, 12	25%	100%	+75%
Pupil 3	M	6	6, 7, 8	97%	100%	+3%
Pupil 4	F	6	3, 4, 6, 7, 8, 9, 10, 11, 12	20%	100%	+80%
Pupil 5	F	6	6, 7, 8, 9, 10, 11, 12	42%	100%	+58%

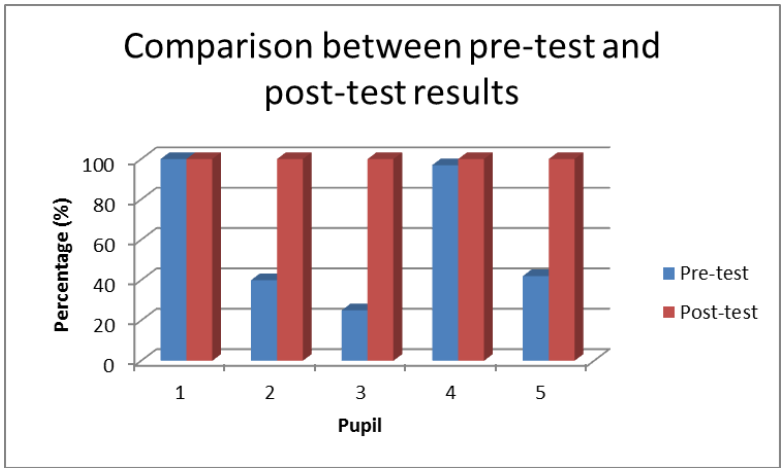


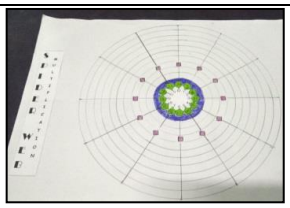
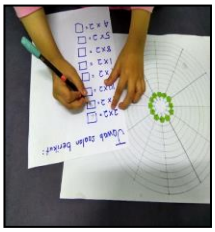
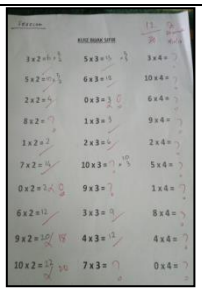
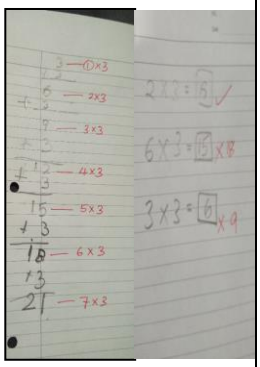
Figure 7: *Comparison Between Pre and Post-Test Results*

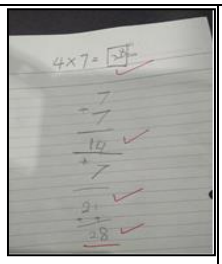
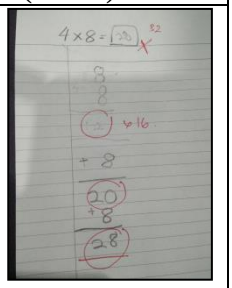
3.2 Results of the Observation

Table 2 illustrates that all pupils also were able to design the Spider Web Multiplication in a fun learning activity. The findings of the observations show that the activities involved were expected to be able to sharpen HOTS among pupils. The HOTS that integrate in the process using the Spider Web Multiplication are analyzing, designing, combining, identifying and creating in the learning process using Spider Web Multiplication. Hopefully, it also build their critical thinking, communicate among friends and teacher, collaboration in main role groups and apply creativity and innovation in their production. It is proven that the learning process involving HOTS increase the pupils engagement and helping them ability in basic multiplication facts. This finding was align with

Benidiktus, Jeinne and Gaguk (2017). According to them HOTS are the ability to think that not only requires the ability to remember, but also higher capabilities.

Table 2: *Observation Before and After the Intervention*

Pupil	**Observation**	
	Before intervention	**After intervention**
Pupil 1	**Observation:** Pupil is guided to use traditional method in basic multiplication facts of 2 which is drawing the circle diagram. The diagrams become messy at the end of the task.  **Learning level:** Understand (LOTS)	**Observation:** Pupil comes out with a neat and attractive Spider Web Multiplication.   Pupil refers to the Spider Web Multiplication easily. In addition, the learning process integrates the HOTS approach. **Learning level:** sketch, combine, measure, separate, design, rearrange, organize, create/ analyse, evaluate
Pupil 2	 **Observation:** Pupil is not able to answer most of the question given. **Learning level:** Understand and memorize (LOTS)	 **Observation:** Pupil able to answer all the questions given and get full marks. Pupil applies Spider Web Multiplication technique in answering the questions. In addition, the learning process is integrated with HOTS approach. **Learning level:** design/ combine, classify, create/ analyse, produce, apply/ evaluate (HOTS)
Pupil 3	**Observation:** Pupil applies the traditional method in basic multiplication facts of 3 by adding same numbers to make a list of basic multiplication facts. But, he gets confused in choosing the suitable answer when he does the pre-test questions given.  **Learning level:** Understand and memorize (LOTS)	**Observation:** Pupils make in using the Spider Web Multiplication and experience the exploration activity and using the Microsoft Excel. In addition, the learning process integrates HOTS approach. **Learning level:** role play, create/ analyse, design, combine, modify, construct, produce, develop, create (HOTS)

Pupil 4	**Observation:** In pre-test activity, pupil gets confuse in choosing the suitable answer when he answers the pre-test questions given.  **Learning level:** Understand and memorize (LOTS)	
Pupil 5	**Observation:** Pupil makes a mistake by adding the same number when she makes basic multiplication facts of 8.  **Learning level:** Memorize (LOTS)	

3.3 Results of the Informal Interviews

As shown in Table 3, the pupils have negative perceptions before the intervention. After the intervention, pupils improve their interest and motivation and have positive perceptions towards basic multiplication facts. This finding was align with Benidiktus, Jeinne and Gaguk (2017). They mentioned that a person's thought can affect the ability, speed and effectiveness of learning.

Table 3: *The Self-Reflection from the Pupils*

Pupil	**Self-Reflection**	
	Before intervention: What are you feel now?	**After intervention: What are you feel now?**
Pupil 1	I feel bored to finish this task.	Clever
Pupil 2	I do not understand and remember basic multiplication facts of 3, 4, 6, 7, 8, 10, 11 and 12.	It was easy to answer the questions.
Pupil 3	I do not memorize basic multiplication facts of 3, 4, 6, 7, 8, 9, 11 and 12. I do not understand the mathematic questions.	Easy to answer the questions.
Pupil 4	I do not memorize basic multiplication facts of 6, 7, 8 and 12. I am weak in the division operation.	Easy and fluency in basic facts multiplication.
Pupil 5	It's difficult to think and memorize basic multiplication facts.	Good

3.4 Teacher's Reflections

Teacher acts as the facilitator that responsible in training the pupils to develop employability skills and expand minds. Teacher has increased pupils' ability, interest and motivation by making

innovation in the teaching and learning process. The integration of HOTS through hands-on and exploration activities which was used in Spider Web Multiplication is recommended in teaching basic mathematical facts among the pupils. It enable teacher to save time and cost spent in teaching the basic multiplication facts. Before the usage of Spider Web Multiplication, teacher needs to drill pupils by using many exercises repeatedly. But now, pupils can master the basic multiplication facts easier in a short time (60 minutes' sessions).

4. Conclusion

As a comparison between traditional methods and innovation Spider Web Multiplication, the conclusions below were drawn based on the findings:

- It is proven that the integration of HOTS in learning basic multiplication using Spider Web Multiplication developed the pupils' ability, improve the pupils' interest and motivation to learn basic multiplication facts.
- The hands-on and exploration approaches in integrating HOTS through Spider Web Multiplication can act as an effective method in teaching and learning basic multiplication facts. Therefore, the innovation can improve the primary school pupils' thinking skills in using the basic multiplication facts from LOTS to HOTS. Besides that, they did not felt stress in memorizing the basic multiplication facts.
- Pupils change their perception from negative to positive towards basic multiplication facts after using Spider Web Multipication.
- Spider Web Multiplication is an effective tool to be used in the learning of basic multiplication facts.

4.2 Recommendation

This study was conducted among five pupils at SIH. I hope to expend the application of Spider Web Multiplication to the primary pupils in regular schools. Furthermore, I hope elements of HOTS can be developed into all Mathematic subjects. I would to suggest Mathematic teachers applied HOTS to all topics in Mathematic and many kinds of pupils' age. It is because the learning process includes fun learning activities and pupils can explore so they can make the learning process more efficient. In the future I also create Spider Web Multiplication Games Box. So I have planned want to conduct an action research to find the effectiveness this games box towards my primary pupils.

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