A Model to Identify the Level of Numeracy Understanding of Primary School Pupils: A Case Study

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ABSTRACT

Numeracy understanding level model is introduced to determine the level of a student in numeracy. There are four stages that have to be passed by all students to achieve understanding in numeracy, which is the one, de-coding, level two; acquisition of knowledge, level three; application and level four; analysis. Numeracy is a part of mathematics and is closely related to each other. In particular, numeracy is the ability to perform basic mathematical operations and understand simple mathematical ideas and apply knowledge and skills in mathematics in everyday life. Numeracy knowledge is very important to learn from an early stage because of numeracy encompasses identifying numbers, basic computation, measurement, geometry, probability and statistics. Numeracy understanding determines students' excellence at a higher level. This is because the basic understandings of numeracy in the classroom makes students are able to apply their knowledge of numeracy in everyday life.

Keywords

Numeracy, Level of understanding numeracy

1. INTRODUCTION

Numeracy in Malaysia was introduced into the curriculum in primary schools when New Primary School Curriculum (KBSR) began in 1983. Numeracy in primary schools includes basic counting skills, and be able to understand simple mathematical ideas. The importance of literacy and numeracy are fundamental to the continuation of mathematics learning to a higher level, but it is also a basis for learning other subjects.

When the curriculum was re-enacted into the Integrated Curriculum for Primary Schools (KBSR) in 1993, the emphasis numeracy continues to help students developing the basic skills of literacy and numeracy. So, the implementation of the literacy and numeracy needs skilled teachers to apply knowledge of mathematics (concepts and skills) in teaching numeracy to students. Thus, the government's desire to see the students has mastered basic literacy and numeracy after attending primary education will be achieved. In 2010, the Ministry of Education (MOE) has implemented an early screening of numeracy to pupils in Year One and 46% of them passed the numeracy (MOE, 2010).

Numeracy is a part of mathematics, in particular literacy and numeracy is the ability to perform basic mathematical operations and understand simple mathematical ideas and apply knowledge and skills of mathematics in daily life (Curriculum Development Division, 2010 & MOE, 2012). Numeracy knowledge is very important to learn from an early stage because of numeracy encompasses identifying numbers, basic computation, measurement, geometry, probability and statistics (Ginsburg, 2006). In Malaysia, the topics in mathematics at the primary level include aspects of literacy and numeracy to be learned by the students at this level.

Based on the mathematical description of the primary school curriculum, numeracy was introduced in Malaysia starting from Year One (Curriculum Development Division, 2010). For the Year One based on titles in the measure of the KSSR (Standard Curriculum for Primary Schools) are divided into two categories, namely, the number and operation, consisting of whole numbers, addition and subtraction, fractions and money. Category two is the measurement and geometry, time and periods, length, weight, liquid volume and space. Year four still use KBSR syllabus (Integrated Curriculum for Primary Schools), the topics introduced starting with whole numbers, fractions, decimals, money, time and periods, length, weight, liquid volume, shape and space. However, the two measures include the aspects of numeracy in primary schools.

Thus, numeracy understanding needs to be applied to students as early learning (MOE, 2010; O'Donoghue, 2002). This is because many students were reported that they only know how to do the calculation algorithm without knowing the reason behind the operation performed to be applied in everyday life (Brown et al, 2003; Earle, 2003; Bobies, 2005; Clarke, 2004). Numeracy understanding in primary schools determines students proficiency at higher level. This is because their understanding of numeracy in the classroom will make students can apply their knowledge in everyday life (Westwood, 2008). For the local study, according to a study by NorainiIdris (2003) on whole number addition scheme on three pupils in Year Two and Three Year three pupils at a primary school in Kuala Lumpur, she found that numeracy concepts such as the concept of ten, the concept of the collection, concept of numbers and calculating skills plays an important role in helping students to build strong schema in whole numbers addition. It was found that the students are able to complete the addition because the concept of numeracy has been known by the students from the start. Therefore, the process of mathematical education that focuses on the basic formation to seeding and developing numeracy knowledge interest, attitude and aesthetic value to create a generation of mathematics cultured (MOE 2001a). Thus, such individual would be able to explore science, adaptation, modification and innovation in complementary or address changes and challenges ahead. This goal is in line with the national education philosophy statement (PFK).

However, according to NorainiIdris (2000), who has conducted clinical interviews with two primary school children, she found that words such as "square" and "rectangle" is not part of the common vocabulary for them. According to her, the word "square" and "rectangle" is still fail to be described by the children and they were unable to describe or delegate the same geometric shape with spoken words, which means, the disciples still did not reflect the words with geometric shapes.

In the 1990's, the NSW Department of Education & Training, (2001.2002) and Brown (2003) have conducted a research to a group of students to survey pupils understanding about numeracy and the reasons of being weak in numeracy. In Malaysia, numeracy understanding aspect has to be considered as the ultimate goal of primary school mathematics curriculum is to develop students with a well-balanced in terms of conceptual understanding and mastery of skills that can be applied in real life (MOE, 2002, 2006).

2. LITERATURE

A proponent of Radical Theory Constructivism (TKR) considers understanding as the individual's ability to build action and operational schemes viable while Bynner (2006) and Gray (2007) also define understanding as the assimilation of one scheme. The definition is modified in view of Skemp (1978) which states understanding as assimilation of the scheme of "appropriate". They dropped the word "appropriate" and reviewed the scheme operation which is assumed to be the basis for developing pupils while facing harassment in problem solving multiplication and division of fractions. Some aspects that were addressed in the study were the students act of interpreting the signs and symbols, exchanging ideas and talking when completing tasks.

Gray (2007) also believes that understanding in their study refers to the meaning that is owned by a person, instead not a comparison of two different forms of understanding to look for right or wrong answers. He also pointed out that the phrase "the concept of x" and "understanding of x" in righteousness often substituted in their research which reports the effect of ones conceptual structure is formed in various ways to understand about x.

Cobb (2005) describes the understanding of definitions from two different perspectives, namely cognitive coordination for students who learn in small groups and students sociological interaction among students in large groups. According to them, students who interact in small groups would develop understanding of individuals resulting from cognitive coordination when interacting with friends meanwhile sociological interaction is the language and culture in classroom environment where the interaction occurs. Both perspectives raised by Cobb found to consider the meaning of mathematical understanding as provided by the student as a result of the interpretation of signs, symbols, representations and words do when interacting with others.

Generally, it is concluded that the definition of understanding expressed by several researchers from TKR views like Enns (2004), Dykstra (2007), Hoffman (2000), Nik Aziz Nik Pa (2008), is consistent with the view of Von Glasersfeld (1995, 2005, 2006) who thought that knowledge is matched and not compatible. If understanding is seen from the comparison of the objective, then it is often defined as a matched. For example, realist founder assume about individual's ability to know the truth timely and accurately. However, for pragmatic understanding follower, they assume human beings have limitations for the outside world to know the truth. Human are said tends to build their understanding according to their own thought. They are also assumed to have a tendency to make mistakes.

3. STATEMENT OF THE PROBLEM

Student's ability to understand numeracy is critical; however, it is regarded as the heart of numeracy in learning mathematics (Askew et al., 2007). Wallence (2009), Killion, K (2002), and Steinle, V (2004) have analyzed past studies and research papers on numeracy and reported that there are various approaches and efforts are being done extensively by researchers to find ways to help students master the problems in understanding numeracy. However, until now it is still heard numbers of criticizing mathematics education researchers about the difficulties in learning about numeracy, especially in understanding the division title, fractions, multiplication, geometry and problem solving (Clarke, 2003).

In Malaysia, pupils of Year Four learn numeracy where the titles in numeracy include topics found in the curriculum of the Integrated Primary School which are numbers, addition, subtraction, multiplication, division, measurement, fractions, decimals, weights, fill fluid volume, money, time and geometry. (Curriculum Development Center, 2012). Therefore, the understanding of the early stages of numeracy is important to prepare for their exams in the sixth and learning of mathematics at a higher level.

According to the Ministry of Education (2011) report, the results of the Primary School Assessment Test (UPSR) found that elementary school students in Malaysia have difficulties in answering questions that require understanding of numeracy, especially for questions that require calculations involving the calculation of basic and problem solving. This supported by the findings from the Trends in International Mathematics and Science Study (TIMSS) in 2010 that showed the students in Malaysia less familiar especially when they face questions involving the understanding, for example, the question that needs to apply an understanding of the real world, such as the money title, length and weights . He added that the students are also less dominating the headlines appearing in the title of numeracy geometry, number, algebra and data.

Numeracy achievement in Malaysia is still in a modest level according to a report done by NKRA (National Key Result Areas) in 2008. It is found 24% Fourth Year students still do not have good performance and still in understanding usage basis only. For example, approximately 20% of the students in Malaysia failed to reach the minimum benchmark Trends in International Mathematics and Science Study (TIMSS) for Mathematics in 2007, compared to only 5 to 7% in 2003. This situation is a major concern because the quality of education should be increased in line with the government desire. This is supported by Van de Rijt, Van Luit and Pennings, (2000) who conducted the study and found that students in Asia are weak in understanding numeracy. Mathematics achievement is an interesting thing and very important in primary schools (Reys, 2007). Mathematics achievement is often seen as a key factor to ensure the success of students in the school system (Curriculum Development Centre, 2001).

For pupils of Year Four, their weakness of misunderstanding basic numeracy concepts in problem solving with words markedly evident in the coding stage (de-coding) and the knowledge acquisition process (Meaning-making). This can be illustrated further with analysis by the Kelantan State Education Department (2012) shows for problem solving questions, especially in identifying the operational base for use in problem solving with words, students are still weak to identify the operations that will be used to complete the questions given in mid-level math test. Primary school pupils identified as having significant weaknesses in basic skills in mathematics (Steffe Thompson, 2000). In addition, there are students who misunderstood the concept, easy to forget, do not know and careless problem-solving strategies. They also tend to learn by rote algorithms.

Therefore, this study is very necessary and important to study in order to produce pupils who constantly argue and analyze the questions given in the context of numerical understanding (Luke and Freebody, 2008). In addressing concerns about numeracy understanding, at an early stage pupils have provided a solid foundation of understanding numeracy especially for basic operational topics, fractions, time, periods and measurement (Malaysia Examination Board, 2012).

Based on previous studies carried out in and out of the country, it is found that majority of researches on numeracy comprehension in such subject which has separated the numeracy of pupils understanding based on behavior theory (BT) and the Theory of Information Processing (TPM). In other words, research on student thinking from their own perspective was ignored. Therefore, this study based on Radical Constructivism Theory (TKR) is necessary and should be taken in Malaysia. This is because the focus of this study is to analyze the understanding of numeracy, literacy and numeracy rather than superficial understanding of comparing such studies conducted under TTL and TPM. Comprehension is defined as the quality of knowledge possessed by students themselves when they apply the understanding of numeracy. Therefore, the study focused on the analysis of patterns of thinking by students behavioral interpretations that is consistent across the range of activities that traversed.

4. FRAMEWORK REVIEW

Radical Constructivism Theory is a psychological approach based on genetic epistemology developed by Jean Piaget. Genetic epistemology (development) involves the study of human development in the process of knowing, paying attention to history, basic and process development, knowledge owned by individuals and not the metaphysical commitments (Nik Aziz, 1999). Radical Constructivism theory also explains how knowledge is constructed until a learning can occur. Knowledge building occurred through two processes, namely the process of assimilation and accommodation. By this process, such scheme that is owned by someone will be undergoing renovation through active interaction with the outside world. According to another theory of radical constructivism, the best way to get a solid knowledge is through the ongoing developing process. One interesting thing that is mirrored by the TKR is a duty to act, think, and build knowledge scheme which should lie in the hands of the individual itself.

The theory assumes the children are building their understanding by sharing the experiences of nature and it has no right or wrong. According to Von Glasersfeld (2007), knowledge assimilation and accommodation occur to form a viable scheme. Thus, to understand the way other people understand the level of numeracy, the analysis of speech and their behavior should be interpreted. The interpretation should be compatible and not commensurate with numeracy concepts which provided in textbooks. This is because TKR assumes people were unable to know the truth of the reality around them. Therefore, Von Glasersfeld (2001) argues this theory does not deny the existence of absolute truth, but they limited the ability of humans from knowing the truth which means that the interpretation of one's conception is not static like a piece of paper that can be found from the file, but it is relatively more dynamic nature as a complete program or activity that is always ready for production use.

Thus, the study of students' understanding of numeracy of Year Four were carried out on a number of assumptions such as children are actively building numeracy understanding through learning processes experienced by them. The knowledge is adaptively built in pupils through better coordination of existing experience to develop a better understanding of viable and non-right or wrong; students understanding of numeracy learning belong in interpretation of their behavior during the conduct of activities in interview sessions, and interaction between researchers and participants in the study is modeling the actions of pupils. Understanding of numeracy learning belongs to students can be interrelated by observations of their behavior that is interpreted seems to occur repeatedly in the context of different tasks

5. UNDERSTANDING NUMERACY LEVEL MODEL FRAMEWORK

Numeracy level of understanding of the model framework consists of four stages, namely the interpretation of the code (de-coding), the acquisition of knowledge (Meaning-making), application (Using), and analysis (analysing) (Luke and Freebody, 2009). Since comprehension and numeracy teaching and learning process is complex (Ball, 2002; Kilpatrik, Swafford and Findell, 2001), this study focuses only on the understanding numeracy according to a critical review of numerical models (Jane Watson, 2008).

Numeracy level of understanding framework model emphasizes the key elements in developing an understanding of numeracy among students, by giving opportunity to students to understand the concept of numeracy and understand the context before understanding the more complex thinking. Second, provide opportunities to explore with others such as paired, group or whole class discussion where different views can be gathered. Third, provide opportunities for students to create something using their new knowledge mainly explain the results to their peers and to prepare to answer exam questions (Watson, 2008).

Thus, in the numeracy understanding level model framework, students can unearth ideas and relate with each other to solve a given problem (Jane Watson, 2009). Numeracy level of understanding model can also be used as a checklist for both teachers and students to see the level of understanding that has been carried out by individuals, explore other kinds of thinking, and students can analyze the questions. This numerical model makes it easy for students to express their thought and adapt them to everyday life (Jane Watson, 2009). The checklists for both students and teachers are with the question of what we have thought for; whether we need to explore other kinds of thinking, what happens if we analyze the question. This model is easy to use so that every student that comes to mind can be written in stages as this numerical model. Through this model, each discussion, not only as the interpretation of the code only, but through this model every idea has its own level and every idea can be categorized according to the stages of the model-level understanding of numeracy.

Based on the numeracy understanding model, pupils can think of various strategies used by specified levels. Pupils should be familiar with this stage and at the beginning of the initial application takes a long time to be adapted in the learning, but this would be a habit to do. Pupils can also use the model level of understanding of numeracy skills in other subjects. This is supported by the Harvard Project Zero (2010), proposes to develop pupils during and after activity

students could be asked to reflect their thinking with questions such as: what is the point numeracy you want to know more about the results.

The next process, identifying what needs to be done and how the process takes place, it is difficult (Wiliam, 2000a). Difficulty is in identifying the next steps and to develop students' understanding (Watson, Callingham&Donne, 2008a). Numeracy involves different ways to solve problems. There is not just one way to get the right answer. Students find it useful to discuss the types of strategies they use in their real lives. Strengthening this strategy gives students a lot of confidence and was convinced that there is only one way to carry out the process in numeracy (Derek Haylock 2003, p 75).

For each question of numeracy, problem solution measures according to the numeracy model should follow the procedures and levels of practical knowledge. This facilitates students to get the answer of certain one question given. Framework of this model also coincides with the constructivist approach in learning in which new knowledge related to what they already know, to build their own understanding, and to create new meaning. This approach will help students to recognize the features of numeracy and everyday situations (Gal, 2002).

Based on the framework of numeracy understanding level model, students can develop their numeracy understanding according to the environment, which will help students develop intelligence so they can make stable decisions in social, environmental, and everyday life. This model itself can act as a transformation tool for teachers to help them to get out of the box using the commonly used method of teaching. However, this model should be adopted in teaching and learning to get compatibility for pupils to practice in numeracy learning.

According to this model it can also help students to develop and understand the concept of numeracy. Students bring their own ideas and knowledge to think of ideas that broke out of their mind. In the framework of this numerical model, we can find out what students know about early exploration, brainstorming, challenging questions, quizzes and questions that require students to think. So the role of a teacher in front of the class is to investigate students' initial understanding by using some of the early activities that can help them to focus in on what we are doing and to remind them of what they already know. This may raise some questions, give them a few case studies to think, explore some different phenomena and asking them to contribute ideas.

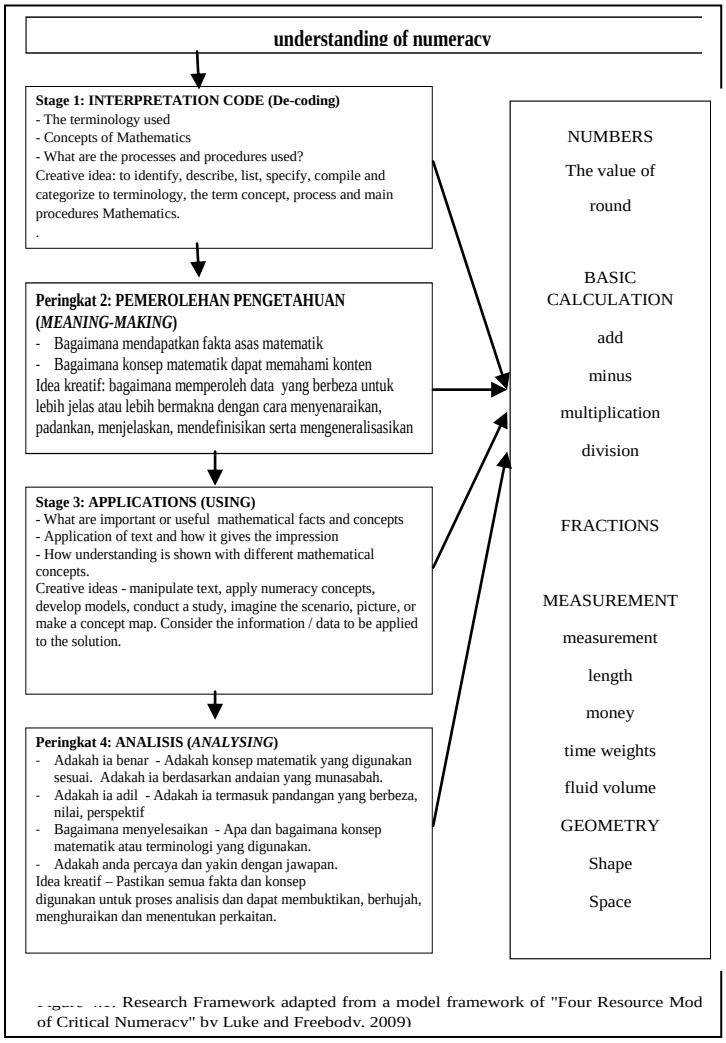
Numeracy understanding level of model framework provides an opportunity for students to understand the concept of numeracy, provide opportunities to explore with others in pairs, groups or the whole class discussion in which different views that can provide opportunities for students to create something using their new knowledge, especially of products that have a larger audience and allow wider feedback from the wider community. The model is also able to attract students developing strategies in the context of the calculation.

Framework of the model numeracy understanding level can trigger deeply of numeracy ideas according to the topics in mathematics. Students are given some examples of questions to get used to and help students familiarize themselves with the interpretation of the code (de-coding) and the acquisition of knowledge (Meaning-making), then to the next stage of the application (Using), and analysis (analysing) (Luke and Freebody, 2009). Through this model, it can also help students to creatively use their understanding of belonging.

Numeracy understanding level model designed to overcome pupils' understanding problem of numeracy. In addition, it is also to overcome the problems faced by the teachers who are teaching and learning who feel frustrated as the students do not understand the concept and never get of what is to be delivered. Therefore, by using the model, it can help in teaching and learning process to go smoothly, open the right ideas and the ability to make strong conclusions based on mathematical reasoning. These skills is called critical numeracy defined by Stoessier (2002, p 19). There is a clear analogy with critical numeracy, which involves the recognition that all texts represent different views of the world (Ian Thompson, 2012).

This study is appropriate to a case study design. Thus, there are various reality in making interpretations or in other words that it may be true from the perspective of a person and not from the others. Researchers have also considered this study is holistic which require exploration of student knowledge system. Stake (2000) also explains that case studies are becoming well-received than qualitative researchers. However, the Stake reported that the case study is not a form of qualitative research, but this study was done analytically and holistically. However, Stake pointed out that a case can be complex or simple, focused and specific as the study of an elderly woman, a student or a study class. Thus, Stake assumes that the case study is a form of research that focuses on a particular entity that involves a period of time to conduct a study to settle certain case.

The participants of this research were the six pupils of year four students that chosen based on three categories who are good, fair and poor according to the monthly test results in mathematics. Those participants for this study consisted of four pupils who have been studying in KBSR syllabus for three years. The participants selection was made with a written consent that obtained by the school, the pupils and their parents on the advice of mathematics teachers.



Research Framework adapted from a model framework of "Four Resource Mod of Critical Numeracy" by Luke and Freebody, 2009)

Figure 1: Model to identify the level of numeracy understanding

Participants were selected using an approach designed for several reasons, firstly, this case study was carried out not for the purpose to colligate the population of year four so the probability sampling should not be used (Merriam, 2002). Second, the participants and the location those were selected suit the study (Creswell, 2008a, 2008b, 2007). Participants were chosen based on their ability, willingness, commitment and motivation to provide the information required in the current study. According to Fraenkel (2006), specific approach is used to select participants who need criteria requiring specific criteria. In addition, it also has the advantage of being able to ensure that adequate information is obtained to answer the research questions

6. RESULTS AND DISCUSSION

This section aims to identify the level of understanding of numeracy that obtained by participants in the study of numeracy which starts with the title number, basic math, fractions, measurement and geometry. Interview is analyzed separately so that the behavior of participants in the study can be summarized.

7. The interview findings result

Case 1: The Student Anessa - First Stage: Construction Code

Anessa aged 9 years and 11 months during the interview was conducted. She is a student of Class Four Iman (4 I). During monthly tests for mathematics in February, she has got an A which marked with 91%, while for the April test she earned 99% in her mathematics. According to Anessa, mathematics is one of the most favourite subjects because she likes counting and solving mathematical questions. She is willing to be a doctor. According to the class teacher, Anessa is a very wise, intelligent and disciplined student until she was appointed to be school prefect. Her parents originated from PengkalanChepa while her father is a contractor and her mother is a lecturer. Anessa is the only child in her family.

At the beginning of the interview session, Anessa was asked to do first task that has three activities then the next was task 2 to task 7 which had all three activities. The interviews were analyzed separately so that the behavior of participants in the study can be summarized. In this passage and next one, (P) that stands for researchers, while (M) denotes the research participants. As a result of the interview and the assignments obtained in the first stage Anessa has been in the first stage that is interpretation of the code where she was be able to describe, identify, list, and states. Some activity behavior described by the following excerpt:

At the first stage, namely the interpretation of the code, Anessa was able to explain and identify additional problems given as "4 + 5" and "3 + 12. Anessa explained the addition by using counting technique. Counting behavior is illustrated by the following two quotes:

Excerpt 1

P: (Show card 4+5 Anessa). Try to read the card.

M: Four plus five

Q: How much

M: Nine (spontaneously)

P: So fast! Can you tell me how you get that answer?

M: (Student mentioned 4 and then said 5, 6, 7, 8, 9)
P: (Showing the card to Anessa). I 3+12

M: Fifteen (spontaneously)
P: Fast. How can Anessa? Please explain.
M: (Student said the number 12, then continued to 13, 14, 15)
P: Why start with 12, not with 3?
M: Easy to count if started with 12.

Excerpt 2
P: (Write math sentence "8 + 3" on paper). How?
M: Eleven (spontaneously)
P: (Write "8 + 7" on paper). How?
M: Fifteen (spontaneously)
P: fast answer
M: Easy

In excerpt 1, Anessa could explain and answered the problem solving of "4 + 5" spontaneously. She was able to explain an answer of "3 + 12" spontaneously. For example, she continually answered "15" without taking the time to compute. In the second excerpt, such as "8 + 3" and "8 + 7", Anessa also could explain and answered the questions spontaneously. At this stage, Anessa was able to identify and knew the basic addition facts. Therefore, she could simply solve such questions given. In conclusion, Anessa behavior shows that she could explain and identified the addition by using abstract unit in calculation. Anessa did not have to produce materials to go for the answer of addition problem.

The level of interpretation code of listing and saying, Anessa has done for the addition problems involving large numbers such as "14 + 12" and "11 + 19". Anessa used algorithm to produce a solution. Excerpt 3, 4 and 5 shows the behavior of Anessa.

Excerpt 3

P: (Show card | 14+12 | to Anessa). Try to read the card.

M: Fourteen plus twelve
Q: How much?
M: Twenty-six.
P: Specify how can Anessa get 26?
M: (Anessa explained and listed)

4 + 2 = 6
1 + 1 = 2
So the answer is 26

Excerpt 4

P: (Write math sentence "11 + 19"). Well "11 + 19", state the answer?
M: Thirty
P: How can Anessa get 30?
M: (Anessa lists and describes solutions):
1 + 9 = 10
One is carried over
1 + 1 + 1 = 3
So the answer is 30.

Excerpt 5

P: (Write math sentence "342 + 18"). Try reading this sentence.
M: Three hundred forty-two plus eighteen.
P: Describe the answer?
M: Three hundred and sixty
P: List and specify how Anessa get 360?
M: (Anessa explained):
8 + 2 = 10 (1 is carried over)
1 + 4 + 1 = 6
3 + 0 = 3
So the answer is 360

In Excerpt 3, Anessa lists problems on digits addition at "sa" where 4 + 2 and the digits of term "twenty" that 1 + 1 to produce an answer. Excerpts 4 and 5 show that Anessa have listed answers correctly and here it was found that Anessa have mastered skills to reassemble. For example, Anessa stated that by changing 10 "sa" to 1 "twenty" and then adding "twenty" and "thirty" to produce the answer "30" to the problem of "11 + 19".

For Task 2, activity 1, Anessa could do the activities that provided perfectly. The behavior is shown in the following of excerpt 6:

Excerpt 6

P: What can be explained when I show some pencils?

(Encourage them to give multiple answers)

M: Hmm ....can count, write and measure.

P: If I put 5 more pencils. What can you say?

M: The pencils become more....

P: How many of the pencils?

M: erm ..count them first.

P: I mean, are you sure and do you know this is addition operation?

M: Yes.

P: Ok, now there are 14 pencils. What can you list of your understanding based on this activity?

M: Sure, there were a number of pencils, then 5 more pencils were added.... the total is 14.

In the next task, Anessa was asked to describe what she can do with a few pencils placed on a table. Anessa argued whether to "count, write and measure". When five more pencils were placed on the table, she said that the pencils became more and more. Anessa identified that she had to do addition operation to get the total number of existing pencil on the table. She listed all the information she has got. Anessa counted the total number of pencils and later she mentioned that the total of the pencils were fourteen.

Next Anessa went to another assignment. Behavior is shown in the following excerpt 7:

Excerpt 7

P: What can you explain about this assignment?

M: There are 16 balloons held by Ahmad

P: Can you list the information obtained?

M: Ahmad is holding 16 balloons in his hands

P: What other information can you provide?

M: Balloon missed ... 4 balloons are on the right hand and another 5 balloons are on his left.

P: What can you say?

M: The question asked about the number of balloons missed.

In excerpts 7T2A2, Anessa read the question carefully and explained that there were sixteen balloons all held by Ahmad. The statement of "Balloon missed ... 4 balloons are on the right hand and the rest of 5 balloons are on the left hand" shows that Anessa was able to list any information obtained from the questions. She stated, "The question asked number of balloons lost ". Anessa has explained that the number of balloons sixteen in all.

Excerpt 8

Q:Tell what you see?

M: Candies.

P: Now you are asked to share the candies with three of your friends equally.

M: Sure.

Q: What can you reveal?

M: Divide one by one until there are no more candies.

P: If you divide one by one, identify this way quick or slow?

M: Fast, if the amount of candies is little.

P: what do you mean?

M: if the candies in small quantities , they can be divided in this way .. but if large quantities must use divide operation.

P: Now do you know what amount of candies in the beginning.

M: no ....but surely just a few.

Q: How do you get to know the original amount of candies?

M: Count from the start or after divided one by one .. We can see how many candies each would get ..and the amount is added..later we will get the real total.

P: Now you say, which method you are going to use?

M: Distribute one by one

P: Why do you use this way?

M: (thinking) ..because I the amount of candies.

P: So ,is division easier?

M: Yes ....because the actual amount of candy is unknown.

In quote 8T5A1, Anessa have seen objects shown and explained about candies. She was asked to divide the candies equally to three of her friends. She stated "Divide one by one until the expiration of the candies". Anessa have explained how to divide the candies. She identified if "If the quantity is small, can be divided in this way ..but if large quantities must use the divide operation". She knows the total number of candies can be accomplished in two ways based on her explanation, "Count from the start or after divided one by one ..we can see how many each one would get .. and this amount is added .. then we will get the sum ". Anessa run an activity to divide some marbles to four of her friends by divide operation. She explained "can apply also ..but if already know the real amount, we better just use divide operation, teacher...", her explanation was when not applying division activity one by one . As a result she found that each person would get four marbles. In this activity, she has divided the marbles one by one to everybody as the marbles quantity was just small.

Based on interviews that have been done, Anessa seemed to be able to explain, say, list and identify all the tasks assigned. It was found where she was able to pass all of the tasks in the first stage but not at the other stages where she was unable to complete the task properly. In conclusion, Anessa behavior has shown that all the tasks given described that she has reached the first level of interpretation of the code in the level of numeracy understanding.

8. RECOMMENDATIONS AND CONCLUSION

Numeracy understanding level model is an innovation designed to suit the curriculum in Malaysia. This model is one of "Thinking Strategies" in creating students and parallel with the implementation of School Based Assessment (PBS), which now is carried out in all schools levels.

The findings of this study were to contribute in terms of knowledge development and contribution to the theory and practice of teaching. In terms of the knowledge development, in-depth research investigation of year four students cognitive in mathematics education is still very limited, especially in numeracy understanding. Since the understanding of numeracy is very important for pupils at early school level hence this study may contribute to the knowledge development especially in the scope of numeracy understanding. The knowledge then can be applied in order to help teachers to invent suitable activities in the process of teaching and learning from students aspect, instead of merely aspects of the curriculum.

This study is also important to give exposure to the teachers about the importance of making appropriate approach based on the students because students understanding lead to be the basis of action to make diagnosis of pupil's understanding in a certain learning situation individually.

Primary teacher training center, the Institute of Teacher Education Malaysia (IPGMs) plays an important role to form efficient trainee teachers in pedagogy field which focuses to the resource, technology, curriculum and methodology. Mathematics subject holds a concept where it cannot be transferred from teacher to students, so the teaching approach that too relies on verbal communication like speech is very limited. Therefore, the results of this study will provide guidance to the trainee teacher in the IPGM and IPTA to focus on the element of specific understanding; in addition it is applied with behavioral theory and information processing in the mathematics curriculum. This is important in order to create direction of mathematics education in line with other developed countries that have better math position at world level.

In theoretical contribution aspects, this study is important in order to add TKR-based studies, particularly focusing on the exploration of students understanding of numeracy specifically which is rarely focused by the researchers among radical constructivism advocators. This study also contributes to build research design, data collection techniques, clinical interview instruments, methods for data analysis, and to summarize the findings of the study in terms of radical constructivism. The aspect mentioned is important as it provides guidance and reference to other researchers comprehensively.

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