

## Response Analysis of Students with Intellectual Disability in Realistic Mathematics Education (RME) Learning

R Agustina<sup>1\*</sup>, N Farida<sup>1</sup>, I Vahlia<sup>1</sup>, N Linuhung<sup>1</sup>, Y Rahmawati<sup>1</sup>, S Nurlaila<sup>2</sup>

<sup>1</sup>Mathematics Education Department, Muhammadiyah University of Metro, Lampung, Indonesia

<sup>2</sup>Guidance and Counseling Department, Muhammadiyah University of Metro, Lampung, Indonesia

\*aasyiquin1212@gmail.com

**Abstract.** Mathematics learning is not only practiced in public school, yet it is also practiced in extraordinary school for the students who have special needs such as students with intellectual disability. This research aims to describe response of students with intellectual disability on Realistic Mathematics Education stages such as (1) understanding contextual problem, (2) designing solution, (3) completing and discussing and (4) concluding. This research is descriptive-qualitative which aims to describe response of students with intellectual disability in Catur Bina Bangsa extraordinary school of Metro in Realistic Mathematics Education learning. The sampling technique of this research uses purposive sampling. The subject of this research is two students with intellectual disability at 3rd grade on material of integer addition operation. Data collecting technique uses observation technique with main instrument is researchers themselves and supporting instrument uses observation sheet. This research also uses source and time triangulations. Base on the research result and discussion can be concluded that the response of students with intellectual disability in realistic mathematics education learning i.e. the stage of : (1) understanding contextual problem, students are able to give real example and calculate the number of image by guidance of teacher, (2) solving contextual problem, students are able to calculate and write the number of existed image by guidance of teacher, (3) comparing and discussing, students are able to recalculate independently, (4) making conclusion, students are able to write down their answer independently.

### 1. Introduction

Mathematics learning that is abstract needs an appropriate learning model to help the teacher in conveying the concept. One of learning model that can be used is Realistic Mathematics Education (RME). Mathematics learning that uses RME can make the students understand the exits concepts by using real examples in the surrounding environment. Learning model of RME can increase the students' activity in learning. RME is also the proper method to improve the quality of learning [1,16]. In the learning process of RME uses 4 stages: (1) understanding contextual problem, (2) designing solution, (3) completing and discussing and (4) concluding.

Mathematics learning is not only practiced in public schools, yet it is also practiced in extraordinary school for the students who have special need such as students with intellectual disability. The students with intellectual disability generally have different type of barriers both from physical and cognitive aspects. The barriers and various behavioral problems possessed by the students with intellectual disability will be very visible in learning activity [2]. In mathematics learning, the students with intellectual disability need teaching material that is real and in accordance with their ability. Mathematics teaching material based on realistic mathematics education (RME) can help the students in learning, it is caused the teaching material uses example of images around students [3].

The students who have special need have the same rights, especially for them who are intellectual disability. The same rights in various matters include getting a decent education either formal or non-formal education. They also have the rights to get all the facilities provided by the state without being



differentiated. One of the students with special need who study in Extraordinary School is students with intellectual disability. The students with intellectual disability generally have different types of barriers from both physical and cognitive aspects [4]. The students with intellectual disability are them who have significantly below average intelligence and they are inability to adapt in behavior that arises during development age. Students with intellectual disability have academic barriers in almost clusters of science, hence in learning service requires appropriate curriculum modification to their specific need. They also need assistance and guidance of teacher [5]. The implementation of mathematics learning for them has many barriers especially to aspect of organizing mathematics subject which related to individual program. The barriers are due to the number of students with various special needs in one class, but the material provided by the teacher is still general. In addition, the problem given also adjusts to the cognitive of each student. One of the materials studied by students with intellectual disability in mathematics learning is the concept of addition number. Based on observation on mathematics learning, students with intellectual disability can only perform addition operation from number 1 to 10 [6]. They also have difficulty to understand the concept of addition that uses contextual learning model. In addition, the response of students to start learning activity is by reading question, although they remain silent. They cannot mention what they know and want to ask because they are waiting for the instruction of the teacher what to do. Therefore, it is necessary to use a more systematic and structured learning model to facilitate them to follow and understand mathematics concept [7].

In previous research, it can be seen that students with intellectual disability need real teaching material, namely RME-based teaching material. With the existence of RME-based teaching material can help the teacher to explain the concept of integer addition. Furthermore, RME-based mathematics teaching material can also attract students with intellectual disability in learning because it uses the example of images surround [8]. Based on this problem, the researchers will conduct research about response analysis of students with intellectual disability in realistic mathematics education learning. Based on the research results, material of this research is an integer addition operation. Mathematics learning which uses RME teaching material gets validation and practicality responses in the category worthy to use [9]. The purpose of this research is to describe the response of students with intellectual disability in the stage of the RME used, namely (1) understanding the context problems, (2) designing solution, (3) completing and discussing and (4) concluding.

## 2. Method

This research is descriptive-qualitative which aims to describe response of students with intellectual disability in Realistic Mathematics Education learning. The location in this research is in Catur Bina Bangsa Extraordinary School of Metro which is located at Jl. Rambutan, Mulyojati 16 C, Metro City. The execution time is carried out within 1 month on May 2018. The sampling technique of this research uses purposive sampling. The subject of this research is two students with intellectual disability at 3rd grade on material of integer addition operation.

Data collecting technique uses observation technique with main instrument is researchers themselves and supporting instrument uses observation sheet. This research also uses source and time triangulations. In the first and second subjects uses time triangulation. Furthermore, in both subjects uses source triangulation. Data collecting on the first subject is conducted on May 3, 2018 and May 9, 2018. Furthermore, data collecting on the second subject is conducted on May 14, 2018 and May 21, 2018. Then, the two subjects are drawn conclusion regarding the response of students with intellectual disability in realistic mathematics education learning.

## 3. Result

This research is conducted at in Catur Bina Bangsa Extraordinary School of Metro. The subject of this research is two students with intellectual disability at 3rd grade. This research is conducted in different class, namely class A and class B. The material used in the research is integer addition operation that is limited to number 15. In this research uses 2 observers to assist in collecting data.

Based on interview with teacher, two students with intellectual disability are placed in different class because they have different characteristic in learning. In addition, they also have different cognitive ability; hence they must be taught with different treatment. The teaching material for students with intellectual disability can use a module in mathematics learning. The use of module designed to adapt conceptual ability can be delivered with a variety of pedagogical approach [10]. One of approaches that

can be used by the teacher in learning is realistic mathematics education (RME). In mathematics learning, the teacher has been given an explanation by the researcher related the stage of RME learning, namely: (1) understanding contextual problem, (2) solving contextual problem, (3) comparing and discussing answer and (4) making conclusion.

This research begins in class A; hereinafter referred to as data source A. Data collection at source A is conducted twice. In the first data collection is obtained result, namely: (1) at the stage of understanding the contextual problem, students pay attention to the teacher's explanation and follow instruction of teacher on teaching material, (2) at the stage of solving the contextual problem, the students calculate and write the number of existed images, (3) at the stage of comparing and discussing answer, students practice to recalculate the number of images and (4) at the stage of making conclusion, the students rewrite the number of images in the book. From the results of data source A, it can be seen that students with intellectual disability in mathematics learning need teacher's guidance intensively. The teacher's guidance provided is a learning service category which theoretically is useful for cognitive development of students with intellectual disability [11].

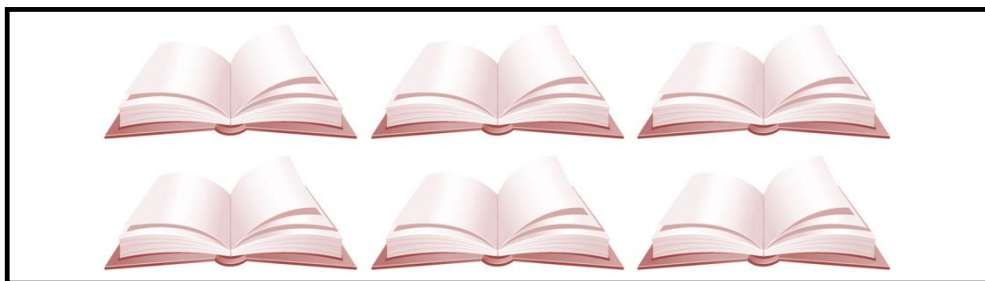
In the second data collection, source A is obtained result, namely (1) at the stage of understanding the contextual problem, students pay attention to the teacher and tell the teacher about the image in the book, (2) at the stage of solving the contextual problem, the students recalculate the number of images in the book, (3) at the stage of comparing and discussing answer, the students calculate and rewrite the number of images in the book and (4) at the stage of making conclusion, the students answer and rewrite the number of images in the book.

After conducting the research in class A, the research is conducted in class B with data source B. In the first data collection of source B, is obtained result, namely: (1) at the stage of understanding the contextual problem, students pay attention to the teacher and tell the teacher about the image in the book, (2) at the stage of solving the contextual problem, students pay attention to the teacher then calculate and write the number of images, (3) at the stage of comparing and discussing answer, the students calculate and answer the teacher's question about the images in the book and (4) at the stage of making conclusion, the students write the number of existed images.

To obtain reliable data, the second data collection is conducted at source B. From this second data collection, the results is obtained, namely: (1) at the stage of understanding the contextual problem, students pay attention to the teacher and calculate the image by teacher's guidance, (2) at the stage of solving contextual problem, the students calculate the images by teacher's guidance then write the number of existed images, (3) at the stage of comparing and discussing answer, the students calculate the number of images in the book and (4) at the stage of making conclusion, students write the number of existed images by teacher's guidance.

#### 4. Discussion

From the research result, it can be seen that the data source A on the first and second data collection there are general similarities. At the stage of understanding the contextual problem students are able to understand the images in the book as follow:



**Figure 1** Image of books is on teaching material.

At the stage of understanding the problem, students are able to tell the teacher a real example of the image. The students point the book on the table as a real example. In addition, students also repeat the teacher's word related to the image such as "book". Then, students try to calculate the number of image of book by teacher's guidance. In the second data collection, there are also similarities in the response of

students at the stage of understanding the contextual problem that is paying attention to the teacher's explanation and then calculating the number of images with by teacher's guidance. The intellectual of students with intellectual disability can be improved by the teacher's guidance intensively during the learning process. In addition, in learning mathematics that uses a simple form operation, students with intellectual disability can still follow the learning well [12].

At the stage of solving the contextual problem, the results of the first and second data collection, the response of students is to recalculate the number of existed images by teacher's guidance. After completing calculating, the students write the number of existed images by teacher's guidance by giving an example about the number that they will write. For the process of writing the answer, the students also still need teacher's help and guidance.

The result of the first and second data collection of source A, the stage of comparing and discussing answer, the response of students is to recalculate the number of existed images, and then they are able to write without teacher's guidance. At this stage, students with intellectual disability can write the number of images well because the process of writing answer has been conducted at the stage of solving the problem. With the result at the stage of comparing and discussing, the teacher's answer only repeats the explanation of the number of existed images. Furthermore, students with intellectual disability can write independently the number of images in the book. The response of students to the use of realistic-based teaching material is very good, that is, they can practice in solving problem in real life [13].

At the stage of making conclusion, from the results of the first and second data collection is obtained that the students answer the teacher's question about the number of existed images and they are able to independently rewrite the number of images. At this stage, students are easier to answer the teacher's questions because they have passed the previous 3 stages. With the result at the stage to conclude the answer, the students can easily conclude the number of existed images.

Beside of data source A, this research also uses data source B that are practiced in different class to data source A. Data collection on data source B is also conducted twice to obtain reliable result. In data source B, the first and second data collection also obtains significant result. The following is a sample image in the book used in data source B:



**Figure 2** Image of teachers is on teaching material.

At the stage of understanding the contextual problem, from the first and second data collection is obtained that the students pay attention to the teacher's explanation and then they are able to point the "seat" as a real example of the images. Before pointing a real example, the students firstly repeat the teacher's statement that the image they see is image of chairs. After pointing a real example of a chair, students try to calculate the number of image of chairs by teacher's guidance.

The results of the first and second data collection at the stage of solving the contextual problem shows that the response of students is recalculate the number of images in the book. This calculating process also requires teacher's guidance, that is, the teacher shows one by one the image of the existed chair. Then students try to write down the number of image of the chairs. Before they write down the number of existed images, the teacher firstly gives an example of the number that must be written by the students in the column provided. In mathematics learning, the teacher's guidance can provide the best opportunity for students with intellectual disability to develop their potential optimally [10].

The third stage of the RME is comparing and discussing answer. At this stage, the same result is generally seen between the first and second data collection. At the stage of comparing and discussing answer, students recalculate the number of existed image of chairs. After calculating, the students write the number of images more easily. It is caused the students have got the process of writing related to the number of images at the stage of solving contextual problem. With the result at the third stage, students with intellectual disability can write independently the number of existed images. It is due to they have got the repetition process in the previous stage. This is consistent with the results of the research [14],

students with intellectual disability can draw flower after being given guidance and repetition by the teacher as much as 13 times in learning process.

At the stage of making conclusion, from the results of the first and second data collection, it is obtained that the students write their answer in the column provided. The process of writing the answer can be done independently by the students. At this stage, the students no longer have difficulties because they often get repetition to do it at the stage of completing and comparing answer. Learning mathematics for the students with intellectual disability through realistic learning makes students can identify the objects around them well [15].

## 5. Conclusion

From the result of the research and discussion above, it can be concluded that the response of students with intellectual disability in realistic mathematics education learning i.e. the stage of : (1) understanding contextual problem, students are able to give real example and calculate the number of image by guidance of teacher, (2) solving contextual problem, students are able to calculate and write the number of existed image by guidance of teacher, (3) comparing and discussing, students are able to recalculate independently, (4) making conclusion, students are able to write down their answer independently.

From this research, the researchers suggest for:

- The teachers, to try to use real examples to explain mathematics concept for students with intellectual disability.
- The teachers, to try to apply RME learning to make it easier for students to learn mathematics.
- The school, to facilitate learning media in mathematics learning for students with intellectual disability.

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