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SINGLE SUBJECT RESEARCH: INCREASING MATHEMATICS LEARNING OUTCOMES OF THE ADDITIVE FRACTIONS USING FRACTIONAL BLOCK MEDIA TOWARD STUDENTS WITH VISUAL IMPAIRMENT

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Abstract:
The purpose of this study is to determine the effectiveness of using the beam media on fractions students with visual impairment to improve the learning outcomes about mathematical summation material on fractions students in YKAB special schools (SLB) Surakarta. The research method which is used in this study is single subject research design experimental that is design A-B-A (Baseline-1 - Intervention - Baseline-2) with the subject is chosen directly by the researchers based on the need of two students on a 4th grade of special school. The Techniques of analysing data used are statistical analysis and visual analysis. Statistical analysis is in the form of charting a simple statistic description of Antam. Visual analysis focuses on changes in one variable and two conditions (results) that change all the intervention phase and the changing compared with the baseline phase. Based on data analysis from all three phases, it is known that the using of fractional block media provides positive influence on mathematics learning outcome fractions summation material of students with visual impairment. Based on these results, we can conclude that fractional block is an effective media to improve the learning outcomes about fraction summation material for fourth grade students with visual impairment.

Keywords: students with visual impairment, mathematics learning, the block media, the additive fractions

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1. Introduction

The students with Visual Impairment is one of the children with special needs who experience obstacles in the power of vision. Rogow and Manson in Hadi (2007) give the term as Visual Impairment. The terms are described about the type of blind and low vision. Blind is used to describe the children who use the palpability in the study, while less refer to tellfor the children who mostly study using residual vision. In the process, children who are blind and less to see have barriers respectively. To the children who are blind information retrieval depend more on other senses that are still functioning. Besides, the children having less see, the rest of their vision can still be used to obtain information, while the other senses are functioning to support the acquisition of such information.

One impact of disturbance blindness either blind or less see is in cognitive development. Cognitive development is not only closely related to intelligence capabilities but also with the ability of the sense of sight. Kosasih (2012) revealed that the blind children have the concepts of an object that is not intact especially, in children who are totally blind. It happens because the children do not have impression, perception, understanding, memory, and visual understanding of the nature object. The understanding of the information and knowledge when the learning of totally blind children depends on sensory experiences that gained through the other functioning senses. Research conducted by Nolan and Ashcroft in Hildayani (2009) found that children with visual impairment had showed poor performance on tasks that require abstract thinking.

The students with Visual Impairment get learning materials in schools through some subjects, one of them is Mathematics. The subject is largely abstract. Pakasi in Purbaningtyas (2013) revealed that "*essential numeracy teaching is the ability of abstract thinking, because basic counting is the relationship between the relationship of two numbers or more*." Nonetheless, the mathematic subject is very important to be mastered by students with Visual Impairment including blind children. Cockrof in Abdurrahman (2012) suggested that mathematics should be taught because (1) it is always used in all facets of life; (2) all fields of study require appropriate math skills; (3) it is a powerful way of concise and clear communication; (4) it can be used to present information in various ways; (5) it improves the ability to think logically, accuracy, and spatial awareness; and (6) it gives satisfaction efforts to solve challenging problems. Based on these opinions, mathematics needs to be taught to students, including blind children to

overcome the problems of everyday activities such as buying and selling, activity measurement, the distance calculating, and so forth.

Minarti's research (2010) revealed that "*based on the fact the blind children have poor numeracy skills*". One of the difficulties face by most of the students with visual impairment in learning of mathematics is the material fractions. Fraction is a number that denote the amount numbers from some parts of numbers that have been shared equally. Fraction consists of a specifies numerator, the number of whole numbers, and the denominator stating which is divided equally. According Muhsetyo (2007), the fractions based on the principle declared some parts of a number of equal parts. The entire amount of the same section together forma unit (unit). In line with these opinions, Sulardi (2008) stated that the denominations is part of something that is intact. The fraction is shown by the shaded area.

Students who bear the totally blind have difficulty in solving math problems, one of them is in a fractions summation material. Understanding the concept of a quarter, half, and others is one example of the using of fractions in dialy life. Therefore, the concept of fractions is very important to be learned both from the mathematical sciences and in daily life. Meanwhile, to build the understanding the concept of fractions is not easy especially for students with visual impairment, because fractions are not a whole number. As a result, fractional math learning materials need props or concrete media for students with visual impairment in order to know the truth and minimize the possibility of misperception in fraction summation.

Problems are experienced by students with visual impairments totally need a way out to solve it. Learning math is a subject providing life skills which are useful in daily life, including for total impaired students. One way to prevent total blind children in order not to fail in mathematics learning material sum of fractions is using props or media that appropriate with the needs of children.

Several studies have been conducted about using the fractional block media to solve the problems on a child's math learning about the fraction materials. The researchers are interested in using fractional block media to improve learning outcomes in math fractions summation material for visually impaired students who experience total disability. Thus, fractions block media is used by the researchers to help students with total visual impairment in improving learning outcomes about fractions summation material.

Kustadi (2011) revealed that the learning media is a tool that can help the learning process and serve to clarify the meaning of the message, so as to achieve the better and perfect learning objectives. Learning media is a way to improve the teaching

and learning process. Considering of many forms of media, the teacher must choose it carefully and use it appropriately. In the teaching and learning activities, the use of word instructional media is often changed with terms such as instructional materials, audio-visual communication, visual education, the props and media of descriptors.

According Sukayati and Suharjana (2009), the meaning of fractions block media is a media that has circular base and can be divided based on the desired fractions. The function of fractions block media is to invest the concept of (1) stating fraction to other forms; (2) making simplethe fractions; (3) comparing two fractions; (4) performing the operation of arithmetic fractions.

Media of fraction block are the props made from cardboard or paper circular and modified which can help the teachers to convey the subjects of fraction material. Media of fraction block is a concrete media that can construct abstract things such as sum of mathematical fractions. Research conducted by Margiyono (2009), fractional block has been qualified as educational props as follows;

1) Based on mathematic concept;
2) Can clarify the concepts of mathematicsin the real form;
3) Durable;
4) Having attractive color and shape;
5) Made from safe materials for the health of students;
6) Simple and easy to manage;
7) Having appropriate and balanced size with the physical size of the student;
8) Can be manipulated; and
9) Helpful.

We know the students with visual impairment have barriers in his vision, so the using of direct touchable media is expected help the students with total impairment to solve their problem on construction immateriality fractional material. Thus, the material can be concrete and understood easily, and their study result of fraction sum material can increase.

2. Material and Methods

2.1 Subject and Setting

The subjects research are two students that totally blind based on the criteria that researchers need, the fourth grade of Special School (SLB) YKAB Surakarta, Indonesia. This research was conducted in the classroom when teaching learning process and individual for 60-90 minutes for each session.

2.2 Collecting Data and Instrument

A. Test

Form of the tests that is used in this study is an objective written test that has 10 items with multiple choice type having more two alternative answers. Objective test with multiple choice type is chosen in this study owing to adapt the characteristics and capabilities of research subjects, that is the fourth grade students with visual impairment. The grating questions that are used in this study are as follows:

Table 1: Mathematics Test criteria Material Addition Fraction

Standard Competence	Competence Basic	Material	Indicator	Number of Questions	Number about
Use fractions in problem solving	Add fractions	1. Fraction with the same denominator 2. Fraction with different denominator	1. Add up the two equal denominators fractions 2. Add up the two different denominators fractions 3. Add up fractions with integers 4. Add up the three fractions same denominator 5. Add up the three different denominators fractions 6. Resolve fractions	2 2 2 1 1 2	1,2 3,4 5,6 7 8 9,10

The way to answer the test is by selecting a correct answer of four options (A / B / C / D) on the provided answer sheet. While the assessment system used to calculate the results of the students' answers in solving the test are as follows:

1. If the student answers correctly, 10 will be got for each number;
2. If the student answers incorrectly, 0 will be got for each number;
3. The total score / maximum value of 100;
4. The final score is the sum of acquisition score.

B. Documentation

In this study, the documentation used is written form in which the result of the test for first student ability in solving the mathematic test about fractions summation.

2.3 Procedures

In this study, the experimental approach of Single Subject Research means the research is a single subject. Single subject research is research with the subject or a single participant which the results of experiments are presented and analyzed based on individual subjects (Sukmadinata, 2006). Single Subject Research with pattern A-B-A (Baseline-1 - Intervention - Baseline-2), where the design may show the cause of the intervention on the dependent variable.

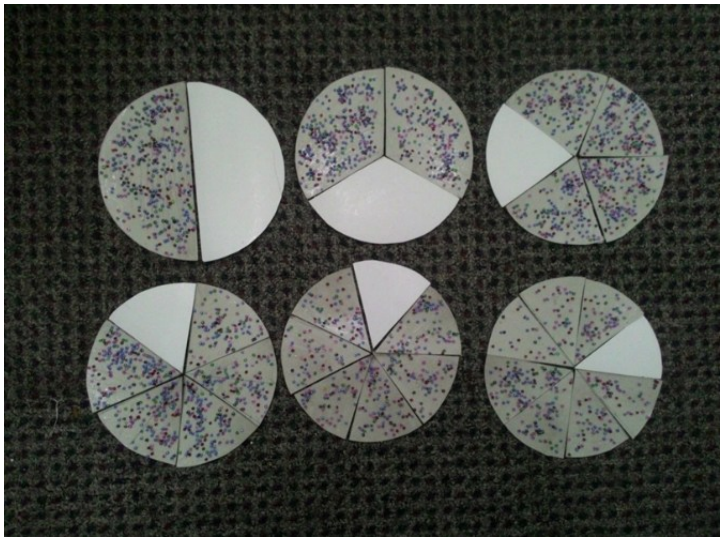
1) Baseline-1phase

Baseline-1 in this study is the condition of the child's ability to solve problems about fractions summation material without the assistance from fractional block media that is implemented for three section of meeting.

2) Intervention phase

In the implementation of this intervention, the researchers used a fractional blok media in mathematics learning activities about fractions summation. In this phase is done in four sessions.

Picture 1 : The Fractions Block Media



a. Baseline-2 phase

Baseline-2 activity is a repetition activity of baseline-1 that is intended as an evaluation to see the effectiveness of interventions on children ability to fractions summation materials. In this phase is performed three sessions.

2.4 Analysis Data

The Technique of analysing data used simple statistics by creating graphs, descriptive statistics, and visual analysis. The analysis compares the conditions in state and inter-state. Analyzing data in this study related to the change to a variable. Obviously, researchers should focus on changing one variable and two conditions (results) that have changed through all the intervention phase and the changing is compared to the baseline phase. If it is true, there is a changing in the baseline phase and the intervention phase and occurs only on the dependent variable, it is indicated that there is an effect of intervention on the subject. In addition, in analyzing is done not only in phase, but also have to analyze the inter condition to determine cause and effect.

3. Results and Discussion

A. Baseline-1 phase

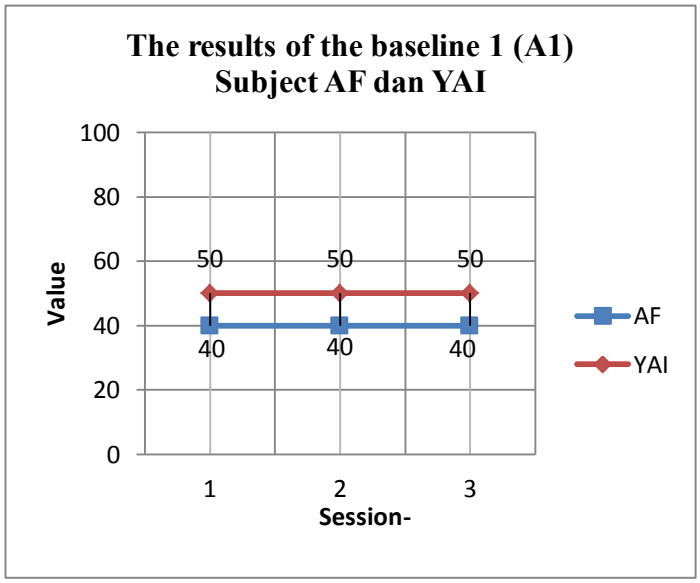
Baseline Phase 1 (A1) which is performed in three sessions to the subject AF and YIA, is put in a table format as a whole. Data from the study at baseline phase 1 (A1) are presented in the following table:

Table 2: Baseline Phase 1 (A1)

Subject	Session	Value	The Correct Answers Items	The Wrong Answer Item
AF	1	40	1,2,7,9	3,4,5,6,8,10
	2	40	1,2,3,7	4,5,6,8,9,10
	3	40	1,2,7,9	3,4,5,6,8,10
YIA	1	50	1,2,7,9	3,4,5,6,8
	2	50	1,2,3,5,7	4,5,6,8,10
	3	50	1,2,3,4,8,9	5,6,8,9,10

Based on AF's data score record in baseline phase 1 (A1), there are three sessions with the acquisition of score at session 1: 40, 2: 40 sessions, and session 3 namely 40. While recording a score YAI showed that baseline phase 1 (A1) conducted during three sessions with the score acquisition at session 1 is 50, the second session is 50, and the third session is 50 scores. Furthermore, to clarify the results of the baseline 1 (A1), the baseline data 1 (A1) is converted into graphic form as follows:

Picture 2. Graph Data of Baseline Phase 1 (A1) Subject AF and YAI



The graph illustrates the first condition of the AF and YAI before given intervention (B) using a fractional block media to improve learning outcomes about mathematical fractions summation materials. When doing fractions summation, AF and YAI gets relative low score in 1-3 session, ranging from 40-40 for AF and 50-50 for YAI. From the baseline data 1 (A1), it is known that there tendency ability of fractions summation at baseline 1 (A1) AF and YAI before doing intervention (B).

B. Intervention phase

The intervention activities (B) are conducted in four sessions which are started by implementing fractional block media for learning fractions summation materials. The steps involved in the intervention (B) are as follows:

1) The blind subjects is in the classroom;
2) The researcher describes the fractions material;
3) The researcher shows block fractions media;
4) Blind subjects grope fractions block media shown by researchers;
5) The research shows various fractions and visually impaired subjects notices by groping block fractions media shown by researchers;
6) The blind subjects imitate fractions exemplified by researchers using fractions block media;
7) The blind subjects try to mention fractions using a fraction block media;
8) The researchers demonstrate how to sum fractions using block media, then the subjects observe by groping block fractions exemplified by researchers;

9) The blind subjects attempt a simple sum of fractional numbers using fractions block media;
10) The blind subjects try to practice the sum of fractions using a fraction block media;

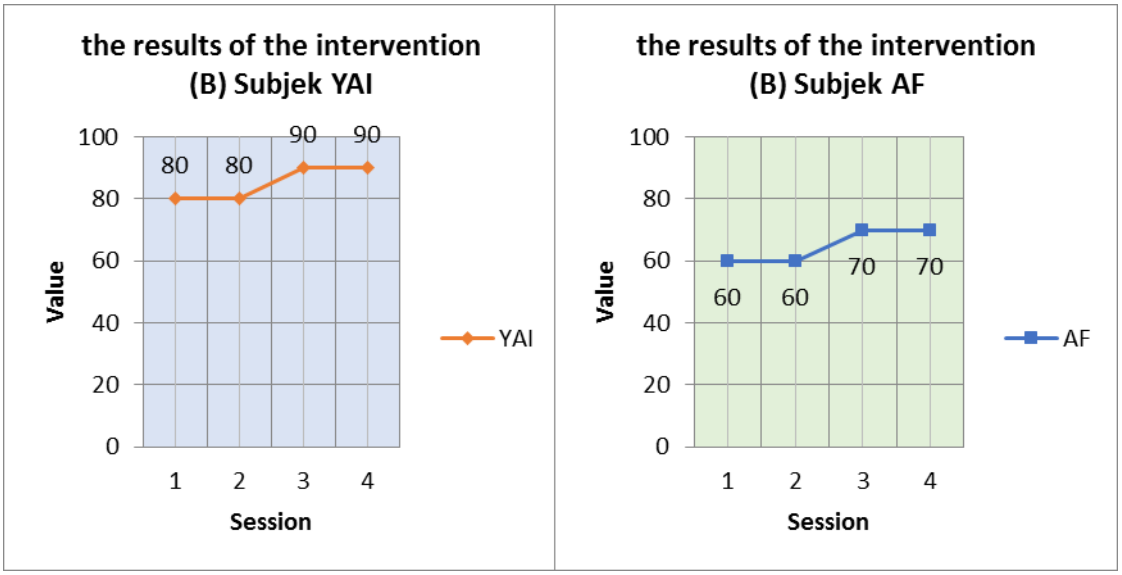
Data from intervention (B) of 4 sessions are incorporated into table format. Data from the study on the intervention phase (B) are presented in Table 3.

Table 3: Intervention Phase (B)

Subject	Session	Value	Item Correct Answers	Item Wrong Answer
AF	1	60	1,2,3,4,7,9,10	5,6,7,8
	2	60	1,2,4,7,9,10	3,5,6,8
	3	70	1,2,3,4,7,9,10	5,6,8
	4	70	1,2,4,5,7,9,10	3,6,8
YAI	1	80	1,2,3,4,7,8,9,10	5,6
	2	80	1,2,3,4,5,7,9,10	6,8
	3	90	1,2,3,4,5,6,7,9,10	8
	4	90	1,2,3,4,5,7,8,9,10	6

Table 3 presents data on the intervention phase (B) which is carried out in four sessions. The lowest score obtained by AF is 60, and the highest score obtained by AF is 70. The lowest score is obtained by YAI is 80 and the highest score obtained is 90. Furthermore the final score of AF and YAI in the intervention phase (B) is converted into graphic form as follows:

Picture 3: Graph of Data Interventions Phase (B) of subject AF and subject YAI



C. Baseline-2 phase

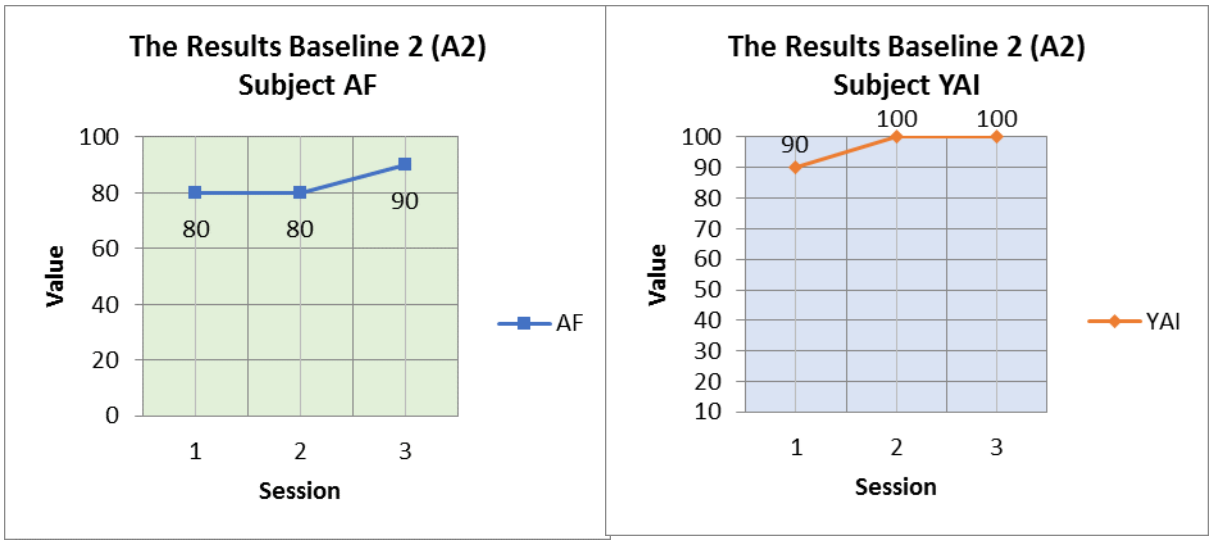
The data gained from baseline 2 (A2) during 4 sections is entered to table form. The data result of research based on baseline phase 2 (A2) is performed on 4.13 tabel.

Tabel 4: Baseline Phase 2 (A2)

Subject	Session	Value	Item Correct Answers	Item Wrong Answer
AF	1	80	1,4,5,6,7,8,9,10	2,3
	2	80	1,2,4,5,6,7,9,10	3,8
	3	90	1,2,3,5,6,7,8,9,10	4
YIA	1	90	1,2,3,4,6,7,8,9,10	5
	2	100	1,2,3,4,5,6,7,8,9,10	0
	3	100	1,2,3,4,5,6,7,8,9,10	0

Based on these data, score of AF and YAI shows that there are three session in baseline phase 2 (A2). AF obtains 80 in first session, 80 in second session, and 90 in third session. While, YAI obtains 90 in first session, 100 in second session, and 100 in third session. Furthermore, data baseline 2 (A2) is converted into graphic form as follows:

Picture 4: Graph of Baseline Phase 2 (A2) for subject AF and subject YAI



Graph baseline phase 2 (A2) describes the condition of the subject AF and YAI after given (B) intervention using a fractional block media to improve mathematics learning outcomes fractions summation materials. The score result of AF's study in 1-3 sessions is relatively high which is around 80-90. In addition, the score result of YAI's study in 1-3 sessions is also high, that is from 90-100.

Baseline data 2 (A2) shows that there is a tendency stability mathematic score acquisition on fraction summation materials learning outcomes after intervention (B).

According to the data of baseline phase 1 (A1) which obtained from subject AF and YAI, their mathematic learning outcomes on fractions summation materials have increased after giving intervention (B)by using the media block fractions. It can be seen from the increased scores achieved by subject AF and YAI starting from from baseline phase 1 (A1), intervention phase (B), and baseline phase 2 (A2).

This research was conducted with a single subject design A-B-A, the baseline phase 1 (A1), intervention phase (B), and baseline phase 2 (A2). All phases are carried out on different days with the same subject and treatment in accordance with the given phase. Baseline phase 1 (A1) was conducted in three sessions, intervention phase (B) was conducted in four sessions, and baseline phase 2 (A2) was conducted in 3 sessions. Various information has been obtained in the baseline phase 1 (A1) phase, intervention (B), and baseline phase 2 (A2). There are three sessions at the baseline phase 1 (A1). This phase is the measurement of blind students' mathematical learning outcomes on fraction summation materials before receiving intervention. In Baseline phase 1 (A1), the subjects were given 10 items of mathematics multiple choice test related to fractions summation materials. Based on data analysis obtained from baseline phase 1 (A1), the average score obtained from AF is 40 and YAI is 50. The data obtained at baseline phase 1 (A1) have a high stability (100%) on the subject AF and YAI Based on these data it can be seen that the ability blind children before given treatment on mathematic learning outcomes with fractions summation material is quite low. Since there is no media which can help student on fractions summation, that condition occurs to the blind students who still have difficulty in understanding the concept of fractions summation. After obtaining students' capability data on stable fractions summation materials, we conducted intervention phase (B).

Intervention phase (B) was conducted four times. The researchers used fractions summation block media for conveying fractions materials in intervention phase (B). The principle of learning with fractional block media is real, durable, attractive, and rewarding. By using this fractional block media, the students can study about fractions concretely. Based on the analysis of data obtained in intervention phase (B), AF obtained average score of 70.25. While, YAI obtained average score of 91.75. The data obtained in intervention phase (B) has high sufficient stability data, 100% in each subject. According to the data, it can be seen that the results of learning mathematics on fractions summation materials using fractions block media toward blind children have increased from baseline phase 1 (A1). It happened since the blind students can construct the abstract objects into the concrete one which is touchable and can be used for fraction summation by using that media. After studying mathematics results data fractions

summation material, blind children showed a positive trend and stable, then the introduction of the intervention is stopped. The next phase is the baseline phase 2 (A2). Baseline Phase 2 (A2) is the final phase in the research design with A-B-A. Baseline Phase 2 (A2) is a measurement of the condition of the end result of learning mathematics fractions summation material blind students after a given intervention (B) by using the media block fractions. Measurement results summation mathematics learning material fractions in baseline phase 2 is done by giving the sum of fractions math problems as many as 10 items directly with multiple choice. Based on the analysis of data obtained at baseline phase 2 (A2), the averaged score of AF IS 83.3. While the subject YAI got a score averaged 96.7. Data obtained at baseline phase 2 (A2) has a high data stability, which amounted to 100%. Based on these data, it can be seen the blind students' results of learning math fractions sum after being given treatment using block media fraction increased from baseline phase 1 (A1), and the intervention phase (B). After mathematic result on fractions summation materials toward visual impaired children has stable data, so the intervention is stopped.

Based on an analysis of data from all three phases, it is known that the use of fractional block media provide positive influence on mathematics learning outcome on fractions summation material toward blind students. It can be happened because the baseline 1 (A1) phase to intervention (B) increased from each subject. Besides, through baseline 2 (A2) which has positive improvement from baseline phase 1 (A1) and intervention phase (B). Data obtained in all phases of the data also have good stability. "*Besides the aspects of stability, whether there is intervention effect or not on the dependent variable also depends on the aspect of level changes, and the size of the overlap that occurs between the two conditions being analyzed*", (Sunanto, 2005). From the analysis of these data, it is known that both peresentase overlap data in this study is 0%. According Sunanto (2005), "*The lower of overlap percentage the better intervention effect to the target behavior*". Thus, the use of the fractions block media in this study is effective to improve blind students' mathematics learning outcomes on fractions summation material.

Fractions block media can be used as an interesting learning media. Fractional block media is a media made from cardboard, with circle-shaped base and it can be divided according to desired fractions. Fractions block media is used as a learning media which construct abstract fragments into concrete one, so the students with visual impairment can learn fractions summation materials easily. The implementation of that media is adapted to students' need and ability. Having fractions block media in learning fractions summation, students with visual impairment become enthusiastic to

participate in learning. It also can increase student interest and reduce their bored when learning mathematics focusing on fraction materials.

Based on research that has been conducted, the use of fractions block media for learning mathematics focusing on fractions summation materials has some advantages and disadvantages. The advantages obtained from the use of fractions block media in learning mathematics focusing on fractions summation materials is increasing enthusiasm of students with visual impairment to participe in learning activities in order to increase their learning outcomes. Material that is simple, real, easy to obtain, and practical size can accommodate students with visual impairment who prefer the tactile senses to learn mathematics fractions summation material. Other advantages obtained by the students is improving memory and easing them with visual impairments to learn fractions summation through concrete media. By using fractional block media, students with visual impairments can learn math fractions summation material independently.

On the other hand, there are weaknesses of all of media that has been designed. The weaknesses of using fractional block media is if the fraction shows large number, the fractional block will be divided into several smaller parts. So, it can be difficult for children with visual impairment. The fractions block size per-5, per-6, -per-7-per-8, per-9, and per-10 showed almost the same size, so the possibility of students with visual impairment having an error in the add fractions due to errors in taking media block fractions may happened. Besides, fractional block media made from cardboard with a smooth-rough surface is only owned by teachers, so students must take turns when using it and it spends much time. As a result, an action of perfecting fractional block media for further research is needed.

If the fractional block media effective in improving learning outcomes of math fractions summation material, the media can be used in studying the concept others fractions. Media is able to make the learning process more enjoyable. Then, the students with visual impairment can understand the concept of fractions well. They are also more active and motivate teachers to be more creative in using provided learning media in order to achieve the learning objectives and improve the quality of education.

4. Conclusion

Based on these results, it can be conclude that the use of fractional block media is effective to improve mathematics learning outcomes focusing on fraction summation material toward the fourth grade students with visual impairment.

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