JURNAL UPI

Indonesian Journal of Community and Special Needs Education

Journal homepage: http://ejournal.upi.edu/index.php/IJCSNE/

The Drilling Method Application Using Abacus to Arithmetic Operations Skills in Student with Hearing Impairment at Special School

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ABSTRACT

The purpose of this study was to determine the effect of the drilling method application using abacus in improving arithmetic subtraction operations skills in deaf children. This study used an experimental method with Single Subject Research (SSR), A-B-A design. The drilling method was used in the learning process. In addition, the abacus media was also used in the subtraction arithmetic operation material in learning mathematics. The results showed that there was an effect of applying the drilling method using abacus in improving the arithmetic subtraction operation skills in deaf children with the initials SS. This could be seen from the increase in the mean level of student's abilities starting from baseline-1 (A1) by 30%, intervention (B) by 65%, and baseline-2 (A2) by 86.66%. The methods and media were suitable to make the lesson easier to understand for students. The drilling method with the abacus media could be used as an alternative for teachers in improving the skills of arithmetic subtraction operations in deaf children. The results of this study are expected to contribute to developing special education related to the application of the drilling method using abacus media to improve arithmetic operations skills in learning next math.

ARTICLE INFO

Article History:
Submitted/Received 01 Feb 2021
First revised 10 Apr 2021
Accepted 16 Apr 2021
First available online 27 Jul 2021
Publication date 01 Mar 2022

Keyword:
Abacus Media,
Counting Operation Skills,
Drilling Method,
Mathematics,
Student with Hearing Impairment

1. INTRODUCTION

Mathematics is a branch of science that can always be learned by every child (Celik, 2018). In formal institutions, mathematics lessons are always available at every level of education from kindergarten to university, both in public schools and in special schools or special schools (SLB). Mathematics lessons should be introduced as early as possible (Ridgway, 2016). That's because, mathematics is one of the subjects that are useful for human life. Studying mathematics requires ability in abstract understanding, because it is related to number symbols and also mathematical symbols (Papadakis *et al.*, 2018). Student with hearing impairment have difficulties in learning mathematics, it can be said that it is natural because general students in regular schools also have difficulty in learning mathematics.

Currently, many studies explain about learning mathematics. Starting from the discussion about learning mathematics (Fuentes *et al.*, 2020), methods for learning mathematics (Supriatna, 2019), media in learning mathematics (Widodo, 2018), problems in learning mathematics (Kunwar, 2020), teaching mathematics (Polydoros, 2021). However, until now there has been no research that explains the effect of applying the drill method with the abacus media in improving arithmetic subtraction operation skills in student with hearing impairment.

Student with hearing impairment are those who have problems in the aspects of hearing and communication [9]. Student with hearing impairment are able to capture subject matter at school like students in general who attend regular schools, one of which is mathematics. Important mathematics lessons are given to student with hearing impairment so that they are able to think abstractly and logically in solving problems for their survival in the future. However, communication problems made it difficult for them to receive information. They find it difficult to accept complex and abstract information (Rusyani *et al.*, 2021a). Simple methods and concrete media are needed in the learning process (Rusyani *et al.*, 2021b). moreover, student with hearing impairment are visual learners (Susetyo *et al.*, 2021).

Therefore, this study aims to determine the application of the drill method with the abacus media in improving arithmetic subtraction operations skills in student with hearing impairment. Single Subject Research (SSR) experimental method with A-B-A design was used in this study. Drill method and abacus media are used to make it easier for students to understand information in the learning process. The results showed that there was an effect of applying the drill method with the abacus media in improving the arithmetic subtraction operation skills in student with hearing impairment with the initials SS. This can be seen by the increase in the mean level of students' abilities starting from baseline-1 (A1) by 30%, intervention (B) by 65%, and baseline-2 (A2) by 86.66%. This research is expected to be an alternative for teachers in improving arithmetic and subtraction operations skills in student with hearing impairment.

2. Theoritical Framework

2.1. Mathematics Learning for Student with Hearing Impairment

Mathematics is a science that is obtained by reasoning (Chotimah *et al.*, 2018). This does not mean that other sciences are not obtained through reasoning, but in mathematics it emphasizes activities in the world of ratios (reasoning), while in other sciences it emphasizes the results of observations or experiments in addition to reasoning. Mathematics learning is given systematically and based on previous learning experiences. Someone will be able to learn new mathematics if it is based on the knowledge that has been learned. Mathematics

DOI: https://doi.org/10.17509/ijcsne.v2i1.37133
p- ISSN 2775-8400 e- ISSN 2775-9857

is one of the many subjects in the curriculum structure in Indonesia which is applied in every level of education (Maryanti, 2021), especially in special schools. There are several materials discussed in learning mathematics, one of which is about subtraction. Reduction is a process of taking part or all of it so that the result or the rest becomes less or less.

For student with hearing impairment learning mathematics is no less important than studying other subjects, but there are many obstacles faced by children in learning mathematics. The difficulty of student with hearing impairment in learning mathematics is broadly divided into two parts, namely difficulties that come from within the child and difficulties that come from outside the child. Difficulties that come from within the child. In student with hearing impairment, this difficulty is related to the inability of student with hearing impairment to obtain information through the sense of hearing so that they have difficulty using language and speech which has an impact on the difficulty of using language for academic purposes. Functionally, the development of student with hearing impairment is influenced by language skills, so the intelligence development of student with hearing impairment is hampered (Susetyo *et al.*, 2021). Difficulties that come from outside the child, many factors are difficult for student with hearing impairment in learning mathematics. In addition to environmental factors, in studying mathematics, errors often occur. One of them is symbols, in learning mathematics many use symbols which have an impact on children having difficulty in learning mathematics, even for student with hearing impairment. Children will answer questions incorrectly because they do not understand mathematical symbols such as plus (+), minus (-), equals (=), and so on. In addition to the difficulty in understanding symbols, other difficulties that make children, especially student with hearing impairment, in learning mathematics are place values, the use of incorrect processes, and illegible writing.

2.2 Drilling Method

One method in the teaching and learning process is the drill method. (drill method) is a teaching method by inviting students to a skill training area to see how to make something, how to use it, what it is made for, what are the benefits and so on (Fitri & Yogica, 2018). The advantages of using the drill method in learning are as follows (Gan *et al.*, 2019): (a) Able to acquire motor skills, such as writing, pronouncing letters, making and using tools. (b) Able to acquire mental skills, such as in multiplication, addition, subtraction, division, signs/symbols, and so on. (c) Can form habits and increase the accuracy and speed of implementation.

In implementing the drill method, steps such as (Kumar *et al.*, 2019):

a. Before the exercise is carried out, students should be given an explanation of the meaning or benefits and objectives of the exercise.
b. Exercises should be done gradually, starting with the simple ones and then progressing to more complex or difficult levels.
c. During the exercise, pay attention to which parts are considered difficult by the child.
d. Need to prioritize accuracy, so that students do the exercises correctly, then pay attention to speed; so that students can perform the speed or skill according to a predetermined time.
e. It is necessary to take into account the training period so that it is not boring but turns the situation into fun.
f. It is necessary to pay attention to individual differences so that the abilities and needs of students are channeled.

2.3 Students with Hearing Impairment

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p- ISSN 2775-8400 e- ISSN 2775-9857

A student with hearing impairment is someone who has a hearing impairment or loss, either partially or completely (Rusyani *et al.*, 2021a). In general, it can be divided into two categories, namely deafness and lack of hearing so that it has an impact on daily life. The inability of student with hearing impairment to hear causes limitations in absorbing information, inhibits abstraction power so that it can also hinder the achievement of wider knowledge (Rusyani *et al.*, 2021b). In general, student with hearing impairment have average or normal intelligence (Rusyani *et al.*, 2021a). Student with hearing impairment tend to have low achievement compared to hearing children their age in verbal subjects such as Indonesian, Science, Social Sciences, Civics, Mathematics (in story problems), and Sound Arts; but in nonverbal subjects such as Sports and Skills, in general, they are relatively the same as friends who hear (Susetyo *et al.*, 2021).

2.4 Abacus Media

An abacus is a medium or tool for performing arithmetic operations in mathematics in the form of a quadrilateral and there are rows of beads that can be shifted from up and down or from right and left. The following are some of the benefits of using the abacus media (Rahadyan *et al.*, 2020), including: (a) Optimizing brain function because when children use the abacus, children will concentrate on counting. Indirectly the mind will work. In addition, children will also use their imagination and logic to calculate the results of mathematical operations which will later be shown in the form of beads so that children's imaginative thinking will work. (b) Train imagination, creativity, logic, systematic thinking, and concentration. (c) Increase speed, accuracy, accuracy in thinking. (d) Becoming more sensitive to spatial arrangements due to the influence of imagining the abacus in the child's mind. If a child is able to imagine mathematical calculations through the mind, the child's thought process will be easy to imagine something abstract. (e) For children who neglect to memorize, the use of the abacus is very helpful.

3. METHODS

This study focuses on the application of the drill method with the abacus media in improving arithmetic subtraction operations skills in student with hearing impairment. The research subjects were student with hearing impairments in special schools, in West Java. We used a single subject research (SSR) experimental research method with an ABA research design. The A-B-A design has three stages, namely baseline-1 (A-1), intervention (B), baseline-2 (A-2).

Figure 1 shows the ABA design. Baseline-1 (A1) is the initial condition of the subject regarding the skills of calculating subtraction operations that are savings and loans without being given instructions or repeated treatments. Measurements in the baseline phase were carried out for three sessions or until the trend in the direction and level of the data became stable with a duration that was adjusted to the needs. Baseline (B), is the condition of the subject when given treatment in the form of intervention through the drill method with the abacus media. In this intervention, students are trained repeatedly, the aim is to see the skills of students in performing subtraction operations that are savings and loans using the drill method. This intervention was given for six sessions or until the trend direction and data level became stable with each session. Baseline-2 (A2), was measured without intervention to determine the effect of the intervention or treatment that had been given. Measurements in the baseline-2 phase were carried out in three sessions.

DOI: https://doi.org/10.17509/ijcsne.v2i1.37133
p- ISSN 2775-8400 e- ISSN 2775-9857

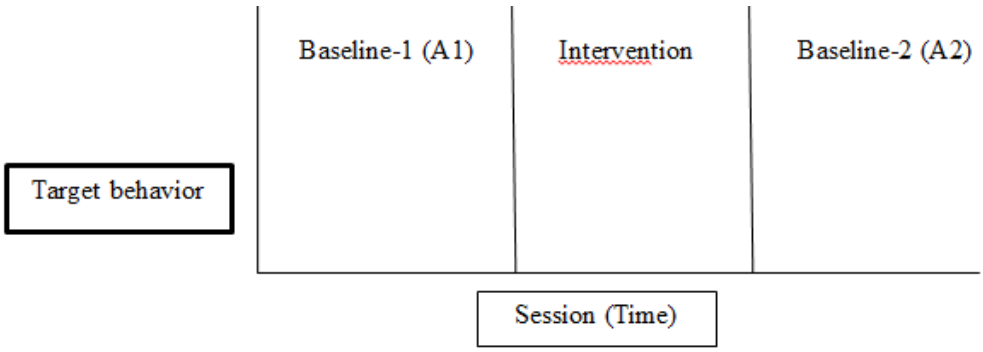

Figure 1. ABA design in single subject research method.

The researcher used a written test, in which students were asked to answer questions about subtraction using a borrowing technique given under conditions of baseline-1 (A1), intervention (B), and baseline-2 (A2). There are several stages in data collection techniques. The stages carried out include: (1) Creating a Research Instrument Grid, (2) Develop Research Instruments, (3) Preparing the Assessment Format as a Guide for Measuring Students' Skills in Reducing Borrowing Techniques, (4) Validity Test, (5) Reliability Test.

4. RESULTS AND DISCUSSION

4.1. Students Demographic

The subject in this study was a student with hearing impairment or deafness who attended SLB. He is 9 years old and is in the second grade of elementary school. The characteristics of the selected research subjects are based on the results of observations and preliminary studies that have been previously conducted by researchers. SS has a hearing loss rate of 90dB and is classified as severely deaf. SS has been able to perform addition and subtraction arithmetic operations without borrowing techniques, but the subject has not been able to perform subtraction calculations using borrowing techniques. Students with hearing impairment have problems with communication (Maryanti *et al.*, 2021).

4.2. Research Data Analysis

For student with hearing impairment, learning mathematics is no less important than studying other subjects. Student with hearing impairment have difficulty understanding or accessing information through their hearing (Hidayat *et al.*, 2020). The obstacles experienced resulted in difficulties in various aspects, such as the academic aspect, in particular performing the operations of calculating the reduction of savings and loans. One method that can be used in performing subtraction operations is the drill method. The skill training method (drill method) is a teaching method by inviting students to a skills training area to see how to make something, how to use it, what it is made for, what are the benefits and so on (Noland *et al.*, 2020). The drill method is also visual and the learning is direct and repeated, so it can be applied to student with hearing impairment who are gems or children who rely on their sense of sight to absorb information.

Efforts to improve the skills of arithmetic subtraction operations are carried out through the drill method with the abacus media. The drill method with the abacus media is a learning method that uses concrete media (Jacquet *et al.*, 2019). The findings obtained are students' skills in addition and subtraction through the drill method have increased. Then the application of the drill method with the abacus media which is visual, direct learning, not difficult, is assumed to improve the operational skills of calculating savings and loans

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p- ISSN 2775-8400 e- ISSN 2775-9857

reduction in student with hearing impairment, because the learning is carried out systematically and consistently in a short period of time but is often done, so that the skills it will become a habit that can be done by itself. Data retrieval at baseline-1 (A1) was carried out with the aim of seeing how the initial ability of the subject or learner in counting operations skills (savings and loans) before being given intervention using the drill method with the abacus media. In this phase, the subject is given a written test of 10 questions that are carried out over three sessions. The ability of students in arithmetic and subtraction operations skills (savings and loans) in the first session received a score of 3 with a percentage of 30%, then in the second session students obtained a score of 3 with a percentage of 30%, and in the third session students obtained a score of 3 with a percentage of 30% . Based on the results from the first session to the third session the results were the same, namely 30%.

After conducting baseline-1 (A1), the next step is to provide intervention (B). The intervention was carried out for six sessions, and every day. At this stage, the researcher carried out learning activities for calculating subtraction operations skills (savings and loans) using the drill method with the abacus media. After the learning is done, the researcher conducts an evaluation which is carried out at the end of the learning activity through a written test, the same as what was done in the baseline-1 (A1) phase. The acquisition scores of students in arithmetic reduction operations skills (savings and loans) in intervention activities are, in the first session they get a score of 6 with a percentage of 60%, in the second session, a score of 5 with a percentage of 50%, third, fourth, fifth and sixth students obtained the same score of 7 with a percentage of 70%. Based on the scores obtained by students in the intervention phase (B), it can be seen that there is an increase in students in performing arithmetic subtraction operations skills (savings and loans).

The baseline-2 (A2) phase was carried out with the aim of seeing how the skills of calculating subtraction operations (savings and loans) were carried out after the intervention using the drill method with the abacus media. The baseline-2 (A2) phase was carried out in three sessions or the same as the baseline-1 (A1) phase. The score obtained by students at baseline-2 (A2) is in the first session getting a score of 8 with a percentage of 80%, then in the second and third sessions students get a score of 9 with a percentage of 90%. Thus, in the baseline-2 (A2) phase, the ability to count operations (savings and loans) using the drill method using the abacus media increased compared to baseline-1 (A1). **Table 1** shows the overall data on the results of the study regarding the arithmetic subtraction operation skills in grade 2 student with hearing impairment at SLB Negeri A Citeureup Cimahi at baseline-1 (A1), intervention (B), and at baseline-2 (A2). **Figure 2** explains visually, the data in table 1 above. About Development of Operational Skills Ability to Calculate Reduction in the baseline-1 phase (A1), the intervention phase (B), and the baseline-2 phase (A2).

Table 1. Overall data capability of operation skills count reduction.

***Baseline*-1 (A1)**			**Intervention (B)**			***Baseline*-2 (A2)**		
Session	**Scores**	**(%)**	**Session**	**Scores**	**(%)**	**Session**	**Scores**	**(%)**
1	3.00	30%	4	6.00	60%	10	8.00	80%
2	3.00	30%	5	5.00	50%	11	9.00	90%
3	3.00	30%	6	7.00	70%	12	9.00	90%
			7	7.00	70%			
			8	7.00	70%			
			9	7.00	70%			
Total	9.00	90%	Total	39.00	390%	Total	26.00	260%
Average	3.00	30%	Average	6.50	65%	Average	8.60	86.66%

DOI: https://doi.org/10.17509/ijcsne.v2i1.37133
p- ISSN 2775-8400 e- ISSN 2775-9857

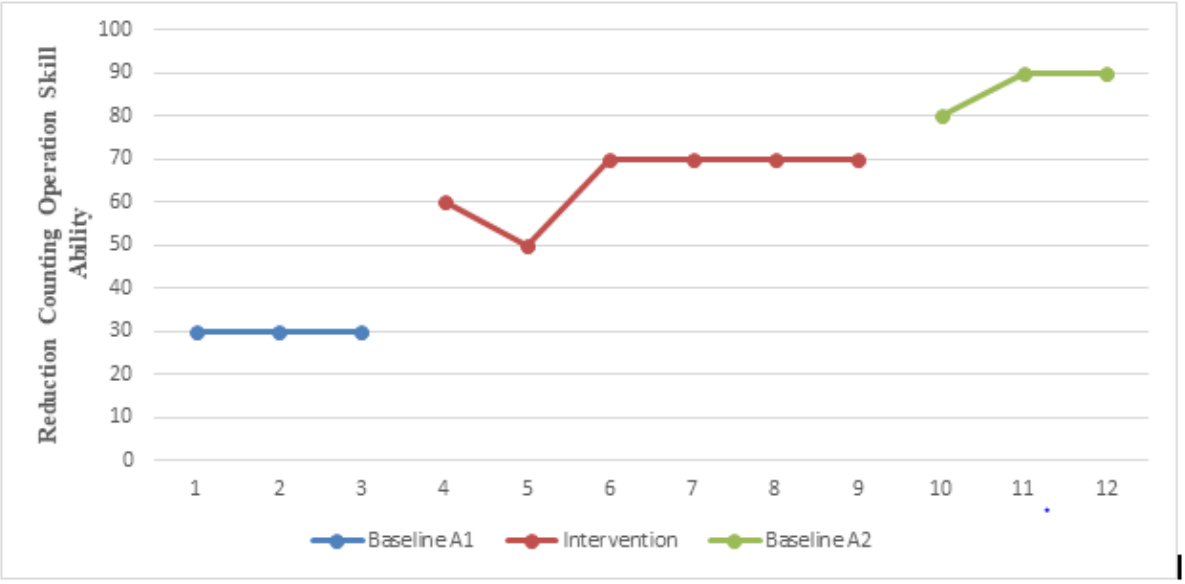

Figure 2. Development of Operational Skills Ability to Calculate Reduction in the baseline-1 phase (A1), the intervention phase (B), and the baseline-2 phase (A2).

4.3. Analysis Data

Based on the results of processing and analysis in outline on the graphs A-B-A yields a result that the application of the drill method with the abacus media can improve arithmetic subtraction operations skills on SS subjects, grade 2 student with hearing impairments at SLB Negeri A Citeureup Cimahi. This can be seen from the increase in the mean level between the subject's initial ability in the baseline-1 phase (A1) and the final ability of the subject in the baseline-2 phase (A2) after the intervention using the drill method increased by 56.66% which means the subject experienced an increase in arithmetic subtraction operation skills.

This happens because the drill method with the abacus media is one of the effective ways, which can be used by teachers during teaching and learning activities, especially the skills of arithmetic and subtraction operations. In addition, the drill method (practice) has benefits for gaining mental skills, such as in multiplication, addition, subtraction, division, signs/symbols, and so on. Learning methods for students should be used methods that attract the attention of students and are easy to apply (Rusyani *et al.*, 2021a). One of the interesting methods is the drill method. The drill method is an activity that is carried out repeatedly so that it strengthens skills so that they become permanent. The drill method is a method that can be used for all groups, including students.

The results showed that there was a change and an increase in the mean level of subtraction arithmetic operation skills at each stage. This can be seen from the mean level of the baseline-1 (A1) stage of 30%, an increase in the intervention stage which has a mean level of 65% and the mean level of the baseline-2 (A2) stage of 86.66%. The baseline-2 (A2) phase is the control phase where in this phase it becomes a benchmark for whether there is a change in the ability to calculate subtraction operations after the intervention is given.

Research subjects with the initials SS experienced an increase in arithmetic subtraction operation skills. In the research process, the intervention applied was the provision of the drill method with the abacus media. The drill method with the abacus media was given continuously for 6 sessions. The drill method with the abacus media has an effect on subtraction arithmetic operation skills, this can be seen from the results of the analysis

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p- ISSN 2775-8400 e- ISSN 2775-9857

between conditions, namely the percentage of data overlap in the baseline-1 condition (A1) to the intervention stage (B) which is 0% and at the intervention stage (B) to the baseline-2 (A2) stage of 0%, these results indicate that the intervention has an effect on the target behavior, which in this study is the subtraction arithmetic operation skill. The smaller the percentage of overlap, the better the influence of the intervention on the target behavior (Holman *et al.*, 2018).

Based on the discussion above, it can be concluded that the drill method with the abacus media has an influence in improving the skills of arithmetic subtraction operations. This is also in line with the results concluding the findings obtained are that the skills of students in addition and subtraction through the drill method in class I have increased (Karnes *et al.*, 2021), Instead of the drill method with the abacus media can be used as an alternative solution to assist students in performing arithmetic subtraction operations.

5. CONCLUSION

In this study, we used the SSR experimental method with the ABA design. The drill method and the abacus media are used during the mathematics learning process for second grade student with hearing impairments. The application of the drill method with the abacus media can improve arithmetic subtraction operation skills in grade 2 student with hearing impairment in SLB. This can be seen from the ability of students before and after the application of the method. This can be seen from the increase in the mean level of the baseline-1(A1) stage by 30%, the increase in the intervention stage with the mean level of 65% and the mean level of the baseline-2 (A2) stage of 86.66%. The application of the drill method with the abacus media proves to be able to help in learning objectives, especially in this study is the skill of arithmetic subtraction operations.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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p- ISSN 2775-8400 e- ISSN 2775-9857