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THE IMPACT OF DEMONSTRATION METHODS SUPPORTED BY ABACUS MEDIA ON THE ADDITION SKILLS OF INTEGERS 1-10 IN CHILDREN WITH INTELLECTUAL DISABILITIES

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Abstract

This research aims to apply a demonstration method using an abacus which can overcome the problem of counting 1-10 in mentally retarded children. This research uses a type of experimental research, namely single subject research with a B-A-A-B design. The data obtained was analyzed using quantitative descriptive analysis and then clarified using graphs and tables. The subjects of this research were students with moderate mental retardation who experienced difficulty in solving addition calculation problems. From the research results, the intervention phase-1, baseline-1, and intervention-2 experienced an increase after being given the intervention and in the baseline phase-2 there was a decrease because the intervention was not provided for a long period of time. With the demonstration method assisted by abacus media, there is an influence on the numeracy skills of mentally retarded students

Keywords: Intelectual Dissability, Demonstration Method, Abacus Media, Counting Skills

Abstrak

Penelitian ini bertujuan untuk menerapkan metode demonstrasi dengan media sempoa yang dapat mengatasi permasalahan berhitung penjumlahan 1-10 pada anak tunagrahita. Penelitian ini menggunakan jenis penelitian eksperimen yaitu penelitian subjek tunggal (Single Subject Research) dengan desain B-A-A-B. Data yang diperoleh dianalisis menggunakan analisis deskriptif kuantitatif selanjutnya diperjelas dengan grafik dan tabel. Subjek penelitian ini adalah siswa tunagrahita sedang dan mengalami kesulitan dalam menyelesaikan persoalan berhitung penjumlahan. Dari hasil penelitian, fase intervensi-1, baseline-1, dan intervensi-2 mengalami peningkatan setelah diberikan intervensi dan pada fase baseline-2 mengalami penurunan karena tidak diberikannya intervensi dalam jangka waktu yang lama. Dengan adanya metode demonstrasi berbantuan media sempoa terdapat pengaruh terhadap kemampuan berhitung siswa tunagrahita.

Kata kunci: Tunagrahita, Metode Demonstrasi, Media Sempoa, Kemampuan Berhitung

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INTRODUCTION

Education is a fundamental right that every citizen should possess. Every individual is entitled to develop and contribute to society, including those with Special Needs (SN). Children with special needs require an appropriate education just like any other child. Through education, children with special needs can optimally enhance their inherent potential. This potential can be realized by providing education and services tailored to the specific needs and characteristics of children with special needs, utilizing suitable strategies and learning media. One area of potential that this research will focus on is children with intellectual disabilities (mental retardation) in special schools (SLB).

A child classified as having intellectual disabilities is one who possesses cognitive abilities below the average level, necessitating specialized services or assistance for their development, including educational programs and guidance (Efendi, 2006). In the learning process, children with intellectual disabilities often struggle to grasp mathematical concepts. Therefore, there is a need for effective teaching methods to facilitate their understanding of mathematics.

Based on the observations, it was found that in the subject of mathematics, the student faced difficulties when solving arithmetic problems involving whole numbers from 1 to 10. During the addition exercises, the teacher instructed the student to use their fingers for counting, leading to a manual counting method. For instance, in the addition problem 3 + 4, the student would represent the number 3 with their right hand and the number 4 with their left hand, subsequently counting the total. However, while using this method, the student frequently made errors in counting and answering the questions, necessitating assistance and guidance to arrive at the correct answers. Furthermore, interviews with the second-grade teacher for students with intellectual disabilities revealed that there were no available resources to support these students in understanding and solving addition problems.

One effective approach to assist students with intellectual disabilities in mastering addition is the demonstration method. This instructional strategy involves the teacher demonstrating the steps of a process with explanations and visual aids, while students attentively observe the teacher as the lesson material is presented (Rahardja, 2002). Additionally, engaging and tangible materials are essential to aid students with intellectual disabilities in grasping mathematical concepts, one of which is the abacus. According to Mardiyana et al. (2002), the abacus serves as a valuable teaching tool for helping children learn to count. The abacus utilized in this study is a rectangular wooden model featuring five beads on each row.

Based on the aforementioned issues, the researcher aims to enhance addition calculation skills by employing a demonstration method supported by the use of an abacus, utilizing the Single Subject Research (SSR) methodology. The study conducted examines the impact of the demonstration method aided by an abacus on the addition calculation abilities at SLB Tunas Harapan IV Sumobito.

METHOD

This study employs the Single Subject Research (SSR) methodology, which focuses on a single subject. According to Sunanto et al. (2005), SSR is a research method designed to assess the impact of repeated interventions on a specific behavior intended for modification. The SSR design utilized in this research follows a B-A-A-B framework, comprising four distinct phases: B1 (intervention-1), A1 (baseline-1), A2 (baseline-2), and B2 (intervention-2). The rationale for selecting this design stems from the necessity of training students with intellectual disabilities in mathematical skills, specifically counting using an abacus. It is essential that these students receive preliminary training; otherwise, they would struggle to solve arithmetic problems using the abacus if introduced to it without prior

preparation. Consequently, the research initiates with the first intervention (B1), followed by the first baseline (A1) after the intervention, then the second baseline (A2), and concludes with the second intervention (B2).

The subject of this research is second-grade students with intellectual disabilities at SLB Tunas Harapan I in Sumobito, Jombang. These students exhibit specific academic abilities in mathematics, such as counting from 1 to 10, writing numbers from 1 to 5, and performing calculations, albeit with guidance and support from their teachers. During mathematics lessons, these students often struggle to maintain focus, frequently disrupting their peers.

The research employs a written test as its primary instrument. This test assesses the students' counting abilities, specifically focusing on their skills in adding whole numbers from 1 to 10. Students are instructed to solve addition problems using an abacus as a learning tool. Data collection occurs through testing conducted across four phases of the study: intervention-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (A2). The data analysis methods utilized in this research include condition analysis and analysis across conditions.

RESULTS AND DISCUSSION

This study employs the Single Subject Research (SSR) methodology utilizing a B-A-A-B design. Data were collected over 16 sessions, comprising 4 sessions during the first intervention phase (B1), 3 sessions in the first baseline phase (A1), 5 sessions in the second baseline phase (A2), and 4 sessions in the second intervention phase (B2). The data were gathered through written tests assessing the addition of whole numbers from 1 to 10. The collected data, which evaluated the addition skills using an abacus during the written tests, were summed to obtain a total score. Each question was assigned a value of one for a correct answer and zero for an incorrect one. The findings from the research indicated the results for the addition skills across the conditions of intervention-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (B2) as follows:

Table 1. Recapitulation of the results of the addition calculation ability from intervention phase-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (A2)

Condition	Session	Score Value
Intervensi-1 (B1)	1	70
	2	70
	3	80
	4	80
Baseline-1 (A1)	1	80
	2	90
	3	90
Baseline-2 (A2)	1	50
	2	60
	3	60
	4	60
	5	60
Intervensi-2 (B2)	1	80
	2	90

3	80
4	90

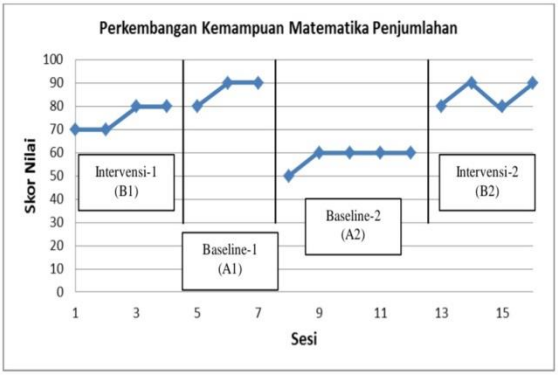

Figure 1. The ability to calculate the addition of intervention phase-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (A2)

Based on figure 1, it can be seen that the data acquisition of mentally retarded students' abilities in the ability to calculate addition from intervention-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (A2) conditions. In the intervention-1 (B1) condition, the lowest data acquisition value was 70 and the highest value was 80. In the baseline-1 (A1) condition, the lowest data acquisition value was 80 and the highest value was 90. In the baseline-2 (A2) condition, the lowest data acquisition value was 50 and the highest value was 60. In the intervention-2 (B2) condition, the lowest data acquisition value was 80 and the highest value was 90.

In the Single Subject Research (SSR) method, data analysis is used, namely analysis in conditions and analysis between conditions. Analysis in conditions is analyzing data in a condition, such as intervention-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (A2). The components analyzed in this condition are determining the length of the condition, estimating the direction of the trend, stability trend, data trace, stability level and range, and level of change. The following is an analysis of each component of the analysis in conditions:

Table 2. Results of analysis in conditions of intellectual disability addition arithmetic ability

No	Kondisi	Intervensi (B1)	*Baseline-1* (A1)	*Baseline-2* (A2)	Intervensi (B2)
1	Panjang Kondisi	4	3	5	4
2	Estimasi Kecenderungan Arah	(+)	(+)	(+)	(+)
3	Kecenderungan stabilitas	100% Stabil	100% Stabil	80% Stabil	100% Stabil
4	Jejak Data	(+)	(+)	(+)	(+)
5	Level Stabilitas dan Rentang	Stabil 70 – 80	Stabil 80 – 90	Stabil 50 – 60	Stabil 80 – 90
6	Level Perubahan	80-70 (+10) Naik	90-80 (+ 10) Naik	60-50 (+ 10) Naik	90-80 (+ 10) Naik

Based on the analysis in the conditions can be summarized as follows: first, the length of intervention condition-1 (B1) is 4 sessions, the length of baseline condition-1 (A1) is 3 sessions, the length of baseline condition-2 (A2) is 5 sessions, and the length of intervention condition-2 (B2) is 4 sessions. Second, the estimated trend direction in intervention conditions-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (A2) tends to increase so that it shows a positive effect. Third, the stability tendency of intervention-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (A2) is stable with a stability value in intervention-1 (B1) 100%, in baseline-1 (A1) 100%, in baseline-2 (A2) 80%, in intervention-2 (B2) 100%. Fourth, the data traces in intervention-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (A2) conditions tend to increase, thus indicating a positive influence. Fifth, the stability level and range in intervention-1 (B1) conditions are stable with a range of 70-80, baseline-1 (A1) conditions with a range of 80-90, baseline-2 (A2) conditions with a range of 50-60, and intervention-2 (B2) conditions with a range of 80-90. Sixth, the level of change in all conditions of intervention-1 (B1), baseline-1 (A1), baseline-2 (A2), and intervention-2 (B2) is 10 and has a positive value.

The data analysis components contained in the inter-condition analysis are the number of variables changed, changes in direction and effect tendencies, changes in stability tendencies, changes in level and percentage of overlap. The following are the components of the inter-condition analysis:

Table 3. Results of the analysis between conditions of the addition arithmetic ability of mentally retarded children

Perbandingan Kondisi	**B1/A1**	**A1/A2**	**A2/B2**
Jumlah Variabel yang Diubah	1	1	1
Perubahan Kecenderungan dan Efeknya	B1 (+) A1 (+)	A1 (+) A2 (+)	A2 (+) B2 (+)
Perubahan Kecenderungan Stabilitas	Stabil ke Stabil	Stabil ke Stabil	Stabil ke Stabil
Perubahan Level Data	80-80 (0)	90-50 (– 40)	60-80 (+20)
Data Overlap	33,3 %	0%	0%

Based on table 3 shows the results of the analysis between conditions in the addition calculation ability of mentally retarded students can be concluded as follows: First, the number of variables from intervention condition-1 (B1) to baseline-1 (A1) is 1 variable. Likewise from baseline condition-1 (A1) to baseline-2 (A2) and from baseline condition-2 (A2) to intervention-2 (B2). Second, the change in the direction of the tendency and its effect on conditions B1 to A1 the trend direction is increasing so it is said to be positive. Likewise, the comparison of conditions A1 to A2 and A2 to B2 the direction is increasing and positive. This can be said that the addition calculation ability has increased and it can be said that in this study it has a positive effect. Third, the change in the stability tendency in the intervention condition-1 (B1) and baseline-1 (A1) the stability tendency is 100%, so the comparison is from stable to stable. In baseline-1 (A1) condition, the stability tendency is 100% and baseline-2 (A2) condition, the stability tendency is 80%, so the comparison is from stable to stable. Then in baseline-2 (A2) condition is 80% and intervention-2 (B2) is 100%, so the comparison is from stable to stable. Fourth, the change in level between intervention-1 (B1) condition is 80 and the first data point in baseline-1 (A1) is 80, so the difference is 0. In baseline-1 (A1) condition is 90 and the first data point of baseline-2 (A2) is 50, so the difference is a decrease of 40. In baseline-2 (A2) condition is 60 and the first data point of intervention-2 (B2) is 80, so the difference is an increase of 20. Fifth, the percentage of everlap in intervention-1 (B1) condition to baseline-1 (A1) is 33.3% where there is one overlapping data. In the condition of baseline-1 (A1) to baseline-2 (A2) the percentage of overlap is 0% which means there is no overlapping data. Likewise, in the condition of baseline-2 (A2) to intervention-2 (B2) the percentage of overlap is 0%.

In the first intervention phase (B1), the subject's counting ability was recorded as 70, 70, 80, and

80, indicating an improvement in addition skills following the intervention. At the onset of the first intervention, the subject demonstrated an understanding of how to add numbers using an abacus. However, the subject frequently struggled to recall the representations of numbers 5 through 10 on the abacus, necessitating repeated practice until mastery was achieved. This observation aligns with the findings of Liswana and Rahmawati (2018), which suggest that students with intellectual disabilities often experience memory lapses, prompting educators to conduct frequent demonstrations during mathematics instruction. The intervention involved demonstrating the use of the abacus. According to Roestyah (2008), the demonstration method is employed to teach students by illustrating and explaining the steps involved in completing a task.

During the intervention, the subject exhibited enhanced addition skills compared to the pre-intervention condition. The subject became more proficient in solving arithmetic problems using the abacus. Additionally, the subject displayed improved focus and was less easily distracted while working on problems, as attention was directed towards the abacus being utilized. This observation supports the assertion made by Sari and Syahrini (2018), which states that employing the demonstration method in teaching arithmetic operations helps concentrate students on a specific object—in this case, the abacus—facilitating a better understanding of the material being taught.

In this study, baseline-1 was given after the intervention because the subjects would not be able to do math problems if they were not trained to use an abacus, so in doing addition math with an abacus, the subjects had to be trained first. In the baseline-1 (A1) phase, the results showed that the subjects' addition calculation ability increased after being given an intervention using the demonstration method assisted by an abacus with a value of 80, 90, 90. In baseline-1, the subjects were fluent in solving addition problems using an abacus. Jadhav & Gathoo (2018) stated that the use of appropriate media can overcome students' difficulties in learning mathematics and improve the quality of the learning process to make it more interesting and effective.

In baseline-1 (A1) conditions or after treatment with the demonstration method assisted by abacus media, the indicators are as follows: (1) knowing the symbols of numbers 1-10 on the abacus, (2) shifting the beads to the top and bottom of the abacus media, (3) adding integers 1-10 using an abacus. From these indicators, the subject can carry out the indicators that have been designed correctly, so that the subject's arithmetic ability after being given treatment increases well. This is in accordance with the opinion of Sasmitowati (2020) that the demonstration method is a very effective method in helping students to answer their learning needs with their own efforts based on clear and correct facts and data obtained from demonstrations. This is in line with Huda (2010) who stated that one of the advantages of the demonstration method is that it makes learning more concrete and clear. Concrete learning can help mentally retarded students understand learning.

Baseline phase-2 (A2) is conducted following baseline phase-1 (A1) with an interval of approximately 8 weeks. During baseline phase-2 (A2), the subjects exhibited a decline in their addition calculation skills, with scores of 50, 60, 60, 60, and 60. This decline can be attributed to the extended

time gap before the testing in baseline-2, which resulted in the subjects forgetting previously learned material during the intervention phase. The subjects struggled to recall the numerical symbols for 5-10 but retained knowledge of the symbols for 1-4 on the abacus, leading to incorrect responses on the test. This observation aligns with Apriyanto's (2012) assertion that children with intellectual disabilities possess a limited memory span, particularly in academic contexts, and often struggle with abstract thinking.

The lengthy duration between baseline-1 and baseline-2 resulted in the subjects forgetting the numerical symbols on the abacus, which hindered their ability to accurately answer addition test questions using the abacus. This indicates that interventions must be implemented consistently. This perspective is supported by Yurmailis et al. (2013), who noted that the most significant challenge faced by children with intellectual disabilities in recalling information lies in their short-term memory capacity, necessitating repetitive teaching methods. Furthermore, research by Putri (2014) indicates that children with intellectual disabilities learn through diligent effort and repetition, as they encounter challenges related to intelligence and physical impairments. Therefore, it is essential to provide continuous intervention using a demonstration method supported by abacus media.

In the intervention phase-2 (B2) the subject experienced an increase in value of 80, 90, 80, 90 after the baseline phase-2 (A2). In the second intervention phase the subject was again given intervention or treatment using a demonstration method assisted by abacus media. This is in line with research conducted by Fajria (2013) which states that the characteristics of mentally retarded children are having limited intelligence which results in difficulties in participating in learning, but if mentally retarded children receive continuous services and guidance, it is expected to be able to improve the ability of mentally retarded children in learning. Therefore, the provision of intervention-2 subjects experienced an increase in their ability to calculate addition after baseline-2. Piaget also stated that to overcome students' difficulties in learning mathematics, each mathematical concept must be introduced in a concrete form (Piaget, 1997). Research conducted by Rohendi, et al. (2017) also stated that the use of learning media can help students improve their arithmetic skills. Therefore, the use of abacus media with demonstration methods can help improve the subject's ability to calculate addition.

Efendi (2006) stated that mentally retarded children are children who are identified as having below average or normal intelligence, so that in terms of their development, mentally retarded children require special services or assistance, including in terms of education programs and guidance. From these characteristics, mentally retarded children need appropriate learning methods and media so that they can better understand mathematics learning materials. One of them is using methods and media that can influence mentally retarded children. Methods that are suitable and have a positive influence on mentally retarded children are lecture, demonstration and drill methods. This is in line with the opinion of Dewi (2016) who explained that the demonstration method is considered appropriate for use with mentally retarded children, because this demonstration method shows directly how to use concrete media in the mathematics learning process. Meanwhile, media that are suitable and have a positive

influence on mentally retarded children are puzzles, card media, abacus, and number boards. This is in line with the opinion of Mardiyana, et al. (2002) that the abacus is one of the mathematical demonstration media that is useful for helping children learn to count.

Research on the demonstration method assisted by the abacus concerning the addition skills of whole numbers from 1 to 10 in children with intellectual disabilities at SLB Tunas Harapan IV Sumobito indicates that the application of this method effectively enhances addition skills. The interventions provided to the subjects significantly improved their addition capabilities. This is evidenced by the analysis results, both within conditions and across conditions, which demonstrate that the abacus-assisted demonstration method positively influences the enhancement of addition skills among students with intellectual disabilities, as indicated by their ability to perform addition operations independently and in accordance with the established indicators. The improvement is observable in the trend and effects, showing a progressive increase from intervention-1 (B1) to intervention-2 (B2).

Based on the data analysis presented in tables and graphs using a B-A-A-B design, it can be concluded that the abacus-assisted demonstration method has a positive impact on improving the addition skills of students with intellectual disabilities. This finding aligns with the research conducted by Widodo & Wahyudin (2018) on the effectiveness of using the abacus as a concrete learning medium, which suggests that concrete or semi-concrete learning media can be utilized to enhance students' mathematical abilities.

CONCLUSION

The use of demonstration methods assisted by abacus media has an effect on the ability to calculate the addition of integers 1-10 in mentally retarded students, which is indicated by the results of the score of the ability to calculate the addition which increased after being given intervention. This is proven by the results of the analysis of the test implementation data that has been carried out. The results of the analysis of the test implementation data show an increase in scores after being given intervention and a decrease in scores after not being given intervention for a long period of time. This shows that the intervention given to the subject has an effect on the target behavior.

Based on the conclusions above, suggestions can be submitted to the parties, namely teachers, schools, and further researchers. For teachers, it is expected to be able to apply the demonstration method and abacus media in mathematics learning in the classroom. For schools, it is expected to be able to provide student needs such as learning media, one of which is the abacus media to support learning activities in the classroom. For further researchers, it is expected to be able to develop the results of this study by developing other methods, media models and learning materials. So that it can be more innovative and this research can be a reference for further research.

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