JURNAL UPI

JURNAL ASESMEN DAN INTERVENSI ANAK BERKEBUTUHAN KHUSUS

Jurnal homepage: https://ejournal.upi.edu/index.php/jassi/index

The Use of Number Tower Media to Improve Intelligence Count Operation Ability in Deaf Students

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ABSTRACTS

The purpose of this study was to determine the use of the Tower of Numbers media in improving the ability to count integer operations for deaf students. The research method used is classroom action research or abbreviated as CAR. The subjects in this study were 4 students with hearing impairments at the Special School, in Subang Indonesia. The results of using the Integer Tower media are very easy and helpful for students in solving math questions in addition and subtraction of integers with results below 15. It can be seen that the average result of the first cycle is 43.75, the second cycle is 56.67, and the third cycle is 66.67. There is an increase of 20.75% from cycle I to cycle III which indicates an increase in the ability to count integer operations through number tower media for deaf students. This is because using the Number Tower media makes it easier for students to complete arithmetic operations on integers. The number tower media is considered by teachers to be used in learning mathematics with integer arithmetic operations and can be used for normal students and students with special needs.

ARTICLE INFO

Article History:
Received 05 Aug 2021
Revised 24 Sep 2021
Accepted 05 Oct 2021
Available online 11 Oct 2021

Keyword:
Concept of integer,
Deaf students,
Media tower number.

1. INTRODUCTION

Deafness is a condition or condition of a person who experiences a lack or loss of the sense of hearing so that he is unable to capture stimuli in the form of sound, sound, or other stimuli through hearing. As a result of the delay in the development of hearing, so that a deaf person is also hampered by his speech and language skills, which results in a deaf person experiencing delays and difficulties in matters relating to communication. Winarsih (2007) suggests that deafness is a general term that indicates hearing difficulties from mild to severe, classified into deaf and hard of hearing. Deafness can occur in pre-language and post-language. Prelingual deafness is a hearing loss that occurs before speech and language skills develop, while post-lingual deafness is a hearing loss that occurs after the development of speech and language skills spontaneously

The following are definitions and definitions of deafness from several book sources; According to Winarsih (2007), deafness is a general term that indicates hearing difficulties from mild to severe, classified into deaf and hard of hearing. Condition of an individual who experiences damage to the sense of hearing so that he cannot catch various sound stimuli, or other stimuli through hearing. Hearing loss that results in a person not being able to capture various stimuli, especially through the sense of hearing. Someone who experiences a lack or loss of hearing ability either partially or completely due to the malfunctioning of part or all of the hearing device, so that he cannot use his hearing device in everyday life which has an impact on his life. In a complex manner.

The material given is planting the concept of negative numbers as well as addition and subtraction operations on integers. This material is one of the basics in teaching the concept of more complex numbers. The results of the study of student books from the Ministry of Education and Culture which are commonly used in the field are still lacking in building the concept of addition and subtraction of integers and in developing students' creativity independently. Based on the results of research conducted by Iskandar et al, it is stated that in the implementation of integrated thematics in the field it is still felt to be lacking in terms of content or material. In addition, in the field, there is also no learning module based on the 2013 curriculum that is practical and effective to be used as a reference in learning. Learning requires teachers to visualize the material they will present to students in the hope that deaf students will understand it more easily. Therefore, it is necessary to have practical and functional media for learning. In terms of language, the word media comes from the Latin medius which literally means "middle", "intermediary". In Arabic, the media is an intermediary (wasaa'il) or an introductory message from the sender to the recipient of the message. However, in terms of terminology, the media has many meanings put forward by experts.

So, in general, it can be interpreted that learning media is a tool for the teaching and learning process. That is everything that can be used to stimulate the thoughts, feelings, attention, and abilities or skills of students so that it can encourage the learning process to occur in students (students/students).

Learning media can also be interpreted as a tool or means or intermediary used in the process of interaction that takes place between teachers and students to encourage the teaching and learning process to acquire knowledge, skills and strengthen what is learned, and helping to achieve quality learning goals (see **Figure 1**). Batubara (2015) revealed that the use of interactive learning media in learning mathematics is one way to visualize abstract mathematical material so that it is easy for students to understand and can improve their memory of the material presented. Learning media is an inseparable part of learning activities

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 1412-9337 e- ISSN 2776-8783

in schools. The utilization of learning media is also a creative and systematic effort to create experiences that can help students' learning processes. This is because the media acts as a learning stimulant and can foster learning motivation so that students do not get bored easily in following the teaching and learning process.

An integer is a number consisting of whole numbers {0,1,2,3,4,...} and negative numbers {-1,-2,-3,-4,…}. Integers or integers in number theory are symbolized by Z. So, it can be written as the set Z={…,-4,-3,-2,-1,0,1,2,3,4,…..}. Integers can be written without a decimal component (comma). If written in decimal, then the writing is the number 0 after the comma. For example 3.0 or 4.0. Integers are made up of numbers. whole and negative numbers whose set can be divided into (i) Positive Integer; (ii) Negative Integer; (iii) Integer Zero.

2. METHODS

The research method used is classroom action research or abbreviated as CAR. The use of classroom action research methods is considered appropriate by researchers because the problems studied are within the scope of the problems of the teaching and learning process in the classroom. The classroom action research method is intended to improve and improve the quality of the teaching and learning process carried out by teachers in the classroom.

Stated that "classroom action research can be interpreted as action research (action research) carried out to improve the quality of the process and learning outcomes of a group of students." The Classroom Action Research process is a series of spirals or cycles of action and research consisting of a sequence of planning (plan), action (act), observation (observe), and reflection (reflect). The design in this study uses a minimum of two cycles of action as shown in **Figure 2**.

The cycle in the research action plan has four phases, namely: (i) planning, (ii) action, (iii) observation, and (iv) reflection. Each cycle consists of 4 phases/stages of planned activities, namely: Develop a plan of action (planning). At the stage of preparing the action plan, this study explained what, why, what, where, by whom, and how the action was carried out, implementation of the action (acting). Action implementation is the implementation or application of the design content, observation (observing). Observation activities are carried out by observer teachers. Observations are carried out at the time of the implementation action. Both take place simultaneously, and reflection (reflecting). This activity recounts what has been done. Reflection activities are very appropriate when the implementing teacher has finished taking the action.

Figure 1. Media tower of numbers.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-8400 e- ISSN 2775-9857

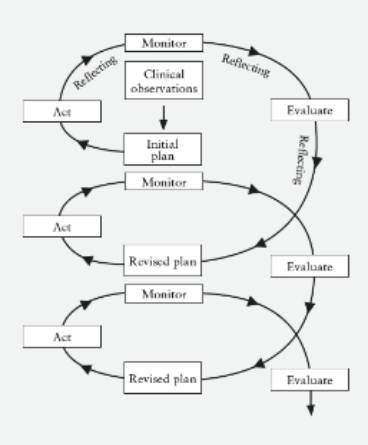

Figure 2. Classroom action research cycle.

2.1 Subject and location

This research was carried out at the Subang State Special School with the research subjects being class VIII students of deaf junior high school, totaling 4 people, namely P, A, V, and C.

3. RESULTS AND DISCUSSION

3.1 Student Demographics

Table 1 describes the initial conditions of students in understanding the concept of integer arithmetic operations under study. In the table, we discuss four students, namely: P, V, A, and C. The students we studied were case VIII SMPLB students with hearing impairments. Student P has better math skills than his friends because student P's communication skills are very good, fast in understanding the commands and instructions given. Student V has the same ability as student P. Student A has lower abilities than students P and V because in communicating they are still not fluent in both sign language and total communication, they still have to be explained with a reel example, and Student C has not been able to understand counting operations. Unanimous because student C has a low arithmetic operation concept ability. Due to the ability to communicate, student C is less able to understand sign language and total communication.

Table. 1 Student's initial ability**.**

No	Subject	Condition of Child Assessment Results	
		Math Ability	**Language skill**
1.	P	Able to perform arithmetic operations	Able to communicate total communication and sign
2.	A	Able to perform arithmetic operations	Able to communicate total communication and sign
3.	V	Able to perform arithmetic operations	Able to communicate total communication
4.	C	Able to perform arithmetic operations	Less able to communicate total communication and signs

The overall test results were obtained from the results of the assessment or pre-cycle and the test results in each cycle, namely cycle I, cycle II, and cycle III. From the results of the arithmetic operation test on integers using the number tower media, the overall results obtained from the assessment results and test results in each cycle, namely cycle 1, cycle 2,

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 1412-9337 e- ISSN 2776-8783

and cycle 3 as shown in the tables above are then made a recap of the results. Test the ability to count operations with integers. The results of the recap of the ability to count integer operations can be seen in **Table 2**.

Table 2. Recap of Operation Test Results Count Integers Data on Operational Assessment Results Count Integers Using Number Tower

Activity	Meeting	P	A	V	C
Pre Cycle		55	40	25	15
Cycle 1	P-1	60	45	25	25
	P-2	65	50	30	35
	P-3	75	65	50	45
Average Value of Cycle Meeting 1		63,33	50	30	31,67
Cycle 2	P-1	70	55	45	35
	P-2	70	65	50	40
	P-3	75	65	50	45
Average Value of Cycle 2 Meeting		71.67	61.67	53.33	40
Cycle 3	P-1	80	65	50	45
	P-2	85	70	55	55
	P-3	90	80	65	60
Average Value of Cycle 3 Meeting		85	71.67	56.67	53.33

In the pre-cycle activity, the average integer arithmetic operation ability test result was 33.75. From this result, P and A had the highest value, while V and C had the lowest value.

Then in the first cycle which was carried out in three meetings, it can be seen that both P, A, V, and C increased. The average value in the first cycle was 43.75 or an increase of 12.9% from the average value in the first cycle. Then in the second cycle, P, A, V, and C increased at each meeting, the average value in cycle II was 56.65 or an increase of 12.84% compared to cycle I. In cycle III both P, A. V, and C experienced a significant increase in all aspects of integer arithmetic operations. The average value in this cycle is 66.67, which is an increase of 8.27%. That approves as Pratama (2016) said that learning mathematics with the use of visual aids can improve numeracy skills for deaf students.

Furthermore, the data recap of the test results for the ability to count integer operations is in **Table 2**. The above is then processed to determine the assessment criteria. The criteria for assessing the ability to count integer operations are based on the Sturgess formula as follows:

(i) Total data (n) = 10

(ii) Minimum data X_{min} = 30

(iii) Maximal data X_{maks} = 100

(iv) Determine the number of interval classes

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-8400 e- ISSN 2775-9857

K = 1 + 3,322 log n

K = 1 + 3,322 log 11 = 5,26 rounded to 5

(v) Calculating the length of the class interval (i)

Interval class length (i) $\frac{Range\ (R)}{Number\ of\ classes\ (k)} = \frac{100-30}{5} = 14$

Furthermore, from the data recap of the test results for the ability to count integer operations using the number tower listed in **Table 3** and then visualized in the form of **Figure 3**.

Data on the results of teacher assessments in the teaching and learning process as shown in **Table 2** is the result of the assessment of the teacher partners as a form of control to maintain and improve the quality of learning. The data is then recapitulated. The results of the recap of teacher assessment scores in the teaching and learning process can be seen in **Table 3**.

To facilitate the analysis and discussion of score data for learning activities, a score conversion was made. This score conversion is used to determine the criteria for assessing the results of the teacher's teaching and learning process through the use of number tower media. The process of making score conversions is as follows:

(i) Total data (n) = 9

(ii) Minimum data Xmin = 59.26

(iii) Maximum data Xmax = 85.19

(iv) Interval class

k = 1 + 3,322 log n = 1 + 3,222 log 9 = 5.17 rounded up to 5 classes

Interval class length (i)

Interval class length (i) (Range (R))/(Number of Classes (k)) = (85.19-59.26)/5 = 5.18 rounded up by 5.

Thus, from the results of the conversion of scores from the activities of the teaching and learning process, it can be determined the assessment criteria for the teaching and learning process of teachers using the number tower media. From the teacher activity data in the process of teaching and learning activities as in **Table 3**, it can be described in graphical form in **Figure 4**.

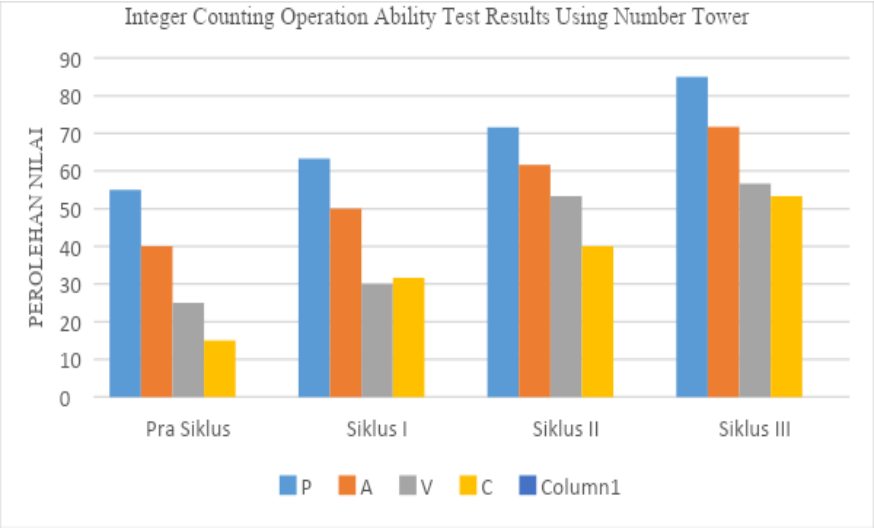

Figure 3. Integer counting operation ability test results using number tower.

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 1412-9337 e- ISSN 2776-8783

Table 3. Recap of teaching and learning activities.

Action Activities	Pert	Skor PBM	Average/cycle
Cycle 1	P1	59,26	64,40
	P2	61,11	
	P3	70,37	
Cycle 2	P1	70,37	72,84
	P2	70,37	
	P3	77,78	
Cycle 3	P1	79,63	82,10
	P2	81,48	
	P3	85,19	

Learning media is a tool or means or intermediary used in the process of interaction that takes place between educators and students to encourage the teaching and learning process to acquire knowledge, skills and strengthen the material learned can be conveyed properly to assist in achieving quality learning goals. Deaf students as seen in the pre-cycle experience difficulty in counting, this is corroborated by the opinion of Prayugo and Effendi (2017) that the Deaf have difficulties in the learning process, especially in arithmetic operations due to hearing impairment which causes delays in language development in understanding and receiving subject matter.

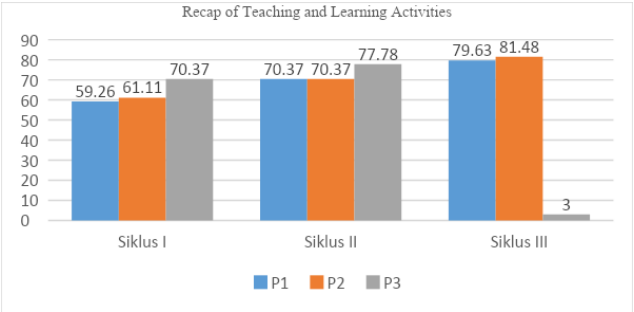

Figure 4. Process activities learning activities cycle 1, 2, and 3.

Media Tower Integers is a medium that can be used to help deaf children in grade 8 SMPLB understand the concept of integers and arithmetic operations of addition and multiplication. As stated by Wong and Evans (2027) that deaf children will be more interested if they get simpler and more practical techniques, this Number Tower Media greatly facilitates and helps students in solving math questions in addition and multiplication of integers with results below 15. It can be seen that the average result of the first cycle is 43.75, the second cycle is 56.67, and the third cycle is 66.67. There is an increase of 20.75% from cycle I to cycle III which indicates an increase in the ability to count integer operations through number tower media for deaf students.

4. CONCLUSION

Based on the results of the analysis and discussion of the data, the study obtained conclusions that the use of number tower media for the numeracy skills of class VIII students

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-8400 e- ISSN 2775-9857

with hearing impairment at the extraordinary junior high school at the Subang State Extraordinary School. The results of this study indicated that the ability of students to perform arithmetic operations on integer's increases at each meeting in the three cycles carried out. The number tower can be used to perform arithmetic operations on integers because it is a practical and easy-to-use medium for every student in this study.

5. ACKNOWLEDGMENT

We acknowledged "Sekolah Luar Biasa Negeri Subang". This study was supported by Kantor Jurnal dan Publikasi (KJP) - Universitas Pendidikan Indonesia (UPI), Departemen Pendidikan Khusus - UPI, dan Dinas Pendidikan Provinsi Jawa Barat bidang Pendidikan Khusus dan Layanan Khusus (PKLK). We also thank to "Indri Nurlaeli Permata Putri, S.Pd, Mukti Amaliani, S.Pd, and Kusmana, S.Pd ". We also acknowledged Deden Syaiful Hidayat, M.Pd. (Kepala bidang PKLK), Dr.Eng. Asep Bayu Dani Nandiyanto (Kepala Kantor, KJP UPI), Dr. Yuyus Suherman (Ketua Departemen, Departemen Pendidikan Khusus, UPI), Rina Maryanti, M.Pd. (Assistant Professor, Departemen Pendidikan Khusus, UPI), Muktiarni, M.Pd. (Assistant Professor, Departemen Pendidikan Tata Boga, UPI), Ahmad Bukhori Muslim (Director, Directorate of International Affairs, UPI), Nissa Nur Azizah, Dwi Fitria Al Husaeni, and Dwi Novia Al Husaeni. This program is also supported by Program Pengabdian Masyarakat and Bangdos UPI.

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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DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 1412-9337 e- ISSN 2776-8783