



Analysis of the Clap Method as an Recognition Strategy Mathematics Numeration in Autism Students at Special Needs School

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Article History:

Received: Mar 04, 2023

Revised: Apr 11, 2023

Accepted: Apr 18, 2023

Online First: May 06, 2023

Keywords:

Autism,
Special Needs School,
Merdeka Curriculum,
Clap Method.

Kata Kunci:

Autisme,
Sekolah Luar Biasa,
Kurikulum Merdeka,
Teknik Bertepuk Tangan.

How to cite:

Suryadi, Y., & Armanto, D. (2023). Analysis of the Cap Method as an Recognition Strategy Mathematics Numeration in Autism Students at Special Needs Schools. *Edunesia: Jurnal Ilmiah Pendidikan*, 4(2), 855-867.

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Abstract: Many interventions are done by parents to build some stimulation for their autistic children. Various stimulation techniques and models are created to stimulate the development of the brain, which is related to the ability to achieve the intended educational achievements. The most important hope of parents for their autistic children is the ability for them to live independently in the future, that is why early interventions need to be done, including educating their children via particular institution unit, such as special needs school, which contains in addition to academic subjects as well as non-academic ones that have been adapted according to the needs of the students. Mathematics is one of the subjects needed by students in general and students with disabilities in particular as a basis for growth in their logical thinking development, which is essential for their future. This research lasted for two months, with a qualitative study focusing on 20 students in Special Needs School at Deli Serdang; in the end, the conclusion is that the clapping technique for introduction numbers in A and B classes works. Students can sequence numbers well enough and know about the symbols of numbers.

Abstrak: Segala intervensi dilakukan oleh para orangtua dan guru dalam usaha menstimulasi anak-anak autistiknya. Beragam teknik dan model stimulasi muncul untuk merangsang daya kembang otak dan kemampuan anak terkait agar mencapai Capaian Pendidikan yang dituju. Harapan para orangtua yang paling utama terhadap anak-anak autistiknya adalah adanya kemampuan untuk mereka hidup mandiri kedepannya kelak, maka intervensi sedari dini dilakukan, termasuk mendidik anak-anak mereka melalui Satuan Pendidikan Khusus, SLB (Sekolah Luar Biasa), yang memuat selain mata pelajaran akademis juga non akademis yang telah diadaptasi sesuai kebutuhan siswa-siswinya. Mata pelajaran Matematika sebagai dasar berpikir logis, sangat dibutuhkan oleh anak-anak pada umumnya, dan anak penyandang autisme pada khususnya, sebagai konsep logika mereka dimasa depan. Penelitian ini berlangsung dalam kurun waktu 2 bulan (Februari hingga Maret 2023) dan bersifat kualitatif, dengan sasaran murid autisme sebanyak 20 anak dari sebuah SLB di Deliserdang. Penelitian ini membuktikan teknik bertepuk tangan sebagai dasar pengenalan bilangan, urutan angka, pada mata pelajaran Matematika pada fase A, cukup efektif dan cukup berhasil, sehingga ketika di fase B, murid-murid telah mampu mengurutkan bilangan kurang dari 10 dengan baik, dan kepada kelas yang lebih tinggi telah mampu mengurutkan hingga angka ke 50 dengan baik, serta berhasil mencocokkan jumlah bilangan dan simbol angka dengan cukup baik.

A. Introduction

The ability of children to recognize symbols and sequences of numbers through mathematics is the basis for them to explore patterns of creative, intelligent, and logical thinking (Surat, 2016). Mathematical, analytical intelligence is essential for ordinary children in general and children with disabilities in particular, especially as a provision for their future life. The introduction to the concept of mathematical logic given to children must be packaged in such a way according to their level of (Suripatty et al., 2019).

The introduction of mathematics as a basis for logical thinking must start early according to age; for example, at a young age, from early childhood education to at least the third grade of elementary school, teaching techniques and media must be in a concrete form that is easy to understand, this is by Piaget's learning theory, and Jerome Bruner, known for his cognitive learning theory (Ariesta, 2021). In contrast, for autistic children in particular, educators must be able to package mathematical concepts as well as possible so that they can be accepted as flexibly as possible as a basis for developing systematic, rational thinking that is adaptive in their future lives (Ulva & Amalia, 2020).

Initiated by EFA (Education for All), which was agreed upon by more than 300 participants in Spain in 1994, countries in Asia then improved the education system for every layer of individuals with disabilities, including in (Nurfadillah, 2021). The existence of a Special Education Unit in the form of an extraordinary school has been regulated in Law No. 8 of 2013. The government, through the Ministry of Education and Culture of the Republic of Indonesia, ensures equal rights in education for people with disabilities, both in the form of providing learning facilities for people with disabilities as well as providing appropriate learning programs for them without discrimination (Priamsari, 2019), as a foundation for the formation of a complete Indonesian society in the future (Suryadi & Ndona, 2023), considering Bappenas data for 2018 there were 21.84 million Indonesians with disabilities, with a significant prevalence level of people with autism, it is estimated that there are 2.4 million people with Autism Spectrum Disorder (ASD) in Indonesia with an increase of 500 new people/year. Indonesia, through the Ministry of Education and Culture itself, regulates the four types of interference that are legally protected itself (Indonesia, 2017) to get the right to education, including (1) physical disabilities, such as physically disabled (D), blind (A), deaf (B), orthopedic disorders and so on related to physical/physical disabilities (2) mental disabilities those that refer to emotional disorders, personal abnormalities (schizophrenia, bipolar, hearing impairment and others) are not said to be intellectual disabilities, because in 2002 dr. Faisah Yatim DTM&H, MPH states that 20% of children with autism (Q) have an IQ (Intelligence Quotient) of more than 70 (Yatim, 2003). This includes disability in social relations (Autism Spectrum Disorder), hyperactivity (3), intellectual disability, a type of disability that is widely known as mentally retarded (C), with cases of RM (mental retardation), namely IQ between 70-90, or below 70, with the general title slow learner, including down syndrome (DS) (4) multiple disabilities, the meaning of multiple disabilities is an individual who has multiple disabilities, such as blind and deaf.

Autistic disability is a disability with pervasive disorders, or pervasive developmental disorders which are often accompanied by sensory and cognitive impairments; in fact, many autistic sufferers have deafness and visual impairment simultaneously (multiple) (Suteja, 2014). The word autism comes from the word auto, which means alone. People with autism, as if they live in their world, have deficiencies in interacting with others. However, few have been able to behave socially after receiving a lot of intervention and education (Koswara, 2016). Autism was first introduced in 1943 by a psychologist from Johns Hopkins University, United States Leo Kanner (Susanti, 2014). Pervasive disorders are developmental disorders, including communication, interaction, and behavioral disorders, such as stimming behavior and pacing. This communication disorder also varies, from communication that is non-verbal to limited communication skills (unique, echolalia, and so on) (Wiguna, 2021). This disorder is a spectrum, so autistic people are known as ASD (Autism Spectrum Disorder).

Symptoms of autism disorders can be detected early by parents of their children from an early age, for example, not turning when called, not interested in interacting with people or the surrounding environment, and looking like a child with hearing (Manalu et al., 2013). In addition, parents can refer to attachment 1 of the Regulation of the Minister of Education and Culture of the Republic of Indonesia number 137, in 2014, concerning national standards for early childhood education content standards regarding the achievement of child development, including the following table:

Table 1. Development of Children Aged 12 - 24 Months

12 - 18 Months	18 - 24 months
Fine Motor	
1. Making free streak	1. Make vertical-horizontal lines
2. Stack three cubes up though it is unperfect	2. Turning the pages of a book even
3. Holds glass with two hands	3. Shred papers
4. Put objects in containers	
5. Spilling objects from containers	
Learning and problem Soling	
1. Mention some names of objects and types of food	1. Using type game tools, playing without order
2. Mention some names of objects pictures of people's faces	2. Understanding pictures of people's faces
3. Name various foods	3. Knowing some basic colors (red, blue, yellow, green)
Symbolic Thinking	
Mention the numbers 1-10 without fingers but many are left out with the fingers	Able to say the numbers 1-5

At the age of development, children aged 12-18 months are at least able to make free streaks, stack small cubes, hold a glass with both hands, put objects into containers, and spill

them, while at the age of 18-24 months, children at least children can say numbers 1 – 5 using their fingers, can understand facial images, can say the names of foods and ask about names of objects or foods that are unfamiliar to them and can recognize some primary colors. Delays in these developments must be watched out for as a symptom of a disorder that must be immediately intervened for optimal child growth and development.

The American Psychiatric Association (APA), in 2013, divided the levels of people with the Autism Spectrum into three levels ([American Academy of Pediatrics, 2023](#)). Level 1, referred to as the 'little help' level, is related to the condition in which autistic individuals have mild autism symptoms and can speak, understand sentences, and engage in social interactions but have difficulty reciprocating in conversations. Level 2, known as the level of needing 'great assistance,' in the sense that individuals with autism at level 2 have experienced a decrease in interaction skills, both verbal and non-verbal, repetitive behavior, and limited interests are highly visible in individuals with autism at this level 2. Level 3 is a personal condition of autism that requires much help and significant support to carry out daily activities. Conditions of severe deficits in skills, non-verbal communication, and very limited initiation of social interaction make level 3 the most severe level in the DSM V (Diagnostic and Statistics of Mental Disorders) issued by APA ([Surjaningrum & Mujahadah, 2022](#)).

Meanwhile, according to Baron Cohen, an autism researcher from the United Kingdom, in 2000, autistic children had limited ability to think about social problems and behaviors. They had difficulty understanding events that involved them, including socializing and communicating ([Kusnadi & Novianti, 2022](#)). The cause of ASD itself has not been established; multi-factorial and genetic factors immensely influence the birth of children with ASD ([Dwiputra et al., 2021](#)); genetic data have reported a high incidence of autism in those who have a prenatal history such as premature, postmaturity, antenatal bleeding in the I - II trimesters and maternal age over 35 years ([Nugraheni, 2012](#)).

For these four types of disabilities, the government regulates and develops an adaptive, contextual curriculum structure as the basis for independent education for each individual. As with public schools, the curriculum structure for individuals with disabilities has implemented modules containing Learning Outcomes and Learning Objectives Flow for each subject. For example, Mathematics which is then addressed to 6 Phases, has three critical points that are developed in the Learning Outcomes and Learning Objectives Flow; the three points are rationale, purpose, and characteristics of mathematics, while the six phases referred to are Phase A to phase F, where in phase A is the class 1-2 phase with a mental age of ≤ 7 years, ends in phase F with a mental age of ± 10 years.

Mathematics itself becomes compulsory learning in the structure of the formal education curriculum, including special formal education units, namely Extraordinary Schools. Mathematics is the basis of numeracy which is very influential in the daily life of a child in the future ([Ekowati & Suwandayani, 2019](#)), especially for people with disabilities who have more challenges in managing their independent lives in the future. Through an independent curriculum, the government guarantees education that is evenly distributed at

all levels of society, including layers of children with cases of illness. The application of the phase system is one example of how education has been differentiated according to the conditions of the children in the field (Kemendikbud, 2022); this is proof of the implementation of how various disciplines are then given to each individual for their self-development. Learning Achievements in phase A for the Mathematics subject itself, namely, *'Pada akhir Fase A, peserta didik dapat memahami, membilang dan menuliskan bilangan asli sampai dengan 20...'* with the Flow of Learning Objectives on number elements, namely (1) mentioning symbols 1-20, (2) sorting numbers 1-20 with concrete objects (3) writing number symbols 1-20 (4) showing how to add natural numbers whose maximum result is equal to 10 with concrete objects (Tahar & Rajani, 2022). In phase A, there is data and opportunity analysis material with the aim that children can separate categories regarding large and small numbers and large and small sizes.

Furthermore, in phase B (generally mentally aged ± 8 years, in grades 3 and 4), the introduction of numbers reaches 50. It begins to recognize the amount of money, but when the introduction of the amount of money will experience repetition in phase C so that in phase B the introduction of money is done as initial socialization only. For data and opportunity analysis, material leads to comparing the number of concrete objects in large or small amounts.

Furthermore, in phase C (generally children aged ± 8 years, in grades 5 and 6), students learn numbers reaching 100. Students have been able to sort numbers 1-100 and have been able to add up concrete numbers with a result of at least 50. In data analysis material and opportunities, students are expected to be able to group objects based on size, shape, and color and present data in tabular form. Phase D (generally mentally aged ± 9 years) has understood the concept of plus-minus numbers up to 100. Students have been able to identify the price of goods in their daily life as an implementation of data and opportunity analysis. Phase E (generally mentally aged ± 10 years, and sitting in grade 10) students already know plus or minus, know the decimal number one decimal place after the decimal point and begin understanding the concept of percent operations. In this phase, students have been able to write down shopping needs and the amount of money needed in tabular form. Phase F (generally aged ± 10 years, sitting in grades 11 and 12), students have been able to carry out mixed operations and have been able to calculate profit and loss in the process of shopping for daily needs with money.

Oriented to the Independent Curriculum for class Q in particular, the mathematics subject given has objectives relevant to independence and life skills, critical and creative reasoning abilities. It was conveyed in the structure of the Merdeka Curriculum that Mathematics for class Q (autism) especially developed the ability to recognize numbers, sequence numbers, and read numbers on concrete objects. It needs to be underlined that understanding story problems will be more difficult for children with autism to understand (Kamilah & Awalludin, 2021). Besides that, algebra and calculus math skills are not given because they are categorized as abstract material (Asesmen, 2022). In the future, it is hoped

that individuals with autism can master numeracy skills for their independence and apply mathematical logic concepts in developing their potential.

B. Method

This research is qualitative, with samples taken from several students with autism and as many as 20 children with autism at SLB.Mutiara Hati Deliserdang. The results of this study are in the form of narratives, which are based on a post-positivist philosophy, namely studying a phenomenon with direct observation as the primary key to research. Collecting data in this study using triangulation techniques. The triangulation technique is a multi-method technique used in researching data through the results of discussions, in-depth interviews, direct observation, and the collection of documents and photos. Researchers conducted in-depth interviews with relevant sources such as teachers and guardians of students. In addition, researchers also made direct observations of children with autism, who were the source of this study. The data is also equipped with photos of Individual Learning Plan (RPI) documents that use the clapping technique in Cognitive and Mathematics learning in the preparatory class and Mathematics in the lower grades.

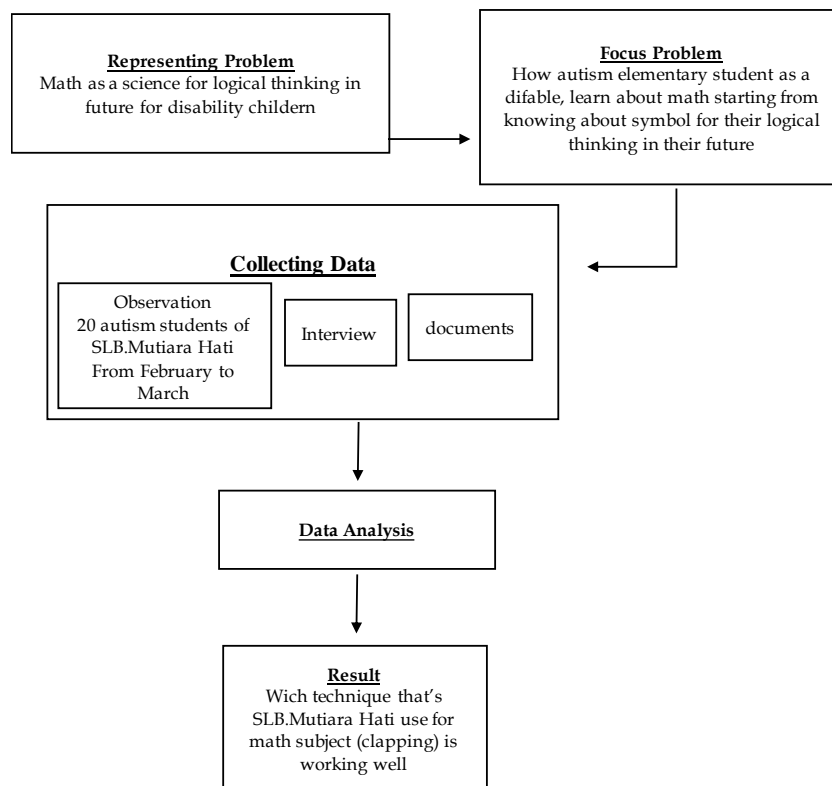


Figure 1. Research Flow

Direct observations of students by researchers lasted for approximately two months, including the collection of documents from the last two semesters at the end of the

2021/2022 academic year and at the beginning of the 2022/2023 semester. At the beginning of the study, data were separated based on class and age through the following table:

Table 2. Names of Students with Autism in Prep 1 And Prep 2 Classes

No.	Name	Age	Autis Level	Class
1	Fatih	9 years old	2	P1
2	Azzahra	10 years old	3	P1
3	Novika	11 years old	3	P1
4	Cristian N.	7 years old	2	P2
5	Al-Farezi	7 years old	1	P2
6	Malik N.	6 years old	2	P1
7	Kiki Nasution	7 years old	1	P2
8	Azmi Siregar	8 years old	1	P2
9	Ayu Zahra	12 years old	3	P1
10	Ayu Zahrani	12 years old	2	P2
11	Shofwan	10 years old	2	P1

Table 2 describes autistic students who are still in the Preparation class, where the preparation class is a class for autistic children who still behave in level 2 and 3 positions. While students who are at level 1 but are in class P2 are in preparation for students' adaptation to grade 1 and usually come or enter school in the middle of the semester, then Kiky, with level 1 autism behavior, is still in class P2 because she was found to have decreased focus in the last semester.

Table 3. Class 1-5 Autism Student Names

No.	Name	Age	Level	Kelas
1	Luis	10 years old	1	3
2	Ahmad Lubis	13 years old	1	5
3	Pertama N.	12 years old	2	1
4	Putra C.	16 years old	2	3
5	Fitrilia	11 years old	1	4
6	M. Pasaribu	15 years old	1	4
7	Ihsan	8 years old	1	1
8	Zalman	11 years old	1	3
9	Ahmad T.	14 years old	1	1

20 students with autism in SLB. Mutiara Hati, there are three students in grade 1, 3 in grade 3, 2 in grade 4, and 1 in grade 5. Of the nine students involved, 2 of them behaved non-verbally. M. Pasaribu is in grade 4, with autism behavior at level 1. Meanwhile, even though he is in grade 3, the son has autistic behavior at level 2 because apart from non-verbal behavior, the son still needs help from other people to exercise independence over himself (bathing, eating, urinating, defecating, and so on). Some of these students are still in grades 1 and 3 even though they have reached the age of 8 and over because these children come to school in the middle of the semester.

C. Result and Discussion

Result

At SLB. Mutiara Hati Deliserdang, where the research was conducted, there were 96 students, of which 20 children had autism. Of the 20 children with autism, 11 are still in the preparatory class; the adaptation class goes to grade 1. The researcher found six students over the age of 9 years still in the preparatory class because they enrolled in an SLB when they were nine years old. In the preparation class, students learn to adapt, improve focus, and develop sensor integration and cognitive and language skills. Students in the preparatory class, namely those who in daily life need help in caring for themselves, apart from including non-verbal individuals as well, two students in the level two category still often have sudden tantrums and cry suddenly with behavior self-endangering stimming. However, in the third year of development from the interventions given at school and support at home, the child has started to be able to eat his drink on his own, even though sudden crying and angry behavior still frequently occur, as well as obstacles to bathing, dressing, must clean himself with the help of his family. 3 out of 20 other autistic students fall into the level 3 category, namely non-verbal autistic, with low vision conditions, bad repetitive behavior, namely hitting the ear to the deformity of the left ear, which is not caused by tantrums but stimming behavior which injures oneself (Novika), skinny body, walking on tiptoe and stooping, still wearing diapers, because he has not been able to give any symbols when he is about to urinate and defecate. Nine other autistic students are in a condition at levels 1 and 2 with verbal abilities, as many as seven people, and two non-verbal students.

Students who studied the clap method in the preparatory class now understand the concept of numbers at least 1-10 well. This is the right step for children to attend the next class, which will recognize numbers of at least 20. clap with help. At the beginning of the introduction of this technique, when the teacher said, "Clap one," generally, students in preparatory classes at levels 2 and 3 still did not understand the teacher's meaning. The teacher demonstrated the clapping movement to stimulate students to imitate the movement. At level 2 students like Cristian, It did not take Farez, Azmi, and Kiki N long to imitate their teacher's movement demonstrating one clap, even though the result was regular applause. Then the teacher repeats the words, "Clap one," while helping, giving a prompt to the student, followed by "Clap two!" The teacher helps students do two claps while saying sequentially with the clapping movement, "One, two."



Figure 2. One Example of the Number Recognition Process with the Clapping Technique



Figure 3. Students Begin to be Able to Carry Out the Instructions 'Clap 1' to 'Clap 7.'

Introducing and developing the clap method to students in the preparatory class produced quite good results. The five students in the preparatory class have been able to demonstrate when the command 'clap one, clap two' until 'clap 7' is said; the children can then also juggle numbers 1-10 in sequence, including concrete objects in front of them, namely small cubes, balls, books, pencils and so on. Whereas six students from the preparatory class could respond to the clapping command, to the 'one clap' command, the related students were starting to understand by making a slower clapping motion than the usual clapping movement. This indicates that the student has achieved the receptive ability to the command 'clap one,' except for one child, namely Novika.

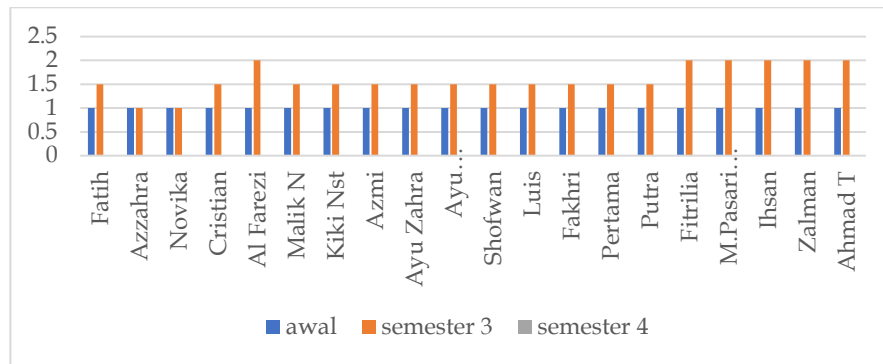


Figure 4. Initial Graph of the Introduction of Numeracy to Students with Autism

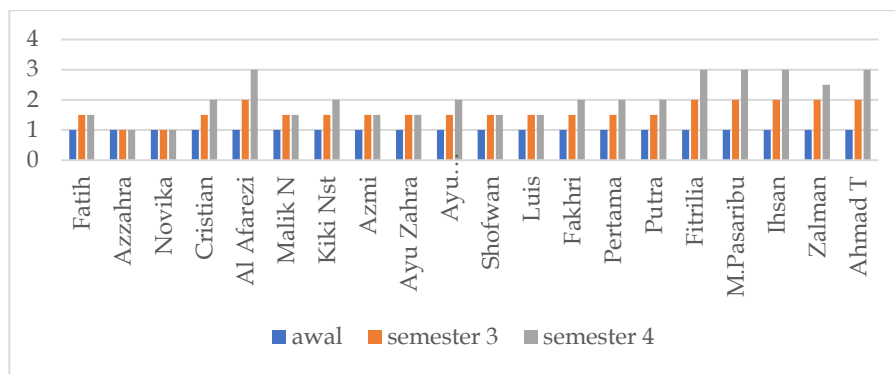


Figure 5. Graph of the Increase in the Numeracy of Autistic Students after Knowing the Clapping Technique

In Figure 5, there appears to be an increase in the understanding of the order and number of numbers in 12 of the 20 students with autism in the SLB in the final semester, namely semester 4. The increase occurred because of the clapping technique used by each mathematics subject in their class. Some students who had experienced an improvement in semester three did not progress in semester four because the teacher introduced numbers above 3. Meanwhile, they were only familiar with numbers 1, 2, and 3. According to the related teacher, introducing more numbers to these children takes more time; maybe in the next class or semester, students can follow the addition of one number.

Discussions

Not only because the comprehension ability of autistic students is very different from one another but due to their different levels and interests. This causes differences in learning plans, known as individual learning plans. Even though they are at the same age and class, each student with autism has a different learning pattern, especially related to communication problems (Kurniawansyah, 2021); this is what causes differences in the ability of students to recognize numbers with this clapping technique. However, the clapping technique carried out by teachers for students with autism is a simple technique that is enough to stimulate students to understand numbers and numbers.

D. Conclusion

For grade students who do not start their class through preparatory classes, such as those coming in grades 1 or 3, with level 2 and 1 behavior, they are happy to learn to recognize numbers by clapping their hands. After the teacher gave examples several times, students with autism who were in grade 1 could immediately imitate and demonstrate clapping on command. In semester 2, the children can already guess concrete objects sequentially. For example, student Ahmad Tanjung (14) is still in grade 1 because student Ahmad T came when he was 14 years old to SLB Ahmad T's condition was verbal; he could be invited to communicate, and he behaved pretty independently even though occasionally he suddenly cried, but Ahmad T was able to quickly calmed down. Ahmad T was able to learn to recognize numbers and number sequence quite well and with a happy feeling when using the clapping technique, thus to Luis (8), and Fakhri (12), the technique of recognizing numbers and sequencing numbers is easier to teach by clapping. The technique of recognizing numbers by clapping can be understood by nine students in grades 1-5, except for the boys, who have been able to receive clapping orders and try to demonstrate them but have difficulty moving their hands due to the stiffness of the child's gross motor skills. Moreover, M. Pasaribu studied number material in another way because he was not interested in applause and had autism and deafness.

Regarding the explanation above, the researchers concluded that the clapping technique used by teachers for autistic students in teaching Mathematics subjects could be pretty effective, with quite good results. In the high class, M. Pasaribu has started shopping at the mini market and picking up the items purchased according to the amount ordered. Also, according to parents, other students with sound development have been able to take items according to the amount ordered.

Developing various learning techniques will be very useful for autistic individuals with various complex disorders. Logic ability will be very beneficial for their independence in the future. Through this research, researchers hope that other studies will emerge that develop other learning that aims to help the learning process of individuals with autism.

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