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## Communication board as a Montessori apparatus in teaching mathematics to autism students

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ARTICLE INFO	ABSTRACT
<p><i>History:</i></p> <p>Received: 03.09.2019 Accepted: 27.09.2019 Published online: 30.09.2019</p> <hr/> <p><i>Keywords:</i></p> <p>Montessori apparatus mathematics communication board autism</p> <hr/> <p>© D. A. S. Cipta, D. Avianty, A. Kurniawati</p> <p>This work is licensed under a "<a href="#">CC BY 4.0</a>" license.</p>	<p>The research of mathematics teachers and instructors is still focused on normal students. Students with special needs are often ruled out. In fact, they also need to learn mathematics. Mathematics is a very basic subject and must be mastered by everyone, including students with special needs. This research is intended to apply mathematics learning to autism students by using communication boards as a Montessori apparatus. Communication is chosen because autistic students have a visual learning style. Furthermore, the learning method is done with Montessori because it takes the concept of learning with the environment, in accordance with the main purpose of learning for autism students to be able to live independently and be empowered in the community. The study used the descriptive qualitative method. According to the research results several Montessori apparatuses have been chosen used including visual schedules, visuals to structure the environment, visual scripts, a visual rule reminder, the visual task analysis, and a choice board.</p>

### INTRODUCTION

Communicating with a normal child is not a difficult matter. They have clear eye contact. Two-way communication, even many directions is very easy to happen. But not with autism students. Need a special way so they can communicate with us. In fact, the learning process will be effective, if communication and interaction between teachers and students occur intensively ([Inah, 2015](#)). Not only that, Communication in the teaching process helps students attach concepts to their own lives, as

students will apply what they learn in class to the world around them ([Weheba, & Kader, 2007](#)).

Autism spectrum disorder is a neuro developmental disorder characterized by deficits in social interaction and communication and the presence of restricted and repetitive behaviour ([Viscidi et al., 2013](#)). Similar to that statement, Marienzy ([2012](#)) states that autism students are students who are only interested in their own world, they do not care about the stimuli that come from other people or the circumstances around them. Referring to these two meanings, it can be concluded that the behaviour of autism

students arises solely because of their inner motivation. Autism students have disorders in social interactions, communication (both verbal and non verbal), and behavior patterns. Autism students have the characteristics of unbalanced development, like repeating activities, communication disorders, hating noise, dislike physical contact, emotional instability, preoccupied with his own world, do not want to make eye contact, stiff when held, and unable to walk when he was two or three years old.

Autism students need to learn mathematics because mathematics is the basis of all fields of knowledge. Mathematics is also very closely related to daily life. Everything we do is based on mathematics. Starting from getting out of bed by looking at the clock which is mathematical knowledge, which is knowing time. Then proceed with activities, for example just buying something also needs to understand mathematics. Even overcoming problems in life can be solved by mathematical thinking. Mathematics teaches logical, critical, analytical, systematic, and creative thinking. Setiawani, Hobri, & Wibowo (2017) state that learning mathematics can train the brain to be able to think logically and be able to develop the creativity of students with autism who have difficulty interacting and socializing with their environment.

In a previous study conducted by Sandewita (2015) about the implementation of mathematics learning conducted by class teachers, experiencing several obstacles including the stop learning activities stopped because autism students were angry and disrupted learning activities. So in this study, the possibility of this must be minimized so that it does not happen.

The thing chosen by the researcher as a way to minimize classroom chaos caused by angry or tantrum attitudes of autism survivors is by presenting a communication board. Autistic students learn better by using the visuals. Tissot (2018) explained identifying specific cognitive difficulties in children with autism that make the use of visual systems preferable. She feels that autistic children have difficulty shifting attention. This makes it hard for them to follow a normally changing conversation or obtain meaning from social events. In addition their cognitive deficits

entail a constrained ability to analyse and integrate information cohesively and flexibly.

The choice of the right learning technique is needed because there is a big difference between normal students and students with special needs. Appropriate methods and techniques can effectively contribute to children's life and learning development (Rosly, & Rahim, 2015).

In this regard, adjusted for the conditions of autism spectrum disorder, the learning method used in this study is Montessori. Montessori is carried by Maria Montessori, a doctor who eventually devotes herself to making a home for children with psychiatric disorders. The Montessori concept in learning activities differs from other concepts. At Montessori, it is students who master the classroom stage with the environment as the focal point of their learning activities (Cipta, 2018).

Montessori emphasizes learning that prioritizes freedom, freedom in choosing activities and free play so that the growth and development of children according to the tempo and speed (Wulandari, 2018). In line with this, Darnis (2018) states that in Montessori, children learn abstract concepts through environments and learning media that are designed according to the child's age and development. Thus, the mathematical concept becomes not difficult for children, but rather more fun and easy to understand.

Thus, in this study applied learning with Montessori method assisted by communication boards in learning mathematics for autism students.

## METHOD

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This research is a qualitative descriptive study. Sugiyono (2016, p. 15) said that qualitative research is a research method based on the philosophy of postpositivism used to examine the condition of natural objects, where researchers as key instruments, data source sampling is done purposively and snowbally, collecting techniques with triangulation (combined), analysis the data is inductive / qualitative, and the results of the study emphasize the meaning rather than generalization. The descriptive qualitative research used in this study was intended to obtain

information about learning mathematics with the Montessori Method in the Extraordinary Autism Elementary School of River Kids in Malang.

This study uses two data sources, the data source in this study is the subject from which the data was obtained. To obtain qualitative data in connection with the problem that the writer will examine. These data include: Primary data sources, Primary data sources are data taken directly, in this study are principals, teachers and students. This research was taken from the results of interviews and observations. Secondary data sources, Secondary data sources are data obtained indirectly or obtained from second parties, in this study the school environment, books, and documentation.

## DISCUSSION

Autism River Kids Extraordinary Primary School is a segregation school for survivors of autism and intellectual disability. This school is located in Upper Joyogrand, Malang City, East Java Province, Indonesia. Autism, as mentioned before, has problems in social interaction. Autism survivors are categorized as mental disabilities. Until this article is published, there is no single drug that can cure autism. The cause of someone becoming autism is unknown. So what can be done is to optimize growth and independence of survivors of autism so that one day he can live without depending on others.

The application of the Montessori Method was chosen in order to practice its independence. In accordance with Montessori principles, autism students will learn in the environment. All learning activities are arranged so that students really interact with the environment. Learning in the Autism River Kids Extraordinary Primary School is done thematically, but the focus of this research is on learning mathematics.

In its application, the Montessori Method requires learning media to achieve learning objectives. Media in the Montessori Method is called the Montessori apparatus. In this study, the Montessori apparatus used in learning mathematics includes pieces of rupiah in learning to count money; dishes, cups, spoons, and other objects that are often found around as apparatus used in counting the number of objects; wall clocks as an apparatus in learning to know time.

Because autism students are visual learners, all activities in learning are packaged by involving communication boards. Some communication boards used are visual schedules, visuals to structure the environment, visual scripts, visual rule reminders, visual task analysis, and choice boards.

Visual Schedules are placed by sticking to each student's desk which serves to place a sequence of student activities during class learning. This form of media has affective and cognitive functions. All students have a visual schedule marked with their photos at the top of the visual schedule. Visual schedules are also an effective way of communication to make agreements between teachers and autism students. Autism students who are only interested in their own world, which can only last for ten minutes of learning, need to be invited to make a learning agreement. For example, now is the time to learn to read, then play with bubbles, then count the next objects to make legos.



*Fig. 1: Visual schedules*

If the activity has been carried out, students must place it in the container provided. If students charge to do activities that become their preoccupations, the teacher will remind him that now is the time to learn (for example, counting). By using these visual schedules, autism students make it easier to communicate with the teacher.

Visuals to structure the environment serves as a medium to introduce the names of objects, names of animals, food, public places and others. Making students' abstract ideas more concrete. This form of media is also used to show desires. This form of media has attention, affective, cognitive and compensatory functions. This media is in the form of series images, each series

consisting of one learning topic. For example the name of the object, counting the number of objects around, counting money, types of food, and so on. For technical use, the teacher will show them in introducing objects that are around.

The mindset of elementary school students is still concrete. He can't think abstractly yet. So that he is not trapped in doing mathematics without logic, mathematics learning must be presented as concretely as possible, according to his thinking patterns. Experience with the real environment is an important aspect of Montessori learning. This was explained by Montessori (2015) *“Education is a natural process spontaneously carried out by the human individual, and is acquired not by listening to words but by experiences upon the environment. The task of the teacher becomes that of preparing a series of motives of cultural activity, spread over a specially prepared environment, and then refraining from obtrusive interference”*. The teacher does not need to intervene excessively in the learning process to increase student creativity.



Fig. 2: Visuals to structure the environment

Visual scripts function to train students' social skills making it easier for them to interact with their interlocutors. Motivate them that interacting with others is not difficult. Because words are made as clear and as short as possible, they are able to simplify their learning efforts. This form of visual media has affective, cognitive and compensatory functions. In its technical application, the teacher makes a visual script according to the needs of each student. For example activities to borrow a pencil, pick up objects, want to go to the bathroom, and so on. In making visual scripts the teacher must use short words that are easily understood by students, for

example saying I want to take paper. Then just show three pictures, namely "I want", "take", and "paper,". Not only shows, autistic students also have to voice it.



Fig. 3: Visual scripts

Visual rule reminder functions as a medium to show the rules that apply and the consequences of what is obtained after performing a behaviour. These rules include what behaviour is allowed and what behaviour is not allowed, everything will have consequences. This form of visual media has attention and affective functions. In technical implementation, it is almost the same as visual script, only if the visual rule reminder is more focused on what behaviour is allowed and not allowed during the activity. So they will be more easily controlled and more focused attention. Almost all teachers apply this form of visual media to students who are able to understand communication / command two stages.



Fig. 4: Visual rule reminder

The visual task analysis functions are to understand the sequence of activities / specific tasks that must be completed by students, this will be very useful in practicing their independence. This form of visual media has cognitive and compensatory functions. For technical implementation, the teacher must first draw a sequence of activities / tasks that must be completed by students. Then after it is finished,



the teacher will show the visual task analysis to them each time they will carry out certain activities / tasks.



Fig. 5: Visual task analysis

In accordance with the Montessori principle, namely freedom with limitation, autism students are free to determine for themselves what they will learn and what they will play. Freedom makes students think creatively, train for independence, and make decisions. The Montessori concept that is also applied here is follow the child. However, following students does not mean allowing students to behave freely. Follow the child in question is to understand the needs of students according to their interests. The communication boards used are in the form of a choice board as follows.



Fig. 6: Choice board

The purpose of using this communication board is to draw the focus of autism students. For example in learning to know and count objects. When the teacher says "Bring three plates in the cupboard," autism students don't just understand the command. He is still preoccupied with his own world without caring about the commands given. So to draw the focus, the teacher will show the communication board. "Look at this," while showing students the visuals to structure the environment. Then the autism student will see the visualization, then the teacher goes back

while showing pictures "take", "three", "plate", "in", "cupboard". The autism student will understand the command, then he will stand up and take three plates in the cupboard.

The characteristics of autistic children that occur in each child differ from one another. The difference looks very specific between them. However, in general these characteristics relate to communication skills, behavioural disorders, and interaction skills.

Children with autism experience several disorders including the cerebellum which functions in sensory, remembering, attention, and language skills. About 50% of children with autism experience delays in language and speech. Many people do not understand the words of an autistic child when spoken to. Children with autism often blurt out meaninglessly that is done repeatedly in languages that are not understood by others, speaking is not used to communicate, and likes to imitate or parrot. In general, autistic children experience verbal and nonverbal communication disorders. Symptoms that often appear are as follows: slow language development, like to imitate or parrot, looks like deaf, difficult to speak, sometimes the words used are not in accordance with their meanings, babble without meaning repeatedly, talk is not used for communication tools. Children usually communicate by showing an object so that other people take the object in question.

Children with autism experience disorders of the limbic system which is the centre of emotions that causes difficulty controlling emotions, easy to throw tantrums, angry, aggressive, crying without cause, fear of certain things. Children like routines that are carried out without thinking and can adversely affect if prohibited and arouse their anger. Children with autism exhibit patterns of behaviour, interests, and activities that are limited, repetitive and stereotypic. This behaviour tends to form a rigid and routine attitude in every activity, often parrot, often pulling an adult's hand when wanting something, indifferent when invited to speak, injuring oneself, not interested in toys. Negative behaviour that appears in children actually does not occur because of no reason. Interference in communication is one of the causes of the emergence of this behaviour. Children express

this behaviour excessively or in need. Excessive behaviour is shown by hyperactivity and tantrums (screaming) in the form of screaming, biting, clawing, hitting and children often hurt themselves. Deficient behaviour is characterized by speech disturbances, inappropriate social behaviour, unnatural play and inappropriate emotions.

Disorders of social interaction are shown by children by avoiding even refusing eye contact, not wanting to turn around when called, no effort to interact with others, preferring to play alone, unable to feel empathy, often refusing to be hugged, away if approached to be invited to play. In addition, children interact with others by pulling on the hands of others to do what they want.

Independence. That is what was emphasized by the Autism River Kids Extraordinary Elementary School as the ultimate achievement in learning. Independence is an attitude that does not depend on others and strives for oneself at work and in solving problems (Wulandari, 2018). In general, independence can be seen from behaviour. However, in reality independence is not only from behaviour, but also in its social and emotional form.

In fact, not infrequently autism spectrum disorders are accompanied by intellectual disability. Moss et al. (2012) explained, "The study of autism spectrum disorders symptomatology in genetic syndromes raises a number of methodological and conceptual issues. Firstly, intellectual disability may play a role in the association between genetic syndromes and autism spectrum disorders".

## CONCLUSION

Mathematics Learning at Autism River Kids' Extraordinary Elementary School in Malang is given thematically with other lessons. The Montessori method is provided with a visual approach. In learning activities, teachers always use communication boards to help them interact with autism students. The Montessori Method is used with the concept of learning in the environment because the main goal for autism students is to be able to live independently in the midst of society.

Some Montessori apparatuses in the form of communication boards were used including visual schedules, visuals to structure the environment, visual scripts, visual rule reminders, the visual task analysis, and a choice board.

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