

Mathematical Gesture of the blind students in the calculate operation of the Bruner learning theory

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Abstract. Gesture is very closely related in everyday life, especially in the field of education. This study was applied to a blind person who is in blind type by applying Bruner's theory of learning in a counting operation. Based on this study, the gesture that emerged during the application of Bruner learning theory was 85 times. It consists of 43 iconic gestures, 22 metaphoric gestures, and 20 times of an all-time gestures. With the percentage of iconic gesture emergence of 50.5%; Metaphorical gesture of 25.9%; and an in-23.6% gesture. At the imposition of the Bruner's theory of learning can be the dominant kinaesthetic intellect among them storytelling, storytelling, singing, and Murotal.

Keywords: *gesture, blind students, Bruner's theory of learning.*

INTRODUCTION

Vision impairment is another term used for people who are visually impaired. Vision impairment or often known as visual impairment is abnormal vision conditions or disorders (Manastas, 2014:3). Blind children are one of the categories of children with special needs that have sensory impairment in vision function (Me, 2017).

The state of vision disorder is a condition when one cannot see a hand movement at a distance of less than one metre, the vision sharpness of 20/200 feet is the sharpness capable of seeing an object at a distance of 20 feet, and the field of management is not wider than 20° (Manastas, 2014:4). Imperfect vision conditions are based on several things such as heredity, due to accidents and others. This condition limits the daily activities for people with visual impairment.

For children in the compulsory period of study, they have a high sense of curiosity, so variety of deeds and words must be delivered in a way that is good and true. This should be done so that children with visual impairment are able to interact normally with everyone they meet. (Kurniawan, 2015) explains that blind children lose time of study in their lives, those with vision limitations are not easy to have an interactions with their environment, having difficulties in finding their toys and friends, and had difficulty imitating his parents in everyday life. A blind who see themselves negatively will have a bad influence on their self esteem (Audit, 2008).

The surrounding people can influence the student's mindset and mental during the life of society later. Support can be provided by inviting students with special needs with positive-minded, convincing that he has the ability, showing the special talents they have, also by doing a flexible approach (Manastas, 2014:2).

Everyone has their own characteristics in solving mathematical problems both orally and in writing. In students with disabilities such as children with special needs, they are usually harder to express their grievances directly. Therefore, everyone around him should be mindful of every movement and behavior he does. In addition to delivering their inconveniences to one thing orally, they unknowingly convey them through his body language. Body language is a means of "listening" to one's emotions and feelings (Antonius, 2019). Emotions are reactions to a person or

to certain events. So it can be said that gesture is the most honest thing inherent to every human being (Antonius, 2019). In fact, when students talk about the concept of what they learn, they often reveal it in body movements first before they reveal it orally and systematically (Fadiana, 2016).

Body language naturally has several types of messages, and by understanding the messages contained therein, we can reveal certain intentions that could not be conveyed by words (Antonius, 2019). Paul Ekman also said that one's emotional leakage could be revealed through a Non-verbal message (body language) (Antonius, 2019). Supporting the use of cues increases the learning opportunity of the word that the child can access, empowering toddlers to seek information about the world around them (Romano & Windsor, 2020).

(Fadiana, 2016) explained that McNeil presented four main categories of gesture, namely:

- Gesture Pointing (deictic) is a movement that serves to show the object or location, often with the index finger or with another finger or the entire hand. For example, pointing to the cube as an expression refers to that cube);
- Iconic gestures are movements that are echoing the semantic content directly through the shape or trajectory of the hand. For example, a hand movement depicting a triangle in the air as a triangular expression;
- Gesture Metaphis is a picture of semantic content through metaphors;
- And Gesture beat is a simple gesture, rhythmic movement that does not reveal semantic content.

However, in this study, researchers focused on research on three types of gesture, namely iconic gestures, metaphoric gestures and an exposed gesture. Gesture is very helpful for others to understand the implied intent of body movements that are done spontaneously by the interlocutor. Gestures are often used as evidence that the body is involved in thinking and talking about ideas expressed through body movements (Fadiana, 2016). Iconicity is usually exploited in the resulting movements by hearing non-signers and in many cases these movements can be aligned in shape with the iconic features depicted in the sign (Ortega, Schiefner, & Özyürek, 2019).

More in the field of education where a teacher must understand the gestures and characteristics of each student. This applies to every time the learning process is done especially on math learning. Mathematics subjects need to be given to all students ranging from elementary school to equip students with logical, analytical, systematic, critical, and creative thinking skills, as well as ability to cooperate (Yusri & Arifin, 2018). Mathematics with life is something that cannot be separated. Math learning needs to be specially designed, so that mathematics is not the dreaded subject, but instead mathematics becomes a lesson of interest by students who can eventually increase students' confidence in mathematics (Hardianto, Subanji, & Rahardjo, 2016). Visually impaired people have a sense of tasting, smell, taste, listeners as a tool that serves to collect various information around. So, the visual disability should be able to use other senses that still function so that the delivered information is easier to understand.

The expression and appreciation of students in solving mathematical problems will help teachers to understand whether the type of problem given is difficult by students, including to identify appropriate and accurate evaluation methods for measuring Mathematical knowledge, as well as to design a more effective learning environment (Fadiana, 2016). Without gestures, according to this hypothesis, the brain circuitry needed for language can not be in the way they seem to have (McNeill, 2013).

Educations have an important roles for person with disability's knowledge. In addition, education has a dynamic influence in preparing human life in the future. Education (Kurniawan, 2015). The classic problem that often occurs in the mathematical learning process is the difficulty of the child in understanding mathematical problems. The unfamiliarity of basic mathematical concepts has become one of the main factors of the students who have difficulty in understanding math lessons.

Based on the problems above related to the limitations of students who are visually impaired and learning process, Bruner theory is considered as the right solution to provide understanding of the learning of counting operations Mathematics in visual impairment. The Bruner theory of learning is considered appropriate because in Bruner's theories there are not boring stages of learning, so students stay excited in mathematics learning activities. Bruner's theory of learning can inspire motivation and make students more active in learning (son, Tampubolon, & Rosnita, 2016). In the application of Bruner's theory teachers only play a role as the creator of learning situations and design learning scenarios so that students are active and independent in reaching the concept of subject matter (Bruno, 2019) according to (Lestari, 2013), based on the explanation Spelled out by (Hudojo, 1998) As for the stages in Bruner's theory as follows: 1) the enactive phase; At this stage of knowledge .

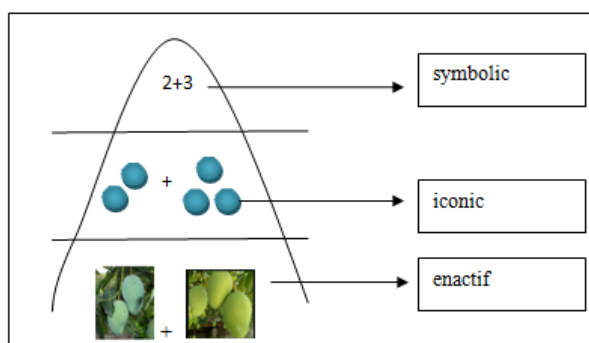


FIGURE 1. Chart of Bruner's theory of learning

RESEARCH METHODS

This research was conducted in SKh Yenaiz with the subject of a visually impaired HK. Researchers act as the main instruments in this research, as they range from the design of the circuit, the data processing, to the research results done by the researchers themselves. This research is a qualitative study with a case study research method.

The Data that can be from the research process is the conversation text of the interview. Researchers use several tools that can strengthen the research results, such as tape recorder, camera phone and observation results. In the data analysis technique, researchers use the ATLAS. TI qualitative data application as an application to simplify the data analysis process.

DISCUSSION

Because the subjects studied were patients with visual impairment belonging to the category of total blind, then this research is done by the method of interview, observation and documentation conducted to complete the information about the gesture Mathematical students who occur when given mathematical stimuli based on Bruner's theory of learning. In this study, students more often use gestures in the learning theory of Bruner active stage. This may be due to the limitations of the blind child only in the sensing field, but the sense of hearing and the perception can be utilized to understand the concept of the integer count.

Tabel 1
Mathematical Gesture Observation Table of the blind students in calculating operations based on Bruner's theory of study

Bruner's Theory	Enaktif	Iconics	Symbolics	Score	% (100%)
Iconics	22	13	8	43	50,5%
Metaforics	12	3	6	21	25,9%
Deictics	3	14	3	20	23,6%

Mathematical Gesture of blind students based on Bruner phase Enaktif learning theory

In the application of the theory of active-stage Bruner learning, researchers use a pen as a concrete object that students often encountered. In its implementation, researchers are helping students to show a group of pens that will be used as concrete objects in the counting operation. Based on the ability of the new students to know the counting stage from the number one to fifty five, the researcher gives the calculated operation applied is the totalizing calculate operation and reduction as the basic calculated operations that need Known by the students. Because at the beginning of the calculation students make an mistaken calculate, then the researcher helps the student to hold the stationery that will be calculated. Based on (Hardianto et al., 2016) The student who first made a mathematical mistake, after getting the help of his friend who used the gesture was able to solve the problem and correct the correct answer. When making mistakes in calculations, students direct the ear to the sound source that BA students do is one manifestation of the sensory use (Rachmaningtyas, 2018). In the application of Bruner learning theory in calculating operations against visually impaired students, there are some gestures or spontaneous movements that are quickly performed by students including:

Iconic Gesture

In iconic spikes, attitudes and speeches usually present the same or part of the same thing (Bowcher & Zhang, 2020). Students pick up stationery that has been in the move from the left hand to the right hand while saying the number "five". In this case, the student gives a cue that the stationery he is given is a number five. Students do the same for the other stages of calculation he does. In this stage, students perform the iconic gestures 22 times.



FIGURE 2. Students pick up stationery that has been in the move from the left hand to the right hand while saying the number "five".

Students pick up stationery that has been in the move from the left hand to the right hand while saying the number "five".

Metaphoric Gesture

The metaphoric Gesture that happens was when students are asked to calculate the number of stationery on the table. Researchers put seven stationery on the table, then students were asked to calculate the number of stationery on the table. The Gesture performed is when the student raises one by one the stationery that is on the table according to the calculations they does. The Gesture that happens is seven times. Another Gesture occurred at the time the researcher asked $2 + 3$ questions, the student was assisted to hold 2 pieces of the left hand pencil and three pencils in the right hands. Then the students unite all the stationery that is in the right hand and his left hand and begin to do the calculations. The Gesture that occurs during the study is when the student moves the stationery from the left hand to the right or vice versa according to the phases of calculation. In this question, students do a metaphorical gesture that is as much as five times.



FIGURE 3. The Gesture performed is when the student raises one by one the stationery that is on the table according to the calculations it does.

Based on the observation that has been done recorded that the students perform metaphoric gesture of 12 movements.

Diectics Gesture

Gesture in. In this gesture students do how many movements such as pointing. This pointing movement is done with the fingers of the hand. However, at this stage, students are more often used to perform a gesture using their index.



FIGURE 4. The Gesture performed is when the student raises one by one the stationery that is on the table according to the calculations it does.

Based on the observation that has been done, it is shown that the same gesture that occurred 3 times.

Blind student mathematical gestures based on iconic Bruner stage learning theory

On the implementation of the iconic Bruner learning theory, researchers use abacus as props that students will use during the study. In its implementation, researchers are helping students to demonstrate the line of pens that will be used as concrete objects in the counting operation. Based on the ability of the new students to know the counting stage from the number one to fifty, the researcher gives the calculated operation applied is the totalizing counting operation and reduction as the basic calculated operations that need to be known by the students.

In the application of Bruner learning theory in calculating operations against visually impaired students, there are some gestures or spontaneous movements that are quickly performed by students including:

Iconics Gesture

In the application of an iconic stage Bruner learning theory, iconic gestures often appear when students are recalculating their operations according to their own points.



(a) (b) (c)

FIGURE 5. Iconic gestures: Students pronounce calculations that correspond to the amount of reduction on the calculation. Students: One, two, three.

Based on the observation that has been done, it appears that the iconic gesture that the student performed is 13 times.

Metaphoric Gesture

The gesture that occurs when research in the enaktif phase, occurs several times metaphoric gestures, such as when the researcher asks students to calculate the number using Abacus, but the students do not want to do so. When the researcher asked her why, she replied "I was ashamed " and then moved the right hand that she would swing from above to touching her cheeks and then towards the left hand that was on the table and then shaking it along with the submission of her head.



(a) (b) (c)

Gambar 6. Methaphoric Gesture



(a) (b)

FIGURE 7. Metaphoric gesture: The movement swinging hands until the two palms are united, then in the release again.

Based on the observation that has been done, it appears that the metaphoric gesture occurred 3 times.

Gesture Deictics

In the application of the Bruner learning theory at the iconic stage, deictic gesture was a gesture that often appears. Because at the application of the use of Abacus students use their fingers to point at Abacus as a sign or limitation of their calculation. Sometimes students also use their thumbs to calculate the abacus.

This Gesture is seen when students are asked to count his or her abacus at the beginning of the application of Bruner's theories in iconic stages. In this case, the student performs deictic gestures 13 times, when the student pointing their abacus one by one before he/she shifts up his abacus, plus 1 time when students explain that the student cannot calculate the next item. At this stage the student performs 14 times the in-time gesture.



FIGURE 8. On-the-gesture: gestures point to the details of abacus such as the calculations.

Based on the observation that has been done was recorded that the students did deictic gesture in 14 times movement.

Mathematical gesture of blind students base on Bruner's learning theory Symbolic Stages

Based on the limitations possessed by the subjects studied, on the application of the theory of learning this symbolic stage Bruner researchers conducted the observation by stimulating the students to do stories related to mathematics. In this case researchers do the research by asking students to sing the song "Balonku".

At this stage, students feel more comfortable with the communication built between the researchers and the students concerned. This is evident when in the midst of an enthusiastic student study to tell a creepy story that he knows. Researchers also listened to the story.

Researchers concluded that the application of Bruner learning theory to blind students, teachers can stimulate the dominant knowledge of the students in question. Based on the research that has been done, here is the result of the gesture occurring from the process.

Iconics Gesture

The iconic gesture that took place on the application of Bruner's theory of learning at the symbolic stage was seen in some very fast-paced gestures, including when the student sang a song called "Balonku". The student lifts the five right fingers while singing the appropriate lyrics.

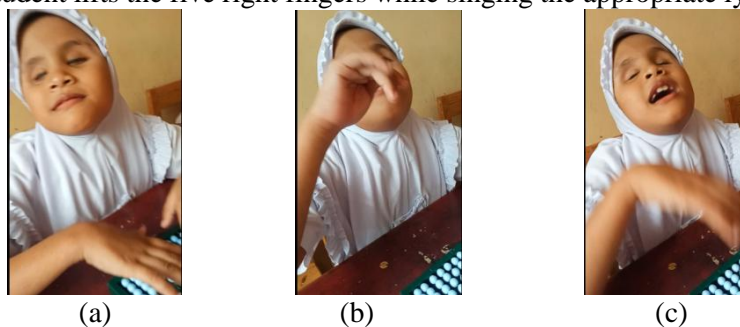


FIGURE 9. Hand gestures stretch the five fingers while saying the lyrics "Balonku there five".

Another Gesture is seen when given a question about the number of people who are at home. Students appoint one of his fingers to show that only one person was in his home. Based on the observation that has been done, it appears that the same gesture that occurred 8 times.

Metaphoric Gesture

A metaphoric Gesture at the symbolic stage occurs when a student moves his or her abacus towards the table while stringing a tone from a few taps resulting from his abhortic that touches the table.

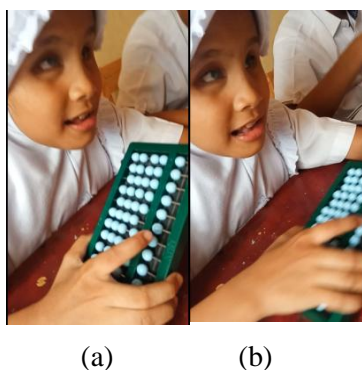


FIGURE 10. Movement swinging abacus towards the table. The next gesture occurred when the student made a shaking motion shake his abacus in the air when the song was finished.



FIGURE 11. Abacus ' Swinging movement when finished singing the song "Balonku".

Next this gesture occurs when students explain who the name of the person who lives in his house while swinging his hand on the table. Based on the observation that has been done, it is seen that the metaphorical gesture occurred 6 times.

Gesture Diektik

In the application of a symbolic phase of Bruner learning theory, there are three times of an applied gesture. That is when students count the number of people in his house when the researcher asks "How many people are at home?"

At the conclusion of this study, precisely on the application of the symbolic stage of Bruner learning theory, students look more comfortable to interact with researchers. It is evidenced by the emergence of some compound intelligence, critical questions and critical attitudes of students. This is evidenced by the results of analysis that shows some facts from the interview results.

	Name	Grounded	Density
<input type="radio"/>	◇ enaktif	<div style="width: 10%;"></div>	10
<input type="radio"/>	◇ gesture diektik	<div style="width: 20%;"></div>	20
<input type="radio"/>	◇ gesture ikonik	<div style="width: 43%;"></div>	43
<input type="radio"/>	◇ gesture metaforik	<div style="width: 21%;"></div>	21
<input type="radio"/>	◇ kecerdasan lain yang dominan	<div style="width: 10%;"></div>	10
<input type="radio"/>	◇ kritis	<div style="width: 47%;"></div>	47
<input type="radio"/>	◇ operasi hitung	<div style="width: 36%;"></div>	36
<input type="radio"/>	◇ pertanyaan kritis siswa	<div style="width: 15%;"></div>	15
<input type="radio"/>	◇ proses berhitung	<div style="width: 9%;"></div>	9
<input type="radio"/>	◇ TB Bruer simbolik	<div style="width: 18%;"></div>	18
<input type="radio"/>	◇ TB Bruner ikonik	<div style="width: 6%;"></div>	6

FIGURE 12. Data analysis results using ATLAS. TI application

Some of the dominant intelligences of visual impairment students are singing, mural, and storytelling.

CONCLUSIONS

Based on this study, the gesture that emerged during the application of Bruner learning theory was 84 times. It consists of 43 iconic gestures, 21 metaphoric gestures, and 20 times of an exposed gesture. With the percentage of iconic gesture emergence of 51.9%; Metaphorical gesture of 25%; and an in-23.6% gesture.

Based on the results of the study above, researchers concluded that the application of Bruner learning theory in blind students is quite capable of making students more relaxed in learning. The stage of Bruner learning theory is capable of creating compound intelligence, critical questions and critical attitudes of students delivered directly by students. This may be due to the lack of blind children only to the sense of vision, but the sense of hearing and neglect can be utilized to understand the concept of the integer count (Heflina, 2015).

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