Independent learning analysis of blind students using mathematics braille modules

F Rahmawati*, M D Pamungkas, and F Andreyanto
Departement of Mathematics and Science Education, Faculty of Teacher Training and Education, Tidar University, Indonesia

*Corresponding author: fadhilahrahmawati@untidar.ac.id

Abstract. In learning, all students are directed to be able to develop independence, one of which is independent learning. This study aims to determine the impact of the use of mathematics braille modules on the learning independence of blind students at Mts Yaketunis Yogyakarta. This research is a qualitative descriptive study. The subjects in this study were 6 students consisting of 1 low vision student, 3 total blind students, and 2 disabled students (blind and mentally retarded in the mild category). Data collection techniques used in this study were questionnaires and observation sheets. The results of this study indicate that the use of the mathematics braille module has a positive impact on the learning independence of blind students at MTs Yaketunis Yogyakarta. The response of blind students to the use of mathematics braille modules in the learning process is positive.

1. Introduction
Mathematics is an important topic for all students, including students with special needs [1]. There are many types of students with special needs in learning, namely blind, deaf, disabled, mentally retarded, speech impaired, autism, and gifted. Each type of disability has its own difficulties in learning. Blind students have difficulty accessing appropriate mathematics learning, which becomes a barrier to cognitive development that affects various areas of life [2,3].

Blind students need appropriate learning media in order to get exposure to mathematical topics according to their needs and abilities. One of the appropriate media for learning mathematics for blind students is the Braille module. The proper use of Braille modules can help blind students understand math material. In addition, the learning independence of blind students can develop better with this Braille module.

Based on research by Depountis et. al [4], the use of learning media for blind students has an impact on their learning independence. According to Desmita [5], independence is a condition in which a person has the desire to compete to advance for his own good, has the ability to take decisions and initiatives to face the problems at hand, has confidence in carrying out his duties, and can be responsible for what he does. However, according to Rusman [6] the independence of learning does not mean that students learn independently without the help of other people. According to Sanjayanti, Sulistiono, & Budiretmani [7], indicators of independent learning are self-confidence, discipline, initiative, and responsibility.

In fact, the learning independence of blind students is still low. During the lesson, blind students are assisted by special companion teachers or volunteers. When learning mathematics, the mathematics teacher provides explanations of topics to all blind students. In addition, the lack of independent learning
in students can affect several negative behaviors, some of which are low creativity and low self-confidence [8].

One of the learning media that can be used by blind students in learning mathematics is the Braille module. Mathematics braille modules are arranged according to the needs and abilities of blind students in learning topics in mathematics. Based on the results of observations, it was found that when learning mathematics blind students did not use the media so that students depend on the explanation from the teacher.

2. Methods
This method of study uses qualitative research methods with case study strategies. Qualitative research is a research procedure that generates descriptive data of written or spoken words from persons and observable behaviors [9]. The case study strategy is an empirical strategy aimed at studying in detail the present phenomenon in a real-life context [10,11].

Data were analyzed by steps Miles and Huberman of analyzing involve data reduction, data display, and verification [12]. The validity of the data in this study uses triangulation, triangulation, i.e., data validity inspection technique utilizing something else outside the data to check or as a comparison to the data [13].

The research subjects were 6 blind students. This research was conducted at MTs Yaketunis Yogyakarta which is located in the special area of Yogyakarta. This research method is a type of qualitative research with a case study approach.

3. Results and Discussion
In learning mathematics for students with special needs, various supporting tools are needed in the learning process. Most of the topics in mathematics learning are abstract so that students need learning tools, especially students who are limited in seeing, many topics can be maximized when they can see. Blind students need media to read the topics that are being studied, one of which is a braille book.

During the learning process without braille books, blind students depend on the presence and explanation of the teacher. Every student needs a companion teacher during learning. In fact, the number of teachers in schools is very limited and does not match the number of blind students there. In fact, one teacher is used to explain topics to four people up to six students.

The subjects in this study involved six blind students consisting of one low vision student, two totally blind students, and three totally blind students with intellectual disabilities (double handicap). Students with multiple disabilities in this study are classified as mild intellectual disabilities so they can still follow the existing curriculum but with a very slow learning rhythm. With such conditions, students are very dependent on the presence of accompanying teachers or volunteers during the learning process.

Based on the results of observations during learning using the braille module, students can learn the material by themselves, but still at the teacher level. The teacher keeps learning activities carried out by students with braille modules to explain parts of the topic that have not been applied by students. During the learning process, blind students occasionally ask math teachers about topics that are being studied in the braille module.

There are four indicators of independent learning, namely self-confidence, discipline, initiative and responsibility, so that blind students can describe the independent learning when learning mathematics using the Braille module, as shown in Table 1.

The topic that students learn with braille modules is geometry. Geometry is one of the important topics in mathematics [14] which studies points, lines, the relation between lines, area and volume [15-16]. According to [17] and [18] many factors affect their ability to learn mathematics. One of them is learning independence.

The learning independence of blind students during mathematics learning on geometrical topics with braille modules increases. Students can read the material then discuss it with friends and teachers. Blind students are not completely dependent on teacher attendance. The presence of a teacher becomes a complement if there are geometry sub-topics that make it difficult for them.


Table 1. Indicator of independent learning.

| No. | Indicator  | Explanation |
|-----|------------|-------------|
| 1   | Confidence | Blind students learn math topics independently. Students do not depend on the explanation from the math teacher. |
| 2   | Discipline | During classroom learning, students pay attention to additional explanations and commands from the math teacher. Students do assignments in the Braille module after discussing math topics. |
| 3   | Initiative | Students discuss with teachers and other blind students to solve things they do not understand. Students try to find other references in learning activities without being asked. Blind students use smartphones with talkback applications to get references to math topics. |
| 4   | Responsible | Students actively discuss with teachers and other students during mathematics learning so as to increase enthusiasm and self-awareness in learning mathematics. |

4. Conclusion
The results of this study indicate that the use of the mathematics braille module has a positive impact on the learning independence of blind students at MTs Yaketunis Yogyakarta. The response of blind students to the use of mathematics braille modules in the learning process is positive.

References
[1] Shomad Z A, Kusmayadi T A, and Riyadi 2018 J. Phys.: Conf. Ser. 983
[2] Brzoza P, Lobos E, Macuca J, Sikora, and Zabka M 2012 For Math Intelligent Tutoring System in Mathematics 4th International Conference on Computer Supported Education
[3] Garderen V D, Scheurmann A, and Jackson C Learn. Disabil. Q. 35 1.
[4] Depountis V M, Pogrund R L, Griffin-Shirley N, and Lan W Y 2015 Teachers’ Perpectives 256
[5] Desmita 2012 Psikologi Perkembangan Peserta Didik Bandung: PT. Remaja Rosdakarya
[6] Rusman 2014 Model-model Pembelajaran Mengembangkan Profesionalisme Guru Jakarta: Raja Grafindo Persada
[7] Sanjayanti A, Sulistiono, and Budiretnani D A 2015 Seminar Nasional XII Pendidikan Biologi FKIP UNS 12 361
[8] Maksum A, Lestari I 2014 Jurnal Parameter 32 1
[9] Creswell J W 2012 Research Design: Pendekatan Kualitatif, Kuantitatif, dan Mixed; Cetakan Ke-2, Yogyakarta: Pustaka Pelajar.
[10] Zaidah Z 2007 Jurnal Kemanusiaan 9 1
[11] Given L M 2008 The Sage Encyclopedia of Qualitative Research Methods. California, Sage- Thousand Oaks
[12] Sugiyono 2013 Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R & D Bandung: Alfabeta
[13] Moleong L J 2013 Metode Penelitian Kualitatif Bandung: Remadja Karya
[14] Chew C M and Lim C S 2013 Asia Pac. J. Educ. Educ. 28 33
[15] Bieber C, Tuna A, and Korkmaz S 2013 Eur. J. Sci. Math. Educ..1 50
[16] Shomad Z A, Kusmayadi T A, and Riyadi 2017 J. Phys.: Conf. Ser. 943 012014
Pooragha F, Kafi S M, and Sotodel S O 2013 *Iran J. Pediatr* 23 103

Rahmawati F, Megita D P, and Sariningtyas R 2019. *3rd International Conference on Learning Innovation and Quality Education (ICLIQE 2019)* (pp. 1369-1375)