

Learn Writing and Reading Braille for Elementary Student with Visual Impairment: A Systematic Review

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Abstract— Student with visual impairment have special needs in the form of Braille to support their reading and writing skills. The ability to read and write Braille is a basic thing that must be mastered by student as the basic skill in the learning process. If the basic skill of reading and writing has been mastered well, it will be easy for children to learn knowledge and information in a more complex learning process. Therefore, it is important to know various ways that can be done in Braille learning for student with visual impairment who are in elementary school. The purpose of this study to examine various ways to learn writing and reading Braille include strategy, method, approach and media. This study was designed use a systematic review method by analyzing 13 articles related to the topic of this study by analyzing data using descriptive analysis. The results of the data analysis in this article content focus of the Braille learning to teaching reading and writing Braille for student can be master reading and writing skills as basic asset in the learning process. However, there are various ways to learning Braille such as strategies, approaches, methods and media that can be used in reading and writing learning, including: word instruction vocabulary, oral Braille reading decoding, individual meaning centered approach, vocabulary flashcards, mangold systems, and short writing (*Tusing*).

Keywords— learn, writing and reading, braille, visual impairment, elementary students.

I. INTRODUCTION

The reading and writing skills is a basic thing that must be mastered as the main base in the learning process. Reading and writing must be mastered by students as early as possible at the level of education for the next learning process can do well. Students must have several supporting aspects of their reading and writing skills, such as: sensory abilities, fine motor skills and perception. If one of these aspects does not function properly, it will affect and inhibit the read and write skills. One of the students who has the potential to experience difficulties in reading and writing is a blind child or children visual impairment who experiences obstacles or limitations in the vision aspect.

The child with visual impairment or blind cannot use vision as a source of information so they need to utilize other senses such as touch and hearing in carrying out daily activities. Bateman, *et al.*, in [1] explained that one who experiences blindness describes that he sees and learns everything with his fingers or through his sense of touch.

Therefore, blind people who experience visual limitations have the main special needs to support the learning process, namely Braille. The learning process is analogous to a snowball, if the beginning of the ball strong, then it becomes larger with a whole, on the contrary if the beginning of the ball is fragile, the snowball cannot grow but will be destroyed over time. This analogous match really well with the learning process of blind children, if the initial asset in the form of Braille mastery is well understood by the child, it will be easy for the child to learn the knowledge and concepts in the book, otherwise if the blind are still difficult to understand Braille it will be more difficult to conveying more complex knowledge and subsequent concepts by utilizing their reading and writing skills.

The Braille reading and writing learning process is carried out through various ways with the aim of conveying knowledge about Braille letters so that it can be understood by students. Dixon & Judith in [2]. states that Braille is still a challenge so people cannot considered difficult and can be learned by all. However, it is necessary to teach Braille with simple delivery so that Braille's goals can be understood and used by blind people as a form of written communication. Related to this case, teachers have responsibility to be able to convey Braille learning in the right and easy way. Teachers can apply various ways that are considered appropriate to the conditions of students in teaching reading and writing Braille in the learning process.

Based on all reasons the importance of Braille as a weapon in reading and writing skills for blind people, so that blind student must understand and use Braille well. Therefore, it is important to know various ways of learning reading and writing Braille for student with visual impairment. Various studies conducted in the realm of special education, describe several ways, strategies and media that can be used in Braille learning for students.

The purpose of this study is to describe learning reading and writing Braille for blind children including various way that can be used to learn Braille. However, the specific research questions are as follows:

- How is learning reading and writing Braille for blind students?
- What are various ways and media that can be used in the Braille learning process for blind students?

- What recommendations are given so that they can be applied in future research?

The rest of this paper is organized as follow: Section II describes the literature review. Section III describes the material and proposed methodology. Section IV presents the obtained result and following by discussion. Finally, section V Concludes this work.

II. LITERATURE REVIEW

Visual impairment is one type classification of special needs that divide into two, namely total blindness and low vision. Total blindness is the condition of a person with only 20/200 vision or less even though with vision correction (glasses), or a person who only has such a narrow view that the longest diameter is not more than 20 degrees while low vision is the condition of someone who have visual acuity among visions 20/70 to 20/200 even with vision correction. The vision limitations experienced make the visual impairment hard to move or do their activities. Blind means that he/she uses touch and hearing as well as the rest of his vision to learn and do assignments, even though it interferes with an individual undergoing functional activity everyday [1],[3].

Blind people experience visual limit, so they need special needs to support the learning process, especially to read and write skills in the form of Braille. Braille is a sign or symbols devoted to blind people to represent letters of the alphabet, numbers and various other meanings. Braille letters are composed of six points arising with a vertical position and two horizontal points, a point arising or a symbol numbered 1-2-3, 4-5-6. These symbols are written using the stylus and Reglet and are read using the fingers or senses of touch [4],[5],[6]. Basic Braille that students should master is in the form of letters and numbers so they can use them to read and write in the learning process. The results of the study, Sacks *et al.*, [7], explained that every blind child has different Braille abilities, high and low performance children also have different interests with Braille, while the results of research describes the factors that can affect the ability of Braille to vary in each child, including: understanding of symbols, the form of words written, the length of words, sentences and paragraphs that are influenced by the concentration of the child. Based on these studies, Braille reading and reading learning for blind children is influenced by various internal and external aspects but has the same research objective, namely children can master Braille as a basic capital in learning.

Mastery of Braille reading, and writing can be done step by step. The blind must first understand the Braille symbol and Braille stationery. Braille letters between writing and reading have the opposite way. Writing Braille letters cannot be read directly like writing letters. Braille writing method is from the left by making a puncture on the Reglet using the stylus and then reading the paper behind is read from left to right.

In the read braille skills aspect, Braille paper is read by touching it with the fingertips or the most sensitive part of the skin. They can use very little pressure when touching the Braille points with the two-handed reading technique, the left hand to find the beginning of the next line, while the

right hand to finish reading the previous line, using at least four fingers [8]. In Braille writing skills aspect, blind people must understand how to write that starts from the right or is contrary to how to read Braille. In one study on reading and writing braille, it was known that early Braille reading, and writing could use special methodology by modifying the methods and tools of reading and writing Braille. At the beginning of teaching the Braille point using a letter board / reading or also called "Record Plank" first. Blind student is introduced to the position of six Braille points both horizontally and vertically. After blind students understand the configuration of Braille points, the teacher can immediately transfer the understanding of blind students about Braille into the Reglet [9].

Braille learning with the aim of providing Braille reading and writing skills to blind children can be done in various ways and media to facilitate the delivery of knowledge about Braille. The media and teaching way of Braille should be simple, easy to understand and use to facilitate the transfer of knowledge in the form of Braille reading and writing to students [2]. The use of certain tools or methods in teaching reading and writing Braille is expected to facilitate the understanding of children with visual impairments by utilizing senses that function properly such as touching and hearing.

III. MATERIAL & METHODOLOGY

This study uses a systematic review method that is by searching for articles related to Braille learning as variables in the article through the Proquest and garuda.risetdikti.go.id databases (Garuda Portal) with descriptive data analysis. The selection of the proquest and portal Garuda as the database in the study was because the articles in the database were varied and could meet the criteria of the articles used in this study, as well as the Portal Garuda articles which met the criteria of research in Indonesia were easier to find and choose. In addition, the selection of these two database sources can be seen in the ways, methods and Braille learning media that are used internationally through articles on both the internasional and nationally through the articles in the portal Garuda. The criteria used in selecting articles that according with the research content are learning Braille with the following conditions:

- Participants are blind children who are in elementary school
- Articles are studies that involve Braille reading and writing learning
- Keywords used: learning reading and writing Braille/ strategy reading and writing Braille/ Approach reading and writing Braille/ media reading and writing Braille/ methods reading and writing Braille/ technique Braille reading and writing
- Published articles range from 2013 to 2018

Based on the criteria for selecting articles that are the source of the research, 13 articles were obtained which met the requirements and in accordance with the content reviewed by the researchers (see Table I). Articles were analyzed using coding as a category of Braille reading and

writing teaching covering techniques / methods, strategies, approaches and media.

reading and writing learning through certain ways and media that are appropriate to the conditions of students.

IV. RESULT AND DISCUSSION

The articles were reviewed with a focus on Braille learning in different ways and teaching media. Articles that have been collected into databases have objectives that are in line with this research, namely, to facilitate children in Braille

TABLE 1. RESULTS OF ANALYSIS OF RESEARCH DATA ARTICLES

Author	Coding: Treatment	Participant	Application in Braille Learning	Result	Further research recommendations
Savaiano, <i>et al.</i> [10]	Strategy: Vocabulary word instruction	3 students with visual impairment	Applying instructions in a word accompanied by flashcard instruction condition and compared with only instructions without the existence of an auditory-only instructional condition.	3 participants mastered reading braille in this way or only hearing instructions. The difference is in recognizing certain parts and memory processes in understanding Braille reading and print out the notes.	This strategy is still difficult to apply to novice Braille, so it is more suitable for high-grade elementary schools that have understood the instructions. In the next study can focus on the treatment that can be given to beginner Braille.
Nannemann, <i>et al.</i> [11]	Strategy: Oral Braille Reading Decoding	3 students with visual impairment	Apply oral reading with Braille coding on books with teaching frequency 2-3 times a week	Of the three subjects Justin John and Bill, there are still some errors in reading the Braille code.	Recommendations for further research are to focus on the stages of tracking, practice and remembering Braille coding so that oral Braille reading decoding can be maximally useful and appropriate and meet children's learning needs.
Toussaint and Tiger [12]	Strategy: Stimulus Equivalence	4 children with degenerative visual impairment	Know Braille letters for beginner Braille readers with three stages, namely reflectivity, symmetry and transitivity	The results are quite good, namely the initial and basic Braille recognition ability of children is helped, although not all children have a significant increase in reading Braille	Researchers can conduct research that focuses on the introduction of Braille letters and how to write them for children who experience decreased visual function.
McMillan [13]	Approach: Individual meaning centered approach (I-M-ABLE)	Kay	I-M-ABLE is applied by giving instructions using keywords that can be related to stories so as to create interest in reading on Kay	Kay managed to improve the ability to read Braille	Recommendations for further research are improving Braille reading and writing skills by utilizing the I-M-ABLE approach.
Schles [14]	Approach: Individual meaning centered approach (I-M-ABLE)	Ajay, who is a teenager, has visual impairment, autism and concentration disorders	Application of I-M-ABLE on Ajay subject. Ajay begins to recognize the symbols of tactile and the remaining vision that is in him.	Ajay is able to understand Braille reading with the help of a personal approach.	This approach is also carried out in the aspect of writing, but it has not been seen that there is a development in Ajay's writing ability, so that later research is expected to focus on aspects of writing the subject so that it can develop in a balanced manner.
Savaiano, <i>et al.</i> [11]	Media: Vocabulary Flashcards	Peter, a students with visual impairment	Students are asked to remember and mention the Braille word they use on a flashcard	The media was effective in teaching Peter to read Braille, Peter was able to say 16 of the 18 words without instructions	Subsequent research can use the media only flashcard vocabulary should be more complex and varied so that it can better train Braille reading skills
Ivy, <i>et al.</i> [15]	Strategy: Constant Time Delay	3 blind students are accompanied by intellectual disabilities	The application is with the help of slowing the limit time of the teacher when giving assignments in class to be able to recognize Braille better	Constant time delay is effective as one of the strategies in teaching Braille for beginners. 3 participants were able to improve the ability to recognize Braille	Researchers can look for other strategies or methods in Braille teaching because this strategy is less effective / fast when viewed from the time used

Satria [16]	Media: Letter card	Student with visual impairment	Braille letter media in recognizing Braille letters in one blind child	with this strategy The results showed a positive influence. The initial ability of children who only knew 13-30% of Braille letters increased to 36-93% after being given treatment using Braille card media	Subsequent research can use other media to improve Braille reading and writing skills to be more varied.
Maryatun [17]	Method / Technique: Manggold System	2 students with visual impairment	The implementation of the manggold system is done 10 times using 10 pieces of reading and the child is asked to read with the calculation of the results in the form of the correct word	Of the 10 pieces of reading that have occurred improvement of test results during assessment, cycle I and Cycle II, namely: R during assessment the initial reading ability is (56), cycle I increases to (79) and cycle II becomes (100). Ir when assessing his abilities (51), silus I (72) and cycle II (97).	The results of the above study note that children's abilities different. This is in accordance with the level of ability of each child, so that further research can consider the child's initial ability so that they choose ways, methods and media that are suitable for each child's condition.
Mutia Khairani [18]	Media: Flashcard Braille	6 students with visual impairment in grade 1 elementary school	Pretest to determine the child's initial ability and posttest is to determine the effect of Braille flashcard media on the ability to read early blind children	Flashcard media has an effect on the early reading ability of blind children. This can be seen from the difference in the average value of blind students before being given treatment using braille flashcard media which is 34 and after being treated with braille flashcard media which is 82.5.	Subsequent research can use other media that is more varied such as audio media or utilizing children's hearing.
Devi Arum [19]	Method / Technique: Manggold read technique	6 students with visual impairment in grade 1 elementary school	Pretest to determine the child's initial ability and posttest, namely, to find out the effect given by the mangold reading technique on the ability to read early blind children	From the average value of the pre-test results before giving the treatment was 50.83, while the post-test results after the treatment was 80. This shows a significant increase in mangold reading techniques on the ability to read braille beginning for blind students.	This method has been proven effective to use, so that it can be used in future research with more complex modifications so that the benefits of research achieved are broader.
Maryatun [17]	Method / Technique: Manggold System	2 students with visual impairment	In Braille learning, the mangold system is used especially in improving the initial reading ability of 2 students	The results of the study showed that the initial reading ability of braille writing on class A students increased. Students can achieve KKM with a percentage of 70% who are in a position to succeed well in the range of 70-80%	Researchers can use this research as a basis for designing research to improve reading skills with subsequent mangold systems.
Rahmadia, <i>et al.</i> [20]	Method / Technique: Short Writing (Tusing)	Student with visual impairment	Tapping was applied to Braille writing skills with a frequency of 30 observations, 10 times in each session divided into 3.	In the initial ability (A) the children's writing data is at 18% -23.2%. The provision of Tusing treatment (B) increases the child's ability to be 40% -42% and on the measurement (A2) after not being given	Tusing can be applied to blind children who have understood the Braille symbol first. Researchers can then focus on teaching early Braille writing or continuing the Tusing method to improve children's writing skills

				back Tusing, the child's ability ranges from 43-50%.
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V. CONCLUSIONS

Braille learning is done with the aim that children with visual impairment can understand Braille reading and writing as a writing communication tool so that it can help the learning process in the classroom. Braille learning is done in various ways and media. Based on the analysis of 13 articles on Braille reading and learning for blind children, there are several strategies, techniques, approaches and media options that can be used in the learning process. Learning strategies that can be used include word instruction vocabulary, oral Braille reading decoding, stimulus equivalence and constant time delay, while techniques that are often used are the mangold system and short writing (Tusing). In the learning approach the Individual meaning centered approach (I-M-ABLE) is used which is personal teaching on children. In addition to the method, there are also media that can be used in the Braille learning process, namely Braille flashcards, letter cards and flashcard vocabulary which are the three media choices using cards as a tool with differences in the content of the content on the card.

Based on the results of the study by using a systematic review, it can be known about the variety of Braille reading and writing learning for blind people who are in elementary school. This research is limited because it cannot reveal the most effective ways or media in Braille reading and learning. Therefore, this research can be the basis for future researchers to be able to uncover strategies, techniques, approaches or other media that are effective for Braille reading and writing teaching for blind people. This is so that Braille reading and writing learning can be carried out effectively and efficiently so that Braille learning objectives can be achieved, namely that blind children can understand and master Braille reading and writing skills as early as possible as a child's basic capital in the next learning process.

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