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Identification of Mathematics Learning Media Needs for Junior High School Students with Hearing Impairment

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ABSTRACT

Students with disabilities face a wide range of obstacles to their academic and personal growth. Because of this, they require educational services tailored to the specific requirements of each student. Even with these disadvantages, deaf pupils must study mathematics. Therefore, there is a need for mathematical learning materials that take into account the specific characteristics and requirements of deaf children. This investigation is a case study of qualitative research. Deaf pupils are the focus of this study. Observation, questionnaires, and in-person interviews were employed to compile the data. In this study, we employ a validity technique known as "source triangulation." The research found that because deaf children rely so heavily on visual cues for knowledge acquisition, tactile learning materials are essential for them to succeed in mathematics. Knowledge can also be more effectively transmitted through the use of learning material that encourages dialogue between instructors and students.

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1. INTRODUCTION

Education is a deliberate strategy that has been proven to improve one's outlook and actions (Akinbote, 2017; Alam et al., 2021; Aningsih et al., 2022). A solid education helps shape future leaders. In order for education to be effective, there must be two-way communication between teachers and students (Kumar & Bervell, 2019; Mischo et al., 2014). The teacher's role as facilitator in the classroom necessitates time and effort; thus, students should not expect an instantaneous learning process.

Researching efficient methods of instruction for students with specific needs presents unique difficulties. Youngsters with special needs are those who exhibit significant and lasting differences in

personality and development from typical youngsters. When compared to typically developing children, children with special needs are characterised by their unique characteristics (Jalil et al., 2021; Zbek et al., 2017; Sulasmi & Akrim, 2020). It is reasonable to believe that children with special needs are those that face delays or accelerations in their development and, as a result, require specialised care (Anggadewi & Evanjeli, 2019; Manora et al., 2020). The term "children with special needs" encompasses a larger concept than only kids with some impairment. In the classroom, children with special needs have unique requirements. Children with unique disabilities face challenges in education and growth. Therefore, there is a demand for individualised educational programmes. Permanent special needs, such as those caused by certain disorders, and temporary special needs, such as those caused by environmental conditions and situations, are two broad categories of children with special needs (Gunawan, 2017; Manora et al., 2020; Rose et al., 2018; Sánchez et al., 2019). Every child with a disability, whether it be permanent or temporary, faces unique challenges in learning and requires individualised instruction. Learning Each child's difficulties can be traced back to one of three sources; the child's immediate surroundings, the child himself, or a mix of the two.

Classification of children with special needs are grouped into children with temporary and permanent special needs. Children with permanent special needs include: 1. Children with visual impairments (blind) a. Children who are less alert (low vision) b. Blind children; 2. Children with hearing and speech impairments (Deaf / Mute) a. Children with less b. Deaf children; 3. Children with intelligence disorders a. Children with intellectual disabilities (intellectual) below average (mental retardation) 1). Children with mild mental retardation (IQ 50 – 70 2) Children with moderate mental retardation (IQ 25 – 49) 3) Children with severe mental retardation (IQ 25 and below) b. Children with intelligence abilities above average 1) Guiffted and Genius, namely children who have intelligence above average 2) Talented, children who have special talents; 4. Children with impaired limbs (physical impairments) a. Children with limb paralysis (polio) b. Children with impaired function of the brain's nerves (cerebral palcy); 5. Children with behavioral and emotional disorders (Disabled) a. Children with behavioral disorders 1) Children with mild behavioural disorders 2) Children with moderate behavioural disorders 3) Children with severe behavioural disorders b. Children with emotional disorders 1) Children with mild emotional disorders 2) Children with moderate emotional disorders; 6. Children with severe emotional disorders Children with specific learning disorders; 7. Children are slow learners 8. Children with autism (Gunawan, 2017).

Hearing loss or deafness is a general term that indicates a hearing disability with a degree of severity from mild to severe (Davidson & Guthrie, 2019; Shoham et al., 2019; Ye et al., 2020). Children who are deaf have either lost all or most of their hearing, making it difficult for them to express themselves vocally (Idoiaga Mondragon et al., 2021). Even though they have been given assistance with hearing aids, they still need special education services. The characteristics of deaf children are as follows: a. Often tilts the head in an effort to hear b. Lots of attention to vibration c. Delay in language development d. No reaction to sounds or voices e. Often uses gestures in communicating f. Less or not responsive when spoken to g. Unclear speech, strange/monotonous sound quality. Learning needs of deaf children The learning needs of deaf children are generally no different from other children in general. But they require attention in learning activities, including: a. Do not invite children to talk by turning their backs on them. b. Children should be placed at the front so they have the opportunity to easily read the teacher's lips. c. Pay attention to the posture of the child who often tilts his head to listen d. Encourage students to always look at the teacher's face, and talk to them so that the teacher's head is level with theirs as much as possible. e. The teacher speaks at normal volume but with clear lip movements.

In the process of teaching and learning mathematics, apart from involving educators or teachers and students directly, other supports are also needed, such as adequate learning tools, use of appropriate learning models or methods, use of interesting learning media, as well as supporting environmental situations and conditions (Alwan, 2020; Pratama & Permatasari, 2021; Sari et al., 2020). Learning media are all forms that can convey and distribute messages from various sources in a planned manner to create a conducive learning environment where recipients can carry out the learning process efficiently and

effectively (Pratama & Permatasari, 2021). In addition to other understandings, learning media are graphic, photographic, or electronic tools for capturing, processing, and rearranging visual or verbal information (Arsyad, 2016). The use of learning media in the learning process will be very good because it can foster high curiosity and new interests, can also generate motivation and stimulate learning activities, and can have a good psychological influence on students. Learning media can assist teachers in conveying material, making abstract material more concrete and complex material easier to understand. The benefits of learning media include clarifying the presentation of messages in the material, increasing and directing students' attention to focus, overcoming the limitations of space and time, and providing similar experiences about events in the student's environment (Alwan, 2020). Learning media can help students to understand basic concepts because the purpose of learning mathematics is not only for students to be able to memorize various formulas but so that they can understand the basic concepts of a topic.

In the quest for knowledge and technology, both the applied and the theoretical facets of mathematics play a significant role (Amiripour et al., 2012; Crowley, 1987). In order to better grasp abstract mathematical concepts, students need a tool that allows them to transform them into concrete examples (Barnett et al., 2014; Hasanah et al., 2017). To ensure that deaf pupils fully grasp the topic, additional supports must be made available to them (Frostad, 1999). In Indonesia, visual aids for ordinary students utilising sign language remain the only available media for teaching and studying mathematics to deaf students. After suffering significant learning loss due to the Covid-19 pandemic, deaf kids had a high demand for mathematics learning materials. Therefore, the purpose of this research is to examine the importance of keeping up with technological advances while designing mathematical learning medium for deaf students.

The development of mathematics learning media for deaf children has been carried out a lot. Research shows that the developed media can help students learn mathematics (Bakti et al., 2021; Razi et al., 2020; Septiyani et al., 2021). However, research on identifying needs before developing learning media for deaf children has not been done.

2. METHODS

This study takes a case study method, making it qualitative in nature. The goal of qualitative research is to gain insight into phenomena by thoroughly understanding how research participants actually feel, think, and act (Moleong, 2017). In this case, the researcher collected data at SLB YPPALB Magelang City with a qualitative approach where the data processing was carried out in text or narrative and obtained through interviews or interviews, observation, and documentation without having to do analysis in calculating numbers (Sugiyono, 2017) . This approach is a research procedure that produces descriptive data in the form of human words and actions which are the center of attention or problems to be studied.

Observation, interviews, and documentation are used to collect data for this study. In order to learn more about anything, researchers conduct a series of steps known as "observation." Interviews are a method of gathering information by questioning a subject in order to elicit the desired response. Documentation refers to the processes involved in gathering information for use in research from written or recorded sources. Thirty-five middle schoolers participated in the study, split evenly between classes VII (14 students), VIII (11 students), and IX (10 students), representing the mild, moderate, and severe deaf categories. Purposive sampling was used to select the participants in this study to meet the requirements of this study.

The researcher is the most important part of this study. Researchers as planners, people who carry out plans, people who collect data, people who analyse data, people who understand data, and finally people who report research results. Other tools include learning media surveys and interview instructions. In this study, data is collected by observing, talking to teachers and students, and giving them questionnaires. This study uses three stages of data analysis, namely data reduction, data presentation and conclusion. Reducing data means summarizing, choosing the main things, and focusing on the important things. The presentation of the data used in this study is with narrative text. Presentation of

data in qualitative research includes the process of clarifying and identifying data, writing organized and categorized data sets so that conclusions can be drawn.

3. FINDINGS AND DISCUSSION

3.1 Identification of Problems Based on Questionnaire Results

Based on the results of filling out the questionnaire by deaf students, it was found that deaf students found it difficult to deal with number operations, such as addition, subtraction, multiplication, and division. Students are sometimes reversed in using the concept of addition and multiplication operations, because the "+" and "x" signs are felt to be similar. In addition, there were some students who filled in the material difficulties on positive and negative numbers. Some deaf students find it difficult when they encounter operational questions on positive and negative numbers. Deaf students experience limitations in the aspect of language because often they cannot follow the daily conversations of people around them, thus affecting their vocabulary. Even though there is a lot of material in junior high school mathematics that can be applied in everyday life.

In the questionnaire items related to deaf students' interest in media, most of the deaf students answered that they needed media that included students in its use. Deaf students like media that can be seen and used directly, making it easier to understand the material. However, there is one pure deaf student (without an intelligence barrier) who needs mathematics learning media that can be used anywhere and anytime, such as videos. However, the videos in question are videos with subtitles or sign language. Deaf students' interest in visual media is also consistent with findings from Marschark et al. (2013). Visual media stimulate deaf students through text, images, and videos so that learning is possible to be more enjoyable (Minarni, 2016).

These results indicate that the need for media development for deaf students is very important due to hearing limitations for students with these disabilities. Teachers must be able to choose appropriate learning media so as to increase student motivation in learning mathematics in special schools. Even though the hearing impairment of these students has the potential to be developed in learning mathematics such as fast counting and so on, it is necessary to make special media so that students can learn mathematics well.

Based on the results of filling out the questionnaire, it was also found that teachers sometimes use simple media to explain math material to deaf students. The media that the teacher used was ice cream sticks to help students understand addition, subtraction, multiplication, and division. In addition, the red and white flag has also been used by the teacher to explain the material on operations on positive numbers and negative numbers.

3.2 Identification of Problems Based on Interview Results

The following is an excerpt from the researcher's interview results with the curriculum field's vice principal.

P.05 : Apakah hambatan yang dihadapi guru dalam kegiatan pembelajaran Matematika terkait dengan kurikulum yang berlaku?

W.05 : Kondisi siswa berbeda jadi membuat proses pembelajaran tidak secepat sekolah lainnya. Media dan sumber pembelajaran yang masih minim. Apalagi matematika dianggap sebagai bidang yang sulit untuk guru maupun siswa, jadi perlu media yang membuat pengetahuan siswa menjadi lebih konkret.

Learning mathematics for deaf students without media is difficult. Deaf students are visual creatures, where students capture almost all of their knowledge through their sense of sight. Thus, mathematics learning media is needed that can provide maximum understanding with the limitations

that deaf students have. Through the development of media that visualizes more learning illustrations, it will make it easier for deaf students to learn mathematics so that they can produce better abilities. If it is developed better, deaf students can learn mathematics optimally so that they can master basic mathematical material, especially arithmetic operations, which are very much needed in everyday life.

Mathematics learning media which in its use involves student interaction, will facilitate the transfer of knowledge from teacher to student. Based on the results of interviews conducted with teachers with the following transcript:

It needs to be understood that in developing learning media for deaf children there are many factors that must be looked at, especially what kind of hearing limitations, then visualization also needs to be considered so that it doesn't even hinder students' abilities (20 September 2021).

The media needed by deaf students is interactive hands on learning, because it can help stimulate the language development of deaf students. Learning media is a tool that is able to assist the teaching and learning process and functions to clarify the meaning of the message or information conveyed, so that it can achieve the planned learning objectives (Syamsiyah Furotun et al., 2021). Meanwhile, hands on learning media can be used through direct interaction between students and teachers with sign language.

P.14 : Bagaimana cara Anda ketika mengajar di kelas?

G.14 : Menggunaka bahasa isyarat dan bahasa bibir. Tapi, penggunaan bahasa isyaratnya masih campur antara BISINDO dan SIBI. Karena ada sebagian istilah yang tidak ada di BISINDO, sehingga perlu campuran dengan SIBI. Penjelasan ke siswa tidak cukup sekali, sehingga pembelajaran memakan waktu lama.

It is known that the language abilities of deaf students are below regular students for up to 3 years (Chen & Wang, 2022; Suarsana et al., 2019). This is in accordance with the results of the interview that the use of sign language assistance is an absolute thing to do while using learning media. The use of sign language in hands on learning mathematics can be structured using standardized sign language in each country, for example, in Indonesia using BISINDO (Bahasa Isyarat Indonesia) and in America using ASL (American Sign Language).

The results of interviews with deaf students revealed the fact that deaf students need hands-on learning that can be used alone with guidance from the teacher so that they can increase their learning independence. In addition, with the ability of deaf students to operate hands-on learning independently, it is possible to increase their self-confidence (Shoham et al., 2019). In order to make it easier to use hands-on mathematics learning, supporting tools can be packaged in a CD (Compact Disk). The supporting tools in question are how to use -on learning, which is translated into sign language, and additional text translation. This can make hands-on learning have the same standards in their use. In addition, hands-on learning can also be used for regular students in general.

4. CONCLUSION

The mathematics learning media needed by deaf students is media that can be used physically (hands-on learning), because deaf students absorb most of their knowledge through their sense of sight. However, due to language limitations, deaf students need sign language assistance in using mathematics learning media. In addition, the use of learning media that involves the interaction of teachers and students will facilitate the transfer of knowledge. Through the need for learning media for deaf students, this is good potential for further researchers to develop it.

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