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# SMART BOOK MATHEMATIC FOR DIFABEL (SOMABEL): WEBSITE-BASED MATHEMATICS LEARNING MEDIA FOR MENTALLY DISABLED STUDENTS USING CARDBOARD WASTE

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**Abstract**

Children with special needs have physical, mental, emotional, social, and intellectual limitations, in this case, one of those included as children with special needs is mental retardation, this is because having intelligence values below average can be an obstacle for them so that difficulties to understand the material in the learning process, especially mathematics. So we need an innovation that has the goal of creating mathematics learning media for mentally retarded children in support of the 2030 SDGs (Sustainable Development Goals) target, namely Smart Book Mathematics for Disabilities (SOMABEL) which hopes to be able to support them in facing obstacles to learning mathematics, especially flat shape material. The research method chosen in this research is Research and Development (R&D), data collection is done by case studies, literature studies, observations, and interviews. The results of the study show that Somabel learning media can increase the learning enthusiasm of mentally retarded students where this media is directly integrated into website-based technology, which has and preserves the culture of Bengkulu Province, as well as good book design and physical media so it is not boring in learning math material. This learning media innovation also assists teachers in teaching teachers, because apart from being a reference material this media is also not boring and can be additional knowledge for introducing culture in Bengkulu Province.

**Keywords:** Learning Mathematics, Research and Development, Website.

## 1. Introduction

Mathematics is the most basic science that must be mastered by everyone, especially students. This is because mathematics is a branch of science whose implementation is closely related to everyday life, one of which is often used in buying and selling transactions. Mathematics always experiences developments that are directly proportional to advances in science and technology, however, quite a few students experience difficulties learning mathematics, especially mentally retarded children. Difficulties in learning mathematics are often felt by those with intellectual disabilities, such as capturing learning material, concentration, social interaction, and imaginative activities, limited abstract thinking abilities, weak memory, and disturbed socialization of the environment.

Children with Special Needs in Indonesia continue to increase every year with information obtained that the largest number is mentally retarded children with an estimated prevalence of 1-

3% of the total population in Indonesia (Padila et al., 2020). Mentally retarded children are children with special needs and those who have obstacles and lack ability in the process of growth and development (Ministry of Health, 2017). Genetic factors (innate) and biological factors (physical and intellectual abilities) are factors that influence children's growth and development (Panzilion et al., 2020).

One of the determinants of success in learning mathematics for those with intellectual disabilities is the discovery of innovations as learning media that are suitable and easy for them to use. One of them is by creating innovative digital-based learning media for mentally retarded children, which is a creative, cooperative learning strategy by utilizing website-based technology in the industrial era 4.0 and is expected to help mentally retarded children in their learning process. This is because digital-based learning media is able to provide an active, easy, and fun mathematics learning atmosphere. After all, students can learn mathematics while playing with this digital media.

Through digital-based learning media, it is hoped that students will be able to be trained in utilizing sophisticated technology in the learning process which will then be directly connected to the website via barcode scanning. The digital learning media website is a mathematics learning media that contains learning videos, example questions, and practice questions. Apart from being a learning medium for mathematics material, especially flat shapes, this media is also very interesting, namely by using bright, funny pictures, and each page of the book has a background image of culture in Bengkulu Province, be it traditional dances, traditional houses, rafflesia flowers, relics. history and so on, so that mentally retarded students don't get bored while learning using SOMABEL media because apart from learning mathematics, this media can also teach existing culture.

Based on the description of the problems above, there is a need for innovation and creativity from young academics to be able to present solutions to existing problems, by creating an innovation, namely "Smart Book Mathematics for Disabled People (SOMABEL): Mathematics-Based Learning Media for Students with Mental Disabilities Website by Utilizing Used Cardboard Waste)"

## 2. Methods

This research was carried out using two methods, namely, first, literature study and library study, as well as research and development methods. Literature study methods and literature studies from various information obtained. Apart from that, conducting observation and interview visits to the Amal Mulia Special School and the State Special School 1 in Bengkulu City to find out information about the mentally retarded students there. We immediately saw the problems in the field, then started designing products with attractive designs and containing elements of culture in Bengkulu Province, preparing barcode scans for website-based materials, namely flat material according to the learning curriculum, making products as supporting media in learning, namely coated Fuzzel with colored sticker paper and designed as attractively as possible, and trials will be carried out on products that have been made and adapted to the needs of the learning process at the school.

The research and development method or the foreign term is called Research and Development (R&D) which is a method used to produce a particular product, carrying out direct

testing to determine the effectiveness of the product Sugiyono (2013). This research aims to find appropriate learning media as a learning approach for students with intellectual disabilities so that the mathematics learning process, especially in plain material, is effective and efficient. For this reason, this research procedure also follows the Plan-Do-Check-Action stage model, namely a recursive process following the stages of design, application to the case subject, evaluation, improvement, and application again.

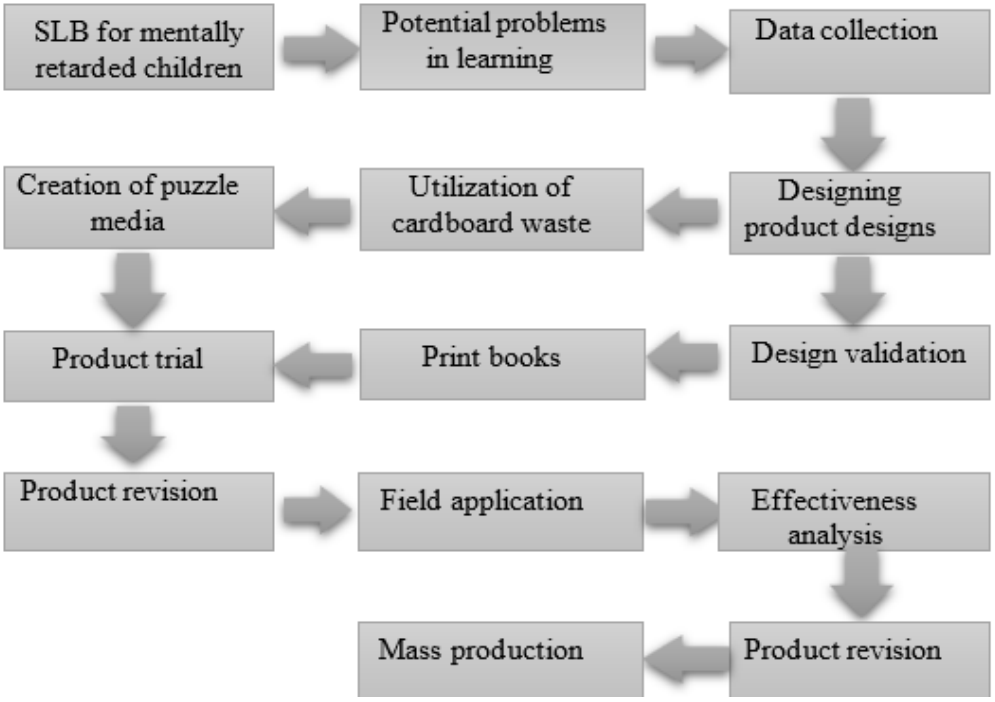


**Figure 1. R & D Method Steps**

## 3. Result and Discussion

Learning media is an important supporting component in the learning process, as the definition states that learning media is anything that can be used to convey messages or information in the teaching and learning process so that it can stimulate students' attention and interest in learning. Febriani & Irdawarni (2019) stated that the use and provision of media during learning is very helpful in making it easier for students to understand the subject matter, especially here in mathematics lessons, that is, it can make abstract material more concrete and easier to understand. This is also supported by the opinion of Fahrurozi et al., (2017) that using multimedia makes lessons more attractive to students and can provide students with examples of how multimedia works. Even though not all respondents can do it themselves, it provides an opportunity for change in a more positive direction in improving children's abilities. Parulian et al., (2020) stated that several factors can influence them, including the child's interests, the child's experience, the surrounding environment, and the development of the child's abilities. The use of learning media can help mentally retarded students understand flat shape material, and teachers can help convey the material to students so that it is easy to understand and as a reference for delivering flat shape material. The smart mathematics book in this writing is called the BUPINKA product which takes the name from the title of this research, namely SOMABEL,

which is a mathematics learning media that helps mentally retarded students improve their ability to learn mathematics, especially in plane material and introduces the culture of Bengkulu Province, so that mentally retarded students can also by learning mathematics, they will get to know Bengkulu culture.

BUPINKA facilitates mentally retarded students who will be given an understanding of mathematics lessons on website-based flat-shape material. After carrying out a direct observation process from the author, it is known that there are still many mentally retarded students at SLB Amal Mulia and SLB Negeri 1 Bengkulu City who have difficulty understanding the material about flat shapes, so they require more attention from any party and the younger generation in improving the quality of educational equality in Indonesia, especially Bengkulu. So moving on from the existing problems, the researchers made an innovation that could help students in learning, namely providing smart mathematics books directly to mentally retarded students and placing them in the school library for teacher reference materials in teaching. Details of the learning media provided were 40 pieces. BUPINKA and 15 puzzles were given at SLB Amal Mulia Bengkulu City, and 60 BUPINKA and 25 puzzles were distributed at SLB Negeri 1 Bengulu City. BUPINKA is equipped with a barcode to connect mentally retarded students to a learning website that contains building material, learning videos, and quizzes (practice questions), and is designed with the concept of Bengkulu culture.

The process in developing this learning media product, based on the R&D method as a reference, is to carry out observations, namely looking at the situation and conditions of learning in SLB directly, seeing and observing problems that are currently becoming priorities in learning, especially still reducing the learning media being developed, so that from the results of observations and These potential problems are then collected data related to the desired needs. Therefore, start by designing a learning media product design, and utilizing used cardboard waste that is no longer used to make a puzzle which will later be able to help students understand the context of the material in the learning book media, then after designing the product and puzzle directly by taking action by printing books as an initial step or experiment that will be applied to students, later from the results of the experiment there will be revisions which will then become improvements to create more media. After revisions have been made and the media has been thoroughly completed, this media is ready to be produced/printed in large quantities, so that later it can be used for learning in class or the school library.

After making direct observations of the mentally retarded students, interviews were then conducted with the students to obtain direct data, several simple questions were made that were easier for the mentally retarded students to understand and answer. Responses from mentally retarded students can be seen in the following table.

**Table 1. Results of interviews with students SLB Amal Mulia and SLB N 1 Bengkulu City**

| Number | Question | Student Response Noble Charity SLB | Student Response SLB N 1 |
|---|---|---|---|
| 1. | Do you like studying Mathematics? | 1. Heni: Like<br>2. Triani: Like<br>3. Ayu: Like | 4. Agus: Don't like<br>5. Diana: Like<br>6. Agung: Like |
| 2. | Do you understand the material presented | Heni: Understand but after finishing the | 1. Agus: Don't understand<br>2. Diana: understand |

| | | | |
|---|---|---|---|
| | by your teacher? | material I often forget.<br><br>Triani: Understand sometimes.<br><br>Ayu: sometimes you understand, sometimes you don't | sometimes<br>3. Agung: understand sometimes |
| 3. | So far has there been any learning media provided by the teacher? | Yes, in the past we used learning media such as wood | It already exists, but the learning media is used for other materials, not for flat construction |
| 4. | Do you understand what your brother explained in front of you? | 1. Heni: understand<br>2. Triani: understand<br>3. Ayu: understand | 4. Agus: understand a little<br>5. Diana: understand<br>6. Agung: understand |
| 5. | Do you have a cellphone? | 1. Heni: have<br>2. Triani: have<br>3. Ayu: have<br>But there are certain days when you can play on your cellphone, such as Saturdays and Sundays | 4. Agus: have<br>5. Diana: have<br>6. Agung: have |
| 6. | By using BUPINKA learning media, do you enjoy learning mathematics, especially about plane figures? | Happy, the pictures are interesting and funny so you don't get bored of learning | I'm happy because the pictures in the book are nice, bright and not boring |
| 7. | Is studying with BUPINKA boring? | No | No |

Based on Table 1, it can be seen that the mentally retarded students of SLB Amal Mulia and SLB N 1 Bengkulu City gave a good response, so this innovation as a mathematics learning media is outstanding to apply in providing an understanding of flat shape material to mentally retarded students, with this media it can provide an innovation that they can use in studying mathematics material, especially plane material. Learning media trial activities were carried out

face-to-face following learning activities at the school. With the BUPINKA learning media trial, students responded enthusiastically to learning mathematics, so they could easily understand the material about flat figures with the help of this learning media.

Apart from conducting interviews with mentally retarded students directly, to measure and collect more specific data results, interviews were also conducted with teachers, regarding the learning media innovations that have been created and the learning systems implemented so far at SLB Amal Mulia and SLB N 1 Bengkulu City, so that Later the results of this interview can become a benchmark for evaluating or improving the media that has been created in the future. The following is a table of results from interviews conducted with teachers of mentally retarded students.

**Table 2. Interview Results of Teachers at SLB Amal Mulia and SLB N 1 Bengkulu City**

| Number | Question | Teacher Response Noble Charity SLB | Teacher Response SLB N 1 |
|---|---|---|---|
| 1. | What are the learning methods carried out at SLB Amal Mulia? | The majority use lecture/conventional methods and sometimes use the media | Learning methods are carried out through communication, task analysis, direct instruction, prompts, and cooperative learning. |
| 2. | How is the mathematics learning process at SLB Amal Mulia? | The learning process runs well and smoothly, but there is still a lack of innovation to support better learning media | The mathematics learning process at SLB Negeri 1 Bengkulu City is introduced from concrete to semi-concrete and then to abstract. |
| 3. | Have you ever used media in learning at SLB Amal Mulia before? If so, what media did you use? | Once. In the past, wood was used as a medium | To introduce flat shapes, the teacher usually first introduces the various types of flat shapes which are explained on the blackboard accompanied by pictures. Then invite the children together to show what flat shapes are found around the children, especially in the classroom. Usually when there is learning media that supports teachers also use it like a disassembly game that resembles existing flat shapes. |
| 4. | What are your hopes for the future mathematics learning process? | So that children understand more quickly and can answer questions better. It is hoped that | Our hope as teachers, with the existence of BUPINKA, is that our students can easily understand mathematics |

| | | | |
|---|---|---|---|
| | | there will be more supportive media such as BUPINKA learning media innovation | learning, especially the material about plane figures. Because BUPINKA is also equipped with an explanation of flat shapes, there are colors in each shape which makes it interesting and helps children recognize various types of colors, shapes, and examples of objects around the child that resemble the shape of existing flat shapes. BUPINKA learning media supports children to respond more quickly understand the material presented and be competent in answering practice questions. |
| 5. | Give your opinion regarding BUPINKA media | Good, and has adapted to the digital era | BUPINKA media is one of the media that helps us as teachers in explaining shape material because it is also equipped with an explanation with a QR CODE and material and questions that are connected to the website. |
| 6. | What do you think about students' attitudes when learning using BUPINKA media? | Very enthusiastic and happily accepts media innovation because it is packaged in an attractive form | It makes students interested and this media can also be used for deaf children because learning is more focused on visual media. This media also makes it easier for teachers to explain material so that it is not only focused on the blackboard at the front of the class. |
| 7. | Has BUPINKA media helped achieve the curriculum regarding plane material? | Already (9th grade curriculum) | Already |

| | | | |
|---|---|---|---|
| 8. | What range of values meets the eligibility of BUPINKA media | Score 8 from a range of 1 to 10 | Score 8.5 from a range of 1 to 10 |
| 9. | What are your suggestions regarding improving BUPINKA media? | The innovation book that has been made is good, beautiful, and interesting. However, it would be even more perfect if it was accompanied by attractive physical media too | It would be better in the future to make this learning media plain so that the child's focus when using the media is not divided. Even if you want to introduce the characteristics of the region In the future, it would be better to create a learning media background to link the material presented to the characteristics of the region that you want to introduce to students. For example: the front of a Bengkulu traditional house resembles a flat shape, and the middle part of a rafflesia flower resembles a flat shape. Maybe it could be related more like that. |

The results in Table 2 obtained responses from teachers as a form of effort to find out their opinions on BUPINKA learning media, so interviews were conducted with teachers at the Bengkulu City Special School. When conducting interviews, health protocols are still implemented. The results of the interviews showed that there is still a lack of availability of learning media that supports the mathematics learning process for mentally retarded children.

Low academic abilities make it difficult for students to learn mathematics, especially in plain material, book learning media are designed with good and bright colors so that mentally retarded students are happy and do not get bored easily. This agrees with Ahira (2011) which is the right color for children who have obstacles in understanding and are hyperactive in understanding concepts with cool and cold colors, so this opinion is in line with the results of the writing. Owlsddottir (2011) states that the color that attracts the most attention is green so it has high energy which can attract the attention of mentally retarded students and can make mentally retarded children calmer, more harmonious, and able to increase the spirit of motivation in the learning process. So that students feel comfortable when studying mathematics, especially flat material, and can play with physical media and learn about several cultures in Bengkulu. Teachers at the Amal Mulia Special School and SLB N 1 city of Bengkulu assess that the BUPINKA learning media is interesting and very good because it uses technology and is relevant to current learning. This is supported by the opinion of Paweni (2009) who states that material by

making Learning innovation media uses software that is supported by colorful visual effects, so it is interesting and interactive and can help in the success of the learning process for students with intellectual disabilities. After using this learning media, mentally retarded students feel helped in obtaining learning outcomes in mathematics, as well as teachers feel helped by this innovation and can apply it in the teaching and learning process in the classroom.


**Figure 2. BUPINKA Learning Media**

Apart from the physical media, the book was created, of course, to make it easier for mentally retarded students to understand and remember the flat material material, here the researchers made physical media as an auxiliary medium by utilizing used cardboard waste. Cardboard waste that is no longer used is shaped into several flat shapes, after that it is made in the form of a puzzle covered with magazine paper which has been designed with bright images and has images of Bengkulu culture, as explained, learning media can be said to be a tool in the form of Physical education can help in the teaching and learning process (Daryanto, 2012). Gerlach and Elly (Kristanto, 2016) state that media can take the form of equipment, materials, people, or an activity where students can gain knowledge (cognitive), attitudes (affective), and skills (psychomotor). So from these two opinions, it can be concluded that learning media is anything that can be used as a forum to help convey information by teachers and can create appropriate stimuli and responses to achieve learning goals. It is hoped that the "BUPINKA" learning media can be used in stages immediately, that is, it can be widely distributed to all special schools in Bengkulu Province or throughout Indonesia so that it is useful in learning activities for mentally retarded children in increasing interest in learning and introduction to culture.

## 4. Conclusion

The results of research interviews that have been conducted with mentally retarded students mean that with this media innovation, mentally retarded students can more easily understand the material about plane shapes, not only helping students improve their mathematical skills but also introducing Bengkulu culture to students. This is because the learning media has a design with images of Bengkulu culture, apart from being designed with innovations that combine offline and online learning by utilizing a barcode system that will be connected to the website. This media website also provides flat shape material which is outlined in learning videos and there are also quizzes in the form of practice questions that can determine students' level of understanding of the flat shape material. So that after using this media the level of interest and enthusiasm for

learning of mentally retarded students increases more than before. Apart from that, as a teacher, I also feel helped by the existence of this learning media, which can be used as a reference book in the teaching process in class, the physical media created can also assist in recognizing several flat shapes.

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