



Improving Understanding of Number through Flipbook Media with a Problem-Based Learning Approach in Autistic Children

Adinda Dewi Sarah Salsabila¹, Zahra Meani², Hayatul Amni³, Ediyanto⁴

State University of Malang, Jl. Semarang No. 5 Malang, East Java, Indonesia

*Author of correspondence, Email: clarissa.cahyarani.2101416@students.um.ac.id

Abstract

This study aims to improve the understanding of numbers in children with autism through the development of flipbook media with a Problem-Based Learning (PBL) approach. The flipbook media is designed to help autistic students understand number concepts in a concrete, interesting and interactive way according to their needs. The development was carried out for three weeks through the stages of analyzing student needs, designing materials, and developing media using the Canva platform combined with learning videos. The media is packaged in an interactive digital form for easy access at any time. Learning using the PBL approach involves students in solving simple contextual problems through material exploration, interactive problem solving, and reflection through questions and answers. This flipbook is equipped with visual elements, interesting illustrations, and interactive videos designed according to the learning style of autistic children to minimize barriers to understanding abstract concepts. The results show that this media is able to increase learning motivation, active involvement, and student understanding of number materials. With its flexibility, this media can support learning at school and at home, making it an innovative alternative to help children with autism achieve the expected learning outcomes.

Keywords: Problem-Based Learning (PBL), Number Comprehension, Autistic Children.

1. Introduction

Education is one aspect that is the basis for self-development. This applies to everyone, including children with special needs such as autism. Autistic children often experience difficulties in understanding basic concepts, including numbers. Therefore, innovative and effective learning media are needed to support their understanding of mathematics. One relevant approach is the use of flipbooks combined with Problem-Based Learning (PBL) methods. Flipbooks, as visual aids, can facilitate the mathematics learning process by presenting information interactively and engagingly. With designs tailored to the target audience, flipbooks can help autistic children more easily grasp number concepts through engaging images, real-life objects, and simple instructions. Meanwhile, Problem-Based Learning (PBL) methods encourage students to actively participate in learning activities by solving real-life problems. This learning method not only improves conceptual understanding but also critical thinking and collaboration skills. In this regard, this article will discuss how the development of flipbooks and Problem-Based Learning (PBL) methods can improve number understanding in autistic children.

Through literature studies and methods conducted to understand the relationship and function of the PBL method and the development of flipbook media, it is hoped that it can create

a new innovation to support the sustainability of mathematics learning with better number recognition material.

CASE STUDY

Understanding Children with Special Needs. Children with special needs are children who require specialized care due to developmental disorders and abnormalities. In relation to the term "disability," children with special needs are those with limitations in one or more abilities, whether physical, such as blindness and deafness, or psychological, such as autism and ADHD (Mardi Fitri, 2021).

Children with special needs are defined as those who require specialized education and services to fully develop their human potential. The term "children with special needs" refers to the need for educational, social, guidance and counseling services, and various other specialized services to meet their needs.

The concept of children with special needs has a broader meaning than that of exceptional children. Children with special needs are those whose education requires special or specific services, unlike those provided by children in general. Therefore, children with special needs require educational services tailored to their individual learning needs.

According to Ilahi, children with special needs are those who have temporary or permanent special needs that require more intensive educational services. Children with special needs are those who differ from the average child their age or children in general. These differences occur in several areas, including abnormalities or deviations in their growth and development, whether physical, mental, intellectual, social, or emotional.

One of the special needs children has is autism. Autism is a developmental disorder characterized by impaired communication, language, and social interaction, as well as impaired interests and repetitive behaviors (Sukanto, 2018). Autism symptoms are present in childhood, characterized by loneliness, delayed language development, spontaneous and limited activity, impulsive behavior, and memorizing things without thinking (Rieskiana, 2021).

Autism is a developmental disorder of the brain and a pervasive disorder characterized by impaired social interaction, delays in communication, disorders in play, language, behavior, disturbances in feelings and emotions, social interaction, disturbances in sensory feelings, and repetitive behavior (Sipahutar & Agustin, 2016).

According to Dimiyati and Mudjiono (Syaiful Sagala, 2011: 62) learning is a teacher's programmed activity in instructional design, to make learning actively, which emphasizes the provision of learning resources. Meanwhile According to Corey (Syaiful Sagala, 2011:61), learning is a process in which a person's environment is deliberately managed to enable him to participate in certain behaviors under specific conditions or produce responses to certain situations. Learning is a special subset of education. Mathematics learning is a process of acquiring new knowledge and experience about mathematics through a series of planned and structured activities.

According to the Ministry of National Education (BSNP, 2006:491), mathematics is a universal science that underlies the development of modern technology, plays an important

role in various disciplines, and develops human thinking power. A strong mastery of mathematics from an early age is necessary to master and create technology in the future. Meanwhile, according to the Big Indonesian Dictionary (2002:723), Mathematics is defined as the science of numbers, the relationship between numbers, and operational procedures used in solving problems regarding numbers.

Mathematics Learning for Autistic Children

In accordance with the above understanding, mathematics learning is a crucial subject for everyday life and the future. This applies to autistic children, and the learning process for autistic children can be tailored to their learning objectives, cognitive abilities, and emotional readiness. Autistic students require engaging learning media. Selecting engaging learning media can facilitate their understanding of the material presented. Using engaging media can help them understand the material.

Interesting learning can also make children focus and interested in learning, one of the interesting learning media for autistic children is Flipbook.

Technological advances can be leveraged to create learning media that motivate students to learn. Educational technology is designed to provide solutions to educational problems and improve the quality of the learning process. Learning media is designed to be more colorful, up-to-date, and more accessible to students (Dirgantara et al., 2022).

One e-book model that can help teachers in creating teaching materials is using a multimedia flipbook. A multimedia flipbook is a combination of text, animation, video, sound, and so on, thus providing audio and visual stimuli that will improve students' memory (Mulyadi et al., 2016). The use of multimedia flipbooks is also very important for students with ASD by teaching theory and practice because students with ASD find it easier to remember and learn when shown videos, images, or writing of abstract objects and activities (Migang & Mahardhika, 2018).

2. Method

This research uses the Research and Development (R&D) type of research, namely, a research method used to produce a specific product and test its effectiveness. The research and development procedure basically consists of two main objectives: (1) developing the product, and (2) testing the product's effectiveness in achieving the objectives. The first objective is referred to as the development function, while the second objective is referred to as validation. Thus, the concept of research and development is more accurately defined as a development effort that is simultaneously accompanied by validation efforts.

3. Results and Discussion

3.1 Result

Knowles in Sujarwo (2015) argues that andragogy, simply put, is the art and science specifically dedicated to guiding the adult learning process. The term "andragogy" itself is rooted in Greek, where "andra" means adult and "agogos" means to guide or lead. Thus, it can

be defined that andragogy is an approach that combines both the facilitator's skills in interacting (art) and an understanding of the principles of adult learning (science) to optimize their learning outcomes. In another view, andragogy is often interpreted simply as an educational process aimed at adults, where adults play an active role as learners. In implementing the andragogy approach, educators should pay attention to learning based on the principles of andragogy. Based on the principles of andragogy, Sujarwo (2015) describes the andragogy approach in planning and implementing the learning activity process can be done through the following indicators: (1) creating a supportive learning atmosphere; (2) building collaborative planning; (3) identifying learning needs; (4) formulating specific program objectives; (5) designing learning experiences; (6) implementing learning activities; and (7) evaluating learning outcomes and re-identifying learning needs. Media development was carried out for approximately 3 weeks with the following stages: analyzing student abilities and needs, analyzing Instructional learning outcomes, then designing materials tailored to students' abilities and needs, and finally, designing the textbook. This textbook was designed using Canva and then supplemented with videos to enhance students' comprehension of the material. Once the textbook was complete, it was created as a flipbook for easy access.



Figure 1: Mathematics Textbook



Figure 2: QR Code Flipbook

Media Usage: In using this flipbook, several steps are implemented to ensure effective learning, especially for autistic children. First, the teacher will provide an initial explanation of

the number material and basic number concepts. Next, the teacher will introduce the flipbook to students and provide instructions on how to use it. The flipbook, equipped with visual materials, colorful illustrations, and interactive videos, will help children focus better and gradually understand the material being taught.

The learning process is conducted using a Problem-Based Learning (PBL) approach, where students are presented with simple problems related to recognizing and comparing numbers. For example, students are directed to complete activities comparing the number of objects through illustrations in flipbooks or to solve interactive problems accompanied by video guidance. Next, the teacher will provide additional questions related to number concepts to strengthen students' understanding and ensure they are able to apply the material in everyday life contexts.

With these steps, the use of flipbooks can facilitate an interactive, engaging, and contextual learning process. The material, presented in visual, text, and audio (video) formats, is designed to better suit the needs of autistic children, who tend to struggle with understanding abstract concepts. Learning conducted using a problem-based learning approach can also increase students' motivation, active engagement, and problem-solving skills in understanding number concepts.

Through the development of this flipbook, it is hoped that students, particularly autistic children, will significantly improve their understanding of number concepts and be able to apply the material in real-world situations. The flexible and easily accessible media also provides opportunities for teachers and parents to support ongoing learning processes both inside and outside the classroom.

MEDIA VALIDATION

Based on the data obtained from the validation of the learning media "Mathematics Textbook for Recognizing and Comparing Numbers for Grade 5 SDLB Phase A", the results were obtained based on 17 aspects which were divided into two main categories, namely construction aspects and material aspects. Respondents' responses indicated that this textbook was generally well-received. The majority of responses fell on the "Agree" and "Strongly Agree" scales, which shows that this book is rated well in terms of construction and material aspects.

Regarding the construction aspect, respondents appreciated the book's design, which was considered attractive with its bright colors and relevant illustrations that are friendly to children with autism. The book also features a QR code that makes it easier for students to access additional materials through interactive video learning media. This is considered capable of increasing student learning motivation. However, there was input from respondents regarding the layout, font size, and visual elements that should be tidied up to be more consistent and easier for students to read. In addition, some respondents suggested that the book have better connections between chapters, so that the material does not feel separate and confusing for students, especially in understanding number concepts. The introductory material in each chapter was also considered to need to be shortened to better suit the characteristics of autistic children who have limited learning focus.

In general, the material presented in this book was considered easy to understand and suited to the needs of SDLB students. Complex concepts were successfully explained in

simple, easy-to-understand language. Respondents also appreciated the use of illustrations, concrete examples, and step-by-step practice exercises, which helped students grasp the concept of recognizing and comparing numbers well. However, there was input that learning objectives or outcomes should be included in each chapter so that students and teachers have clear guidance on the learning targets to be achieved. Respondents also suggested adding interactive examples such as group games or simple physical activities to encourage active student engagement. Several respondents suggested additional visual aids such as number lines or manipulative models to strengthen students' understanding of number concepts, the symbols "greater" ($>$) and "lesser" ($<$), and number comparison.

The main strength of this book lies in its attractive design with bright colors and illustrations that are fun for students. This book also features a QR code that allows students to access additional material in more depth. The simple and structured presentation of the material makes this book suitable for students with autism. Furthermore, the varied practice questions help students understand number concepts gradually, from simple to complex. The book's main weakness lies in the lack of a stated objective or learning outcomes in each chapter are unclear, making learning targets unclear. Furthermore, the interconnections between chapters require improvement to form a coherent whole. The introductory material is also deemed too long and should be shortened to accommodate the needs of autistic students.

Some suggestions for improving this textbook include including learning objectives or outcomes in each chapter to make learning targets clearer and more focused. Furthermore, the introductory material should be shortened to be more concise and appropriate to the needs of autistic students who have limited learning focus. Respondents also suggested providing more interactive examples and a wider variety of visual aids, such as number lines or manipulative models, to help students understand concepts more concretely. Finally, it is important to improve the interconnectedness between chapters to make the material feel more cohesive and less confusing for students when studying subsequent chapters.

Overall, this textbook has good potential as a Mathematics learning medium for SDLB Phase A students. With improvements in aspects of learning objectives, interconnections between chapters, and presentation of the material, this book will be more effective and interesting for students. This book is still considered strong in terms of visual aspects, presentation structure, and exercise variety, thus providing significant benefits for students in understanding the concept of recognizing and comparing numbers.

3.2 Discussion

Learning science is crucial for students because it helps them think better, understand more, and interact with the world around them. They can identify problems, analyze them, and find appropriate solutions. Even in special schools, children with special needs are educated to learn. In learning, students require special approaches and media to support their learning process so that lessons are easily understood and absorbed.

Based on the problem analysis that we have conducted, the findings based on the results of interviews conducted with two sources, namely the 3rd grade SDLB teacher and the parents

of autistic students, show that the obstacles in mathematics learning involves repeating material explanations. This results in a lengthy learning process, which means learning objectives may not be achieved within the allotted time.

Therefore, according to the problem analysis that has been carried out, learning mathematics for autistic children requires interesting learning media that can make the learning process more interactive.

According to Andini et al. (2018), developments in information and communication technology have also influenced the advancement of teaching materials innovation. One such innovation is e-books, which are multimedia-based electronic books. According to Prabowo (as cited in Sukardi (2021), books generally consist of a collection of paper containing text and images. E-books contain information in digital form, which can also take the form of text and images.

Using the Flipbook learning media can make it easier for teachers to convey material and the learning process will be more interactive. By utilizing learning media such as flipbooks, it will be easier for children to understand the material and children will also be more interested in learning. Flipbook media is equipped with pictures and illustrations that are interesting for autistic children and children will be able to understand and remember the material more easily so that learning will be more interactive.

The advantage of multimedia flipbook learning media is that autistic children can easily access learning using various gadgets or computers anywhere and anytime, allowing them to fully master the subject matter. Multimedia flipbooks can be developed from various applications, one of which is FlipBuilder. According to Hardiansyah, FlipBuilder has the advantage of being able to input videos into PDFs, so they don't have to be opened elsewhere or in a separate place but are directly inputted into the PDF file (Yunianto et al., 2019).

The weakness of flipbook learning media is that it lacks flexibility in content, unlike flipbook media, which is fixed and does not change to adapt to the individual learning needs of autistic children. Flipbooks with page designs that static so that the content or material used in the flipbook only focuses on one material.

4. Conclusion

The use of flipbook media based on the Problem-Based Learning (PBL) approach can improve the understanding of number concepts in autistic children. Flipbooks designed with attractive visual elements, illustrations, and interactive videos help facilitate a more concrete, engaging learning process, and tailored to the individual needs of autistic children. This flipbook is specifically designed by combining attractive visual elements, colorful illustrations, and interactive videos to help autistic children understand abstract material in a more concrete, engaging, and tailored to their individual needs. The development process involved analyzing student needs, designing materials, and integrating technology through the Canva platform and QR codes for easy and flexible access. Through the PBL approach, students are encouraged to actively solve simple

problems related to number concepts, which not only improves their understanding but also trains critical thinking and problem-solving skills. The results of the study showed that the use of this flipbook successfully increased learning motivation, active engagement, and students' ability to understand number concepts in a gradual and structured manner. Furthermore, the flexibility of this medium allows its use not only in schools but also at home, with greater collaborative involvement of teachers and parents. However, to increase its effectiveness, several improvements are still needed, such as refining the layout, strengthening the interconnections between chapters for greater integration, and adding clear learning objectives to each section of the material. With further innovation and adjustments, this flipbook medium has great potential to become an effective solution in mathematics learning for autistic children, helping them achieve their expected learning outcomes more optimally.

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