Optimization of Flexible Room Divider Usage in SLB-C Karya Bhakti Classrooms: An Approach to Learning Patterns for Children with Intellectual Disabilities

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ABSTRACT
This research endeavors to address the challenges faced by Special Learning Centers (SLBs), particularly SLBs-C, which operate in limited spaces and utilize room dividers to separate classrooms. The utilization of these dividers presents limitations and impedes the learning process for children with intellectual disabilities. This study adopts a design thinking methodology, focusing on the observations and requirements for flexible spaces at SLB-C Karya Bhakti. Data collection involved stakeholder interviews, questionnaires, visual observations, and a literature review. The gathered data was subsequently analyzed through a SWOT analysis and organized using a mind-mapping technique to develop a design concept for an optimal room divider that enhances room flexibility. The identified challenges served as the foundation for an iterative design process, resulting in a product tailored to the specific needs of SLB-C Karya Bhakti. This product underwent validation with stakeholders and experts before its implementation. The outcome of the design is a recommendation for optimizing the use of room dividers with materials and designs that cater to the requirements of children with intellectual disabilities. The implementation of an optimized room divider has demonstrated a positive impact on the concentration of children with intellectual disabilities, enhancing the teaching and learning process.

INTRODUCTION

Special Schools (SLB) are designed for children with special needs. All aspects, including facilities, infrastructure, human resources, learning systems, and other areas, are tailored to support the growth and development of children with special needs. "It is important for people with disabilities and children with special needs to receive fair and non-discriminatory services, matters, and facilities" (Pawalin, 2017). This concept of services and facilities places the service recipients as citizens, an idea rooted in the concept of the welfare state (Riwanto & Gumbira, 2017). The criteria for measuring the ideal accessibility of these facilities can be seen from four aspects: safety, ease, comfort, and aesthetics (Bhat, 2000)

SLB-C Karya Bhakti is a school for children with special needs (ABK) in Bandung, offering education from elementary to high school levels. The school accepts children with various characteristics, but it focuses more on children with intellectual disabilities (SLB-C). It is located in Cibeunying Kidul, Bandung.

One type of special needs child typically educated at SLB is a child with intellectual disabilities. Intellectual disability is a condition where a child has delayed intellectual development. Each classification is always measured by their IQ level. Children with intellectual disabilities tend to have difficulty concentrating fully and are easily distracted by their surroundings. They cannot focus their attention and often cannot pay attention for a long time, according to Astati (1995: 29) (Fajriyah, 2023). Therefore, placement for children with intellectual disabilities is usually limited to 2 to 4 students per class, as stated by Silvia Novita, the principal of SLB-C Karya Bhakti, during an interview.

Due to the special needs of children with intellectual disabilities, they require specific facilities, infrastructure, supportive tools, and special furniture. In the study "Relationship on the cognitive development patterns and adaptive behavior of children with intellectual disabilities," it is often found that handling these children is challenging and sometimes not well understood. From a design and architectural perspective, the arrangement of spaces is adjusted according to the elements, truly tailored to children with intellectual disabilities, to maximize the learning process and foster the children's independence (Yosiani, 2014). Additionally, according to Rochyadi (2012), the most suitable learning system for students with intellectual disabilities is small group activities, so students' focus is not divided. Various activities, changing locations, and allowing students to manage their learning needs by themselves, along with implementing interaction grouping in Learning Centers, are recommended.

Considering the large number of students, a significant number of rooms is needed to make the teaching and learning process effective. However, the limited number of rooms, the size of the SLB location, and costs are significant challenges. To address these issues, room dividers/partitions become a solution to overcome these problems. What kind of room dividers can be used at SLB-C Karya Bhakti to avoid complex circulation and increase focus, given that children with intellectual disabilities have difficulty concentrating (Yosiani, 2014)
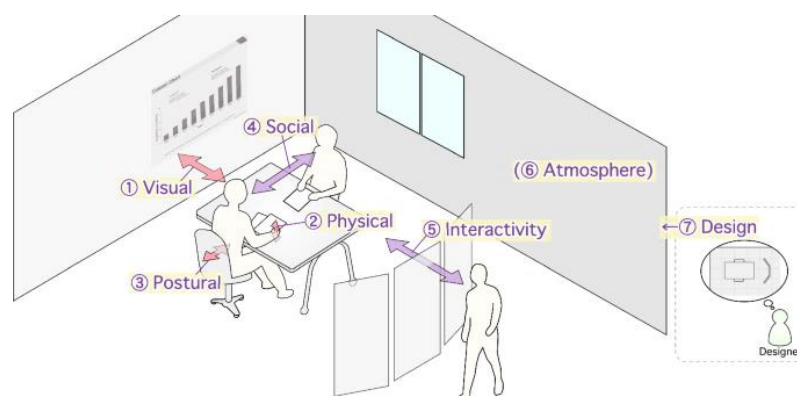

Figure 1 The implementation of room dividers in workspaces – interaction spaces
(Fujita et al., 2023)

In this study, the steps are taken using a design approach with the application of design thinking. The stages include empathize, define, ideate, prototype, and test(Wibowo & Setiaji, 2020). In the context of SLB-C Karya Bhakti, the application of design thinking can begin with deeply understanding the needs and expectations of the users (empathize), formulating the application of room dividers to the learning patterns of students with intellectual disabilities at SLB-C Karya Bhakti (define), generating ideas and alternative strategies to solve the learning pattern issues of these students (ideate), developing these ideas into prototypes or designs to be implemented (prototype), and finally testing and evaluating the results of these prototypes (test) to ensure they meet the needs and goals of SLB-C Karya Bhakti.

Based on the data obtained, an analysis was conducted specifically for children with intellectual disabilities at SLB-C Karya Bhakti by examining the overall relationships through data collection, which was formulated into brainstorming sessions, descriptive analysis of questionnaires, mind mapping, and comparison matrices. The groups of questionnaire questions were also continued

in the form of diagram charts. Each chart provides an illustration for the conclusions of the respondents' answers, which will also be used for validating the identified issues (Soewardikoen, 2019).

The importance of facilities and infrastructure, such as room dividers in classrooms for children with intellectual disabilities, is the main support and foundation of this research. By exploring the gap between the needs and the availability of facilities and infrastructure at SLB-C Karya Bhakti, the research results are expected to provide concrete and implementable recommendations to improve accessibility, the quality of learning, and the learning experience of students with special needs in the school environment.

METHOD

In this study, the steps utilize a design approach through the application of design thinking. The stages include empathy, problem definition, ideation, prototyping, and testing(Wibowo & Setiaji, 2020). In the context of SLB-C Karya Bhakti, the application of design thinking can begin with a deep understanding of the needs and expectations of the users (empathize), formulating the implementation of room dividers to address the learning patterns of students with intellectual disabilities at SLB-C Karya Bhakti (define), generating alternative strategic ideas for solving the learning challenges faced by these students (ideate), developing these ideas into prototypes or designs to be further developed (prototype), and finally testing and evaluating the results of the prototype to ensure alignment with the needs and objectives of SLB-C Karya Bhakti (test).

Based on the data collected from SLB-C Karya Bhakti, particularly concerning students with intellectual disabilities, an analysis was conducted to explore overall relationships based on the data collection. This was formulated into brainstorming sessions, descriptive analysis from questionnaires, mind mapping, and comparison matrices. The group of questionnaire items was also represented in diagrammatic form. Each diagram serves as a visual representation for summarizing respondent answers, and these results will be used for validating the categorized issues.
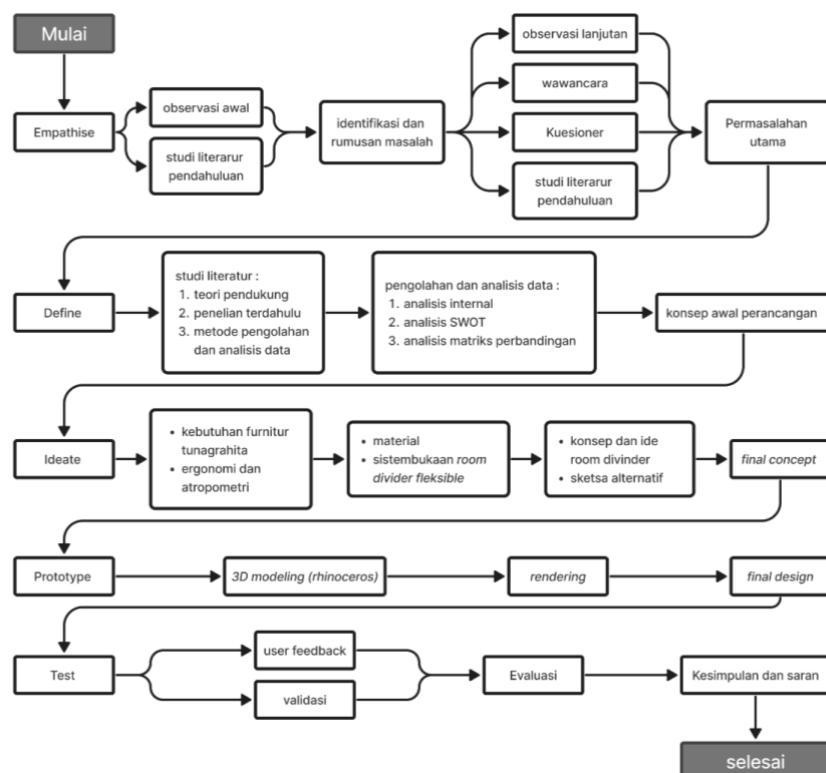

Figure 2 Research methodology chart

RESULT AND DISCUSSION
1. Empathize

The empathize process begins with conducting direct observation of SLB-C Karya Bhakti, located at Jl Sepondok III, Padasuka, Cibeunying Kidul, Kota Bandung, West Java 40125. This aims to directly observe and identify any issues that may exist at SLB-C Karya Bhakti. This school accepts students from elementary school (SD) to high school (SMA), with a total of 52 students and 10 teachers as of the 2024/2025 academic year.

Figure 3 Condition and facilities SLB-C karya bhakti

The facilities available at SLB-C Karya Bhakti include a three-story building with a land area of 138 m² and a building area of 378 m². The first floor is utilized for the principal's office, teachers' room, kitchen, and toilet. The second floor consists of one room partitioned into four classrooms, equipped with two toilets. The third floor also consists of one room partitioned into two classrooms, one multifunctional skills room, and two toilets.

From observations, several behaviors of intellectually disabled children were noted, such as poor behavioral adjustment to the environment, aggressiveness, difficulty focusing, and easy distraction. This is supported and confirmed by Rochyadi & Alimin (2005), who state that the main issues experienced by children with intellectual disabilities are developmental problems and low intelligence, which cannot be cured. "Mental retardation is not a disease but a condition" (Efendi, 2005). Additionally, the principal of SLB-C Karya Bhakti, Mrs. Silvia Novita, S.Pd, confirmed in an interview that "the maximum focus for students in each class is only five students per class."

Figure 4 Percentage of questionnaires

Followed by the distribution of questionnaires to intellectually disabled children using the Likert method with a scoring range from 1 to 5. From the questionnaire results

regarding the arrangement, availability, and facilities of the rooms, 41% are still not optimal. The lack of optimization is indicated by the placement of facilities that are not well-organized, the absence of therapy facilities, and one classroom still being used for various activities.

2. Define

To analyze the existing problems, a SWOT analysis was used with the aim of generating a concept or main idea for the design. This was done by selecting one box from the combination of SWOT indicators (Wijaya & Adib Sultan, 2019). The SWOT analysis was conducted to identify the strengths, weaknesses, opportunities, and threats of SLB-C Karya Bhakti. In performing the SWOT analysis, data was collected regarding learning patterns, facilities, environment, competition, and other relevant factors. Here is the SWOT analysis of SLB-C Karya Bhakti.

Table 1 . SWOT

Strengths	Weaknesses
• Special Facilities • Group Learning Process (2-4 students per class) • Multisensory Teaching Methods • Safe and Supportive Environment • Individual Approach	• Limited Space • No Skills Room • No Therapy Services • No Art Teacher • Inadequate Accessibility and Room Facilities • Facilities Not Suitable for Children with Special Needs (ABK)
Opportunities	**Threats**
• Many Facilities Can Still Be Developed • Collaboration with Experts • Adopting the Latest Teaching Methods • Potential to Receive Community Support and Donations to Improve Facilities and Equipment	• Lack of Trained Staff in Intellectual Disability Skills • Unstable Funding • Competition with other educational institutions in providing quality special education • Security Risks related to equipment and skills activities

Based on the SWOT analysis, there are many areas related to room conditions and learning patterns that can still be developed, such as limited space, facilities that are not suitable for children's needs, potential adoption of the latest teaching methods, individualized learning approaches, and group learning implementations. It can be concluded that the main issues in this study revolve around the constraints of space, inadequate facilities, and group learning patterns.

Referring to suitable learning strategies for intellectually disabled children according to Rochyadi (2012), furniture provided should be movable and easy to handle:
1) Knock Down: Furniture with a dismantleable system that allows for practical and instant packaging.
2) Mobile Furniture: Typically equipped with wheels for easy movement, though security considerations are important; some have locks on the wheels for safety.
3) Free Standing: Permanent construction that is ready to use, with mobility depending on the material weight and items placed.
4) Built-in: Furniture integrated into the room, fixed and not movable.

Room dividers primarily serve as partitions. For special needs children, they function to simplify circulation and enhance focus, as these children struggle with attention (Yosiani, 2014). According to King (2002), room dividers function as units to divide space, provide vertical work surfaces, facilitate easy interior changes, and regulate interaction.

Following the SWOT analysis, a mind mapping exercise using the 5W+1H method was conducted to determine the appropriate room divider design for users, considering their needs, usage methods, and utilization. It's crucial to identify key issues that can affect the effectiveness and comfort of the space.
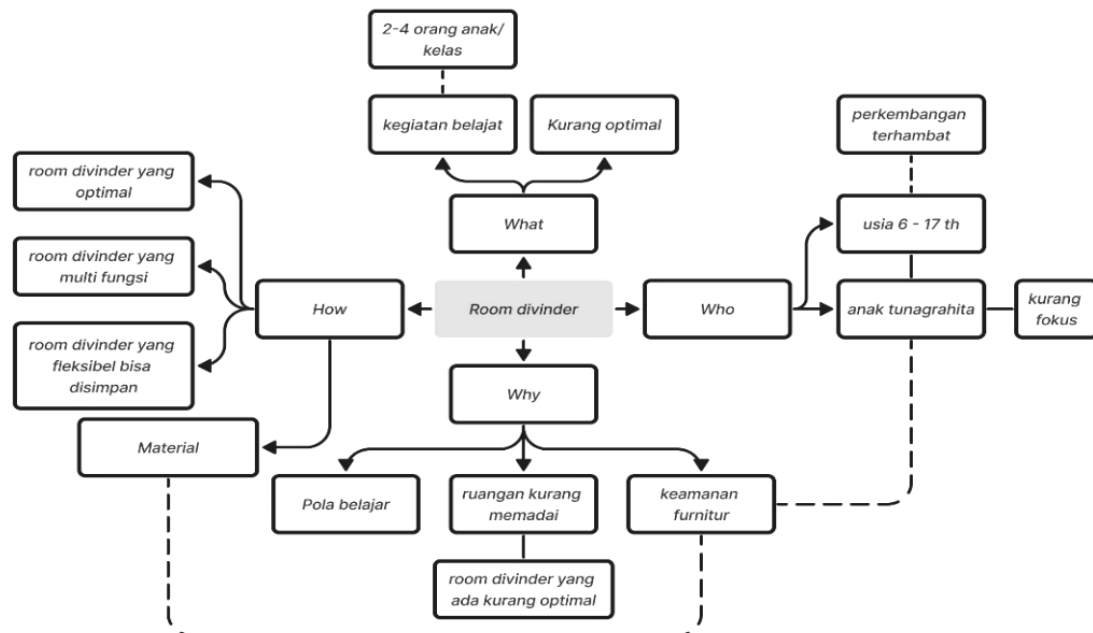

Figure 5 Mindmapping

3. Ideate

The ideation techniques used include determining the design concept, mind mapping, sketching, and evaluation. From the many ideas gathered, it is necessary to evaluate each idea at the end of this stage to identify the best concept.

The learning patterns of children with intellectual disabilities require spacious rooms with only a few students in each room. Limited room size and availability are typically addressed with room dividers or partitions. The room divider concept involves using materials that are safe for children, flexible, and adaptable to the room's needs, while also being multifunctional, aesthetically pleasing, and compliant with the design requirements for furniture for children with special needs.

The application of colors aligns with a "fun and functional" concept. According to the Merriam-Webster Dictionary, "fun" is defined as something that provides entertainment or enjoyment, particularly cheerfulness. "What is attention-grabbing comes from its context," as stated by Azis et al. (2021). In other words, aspects such as color, design shape, and other elements form the foundation of attraction for SLB-C children. A school interior design with a fun atmosphere arises from shapes, colors, and other interior elements that, psychologically, can enhance learning motivation or stimulate students, thus supporting their development. Meanwhile, "functional," as defined by the Oxford Dictionary, refers to something designed to be practical and useful rather than just attractive. Functional design maximizes the utility of a space while maintaining the comfort of its users. The level of comfort is influenced by good interior arrangement and spatial planning.

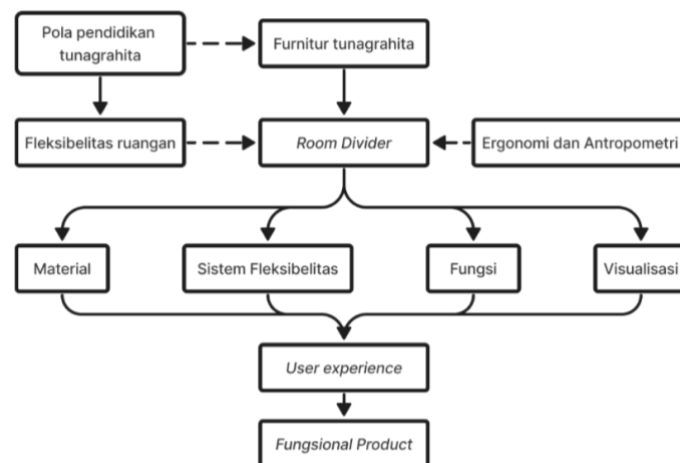Available online : https://jurnal.unimed.ac.id/2012/index.php/gorga

Figure 6 Theoretical framework

The concept of the room divider at SLB-C Karya Bakhti is a modular (flexible) room partition. Modular design refers to units that are assembled to adapt to the users' needs(Setya Pambudi et al., 2024). This approach is due to the limited space at SLB-C Karya Bakhti. Once the concept for the room divider has been tailored to align with the learning patterns of students with intellectual disabilities, the next step is to create sketches as a solution to the identified issues. The sketching process begins by measuring the room conditions to achieve accurate sketches. These sketches will serve as a foundation for further development in the design process, aiding in concept visualization and planning.
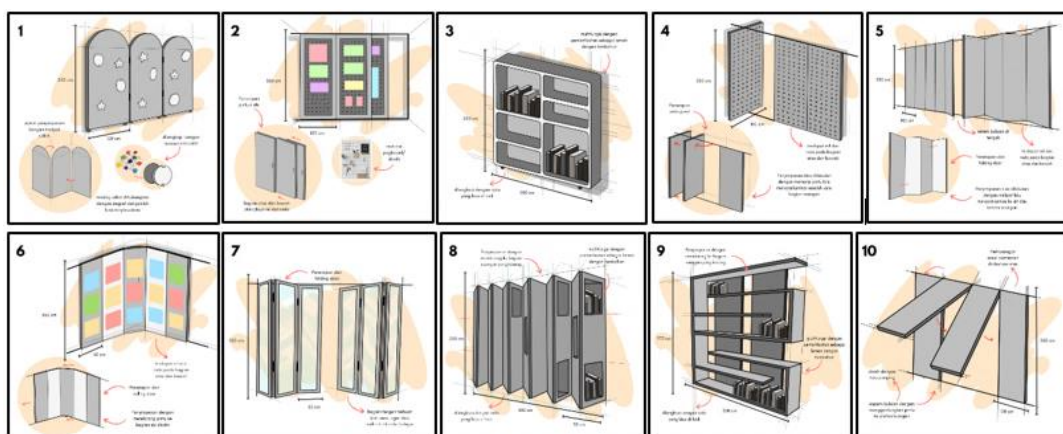

Figure 7 Room measurement process

Figure 8 Alternative Sketch

The next step is to determine the final sketch, considering various parties such as experts like professors and SLB-C Karya Bhakti to review the design response and gather feedback on the room divider design. Feedback from various parties has been quite satisfactory, assuming that the designed room divider can be applied and implemented in their classrooms. However, for implementation in the classrooms, it is necessary to refine the design by integrating several sketches into a final sketch, considering the classroom's limitations, including central pillars. Additionally, placing the room dividers on one side of the room for storage will facilitate and expedite teachers in using the room dividers. To realize these adjustments, SLB-C Karya Bhakti requires a cost estimate (RAB). Below is the final sketch result based on feedback from relevant parties.
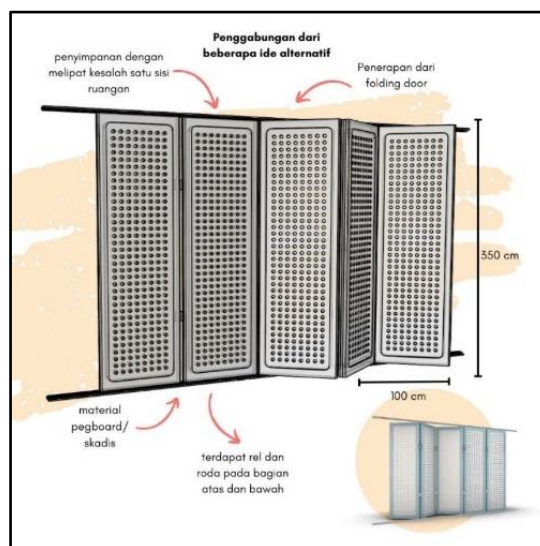

Figure 9 Final Sketch

The final sketch determines the materials and system for the designed room divider. PVC is a material produced through extrusion processing using foam processes. PVC sheets are commonly used in various products due to their durability and water resistance (Qorira & Waskito, 2020). In addition to PVC, pegboard, also known as a pinboard, is used. The use of pegboard is intended to maintain air circulation because the holes in the pegboard allow airflow and light to pass through. This is crucial since light and lighting are essential in creating the atmosphere of a room (Florencia et al., 2023). Another use of the pegboard is as a placement for students' artwork.
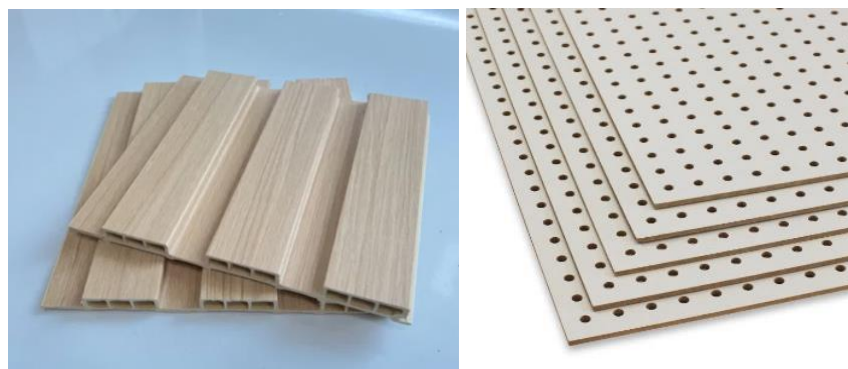

Figure 10 PVC and Pegboard materials
Source : Amazone UK

The room divider opening system utilizes a sliding door mechanism, requiring wheels, tracks, and hinges. Here are the wheels, tracks, and hinges available in the market for sliding doors.

Figure 11 wheels, rails and hinges
Source : WINA SS

4. Prototype

After finalizing the final sketch, a prototype is created using the 3D modeling application Rhinoceros. The purpose of creating the prototype is to provide users with a realistic depiction of the room divider design that will be installed in the space. The prototype is also directly implemented in the design process by a colleague focusing on the interior of SLB-C Karya Bhakti.
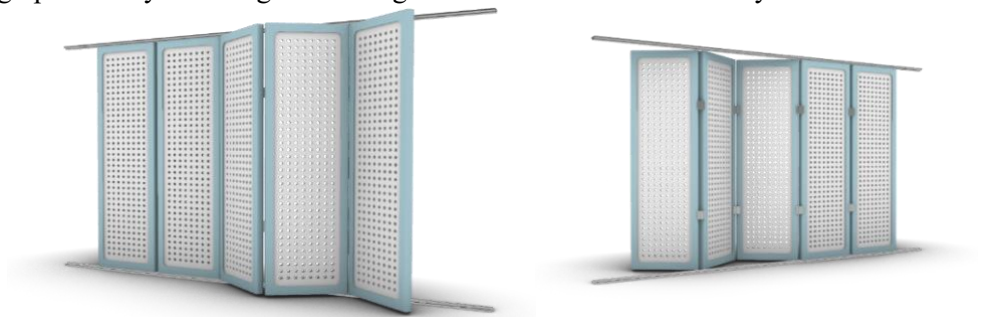

Figure 12 Prototype Room Divinder

Figure 13 implementation of the interior documentation prototype – fauziyah afni

5. Testing

Testing is intended to evaluate the success and gather feedback from stakeholders regarding the design prototype. This involves presenting the prototype results and conducting interviews with SLB-C Karya Bhakti stakeholders. This process ensures that the design outcomes truly meet the previously identified needs.

Tabel 2 Principal's Assessment (Mrs. Silvia Novita, SP. d)

Figure 14 testing process and prototype presentation

1	Mrs. Silvi sees that the multifunctional room divider design helps teachers better manage the classroom, especially in situations where there is a need to separate students based on activities or required levels of attention.
2	Material and ergonomics in design certainly enhance student safety by considering unforeseen events such as tantrums and accidental pushes.
3	In addition to functionality, the principal also notes that the aesthetics of the room divider create a more pleasant and tidy atmosphere in the classroom.

Overall, testing of the room divider prototype at SLB C Karya Bhakti showed positive results. The implementation of the room divider not only enhances learning effectiveness and classroom management but also receives positive feedback from experts, teachers, and the principal. These findings indicate significant potential for further use and development of this prototype in other schools with similar needs.

CONCLUSION

The challenges related to the learning patterns of students with intellectual disabilities, such as difficulty focusing, easy distraction, and the inability to learn in large class sizes, can be addressed by organizing classes with 2-4 students per class. However, this approach also introduces new challenges related to space limitations. Therefore, many schools, particularly SLB-C Karya Bhakti, which face spatial constraints, use room dividers to divide one room into multiple spaces that can be used simultaneously. The implementation of room dividers in the teaching process aligns with the requirements and learning patterns of intellectually disabled students.

The use of PVC material, pegboard, and a sliding door opening system facilitates mobility and enhances the effectiveness of room divider placement. Integrating furniture elements that support functionality, comfort, and aesthetic appeal in the classroom can improve the focus and concentration of intellectually disabled students. This approach is tailored to ergonomic principles, anthropometrics, learning patterns, and room aesthetics.

Overall, based on testing the room divider prototype at SLB C Karya Bhakti, positive results were observed. The implementation of room dividers not only enhances learning effectiveness and classroom management but also receives positive feedback from experts, teachers, and the principal. These findings indicate significant potential for further use and development of this prototype in other schools with similar needs. However, the planned implementation of the designed room dividers has not yet been realized due to budget constraints and resource management issues. Moving forward, considerations will be made regarding budget planning and potential materials that can be used.

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