NUSANTARA CIVIL ENGINEERING JOURNAL
Vol.3 No.01 (2025) pp. 21-27
DOI: https://doi.org/10.32487/nuce.v3i1.611

Portable Ramp for Special Needs Student in Primary School

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Received 26-03-2025; revision 23-04-2025; accepted date 02-06-2025

Abstract
This study focused on designing and implementing a portable ramp to enhance accessibility for wheelchair-using students special needs at sekolah Kebangsan Cheng, Melaka and Sekolah kebangsaan Bukit China, Melaka. Students and teachers faced difficulties accessing areas like canteens, classrooms, and assembly halls due to architectural barriers such as stairs and uneven terrain. Many schools lack permanent infrastructure to support mobility-impaired students special needs, limiting their participation. The portable ramp was developed as a safe, reliable, and convenient solution for overcoming these obstacles. It facilitates smooth transitions between elevations, ensuring ease of movement and addressing mobility challenges. Field tests and questionnaires were conducted to assess the ramp's durability and effectiveness. Teachers and student assistants participated in pre- and post-test evaluations to measure their understanding of the ramp's use, complemented by a practical demonstration of its setup. User feedback and testing revealed that Ramp-On effectively improved accessibility and safety in school settings. While some areas for enhancement were noted, the majority of responses were positive, affirming the ramp's success in meeting the needs of primary school students special needs with mobility impairments.

Keywords: *wheelchair user; primary school; special needs*

1. Introduction

Ramp, according to the Oxford Dictionary, refers to a slope that joins two parts of a road, path, building, etc., when one is higher than the other (Oxford University Press, 2023). Despite often being overlooked due to their simplicity, ramps play a crucial role in providing accessibility and facilitating seamless transitions between different elevations (Smith, 2020). These inclined planes, characterized by a gentle slope, are designed to assist individuals in navigating spaces with ease, ensuring that mobility is not hindered by stairs or abrupt changes in terrain (World Health Organization, 2017).

Ramps are not only functional but also represent a commitment to inclusivity, offering a pathway for people with diverse abilities to navigate public spaces, buildings, and various environments without barriers (Brown & Carter, 2019). Ramps can be designed for permanent installation or as portable, temporary solutions, depending on the needs of the space.

Portable ramps are created to improve accessibility and mobility for individuals with disabilities or mobility impairments in a flexible and adaptable manner. Unlike permanent ramps, which can be costly and impractical in some environments, portable ramps offer a versatile and cost-effective solution (Jones et al., 2018). They can be quickly set up as needed and removed or stored when not in use, making them practical for temporary or intermittent accessibility needs.

Incorporating ramps into various settings, such as schools, workplaces, public buildings, and transportation hubs, promotes inclusivity and equal opportunities for all. By enhancing accessibility, ramps support broader goals of diversity and independence, allowing individuals with mobility impairments to participate fully in all aspects of life (National Council on Disability, 2021).

2. Methodology

The process begins with conducting an observation at the Special Education Unit of Sekolah Kebangsaan Bukit China, Melaka, to identify the main issue faced by the students. The identified problem relates to the limited mobility of wheelchair-bound students in accessing various locations. The proposed solution is to construct a portable ramp to facilitate the movement of these special education students in wheelchairs. Thus, measurements of the height and length of the areas requiring the ramp are taken to ensure the design meets the actual needs. These measurements and data form the basis for the innovation of the ramp product. Based on the collected data, the ramp design is sketched according to the required specifications.

Next, a discussion is held with the carpenter to explain the design and ensure all technical requirements are understood. Following that, the necessary materials for building the ramp, such as wood of various sizes, are prepared. The ramp construction takes place at the carpenter's workshop and involves several key steps, including cutting the wood, smoothing rough surfaces, installing support legs, and creating foldable legs (collectable legs) for easier storage and mobility. The placement of the support legs on the ramp is also determined to ensure the ramp's stability during use.

Once the ramp is completed, it is tested on-site to ensure it functions as intended. The ramp is installed at the school and tested by real users, including teachers, assistants, and special education students who use wheelchairs as respondents. These respondents are then asked to complete a questionnaire to provide feedback on the effectiveness and suitability of the ramp. The collected data is analyzed to identify areas for improvement. Based on this analysis, the process is refined to produce a higher-quality and more functional ramp. Once all issues are resolved and the ramp is successfully implemented, the process is considered complete.

3. Data Analysis and Discussion

3.1 Field Test and Questionnaire

To evaluate the portable ramp, a field test is conducted to identify its strength. Key aspects assessed during the test include the ramp's stability, ease of setup, durability, ability to accommodate different user profiles, and compliance with accessibility standards.

Additionally, a questionnaire is administered to collect direct feedback and insights from users about their experience with the ramp. This approach enables researchers to comprehensively evaluate the product's effectiveness.

3.2 Questionnaire analysis

Insights gained from data analysis can guide the future development and optimization of the ramp, ensuring it remains a reliable and practical accessibility solution. This analysis

also helps determine whether the ramp improves accessibility and ease of use and identifies any necessary adjustments.

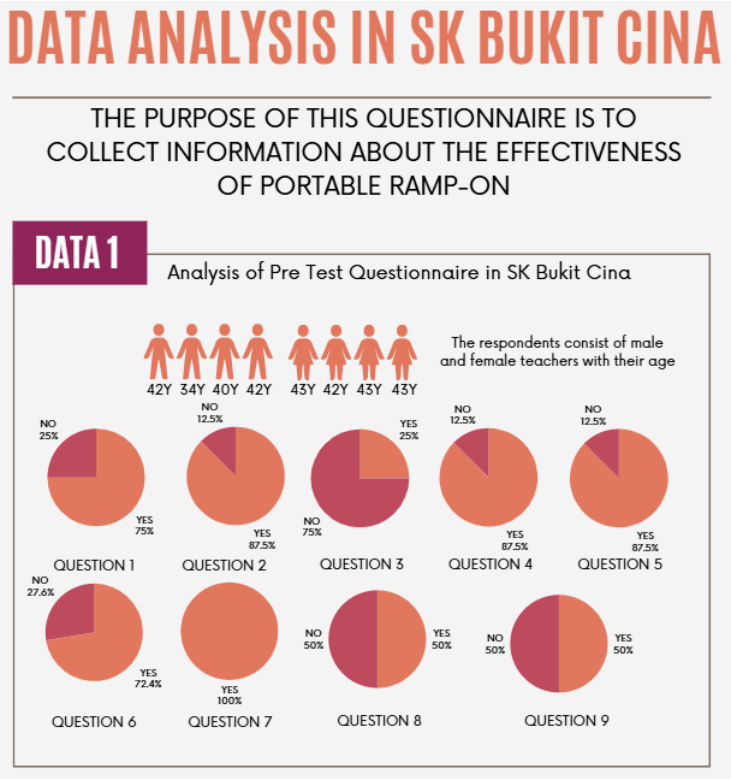


Figure 1: Analysis of Pre-test questionnaire in Sekolah Kebangsaan Bukit China, Melaka

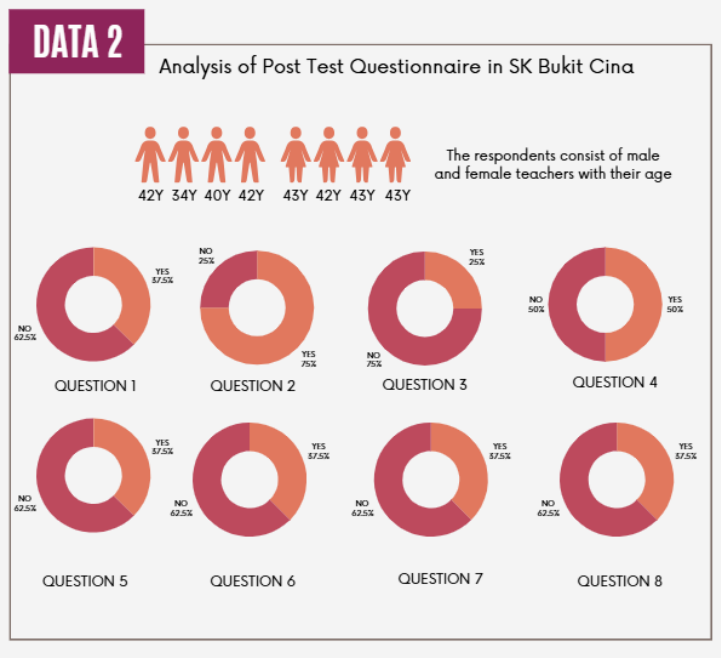


Figure 2: Analysis of Post-test questionnaire in Sekolah Kebangsaan Bukit China, Melaka

Sekolah Kebangsaan Bukit Cina terrain features a more flat structure such as level ground or different level of inclines . This can impact the data obtained from the questionnaire

because users may only be able to utilize the ramp in certain scenarios, such as accessing platforms or stages with a consistent 15cm height difference.

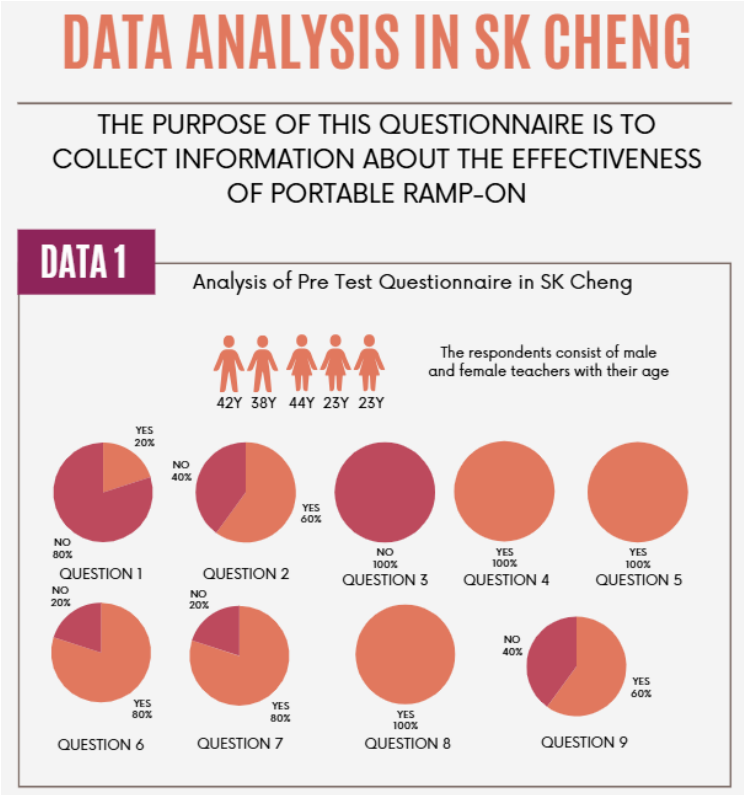


Figure 3: Analysis of Pre-test questionnaire in Sekolah Kebangsaan Cheng, Melaka

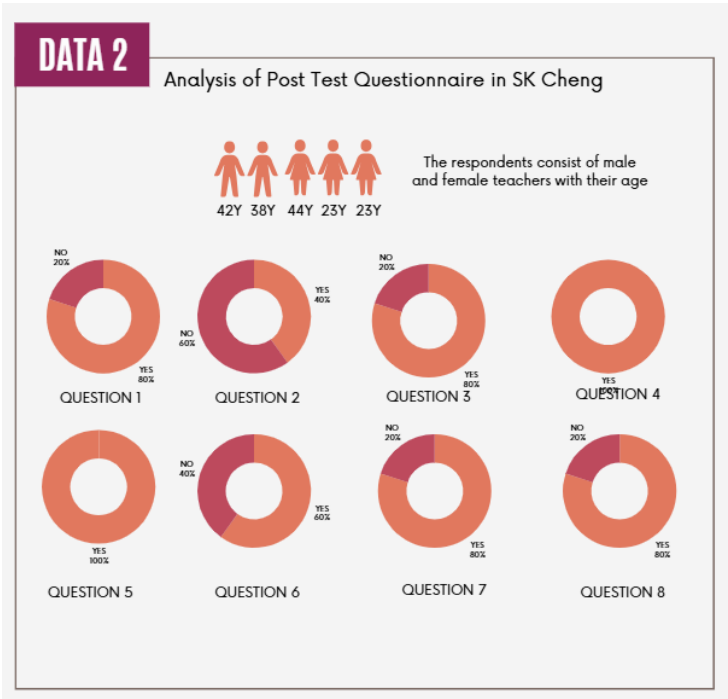


Figure 4: Analysis of Post-test questionnaire in Sekolah Kebangsaan Cheng, Melaka

Sekolah Kebangsaan Cheng school terrain aligns well with the height of the ramp, it enhances the usability and effectiveness of the ramp . Users can confidently and comfortably

utilize the ramp to access various areas within the school, knowing that it complements the surrounding terrain effectively. This enhances the overall usability and functionality of the ramp.

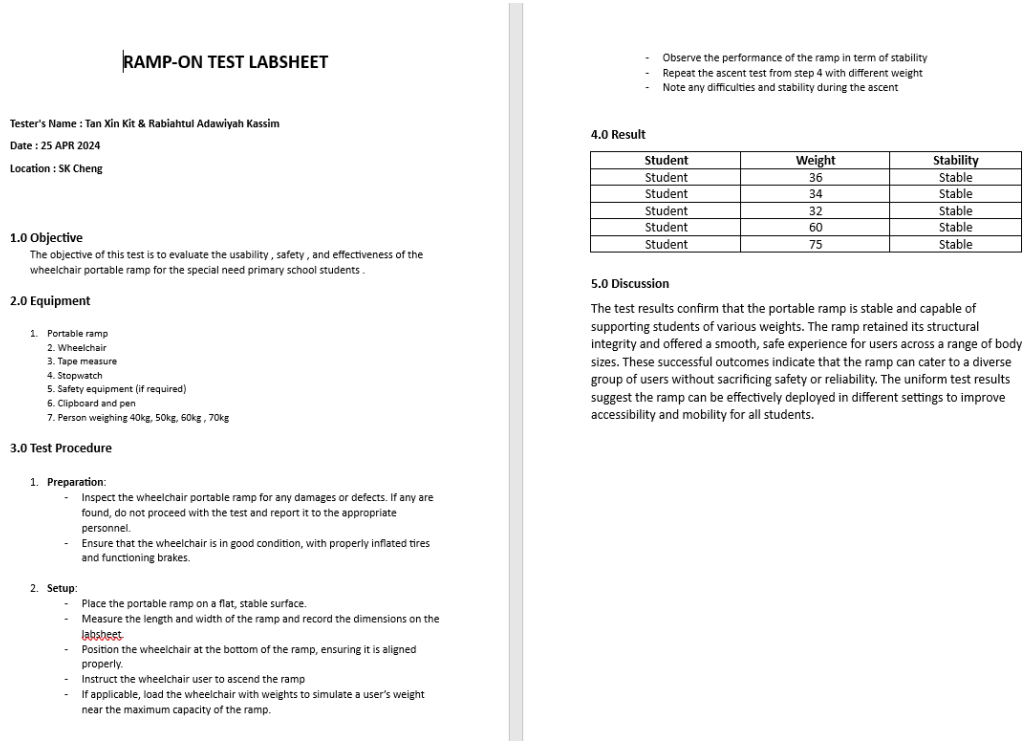
The pre-test responses from both SK Bukit Cina and SK Cheng highlight the initial challenges faced by wheelchair users in accessing school facilities due to architectural barriers. Users reported difficulties in maneuvering over uneven terrain and accessing elevated areas without external assistance.

The post-test results demonstrate significant improvement in accessibility and user satisfaction after implementing the portable ramp. Participants noted the ramp's ease of setup, stability, and enhanced safety during use. Additionally, both teachers and students observed smoother transitions and a reduction in physical strain while using the ramp.

The comparative analysis between pre- and post-test results confirms that the portable ramp is an effective solution for improving mobility and accessibility for wheelchair users in primary schools. It addresses key user needs, demonstrating reliability, durability and ease of use, making it a practical tool for fostering inclusivity in educational settings.

3.3 Field Test Analysis

By testing the ramp with students of various weights, researchers can assess its structural integrity and durability under different loads. This testing helps verify that the ramp can support users of all sizes safely and reliably without risk of failure or instability.



RAMP-ON TEST LABSHEET

Tester's Name : Tan Xin Kit & Rabiahtul Adawiyah Kassim

Date : 25 APR 2024

Location : SK Cheng

1.0 Objective

The objective of this test is to evaluate the usability , safety , and effectiveness of the wheelchair portable ramp for the special need primary school students .

2.0 Equipment

1. Portable ramp
2. Wheelchair
3. Tape measure
4. Stopwatch
5. Safety equipment (if required)
6. Clipboard and pen
7. Person weighing 40kg, 50kg, 60kg , 70kg

3.0 Test Procedure

1. **Preparation**:
   - Inspect the wheelchair portable ramp for any damages or defects. If any are found, do not proceed with the test and report it to the appropriate personnel.
   - Ensure that the wheelchair is in good condition, with properly inflated tires and functioning brakes.
2. **Setup**:
   - Place the portable ramp on a flat, stable surface.
   - Measure the length and width of the ramp and record the dimensions on the labsheet.
   - Position the wheelchair at the bottom of the ramp, ensuring it is aligned properly.
   - Instruct the wheelchair user to ascend the ramp
   - If applicable, load the wheelchair with weights to simulate a user's weight near the maximum capacity of the ramp.
   - Observe the performance of the ramp in term of stability
   - Repeat the ascent test from step 4 with different weight
   - Note any difficulties and stability during the ascent

4.0 Result

Student	Weight	Stability
Student	36	Stable
Student	34	Stable
Student	32	Stable
Student	60	Stable
Student	75	Stable

5.0 Discussion

The test results confirm that the portable ramp is stable and capable of supporting students of various weights. The ramp retained its structural integrity and offered a smooth, safe experience for users across a range of body sizes. These successful outcomes indicate that the ramp can cater to a diverse group of users without sacrificing safety or reliability. The uniform test results suggest the ramp can be effectively deployed in different settings to improve accessibility and mobility for all students.

Figure 5: Labsheet Test of Ramp-On

The consistent results across tests suggest that the ramp can be confidently used in different environments to enhance accessibility and mobility for all students.

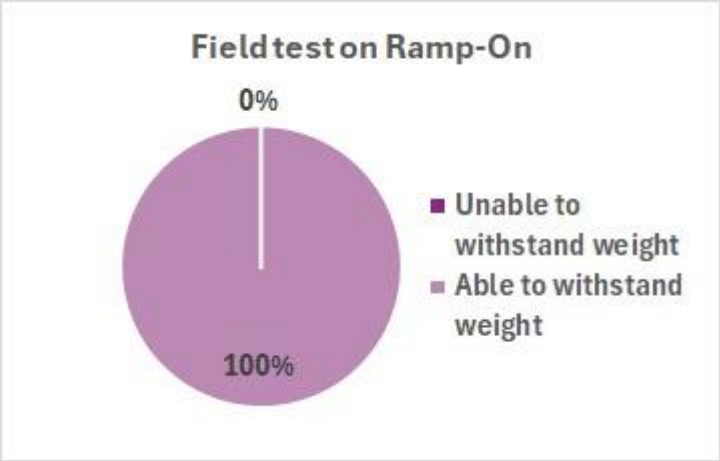


Figure 6 : Pie chart shows the result of the test

4. Conclusion and Suggestion

The implementation of the portable ramp has proven to be successful, achieving the project's initial objective of improving accessibility for wheelchair users in primary schools. Feedback from field tests and questionnaires demonstrates that the ramp fulfills user needs, providing smooth transitions across different elevations. Its ease of use, stability, and durability have enhanced mobility and safety for both students and educators, contributing to an inclusive school environment.

Suggestions for Improvement:

1. Enhanced Material Selection: Consider using advanced, lightweight materials to further improve the ramp's portability and durability.
2. Customizable Designs: Develop ramps with adjustable height and width to cater to various school terrains and unique user needs.
3. User Training Programs: Conduct regular training sessions for school staff and students to maximize the ramp's benefits and ensure proper usage.
4. Ongoing Feedback Mechanism: Establish a system for continuous feedback from users to identify areas for further refinement.

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