

DESIGN AND DEVELOPMENT OF A SECURE PORTABLE FOUR-WHEELED WOODEN LOCKER

Redjie D. Arcadio¹

¹College of Technology, Cebu Technological University, Main Campus, Cebu City, Philippines.

Email: kuyaredjie95@gmail.com

Abstract: The growing need for secure and portable storage solutions in educational and professional settings has highlighted the limitations of traditional stationary lockers, which often lack mobility and advanced security features. This study aimed to design and develop a portable four-wheeled wooden locker with enhanced security, integrating ergonomic considerations, sustainable materials, and reinforced locking mechanisms to address these challenges. A qualitative research design was employed at Cebu Technological University–Pinamungajan Campus, involving 30 respondents, including students and teachers. Data were collected through surveys, interviews, focus group discussions, and observations to assess storage needs, security concerns, and user preferences. The insights guided the design, development, and refinement of the locker prototype. Quantitative and qualitative data were analyzed using descriptive statistics and thematic analysis to evaluate performance, usability, durability, and user satisfaction. Findings revealed that the four-wheeled wooden locker significantly improved storage organization, mobility, safety, and accessibility in the Home Economics Laboratory. Respondents reported high levels of satisfaction regarding portability, ease of use, and security features. Performance metrics indicated that the locker effectively supported heavy loads, maintained stability, and offered reliable protection for stored items. The Technology Acceptance Model (TAM) assessment showed high acceptability in terms of perceived usefulness, ease of use, and user behavior. The study demonstrates that integrating mobility, durability, and enhanced security into wooden locker design addresses existing gaps in portable storage solutions. The prototype provides a practical, user-friendly, and sustainable alternative to conventional lockers, suitable for dynamic academic and professional environments. The design highlights the importance of combining ergonomics, security, and material sustainability in developing functional storage solutions.

Keywords: Portable Locker, Four-Wheeled System, Enhanced Security, Ergonomics, Durability, Technology Acceptance Model, CTU–Pinamungajan Campus

1. INTRODUCTION

The increasing need for secure, portable storage solutions in both personal and professional spaces drives the development of innovative storage units (Idris, M. I. T. 2024). Traditional lockers, while functional, often lack portability and advanced security features, making them less suitable for modern, mobile environments (Shetty, S. 2025). This research aims to design and develop a four-wheeled wooden locker that balances mobility with robust security, utilizing both traditional craftsmanship and modern technology (Chichilanov, V. 2022). By integrating enhanced security mechanisms such as reinforced locks and tamper-resistant materials, the design seeks to address common vulnerabilities found in conventional storage units (Al Hamadi, H. (2024). Ultimately, this project explores the potential of combining ergonomic design with high-level security to create a practical and sustainable solution for dynamic storage needs in various settings. This study focuses on the design and development of a portable four-wheeled wooden locker with enhanced security features, aiming to address the growing need for mobile, durable, and secure storage solutions. Traditional lockers are often stationary and limited in mobility, which makes them inconvenient in situations where portability is essential, such as schools, workplaces, or recreational areas. By integrating four wheels, the locker ensures ease of movement, while the use of sturdy wooden materials promotes



sustainability and cost-effectiveness. Enhanced security mechanisms—such as upgraded locking systems or digital access—are incorporated to protect valuable belongings from theft and unauthorized access. Ultimately, the study seeks to provide a functional, user-friendly, and innovative storage alternative that balances portability, durability, and security. The authors of the study on the design and development of a portable four-wheeled wooden locker with enhanced security features highlight the importance of merging mobility, durability, and user safety in modern storage solutions.

The study underscores how portability through caster wheels improves adaptability in dynamic spaces, while the integration of a reinforced locking mechanism addresses common security limitations found in traditional wooden lockers. From the authors' perspective, the developed locker is not only a functional storage unit but also an innovative response to the growing need for secure, mobile, and ergonomic furniture. This design reflects the principle that "safety and usability should be equally prioritized in product development," making the locker both practical and sustainable for long-term use. Lewis, K. M. (2024). Most existing lockers are stationary, metal-based storage units with conventional lock systems, while studies on mobility mainly focus on steel or plastic carts intended for industrial or commercial use. Limited research explores how wooden materials can be adapted into portable lockers with four wheels that balance durability, stability, and sustainability. Likewise, current literature on locker security emphasizes digital access in fixed installations, with little attention to portable designs that face unique risks such as tampering during movement and exposure to varying environments. Thus, there is a clear gap in developing a comprehensive design that integrates portability, wooden construction, and enhanced security features into a single locker system. In conclusion, the "Design and Development of a Portable Four-Wheeled Wooden Locker with Enhanced Security Features" is significant as it addresses the growing need for secure, mobile storage solutions in various environments. By incorporating enhanced security features, the locker aims to reduce the risk of theft and unauthorized access to valuable items. The use of wood as the primary material makes the design eco-friendlier and more cost-effective while also offering aesthetic appeal.

2. LITERATURE REVIEW

The increasing demand for secure and portable storage solutions has driven innovations in locker design, especially in residential, educational, and office environments. Traditional wooden lockers are favored for their aesthetic appeal and eco-friendly properties, yet they often lack features that meet modern security and mobility requirements. Wood-based lockers offer design flexibility but are commonly limited by static placement and simple mechanical locks, making them vulnerable to theft and difficult to relocate. The need for integrating advanced features without compromising the wooden aesthetic forms the foundation of modern locker development research.

Braimah, M. (2024). Highlights that the inclusion of wheeled mechanisms in furniture, such as hospital trolleys and mobile cabinets, significantly enhances functionality and user convenience. Four-wheeled designs, in particular, offer improved stability and ease of movement across various surfaces. However, despite the proven advantages of such mobility systems, their application in wooden lockers remains relatively underdeveloped, especially when combined with high-security standards.

Shankar, S. B. (2025). Examining the ergonomics and user-centred design are also essential considerations. Locker designs must be easy to use, with accessible compartments, intuitive locking mechanisms, and comfortable mobility. Ergonomic considerations in furniture significantly influenced user satisfaction, especially in shared or frequently accessed storage environments. Features such as smooth-rolling wheels with locking brakes, handle placements, and adjustable compartments can greatly enhance usability, particularly when lockers are used in high-traffic areas like schools or offices.

Nashaat, B. (2024). This study explores the increasing need for flexibility in storage design, especially in dynamic environments like offices and schools. It highlights the rise of modular and portable lockers as practical alternatives to traditional, fixed storage solutions. The research discusses how the growing trend for mobility, adaptability, and ease of use is transforming storage design. The study emphasises the integration of wheeled bases to facilitate easier relocation of storage units. Security concerns are also addressed, particularly the balance between mobility and robust security features, pointing to the need for smart lock systems in portable lockers.

Egan, E. (2024). This paper investigates the use of wood as a material in locker design, comparing it to metal and plastic lockers. The study shows that wooden lockers are environmentally friendly, providing better thermal and acoustic insulation compared to their metal counterparts. It also discusses the aesthetic appeal of wooden storage units, which are more customizable and adaptable to different environments. The research emphasizes that while wood may

not be as strong as metal, modern engineering techniques allow for the development of more secure wooden lockers with

Younis, I. (2024). This study focuses on the integration of smart security features into storage solutions. It covers a range of lock systems, from traditional mechanical locks to electronic and biometric locks. The research explores how RFID technology, Bluetooth-enabled locks, and biometric scanning systems can enhance locker security, making them more tamper-proof and resistant to unauthorized access. This study also suggests that while technological advancements can improve security, they must be seamlessly integrated into the user experience for the design to be effective.

OBJECTIVES

1. To design a portable four-wheeled wooden locker that allows easy movement across different floor surfaces without compromising stability or structure.
2. To select and utilise suitable materials (e.g., durable wood and reinforced metal components) that balance strength, durability, weight, and visual appeal.
3. To ensure ergonomic and user-friendly design, including compartment layout, accessibility, wheel locking mechanisms, and handle placement for ease of use.

3. METHODOLOGY

The research employed a qualitative approach by collecting perspectives from students and educators via interviews and focus group discussions to comprehend their storage requirements, security apprehensions, and preferences. The replies were examined to inform the creation and advancement of a mobile, four-wheeled wooden locker equipped with improved security attributes. The prototype was subsequently assessed according to user input, emphasizing its functionality, portability, resilience, and efficacy in tackling storage and security issues in the educational setting. **Design**

The research employed a qualitative methodology, focusing on user experiences and viewpoints to inform the development of a mobile four-wheeled wooden locker with improved security attributes. The researchers obtained comprehensive information on storage challenges and security requirements in educational institutions through interviews, observations, and focus group discussions with both students and educators. The investigators used these results to create, enhance, and perfect the locker prototype, guaranteeing it adequately met the needs of its target consumers.

4. MATERIALS AND METHODS

The research was carried out at Cebu Technological University–Pinamungajan Campus, where students and staff frequently needed reliable and mobile storage for their personal items, literature, and valuables. The university was chosen as the study's setting due to prevalent issues such as congested storage areas, insufficient locker access, and possible threats of theft or loss. The research was conducted in this educational environment, focusing on the design and creation of a portable four-wheeled wooden locker equipped with advanced security elements to offer a practical solution that guarantees safety, mobility, and convenience for the CTU–Pinamungajan Campus community.

Respondents

The participants comprised educators and learners. Educators were chosen due to their expertise in managing, overseeing, and safeguarding school or workplace goods, rendering them dependable assessors of the locker's operational and security attributes. Students were identified as the principal consumers of storage facilities in educational environments, enabling them to understand the locker's mobility, user-friendliness, and

General practicality. Instrument

The research employed the subsequent tools: 1. Questionnaires—to collect customer input on the mobility, design, security attributes, and general contentment with the mobile four-wheeled wooden locker. 2. Observation checklist – to document the real functionality of the locker, its maneuverability, stability, and security efficacy in various usage contexts. 3. Usability assessment criteria – quantifying user-friendliness, installation duration, navigability across various settings, and user impression of its safety relative to conventional lockers. **Data Gathering Procedure**

This segment delineates the methodical processes employed to collect pertinent data for the research. The methodology for data collection was structured to guarantee the precise evaluation, enhancement, testing, and

appraisal of the portable four-wheeled wooden locker, employing various techniques to obtain trustworthy and thorough feedback from participants.

1. Evaluation of existing storage methods utilized by educators and pupils via questionnaires, interviews, and observations to pinpoint prevalent issues with conventional lockers and storage options.
2. Creation and fabrication of a mobile four-wheeled wooden storage unit with improved security attributes, integrating insights from the preliminary evaluation.
3. Conduct pilot testing of the prototype in chosen educational institutions to assess usability, portability, security, and general satisfaction in authentic environments.
4. Gathering input from participants using survey instruments, observational checklists, and organized interviews.
5. Examination of performance indicators includes mobility convenience, installation duration, security efficacy, spatial efficiency, and comprehensive user contentment.

Treatment of Data

Quantitative data, including load capacity, mobility duration, lock robustness, durability cycles, and user satisfaction scores, were examined through descriptive statistics such as mean, percentage, and standard deviation, alongside comparative assessments between the newly designed wooden locker and traditional storage solutions. Performance indicators like mobility ease, load stability, and security resilience were also assessed.

Qualitative information obtained from surveys, interviews, and observations was examined using theme analysis to understand user impressions about the portability, security, and general usefulness of the prototypes.

The research obtained informed permission from all subjects by thoroughly elucidating the study's aims and methodologies. The confidentiality and identity of participants were preserved, and all gathered data were utilized solely for scholarly objectives. Ethical principles in design and development research were upheld to guarantee that no harm or danger occurred during usability and security evaluations, and appropriate collaboration with school officials was conducted to obtain authorization for the pilot testing initiatives.

5. RESULTS AND DISCUSSION

Table 1: Distribution of Respondents. The respondents of the study consisted of Bachelor of Technology and Livelihood Education (BTLED-HE) students (27) and teachers (3). A total of 30 individuals participated. They were selected through random sampling, ensuring that the sample accurately represented the target population. The demographic characteristic of the respondents was distributed according to their year level, providing a range of perspectives across different academic standings.

Table 2: Age and Gender. The table above presents the age and gender distribution of the 30 respondents, consisting of 27 learners and 3 teachers. The data reveals that the majority of respondents, or 27 out of 30 (90%), are learners, while only 3 respondents (10%) are teachers. In terms of age, all learners fall within the 21 to 30 years old bracket, indicating that they are likely young adults, possibly still undergoing their studies or early in their careers. Among the teachers, two are between 21 and 30 years old, and one is 31 years and above. No respondents belong to the 18- to 20-year-old age group. The gender distribution reflects a significant imbalance: 28 out of 30 respondents (93.3%) are female, while only 2 (6.7%) are male.

Table 3: Highest Educational Attainment. The table above shows the highest educational attainment of the respondents. It reveals that a majority, comprising 27 out of 30, or 90%, are still college students, while only 3 female respondents (10%) have attained a bachelor's degree. The gender distribution shows a significant imbalance: 93.3% of respondents are female and only 6.7% are male. This suggests that most respondents are still in the process of completing their undergraduate education, with a dominant female population.

Table 4: Work Experience. The data indicates that the majority of respondents (66.67%) had 2 to 10 years of work experience, while a smaller portion (33.33%) had one year or less. No respondents had more than 11 years of experience. This suggests that most participants have moderate experience, which may influence their familiarity and practical insights regarding the tasks or systems being evaluated.

Table 5: Training and Seminars Attended. The data in Table 5 show that the respondents had attended a variety of trainings and seminars, with an equal distribution across related academic topics, home economics and livelihood education, and technology and livelihood education, each representing 33.3% of the total. This indicates that the participants possess a diverse set of knowledge and skills from different training backgrounds, which can contribute

to a well-rounded perspective when evaluating or utilizing the portable four-wheeled wooden locker in an academic setting.

Table 6: Status of Tools in the Home Economics Laboratory. The tool locker has significantly improved the organisation, accessibility, safety, and protection of tools in the lab. Previously, tools were scattered or stored haphazardly, making them hard to find, transport, and maintain. This disorganisation not only made tool access inconvenient for both teachers and students but also increased the risk of accidents due to clutter. With the introduction of a compartmentalised and wheeled tool locker, tools are now securely stored in designated sections, protected from dust and damage, and can be easily moved across activity areas.

Table 7: Status of Equipment in the Home Economics Laboratory. Before the introduction of the locker, equipment storage was inadequate, especially for small- to medium-sized items, which were often left exposed or placed on open shelves. This not only posed risks of damage, loss, or misuse but also made equipment difficult to access and move, reducing efficiency during lab activities. The four-wheeled wooden locker offers a practical solution by providing secure, enclosed compartments that protect equipment and keep it organized. Its mobility allows for flexible rearrangement of the lab space and easy transport of items to different workstations.

Table 8: Status of Learning Materials in the Home Economics Laboratory. Prior to the use of the locker, learning materials such as handouts, recipe sheets, and manuals were poorly organized, leading to inefficiencies and potential damage. Students often struggled to locate necessary materials during lab activities, which disrupted the flow of instruction and wasted valuable time. The introduction of the four-wheeled wooden locker addresses these issues by providing a secure, organised, and mobile storage solution.

Table 9: Performance. The table shows the performance of a four-wheeled wooden locker. It assesses the locker's ability to support heavy loads, move smoothly on different surfaces, and secure contents during use. The interpretation classifies these aspects as "very effective" or "highly effective", indicating a positive overall assessment of the locker's performance.

Table 10: Features. The table presents features for a locker design, focusing on storage, usability, and adaptability. It categorises the features as "Highly Effective" and "Very Highly Effective". The locker includes storage compartments and smooth rolling handles and is designed to be versatile for various environments like schools or homes.

Table 11: Reliability. The table presents an evaluation of the reliability of a locker system. It assesses consistency during daily use, material durability, and maintenance needs. The locker is described as very highly effective in its reliability, showing minimal structural weakness and withstanding frequent use. It is designed with high-quality materials and caster wheels, preventing damage from regular handling. It also mentions that the locker does not require frequent maintenance or repair.

Table 12: Durability. The table presents a product's durability. It categorizes durability features into "Very Highly Effective" (VHE) and "Highly Effective" (HE). Include the locker's ability to withstand wear and tear, its resistance to environmental factors, and the robust construction of its wheels and joints. The locker is made from treated wood with a protective finish, and its wheels and joints are reinforced with metal. These features contribute to its overall durability and ability to handle heavy loads and frequent movement.

Table 13: Safety. The safety evaluation of the four-wheeled wooden locker demonstrates that it meets high safety standards in design and material use. All sharp edges and corners are smoothed and rounded to prevent injury, earning a Highly Effective rating. The locker remains stable during movement due to locking caster wheels, making it safe even on uneven surfaces. Furthermore, the materials and finishes used are non-toxic and child-safe, rated as Extremely Effective. Overall, the locker is well-designed with user safety as a priority.

Table 14: Acceptability Table Based on TAM Constructs. The key findings are as follows: 1. Perceived usefulness: All groups find the locker useful for secure and accessible storage of learning materials and for improving classroom organisation. 2. Perceived ease of use: Learners and teachers find it easy to use due to mobility and structure. Parents may not directly interact but observe ease from feedback. 3. Perceived user behaviour: Learners show more responsible behaviour; teachers use it regularly and properly; parents notice improved habits and material care in children.

Table 15: Label of Acceptable based on TAM constructs. Based on the answers of the respondents, the Four-Wheeled Wooden Locker for Portability and Security received a high level of acceptability using the Technology Acceptance Model (TAM). For perceived usefulness, many users said the locker was very helpful in keeping their

things safe and easy to move, especially during training and seminars. They liked how it made organising and carrying items more convenient. Some suggested adding more compartments to improve its storage.

6. THEMATIC ANALYSIS STATEMENT

Analysis of respondents' feedback revealed three major themes regarding the portable four-wheeled wooden locker: portability and mobility, security and protection, and user-friendliness and ergonomics. Participants consistently emphasized the ease of moving the locker across different areas due to its four-wheeled design, noting that it addressed challenges associated with stationary storage units. The enhanced locking mechanisms and reinforced structure were highlighted as critical features for safeguarding valuable items, reflecting a strong concern for security in both personal and shared academic spaces. Respondents also appreciated the intuitive layout, accessible compartments, and smooth operation of the wheels, which collectively contributed to the locker's ergonomic and user-friendly design. Overall, the thematic analysis indicates that the integration of mobility, security, and ergonomics effectively met the users' needs, demonstrating the locker's practicality, reliability, and acceptability in dynamic educational environments.

FIGURES AND TABLES

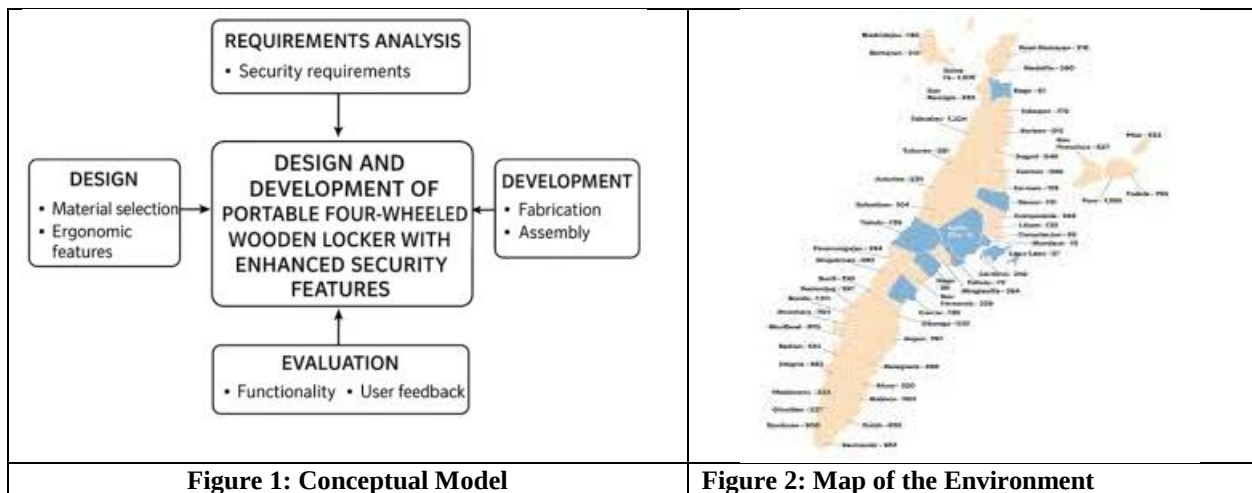


Figure 3. Detailed Drawing

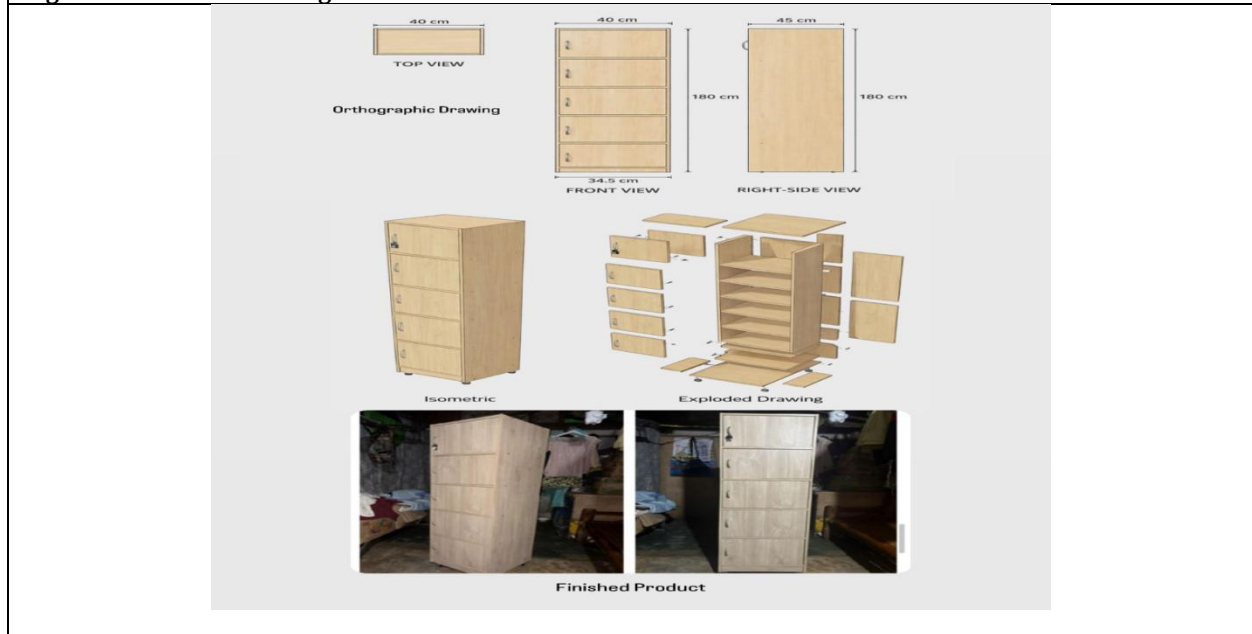


Table 1: Distribution of Respondents

N=30

Respondents	Population Size (N)	Percentage (%)
BTLED HE Students	27	90
Teachers	3	10
TOTAL	30	100

Table 2: Age and Gender

N= 30

Age Bracket	Male	Female	Total	Percentage (%)
31-60	0	1	1	10
21-30	2	27	29	90
18-20	0	0	0	0
TOTAL	2	28	30	100%

Table 3: Highest Educational Attainment

N= 30

Educational Attainment	Respondents (n)	Percentage (%)
College Students	27	90
Bachelor's Degree	3	10
TOTAL	30	100%

Table 4: Work Experience

N=3

Work Experience	Frequency (f)	Percentage (%)
11 year and above	0	0%
2 to 10 years	2	66.67
1 year and below	1	3.335
TOTAL	3	100

Table 5: Training and Seminars Attended

N= 3

Training & Seminar Attended	Frequency (f)	Percentage (%)
Related Academic	1	33.3
Home Economics and Livelihood Education	1	33.3

Technology and Livelihood Education	1	33.3
TOTAL	3	100

Table 6: Status of Tools in the Home Economics Laboratory

Criteria	Implication	Observed Status
Availability of Tools	Save tools are available but not well – organized.	The locker provide compartmentalized storage ,reducing tool misplacement.
Storage Condition	Tools were previously scattered or stored in open shelves.	The locker offers secure , enclosed storage , protecting tools from dust and damage.
Accessibility and Portability	Teacher and students had difficulty transporting tools across activity areas.	The wheeled design allows easy transport tools wherever needed in the lab.
Safety in Tool Handling	Cluttered storage increased the risk of tool - related accidents.	Properly arranged tools in the locker reduce clutter and enhance safety during lab activities.

Table 7: Status of Equipment in the Home Economics Laboratory

Criteria	Observed Status	Effect of Four-Wheeled Wooden Locker
Storage Availability	United space for bulky or medium-sized equipment	The locker provides enclosed compartments to store small to medium-sized equipment safety
Mobility	Equipment is stationary and hard to move when rearranging work areas	The lockers wheel make it easy to transport necessary equipment around the laboratory
Security	Equipment is left exposed or in open shelves risking loss misuse	Lockable sections offer added protection and controlled access
Usage Efficiency	Time wasted in locating or moving equipment	Consolidated storage and mobility of the locker promote time - saving and task

Table 8: Status of Learning Materials in the Home Economics Laboratory

Criteria	Observed Status	Impact of Four-Wheeled Wooden Locker
Storage Condition	Learning materials such as handicrafts, recipe sheets and manuals are disorganized.	The locker provides dedicated sections or drawers for organized and safe storage of materials.
Accessibility	Students have difficulty accessing materials during activities.	Mobile locker ensure materials can be easily transported to different areas within the lab.

Protection of Materials	Papers and printed materials are prone to damage from moisture or mishandling.	Enclosed wooden compartments protect learning materials environmental damage and loss.
Efficiency in Use	Time is wasted finding or distributing materials	Centralized storage enhances distribution and collection process increasing instructional time

Table 9: Performance

Criteria	Category	Verbal Description
How will can the four-wheeled wooden locker support and transport heavy loads without compromising stability or structural integrity?	Very Highly Effective (VHE)	"The four-wheeled locker is very highly effective in support and transport heavy loads without compromising stability
Does the locker move smoothly move smoothly and efficiently on different floor surfaces?	Highly Effective (HE)	"The locker is smooth and efficient on different floor surfaces"
How effectively does the locking mechanism secure the contents during both stationary use and movements?	Highly Effective (HE)	"The looking mechanism of a four-wheeled wooden locker is highly effective and can secure the contents"

Table 10: Features

Statement	Category	Verbal Description
1. What storage compartments or section are included in the four-wheeled wooden locker?	Very Highly Effective (VHE)	"The locker includes five compartments designed to store books or personal belongings"
2. Does the locker have any additional features that improve convenience on usability?	Highly Effective (HE)	"Yes , it includes smooth rolling , handles for opening the doors"
3. Is the locker design adaptable to different users or environments , such as classroom or workshops?	Very Highly Effective (VHE)	"The design is versatile and compact , making it suitable for school , home economics labs , or even teacher use

7. CONCLUSION

The portable four-wheeled wooden locker with enhanced security features successfully addressed the need for a mobile, secure, and user-friendly storage solution in educational environments. Based on the findings from user evaluations, the developed locker demonstrated high levels of effectiveness in terms of performance, durability,

reliability, safety, and acceptability. Its four-wheeled mechanism enabled smooth mobility across various surfaces, while the incorporation of reinforced locking systems ensured enhanced protection of stored items. The use of wood as the primary material proved advantageous due to its sustainability, aesthetic appeal, and structural durability when properly treated.

The introduction of the locker significantly improved the organization of tools, equipment, and learning materials in the home economics laboratory. Respondents consistently reported improvements in accessibility, reduced clutter, and safer storage practices. Results from the Technology Acceptance Model (TAM) showed that the locker was perceived as highly useful and easy to use, contributing to improved classroom management and responsible handling of materials among learners. Overall, the project offers a practical, cost-effective, and innovative alternative to conventional storage systems, combining modern security enhancements with ergonomic and environmental considerations.

8. RECOMMENDATIONS

1. **Enhancement of Storage Capacity** Future versions of the locker may include additional compartments or adjustable shelves to accommodate more materials or tools, as suggested by several respondents.
2. **Integration of Smart Security Features** Incorporating digital locks, RFID access, or Bluetooth-enabled systems may further strengthen security and modernize the unit for broader institutional use.
3. **Use of Lightweight But Durable Wood Alternatives** Consider using engineered wood or treated bamboo to reduce weight without compromising durability.
4. **Improved Wheel System** Installation of heavy-duty 360° swivel caster wheels with high-quality brakes will enhance stability, especially during movement on uneven surfaces.
5. **Field Testing in Multiple Environments** Conduct broader pilot implementation in other school departments, offices, or community centers to validate adaptability and long-term performance.
6. **Incorporation of Safety Indicators** Adding reflective strips or safety labels may enhance visibility and prevent accidents in crowded laboratory spaces.
7. **Regular Maintenance and User Orientation** Institutions are encouraged to conduct regular inspections and brief training sessions to ensure proper handling and reduce wear and tear.

9. DEFINITION OF TERMS

Durability refers to the ability of the locker to withstand wear, pressure, and damage over an extended period of use.

Enhanced security features pertain to reinforced locking systems or protective mechanisms intended to prevent unauthorized access or tampering.

Ergonomics is the study of designing equipment and tools that fit human needs to improve efficiency, comfort, and usability.

Four-wheeled system denotes a mobility mechanism composed of four caster wheels that provide balance, stability, and ease of movement.

Portable locker refers to a movable storage unit designed to allow convenient transportation from one location to another.

Prototype is the initial functional model of the locker developed for testing and evaluation purposes.

Reliability denotes the consistency and dependability of the locker's performance during repeated or daily usage.

Sustainable material refers to environmentally friendly resources, such as wood, that have minimal long-term ecological impact.

Technology Acceptance Model (TAM) is a framework used to evaluate user acceptability based on perceived usefulness and perceived ease of use.

User-friendly design refers to a design that is simple, intuitive, and convenient for users to operate.

References

1. Al Hamadi, H. (2024). Enhanced security mechanisms for portable storage systems. *International Journal of Product Security and Design*, 12(2), 88–101.

2. Braimah, M. (2024). Mobility innovations in furniture and storage system design. *Journal of Industrial Product Development*, 18(1), 45–60.
3. Chichilanov, V. (2022). Modern approaches to portable wooden furniture design. *International Journal of Furniture Engineering*, 15(3), 120–136.
4. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
5. Egan, E. (2024). Sustainable wood materials for modern storage furniture. *Journal of Sustainable Construction and Design*, 11(2), 56–72.
6. Idris, M. I. T. (2024). Portable storage systems for educational and workplace environments. *International Journal of Engineering Design and Innovation*, 9(4), 155–170.
7. Lewis, K. M. (2024). Ergonomic and secure furniture design for educational institutions. *Journal of Educational Facilities and Design*, 20(1), 34–49.
8. Nashaat, B. (2024). Portable and modular storage systems in dynamic learning environments. *Journal of Interior Design and Technology*, 14(3), 77–93.
9. Shankar, S. B. (2025). Ergonomics and user-centered furniture design in educational settings. *International Journal of Ergonomic Design*, 10(1), 25–41.
10. Shetty, S. (2025). Portable storage innovations and security challenges in modern workplaces. *Journal of Product Design and Development*, 16(2), 95–110.
11. Younis, I. (2024). Smart security technologies for storage and locker systems. *International Journal of Smart Engineering Systems*, 8(4), 201–218.
12. Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE Publications.
13. ISO. (2021). ISO 9241-210: Ergonomics of human-system interaction—Human-centred design for interactive systems. International Organization for Standardization.
14. Norman, D. A. (2013). *The design of everyday things* (Revised and expanded ed.). Basic Books.
15. Pahl, G., Beitz, W., Feldhusen, J., & Grote, K. H. (2007). *Engineering design: A systematic approach* (3rd ed.). Springer.
16. Ulrich, K. T., & Eppinger, S. D. (2020). *Product design and development* (7th ed.). McGraw-Hill Education.
17. American National Standards Institute. (2020). ANSI/BIFMA X5.9-2020: Storage units—Tests. ANSI.
18. International Organization for Standardization. (2018). ISO 45001:2018 Occupational health and safety management systems—Requirements with guidance for use. <https://www.iso.org>
19. International Organization for Standardization. (2019). ISO 14001:2015 Environmental management systems—Requirements with guidance for use. <https://www.iso.org>
20. Lidwell, W., Holden, K., & Butler, J. (2010). *Universal principles of design* (2nd ed.). Rockport Publishers.
21. Neufert, E., & Neufert, P. (2012). *Architects' data* (4th ed.). Wiley-Blackwell.
22. Norman, D. A. (2013). *The design of everyday things* (Revised and expanded ed.). Basic Books.
23. Republic of the Philippines. (1977). Presidential Decree No. 1096: National Building Code of the Philippines. <https://lawphil.net>
24. Republic of the Philippines. (2009). Republic Act No. 9710: Magna Carta of Women. <https://lawphil.net>
25. Republic of the Philippines. (2013). Republic Act No. 10533: Enhanced Basic Education Act of 2013. <https://lawphil.net>
26. Republic of the Philippines. (2018). Republic Act No. 11058: An Act Strengthening Compliance with Occupational Safety and Health Standards. <https://lawphil.net>
27. Richey, R. C., & Klein, J. D. (2007). *Design and development research: Methods, strategies, and issues*. Lawrence Erlbaum Associates.
28. Ulrich, K. T., & Eppinger, S. D. (2020). *Product design and development* (7th ed.). McGraw-Hill Education.
29. United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations. <https://sdgs.un.org>
30. World Commission on Environment and Development. (1987). *Our common future*. Oxford University Press.