

Multi-Purpose Teaching Implements

Angel Grace Arciaga Datulayta¹, Joel Vocaes Misanes, PhD²

¹Master of Technology Education, University of Southern Mindanao-Kidapawan City Campus, Cotabato, Philippines

²Associate Professor V/Dean, College of Trades and Industries, University of Southern Mindanao-Kabacan Campus, Cotabato, Philippines

Email of Corresponding Author: angelgracedatulayta93@gmail.com

Publication history:

Received: August 11, 2026

Accepted: September 18, 2026

Revised: September 13, 2026

Published: September 19, 2026

International Journal of Sustainable and Integrated Studies, Vol. 1, No. 2, pp. 429–434, September 2026.

Abstract

This study developed and evaluated the acceptability of Multi-purpose Teaching Implements designed to integrate classroom organization, instructional presentation, storage, mobility, and multimedia functions within a single movable structure. Guided by learning and instructional design principles and an input-process-output approach, the study employed a project development approach and quantitative research design. The prototype incorporated detachable sliding whiteboards, storage compartments, an extendable working table, caster wheels, and a motorized Smart TV lift. A researcher-made, expert-validated questionnaire using a four-point Likert-type scale was administered to 40 purposively selected respondents consisting of teachers, Junior High School learners, and Senior High School learners from Malasila National Vocational and Technological High School. Frequency count and mean were used to analyze the data. Findings showed that the prototype was rated Highly Acceptable in terms of design, with an overall mean of 3.96; materials used, with 3.92; and usability, with 3.94. Respondents considered the implement useful for classroom organization, collaborative activities, multimedia presentations, storage, mobility, and additional workspace. However, limitations were identified regarding the height of the whiteboard frame, limited storage, structural weight and aesthetics, placement of components, television security, hinge mechanism, and lifting arrangement. Recommended improvements included adjusting the whiteboard height, increasing storage, using lighter and more durable materials, improving component placement and locking mechanisms, and refining the lifting system. The study supports SDG 4: Quality Education through flexible and technology-supported classroom resources and SDG 9: Industry, Innovation and Infrastructure through the development of an integrated instructional product. Its sustainability contribution is primarily educational, technological, and institutional by promoting adaptable learning spaces, purposeful technology integration, and more efficient use of classroom resources.

Keywords: Classroom Organization, Educational Technology, Flexible Learning Environment, Instructional Facility, Multi-Purpose Teaching Implements, Product Development, Smart TV, Usability

1. Introduction

Effective teaching depends on instructional strategies and on learning environments that provide accessible, flexible, and appropriate resources. Classroom furniture, writing surfaces, storage, and educational technology can influence how teachers organize instruction and how learners participate in classroom activities. Recent research indicates that flexible classroom arrangements can support learner agency, engagement, collaboration, and student-centered teaching when physical spaces are aligned with instructional needs (Morris and Imms, 2025; Sathish and Lau, 2026). The present study develops Multi-purpose Teaching Implements, a movable classroom facility integrating detachable whiteboards, storage compartments, an extendable table, caster wheels, and a motorized lift for a Smart TV. It is intended to address practical concerns involving classroom organization, group presentations, multimedia instruction, storage, workspace, and mobility. The study focuses on designing and constructing the implement and determining its acceptability in terms of design, materials used, and usability.

Physical classroom conditions can support or constrain participation, organization, and instructional flexibility. Morris and Imms (2025) found that flexible furniture can support learner agency and engagement while enabling teachers to adopt more student-centered practices. Similarly, Fullerton and Nicholls (2026) showed that flexible configurations, accessible storage, writable surfaces, and adaptable classroom spaces can support different forms of teaching and student engagement, although effective use depends on how well the physical environment matches pedagogical needs. Within the study setting, limited storage, workspace, presentation surfaces, and mobility of teaching materials created practical concerns for teachers and learners. The proposed Multi-purpose Teaching Implements addresses these concerns by combining several classroom functions within one movable structure.

Flexible learning environments allow instructional spaces to be reorganized according to activities, learner needs, and teaching approaches. Sathish and Lau (2026) identified movable seating, collaborative work surfaces, varied learning zones, and task-responsive arrangements as important dimensions of classroom spatial flexibility. Such flexibility becomes educationally meaningful when physical arrangements are appropriately connected with teaching and learning activities. Writing and display technologies can also support classroom interaction. Kühl and Wohninsland (2022) found that meaningful use of interactive whiteboards can support learner motivation and learning performance. Educational technology, however, should complement rather than replace teacher-led instruction and should be selected according to relevance, accessibility, evidence, and sustainability (UNESCO, 2023). These findings support the proposed integration of detachable whiteboards and a Smart TV within a multifunctional classroom structure.

The study is situated at Malasila National and Vocational High School, Malasila, Makilala, North Cotabato, where the project responds to concerns involving learner group activities, teacher storage, instructional-material mobility, and temporary classroom or TLS conditions. The implement is therefore designed around the practical requirements of its intended school environment. More broadly, contemporary education increasingly requires learning spaces that accommodate collaboration, learner-centered activities, technological resources, and changing instructional arrangements. International research demonstrates continuing interest in flexible and multifunctional classroom environments (Morris and Imms, 2025; Fullerton and Nicholls, 2026; Sathish and Lau, 2026). Technology integration likewise remains important, provided that technology responds to educational needs rather than being adopted solely for its availability (UNESCO, 2023).

The study is broadly grounded in learning and instructional design principles that connect educational needs with purposeful design decisions. McDonald (2024) explains that theory can guide instructional designers in making informed judgments about learning solutions according to learner needs and context. In this study, these principles are reflected in the development of a classroom implement intended to support interaction, organization, accessibility, and multimedia instruction. Conceptually, the study follows an input-process-output approach. Relevant ideas, references, materials, tools, equipment, labor, and evaluation instruments serve as inputs; planning, designing, constructing, testing, revising, and evaluating constitute the development process; and the completed Multi-purpose Teaching Implements represents the output.

Recent literature supports flexible furniture and adaptable learning environments, but their effectiveness depends on purposeful alignment between physical design and classroom activities (Morris and Imms, 2025; Sathish and Lau, 2026). Within the prior technologies reviewed in the study, individual features such as mobility, writing surfaces, storage, detachable components, and technology integration were available, but no single reviewed design combined all the functions proposed in the present project. The study therefore develops an integrated structure combining detachable whiteboards, storage, additional workspace, mobility, and a motorized Smart TV lift and evaluates its acceptability in terms of design, materials used, and usability.

The study is primarily aligned with SDG 4: Quality Education because it seeks to improve access to organized, flexible, and technology-supported classroom resources. It also relates to SDG 9: Industry, Innovation and Infrastructure through the design and construction of a multifunctional instructional product integrating traditional classroom equipment with technological features. These areas remain part of the United Nations' broader priorities for advancing education, innovation, infrastructure, and digital transformation (United Nations Department of Economic and Social Affairs, 2025).

The study contributes primarily to educational, technological, and institutional sustainability. Educationally, the implement supports collaborative activities, classroom presentations, and multimedia instruction. Technologically, it integrates traditional writing surfaces with a Smart TV system while maintaining teacher-led learning, consistent with recommendations for purposeful technology use in education (UNESCO, 2023). Institutionally, its integrated storage, workspace, and mobility features may help schools use classroom space and instructional resources more efficiently. The project therefore connects education, instructional technology, product design, and classroom resource management within one practical intervention.

2. Material and methods

2.1 Research Design

The study employed a project development approach and quantitative research design. The project development component involved planning, designing, constructing, testing, and revising the Multi-purpose Teaching Implements, while the quantitative component was used to obtain numerical assessments of its acceptability. Quantitative research is appropriate when measurable data are systematically collected and analyzed to address predetermined research objectives (Creswell & Creswell, 2023). The prototype was constructed primarily from wood and aluminum and incorporated three detachable sliding whiteboards, storage compartments, an extendable table, caster wheels with locks, and a motorized lift with a Smart TV bracket. The whiteboards measured 60 × 90 centimeters, while the entire structure measured 72 inches in height, including the wheels. The storage compartments were intended for instructional materials, forms, workbooks, and learner outputs, while the Smart TV component supported multimedia instruction. The total material cost was ₱23,116.00, with labor computed at 40% of the material cost or ₱9,246.40, and a 10% contingency cost of ₱2,311.60, resulting in an estimated total project cost of ₱34,674.00.

2.2 Locale of the Study

The evaluation was conducted at Malasila National Vocational and Technological High School, Malasila, Makilala, Cotabato. The school was formerly known as Malasila High School and was founded in 1995. At the time of the study, it had 665 Junior and Senior High School learners and 33 teaching personnel. The locale provided the setting for assessing the acceptability of the developed teaching implement.

2.3 Respondents of the Study

The study involved 40 respondents, consisting of 10 teachers, 15 Junior High School learners, and 15 Senior High School learners from Malasila National Vocational and Technological High School. They evaluated the Multi-purpose Teaching Implements based on its design, materials used, and usability.

2.4 Sample and Sampling Procedure

The study employed purposive sampling in selecting the 40 respondents. The teachers and learners were deliberately selected because they were directly involved in classroom teaching and learning activities and could provide relevant evaluations of the prototype. Purposive sampling selects participants according to characteristics that are specifically relevant to the objectives of the investigation (Andrade, 2021). The selected respondents assessed the Multi-purpose Teaching Implements according to design, materials used, and usability through the researcher-developed evaluation questionnaire.

2.5 Research Instrument

A researcher-made evaluator's questionnaire was used to determine the acceptability of the Multi-purpose Teaching Implements. It employed a four-point Likert-type scale with the following response categories: 4 for Highly Acceptable, 3 for Acceptable, 2 for Not Acceptable, and 1 for Highly Not Acceptable. Rating scales provide structured response categories through which respondents can express levels of evaluation or perception (Taufique et al., 2026). The questionnaire was subjected to content validation by three experts who evaluated its clarity, relevance, and appropriateness. Expert review is an established approach to establishing whether questionnaire items appropriately represent the intended content or construct (Madadzadeh & Bahariniya, 2023). The validators provided mean scores of 4.66, 5.00, and 4.33, resulting in an overall mean of 4.66, interpreted in the manuscript as Highly Valid. An open-ended portion was also provided for respondents' comments and suggestions for improving the prototype.

2.6 Data Gathering Procedure

The development process began with the identification and preparation of the required materials. The structure was fabricated using mahogany wood and aluminum and incorporated storage compartments, detachable whiteboards, an extendable table, caster wheels, and a concealed motorized lift for the Smart TV. A drawer-slide mechanism was installed to allow movement of the whiteboard frame and facilitate the attachment and detachment of the whiteboards. The project was completed over approximately 10 weeks, consisting of two weeks for planning, one week for designing, one week for purchasing and preparing materials, three weeks for construction and fabrication, one week for testing and revision, and two weeks for report writing. Following fabrication, the prototype was tested for possible defects. The testing identified loosening screws in the self-locking hinge of the extendable table, which were replaced with heavy-duty connector screws. For the evaluation phase, the researcher prepared the required ethics-review documents and a letter requesting permission from the school principal. Upon approval, the researcher coordinated with the school administration, personally facilitated the onsite evaluation, addressed respondents' concerns, and collected the completed questionnaires immediately after administration.

2.7 Data Analysis Techniques

The study used frequency count and mean to analyze responses obtained through the four-point acceptability scale. Frequency counts summarized the distribution of responses, while mean scores were used as the study's aggregate measure for determining the acceptability of the Multi-purpose Teaching Implements according to design, materials used, and usability. The use and interpretation of Likert-type response formats require explicit specification of response categories and analytical procedures (Taufique et al., 2026). The statistical procedures reported here follow those specified in the original methodology.

2.8 Ethical Considerations

The researcher submitted the requirements for ethics review before conducting the evaluation and secured permission from the school administration prior to onsite data collection. These procedures supported the ethical conduct of research involving human participants. Current Philippine ethical guidance emphasizes appropriate review and protection of the rights and welfare of research participants (Philippine Health Research Ethics Board [PHREB], 2022).

3. Results and Discussion

3.1 Development of the Multi-purpose Teaching Implements

3.1.1 Design of the Multi-purpose Teaching Implements

The completed Multi-purpose Teaching Implements measured 72 inches in height and 69¾ inches in length. It incorporated sliding and detachable whiteboards, a motorized Smart TV lift, an extendable working table, storage cabinets, and caster wheels. Aluminum was used for the whiteboard frame, while wood formed the main housing. These components combined writing, multimedia presentation, workspace, storage, and mobility within a single classroom structure. The integration of movable, adaptable, and multifunctional components is consistent with recent research on flexible learning environments. Morris and Imms (2025) found that flexible furniture can support learner agency and engagement, while Sathish and Lau (2026) identified movable furniture, collaborative work surfaces, and task-responsive spatial arrangements as important attributes of flexible classrooms. Fullerton and Nicholls (2026) likewise emphasized the importance of built-environment features that support adaptable and engaging learning spaces.

3.1.2 Construction of the Multi-purpose Teaching Implements

The prototype was constructed using wood, a steel-framed whiteboard, a motorized TV lift, caster wheels, hinges, self-locking folding hinges, magnetic cabinet mechanisms, heavy-duty connector screws, electrical components, and finishing materials. Construction involved preparing and assembling the wooden housing, installing the sliding whiteboard mechanism, constructing the extendable table and cabinets, mounting the motorized TV lift, attaching locking caster wheels, and installing the electrical components. These procedures resulted in a functional prototype with the intended instructional and organizational features. The completed structure reflects the principle that learning-space design should connect physical features with their intended pedagogical functions. Sathish and Lau (2026) emphasized that classroom flexibility becomes educationally meaningful when spatial arrangements and physical features are aligned with teaching and learning activities. Similarly, Makaremi et al. (2024) identified classroom layout, furniture, visibility, and adaptability as important dimensions of the physical learning environment.

3.2 Acceptability of the Multi-purpose Teaching Implements

The Multi-purpose Teaching Implements was evaluated by 40 respondents consisting of 15 Junior High School learners, 15 Senior High School learners, and 10 teachers. Its acceptability was assessed according to design, materials used, and usability.

3.2.1 Acceptability in Terms of Design

The design obtained an overall mean of 3.96, interpreted as Highly Acceptable. The highest rating of 4.00 was obtained for its suitability in temporary learning spaces and regular classrooms and for the balance and stability of the overall structure. The extendable working table and suitability of the organizer's height and size received 3.98, while the detachable whiteboard, motorized TV lift, organizer layout, component arrangement, and accessibility of storage received 3.95. The overall aesthetic, organization, and classroom suitability obtained 3.85. These findings indicate consistently high acceptance of the prototype's flexibility, organization, accessibility, and structural design. The findings are consistent with research showing that adaptable classroom furniture can support different learning activities and provide learners with greater flexibility in using their learning environment. Morris and Imms (2025) reported that flexible furniture can support student agency and engagement, while Fullerton and Nicholls (2026) highlighted the value of flexible learning spaces in supporting different learner and instructional needs. Sathish and Lau (2026) further concluded that spatial flexibility depends on the alignment of movable and adaptable physical features with pedagogical activities.

3.2.2 Acceptability in Terms of Materials Used

The materials used obtained an overall mean of 3.92, interpreted as Highly Acceptable. Individual ratings ranged from 3.85 to 3.96, indicating favorable assessments of the wooden structure, cabinet and shelving materials, steel whiteboard frame, motorized TV lift, caster wheels, drawer slides, locks, writing surface, structural frame, varnish, and extendable-table support. The overall appropriateness of the materials for long-term classroom use received a mean of 3.95. These findings indicate that respondents considered the physical components appropriate for their intended classroom functions. Makaremi et al. (2024) identified furniture quality, spatial layout, accessibility, and physical classroom features as relevant considerations in the quality and experience of learning environments. Sathish and Lau (2026) similarly emphasized that the physical attributes of flexible classrooms must correspond with their educational functions and intended patterns of use. Thus, the favorable evaluation of the materials supports the functional requirements of the developed teaching implement.

3.2.3 Acceptability in Terms of Usability

Usability obtained an overall mean of 3.94, interpreted as Highly Acceptable. Individual indicators ranged from 3.93 to 3.98. The storage compartment and extendable working table obtained the highest ratings of 3.98, while the motorized TV lift, organized storage, and support for interactive teaching received 3.95. Other features, including the detachable whiteboard, mobility, transportation of instructional materials, support for teaching and student engagement, and overall multifunctionality, also received highly acceptable evaluations. The findings indicate that respondents considered the prototype useful for classroom organization, collaborative activities, multimedia presentations, mobility, storage, and additional workspace. The usability findings correspond with Morris and Imms (2025), who found that flexible furniture can facilitate learner choice, engagement, and adaptable teaching practices. Sathish and Lau (2026) likewise identified movable elements and collaborative surfaces as important features of flexible learning environments. The favorable assessment of the Smart TV component is also consistent with evidence that appropriately integrated educational technology and multimedia can support learning and engagement. Kühl and Wohninsland (2022) found improved motivation and learning performance when interactive display technology was appropriately incorporated into classroom instruction, while Çeken and Taşkın (2022) emphasized the importance of purposeful multimedia design across learning environments. Overall, the high ratings across design, materials used, and usability indicate that respondents perceived the Multi-purpose Teaching Implements as an acceptable instructional facility for classroom use. Its integrated storage, movable structure, detachable writing surfaces, working table, and multimedia component correspond with contemporary approaches emphasizing adaptable physical spaces and purposeful integration of educational technology (Morris & Imms, 2025; Sathish & Lau, 2026; Valverde-Berrocso et al., 2022).

4. Conclusion & Recommendations

The Multi-purpose Teaching Implements successfully integrated traditional and modern instructional features through detachable sliding whiteboards, a motorized Smart TV lift, an extendable working table, storage compartments, and movable components. The prototype was constructed using wood, steel, and durable mechanical parts to provide stability, functionality, and safety for classroom use. Overall, the project was rated Highly Acceptable in terms of design, materials used, and usability, indicating that it can support interactive instruction, classroom organization, multimedia presentation, and efficient lesson delivery.

The Multi-purpose Teaching Implements may be further improved by lowering the whiteboard frame to accommodate learners of different heights, adding more storage drawers, using lighter and more durable materials, and relocating the table and cabinets to the rear portion. Further improvements may include placing the whiteboards behind the television, providing a security lock for the TV compartment, replacing the existing hinge with a more modern locking mechanism, and adopting a dual-function manual and electric lifting system for the whiteboards. These refinements may improve the functionality, accessibility, safety, and appearance of the teaching implement for school use.

The developed prototype had several design and functional limitations identified during its evaluation, including the height of the whiteboard frame, limited storage compartments, the weight and aesthetic characteristics of the wooden structure, the positioning of the table and cabinets, and the absence of a lock for the television compartment. The current hinge mechanism and lifting arrangement also require further improvement, while the placement of the whiteboards relative to the television may need modification to achieve a more practical and accessible classroom configuration.

5. Compliance with ethical standards

The study observed the institutional and ethical requirements applicable to school-based data collection. Prior to the evaluation of the Multi-purpose Teaching Implements, the researchers prepared the required ethics-review documents, requested permission from the school principal, coordinated with the school administration, and conducted the onsite data-gathering activities only after the necessary institutional permission had been secured.

REFERENCES

- Andrade, C. (2021). The inconvenient truth about convenience and purposive samples. *Indian Journal of Psychological Medicine*, 43(1), 86–88. <https://doi.org/10.1177/0253717620977000>
- Çeken, B., & Taşkın, N. (2022). Multimedia learning principles in different learning environments: A systematic review. *Smart Learning Environments*, 9, Article 19. <https://doi.org/10.1186/s40561-022-00200-2>
- Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE Publications. <https://us2.sagepub.com/en-us/nam/research-design/book270550>
- Fullerton, S., & Nicholls, C. D. (2026). Engaging the disengaged: Investigating the built environment in a secondary FlexiSpace. *Learning Environments Research*, 29, Article 15. <https://doi.org/10.1007/s10984-026-09571-6>
- Kühl, T., & Wohninsland, P. (2022). Learning with the interactive whiteboard in the classroom: Its impact on vocabulary acquisition, motivation and the role of foreign language anxiety. *Education and Information Technologies*, 27(7), 10387–10404. <https://doi.org/10.1007/s10639-022-11004-9>
- Madadzadeh, F., & Bahariniya, S. (2023). Tutorial on how to calculating content validity of scales in medical research. *Perioperative Care and Operating Room Management*, 31, 100315. <https://doi.org/10.1016/j.pcorm.2023.100315>
- Makaremi, N., Yildirim, S., Morgan, G. T., Touchie, M. F., Jakubiec, J. A., & Robinson, J. B. (2024). Impact of classroom environment on student wellbeing in higher education: Review and future directions. *Building and Environment*, 265, 111958. <https://doi.org/10.1016/j.buildenv.2024.111958>
- McDonald, J. K. (2024). Using theory as a learning and instructional design professional. In J. K. McDonald & R. E. West (Eds.), *Design for learning: Principles, processes, and praxis*. EdTech Books. https://edtechbooks.org/id/future_views_of_theory_in_learning_and_instructional_design
- Morris, J. E., & Imms, W. (2025). Flexible furniture to support inclusive education: Developing learner agency and engagement in primary school. *Learning Environments Research*, 28(2), 223–248. <https://doi.org/10.1007/s10984-024-09522-z>
- Philippine Health Research Ethics Board. (2022). National ethical guidelines for research involving human participants 2022. Philippine Council for Health Research and Development. https://www.pchrd.dost.gov.ph/wp-content/uploads/2023/05/2022-NEGRIHP_Official-Gazatte_Ver-5-1.pdf
- Sathish, S., & Lau, S.-K. (2026). Spatial flexibility and 21st-century education: A review-informed synthesis of learning-oriented classroom design attributes. *Educational Research Review*, 52, 100820. <https://doi.org/10.1016/j.edurev.2026.100820>
- Taufique, K. M. R., Sabbir, M. M., & Rabbanee, F. K. (2026). A guide to key decision criteria for Likert-scale use in survey research. *Global Business and Organizational Excellence*, 45(5), 493–508. <https://doi.org/10.1002/joe.70032>
- UNESCO. (2023). *Global education monitoring report 2023: Technology in education: A tool on whose terms?* UNESCO. <https://doi.org/10.54676/UZQV8501>
- United Nations Department of Economic and Social Affairs. (2025). *The Sustainable Development Goals report 2025*. United Nations. <https://unstats.un.org/sdgs/report/2025/>
- Valverde-Berrocoso, J., Acevedo-Borrega, J., & Cerezo-Pizarro, M. (2022). Educational technology and student performance: A systematic review. *Frontiers in Education*, 7, 916502. <https://doi.org/10.3389/feduc.2022.916502>