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Innovated Retractable Whiteboard

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***Abstract:** This research study featured an innovative retractable whiteboard. The researchers investigated the impact of an innovative retractable whiteboard on CTU-Pinamungajan Campus students' academic community engagement and learning, and consequently evaluated the acceptability and efficiency of the proposed adjustable whiteboard at CTU-Pinamungajan Campus in the school year 2023-2024. The convenience sample technique allowed for a total of 100 respondents to be selected. The study employed an experimental design and a quantitative research method. This determined the demographic profile of the respondents and their perspectives on the innovative retractable whiteboard in terms of its technical requirements, level of performance, and acceptability. We gathered the data using researcher-made questionnaires. We then tabulated and computed these data sets using a frequency table and a weighted mean. The results were based on the statistical treatment used, and the average yield indicates the level of interpretation. Findings revealed enhanced student engagement, improved learning outcomes, and a collaborative learning environment facilitated by the whiteboard. This was made evident by the aggregated mean values, which were interpreted as strongly agreeing, excellent, and highly acceptable. Based on the data, the researchers conclude that the respondents find the innovative retractable whiteboard useful, functional, efficient, and acceptable.*

***Key words:** Industrial Technology, retractable whiteboard, students, faculty, academic community engagement and learning outcomes.*

Introduction

People describe school as a place that fosters learning and an interactive, effective exchange of ideas (Bendanillo et al., 2023). This houses the facilities that students require for nourishment and development. A school depicts an organized setting to efficiently deliver a sequential set of instructions that students practice to exercise their minds, primarily their creative and critical thinking skills.

Learning is a two-way process that requires both parties to engage. Learning is a two-way process that requires both parties' engagement (Canillo & Bendanillo, 2023). To meet on common ground, the instructors and the students must exert effort and coordinate in the learning and refining process. However, there are instances where the instructors cannot keep hold of the students' attention. The absence of physical facilities designed to aid, facilitate, and stimulate learning is one of the reasons. Students' attitude toward learning has become a bigger concern for instructors. According to Akomolafe and Adesua (2016), the presence of well-equipped physical facilities in the educational environment significantly enhances kids' motivation to learn. They added that teachers require them to develop an ideal working environment, and the availability of these facilities can spark students' interest in learning, invariably leading to higher performance.

Given the increasing enrollment rate and Cebu Technological University-Pinamungajan Campus's status as one of the most sought-after universities, it is crucial for those in positions of authority to understand the significance of providing adequate facilities and understanding how to engage their students to foster a passion for learning (Arcadio, 2023). Divided attention and poor interaction can be such a challenge in a classroom setting. It can cause frustration among instructors and confusion among students to surface.

As students' engagement could eventuate into an effective transmission of ideas, the researchers were motivated to create an innovative retractable whiteboard, a tool essential for advancing teaching practices, improving student outcomes, and creating inclusive and dynamic learning environments. This whiteboard's height is adjustable to meet the needs of the classroom setting. It can create a classroom that accommodates everyone, reaching a larger audience and adjusting the presentation to an accessible level so that students at the back can see the information presented upfront, fostering great ideas and interactive discussions. More than that, the innovated whiteboard also offers convenience to students with varying heights, especially in an interactive and meaningful learning experience.

Statement of the Problem

This research assessed the development of an Innovated Retractable Whiteboard and determined its performance and level of acceptability at Cebu Technological University-Pinamungajan Campus, Pinamungajan, Cebu during Academic Year 2024 2025 towards technology diffusions.

Specifically, this sought to the answer questions:

1. What is the profile of the respondent groups as to:
 - 1.1 Age and gender, and
 - 1.2 Course and section?
2. What is the prior arts related to classroom board?
3. What is the development of an Innovated Retractable Whiteboard as to;

3.1 Technical Requirement

3.1.1. Design and features,

3.1.2. Cost,

3.1.3. Ergonomic, and

3.1.4. Fabrication?

4. As perceived by the respondent groups, what level of performance of an Innovated Retractable Whiteboard based on quality Dimensions as to:

4.1. Quality,

4.2. Aesthetics,

4.3. Conformance,

4.4. Reliability

4.5. Durability?

5. As rated by the respondent groups, what level of acceptability of the retractable whiteboard as to:

5.1. Perceived usefulness,

5.2. Perceived ease of use,

5.3. Users satisfaction?

6. Based on findings, what Technology can be diffused?

Significance of the Study

The research study would deem beneficial to the following:

CTU-Pinamungajan Campus. The research study can help assess the school facilities and promote the use of the innovative adjustable height whiteboard which can potentially lead to improved knowledge retention, better understanding of course materials, and overall academic performance among students.

Faculty. The research study is a big help to promote collaboration among faculty and students including the adaptability which can inform future decisions on the adoption and integration of similar technologies to enhance the overall educational experience.

Students. The research study helps students to develop and practice a more interactive and inclusive learning environments, where they feel empowered in actively contributing to the learning process.

Future Researchers. The research will serve as the basis for future researchers who wish to go through another deep investigation relating to the same field of interest.

Theoretical Framework

Recognizing what the students need in a diverse learning environment is crucial to their development, so it serves as one of the factors for school, facility, and experience evaluation. Every institution is committed to providing a nurturing and supportive environment where every student feels a sense of belonging and consequently interacts in a meaningful and collaborative exchange of ideas

(Tapangan et al., 2023). However, student engagement remains a puzzle that each institution is trying to analyze, construct, and sustain.

Trowler (2010) defined student engagement as the interaction between time, effort, and other relevant resources invested by both students and their institutions, with the intention of optimizing the student experience, enhancing learning outcomes and development, and improving the institution's performance and reputation. The school strives to create an environment that fosters student engagement and meaningful idea exchange, supported by advanced and immersive facilities. Every institution creates opportunities to help students grow in both knowledge and confidence (Arcadio et al., 2024). The introduction of state-of-the-art facilities and an innovative approach to foster academic and personal growth can make a huge difference in sustaining students' attention and inspiring engagement.

According to Imms et al. (2020), it is widely accepted that furniture is a critical component of an innovative learning environment, which by itself is defined as those learning configurations that successfully merge innovative design with innovative practices.

By fabricating an innovative retractable whiteboard, the study anchors itself to Davis's Technology Diffusion, Quality Dimensions of Garvin's Theory, and Technology Acceptance Model Hodroj, T. (2019). Garvin's theory provides a framework for better comprehension and a basis for evaluating the quality of a product. This theory states that quality is not a single recognizable characteristic; rather, it is multifaceted and appears in many different forms. He proposed the eight facets, or dimensions, of product quality. This includes performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality (Sinclair et al., 1993).

Besides quality, the Technology Acceptance Model by Davis sheds light on the process of underpinning the acceptance of technology in order to predict its behavior and provide a theoretical explanation for the successful implementation of technology. This suggests that the two key factors that influence technology adoption are perceived usefulness and perceived ease of use. Furthermore, the model suggests that these perceptions influence a user's attitude towards technology use (TheoryHub, n.d.; Cao et al., 2023).

These theories are considered by the researchers because they directly relate to the study. The retractable whiteboard aims to establish an inclusive classroom that eliminates obstacles in the learning process. One aspect that must be considered is its ability to deliver its purpose. These theories assess the quality of the innovative retractable whiteboard, as well as its impact on the intended audience.

Research Methodology

The research methodology section outlines the study's methods and procedures, including the research design, flow of the study, environment, respondents, instruments, data gathering, and statistical treatment.

The study made use of a descriptive survey methodology associated with a quantitative approach to assess the efficacy, efficiency, and level of acceptance of a retractable whiteboard. Using researcher-made questionnaires, the study identified respondents' profiles and evaluated their perceptions of the whiteboard's technical requirements, performance, and acceptability.

Conducted at the Cebu Technological University Pinamungajan Campus, the study involved 100 BIT students and faculty members selected through convenience sampling. The university, located in Barangay Pandacan, Pinamungajan, Cebu, spans 2.5 hectares and offers programs in education, hospitality management, and industrial technology, with 1,129 students and 66 faculty members.

We used a researcher-made questionnaire with a Likert scale to evaluate respondents' profiles and the technical specifications, performance, and acceptability of the whiteboard. The data gathering procedure included creating and approving the questionnaire, conducting the survey, and collating and tabulating the data. Data analysis involved computing, analyzing, and statistically interpreting the results.

The statistical tools used were the weighted mean to determine the weighted average of each indicator and frequency tables to summarize the data.

Results and Discussion

In this part, the researchers present, analyze, and interpret the data gathered according to the research study's problem. As can be seen below, the data collected from the respondents indicates a predominantly youthful demographic, with most being BIT students and a male majority. The study further evaluates the innovative retractable whiteboard across several dimensions: design and features, cost, ergonomics, fabrication, performance, aesthetics, conformance, reliability, durability, and user acceptability.

Profile of the Respondents

The profile of the respondents in terms of age, gender and course were gathered and analyzed for an accurate description of the respondents.

Table 1. Demographic profile of the respondents

Age	43-48 yrs. old	2
	37-42 yrs. old	3
	31-36 yrs. old	2
	25-30 yrs. old	11
	19-24 yrs. old	82
Gender	Male	67
	Female	33
Course/Major	BIT Students	93
	Faculty	7

Table 1 revealed the demographic profile of the respondents. As per responses, there are eighty-two (82) number of respondents whose ages were ranging from 19-24 years old; eleven were ages ranging from 25-30 years old, two for ages ranging from 31-36 years old, three for ages ranging from 37-42, and two for ages ranging from 43-48 years old. In addition, the number was dominated by male respondents where there were sixty-seven of them and only thirty-three female respondents. Most of them were BIT students, and seven selected faculty.

Test on the Technical Requirements of the Innovated Retractable Whiteboard

Table 2. Design and Features

Statements	Aggregate Mean	Interpretation
1. The innovated retractable whiteboard offers easy height adjustment.	4.5	Strongly Agree
2. The materials used in the product shows high durability.	4.57	Strongly Agree
3. The whiteboard elements are high in quality.	4.4	Strongly Agree

4. The innovated retractable whiteboard is defined by its good serviceability in the classroom setting	4.5	Strongly Agree
5. The innovated whiteboard is portable.	4.6	Strongly Agree

Legend:

X	SUM		
%	Percentage		
S	Statement		
4.21 - 5.00		SA	Strongly Agree
3.41 – 4.20		A	Agree
2.61 – 3.40		N/NA	neither/nor Agree
1.81 – 2.60		DA	Disagree
1.00 – 1.80		SD	Strongly Disagree

Table 2 presented the data pertaining the design and features of the innovated retractable whiteboard. The innovated retractable whiteboard offers easy height adjustment; the respondents had an aggregated mean value of 4.5 which is interpreted as strongly agree. On the statement that stated the material used in the product shows high durability, an aggregate mean of 4.57 was obtained which has a strongly agree interpretation. In addition, the selected respondents strongly agreed that the whiteboard elements are high in quality with an aggregate mean of 4.4. Apart from that, the innovated retractable whiteboard is defined by its good serviceability in the classroom setting with an aggregate mean of 4.5 which is translated as strongly agree. Respondents also viewed the innovated whiteboard as portable, which aggregated mean is 4.6. Respondents strongly agreed to the design and features offered by the retractable whiteboard.

Table 3. Cost

Statements	Aggregate Mean	Interpretation
1. The materials used in the construction of the retractable whiteboard are affordable.	4.7	Strongly Agree
2. Defined by its durability, the innovated retractable whiteboard requires minor repair and replacement over a period of time.	4.6	Strongly Agree
3. The innovated retractable whiteboard offers cost-effective inputs to the student learning process.	4.65	Strongly Agree
4. The whiteboard has surface that is anti-scrap and easy to wipe clean, which consequently help minimize disposal costs.	4.75	Strongly Agree
5. The retractable whiteboard requires minimal maintenance costs.	4.8	Strongly Agree

As shown in table 3, cost as one of the bases for technical requirements, the tabulated and calculated means for each given statements portrayed the respondents’ perspectives. The selected respondents strongly agreed that the materials used in the construction of the retractable whiteboard are affordable given the aggregate mean of 4.7. And defined by its durability, the innovated retractable whiteboard

requires minor repair and replacement over a period of time with an aggregated mean of 4.6. In addition, the respondents strongly agreed that the innovated retractable whiteboard offers cost-effective inputs to the student learning process with a calculated mean of 4.65. The whiteboard that has surface that is anti-scrap and easy to wipe clean, respondents with an aggregated mean of 4.75 strongly agreed that this help minimize disposal cost. Moreover, selected respondents strongly agreed that the retractable whiteboard requires minimal maintenance cost.

Table 4. Ergonomics

Statements	Aggregate Mean	Interpretation
1. The retractable whiteboard allows users to position it at a comfortable height.	4.5	Strongly Agree
2. The whiteboard offers smooth surface for writing.	4.8	Strongly Agree
3. The innovated whiteboard can be easily maneuvered.	4.7	Strongly Agree
4. The innovated retractable whiteboard has size and design that befits its usage.	4.6	Strongly Agree
5. Provided with a smooth running pedal that drives the height adjustment, the retractable whiteboard limits forceful exertion.	4.8	Strongly Agree

Table 4 established sound data for the ergonomic. The tabulated and calculated mean projects a strongly agree interpretation on the statements pertaining the ergonomics of the innovated retractable whiteboard. The selected respondents strongly agreed that the retractable whiteboard allows users to position it at a comfortable height and that it offers smooth surface for writing with an aggregated means of 4.5 and 4.8. In addition, with an aggregate mean of 4.7, the respondents strongly agreed that the whiteboard can be easily maneuvered given that it is portable. The respondents have also seen that the innovated retractable whiteboard has size and design that befits its usage, which gained an aggregated mean of 4.6 and has a strongly agree data interpretation. And provided with a smooth running pedal that drives the height adjustment, the selected respondents strongly agreed with an aggregate mean of 4.8 that the retractable whiteboard limits forceful exertion.

Table 5. Fabrication

Statements	Aggregate Mean	Interpretation
1. The whiteboard is conceptualized through drawing, and Sketch Up to visualize the final product.	4.6	Strongly Agree
2. The retractable whiteboard is designed in a modern style, motivated to capture students' attention.	4.7	Strongly Agree
3. The utilized materials are adequately and equitably resourced.	4.75	Strongly Agree
4. The innovated whiteboard frame components were attached through full-weld and screw.	4.65	Strongly Agree
5. The retractable whiteboard is reinforced with four 360° swivel wheels with locking system to ensure stability during use.	4.6	Strongly Agree

Table 5 presented the data as to its process in fabrication. The selected respondents strongly agreed to the statements indicated in the fabrication process, that the whiteboard was conceptualized through drawing and SketchUp to visualize the final product. It had an aggregated mean of 4.6. With an

aggregated mean of 4.7, they also strongly agreed that the retractable whiteboard is designed in a modern style, motivated to capture the students’ attention. Apart from that, a mean of 4.75 was obtained as the respondents strongly agreed that the utilized materials are adequately and equitably resourced. In addition, the respondents, after seeing the product strongly agreed that the innovated whiteboard frame components were fixedly attached through full-weld and screw. Moreover, with an aggregated mean of 4.6, selected respondents strongly agreed that the reinforcement of four 360° swivel wheels with locking system made the retractable whiteboard to ensure stability during use.

Test on the Level of Performance of the Innovated Retractable Whiteboard

Table 6. Quality

Statements	Aggregate Mean	Interpretation
1. The high-quality innovated whiteboard incorporates eco-friendly materials.	4.75	Excellent
2. The innovated retractable whiteboard has good texture and structure because of the choice of materials.	4.65	Excellent
3. The whiteboard is scratch and stain resistant though frequently use.	4.7	Excellent
4. The retractable whiteboard offers a range of functionality to meet the diverse needs of users.	4.8	Excellent
5. The innovated whiteboard has smooth adjustment mechanism.	4.65	Excellent

Legend:

X	SUM		
%	Percentage		
S	Statement		
4.21 - 5.00		E	Excellent
3.41 – 4.20		VS	Very Satisfactory
2.61 – 3.40		S	Satisfactory
1.81 – 2.60		LS	Less Satisfactory
1.00 – 1.80		NS	Not Satisfactory

The table above showed the level of performance which pertains to the quality of the innovated retractable whiteboard. As indicated in its aggregated means, the respondents had consistently rated the whiteboard positively. In the statement that said the high-quality innovated whiteboard incorporates eco-friendly materials, respondents strongly agreed to it with an aggregate mean of 4.75, which can be translated as excellent. The respondents also find the whiteboard excellent as it has a good texture and structure because of the material choice which obtained an aggregate mean value of 4.65. Apart from that, respondents strongly agreed that the whiteboard is scratch and stain resistant through frequently use with an aggregate mean of 4.7. In addition, the selected respondents find the quality of innovated whiteboard excellent as it offers a range of functionality to meet the diverse needs

of users given an aggregated mean of 4.8. And, for having a smooth adjustment mechanism, the respondents find the whiteboard excellent which mean was 4.65.

Table 7. Aesthetics

Statements	Aggregate Mean	Interpretation
1. The innovated retractable whiteboard is wisely and appropriately proportioned.	4.82	Excellent
2. The flat, regular surface of the retractable whiteboard has sufficient clearance that accommodates the interactive whiteboard discussion.	4.76	Excellent
3. The whiteboard is neatly refined and polished.	4.65	Excellent
4. The materials used provide sophistication to the whiteboard.	4.68	Excellent
5. The retractable whiteboard features blends seamlessly with the school environment.	4.6	Excellent

Table 7 showed the tabulated and calculated mean of the selected respondents as per the level of performance indicator, aesthetic. The aggregate mean values presented had shown that the innovated retractable whiteboard as to its organized fabrication and design (aesthetic) was indeed excellent. The selected respondents find the whiteboard excellent with an aggregate mean value of 4.82, as it is wisely and appropriately proportioned. They also find the innovated whiteboard excellent for its flat, regular surface that offers sufficient clearance, accommodating interactive discussion with a mean value of 4.76. Apart from that, the whiteboard was neatly refined and polished which allowed the respondents to give excellent rating. And aesthetically, the materials used providing sophistication to the whiteboard and its features blending seamlessly with the school environment attracted a positive feedback from the selected respondents and gained aggregated mean values of 4.68 and 4.6, respectively.

Table 8. Conformance

Statements	Aggregate Mean	Interpretation
1. The retractable whiteboard meets the desired requirements in terms of size, features, functionality, and performance in an educational setting.	4.7	Excellent
2. The design of the innovated whiteboard adheres to the need to tailor varied learners.	4.75	Excellent
3. Defined by its mobility, the retractable whiteboard can be stationed with great stability in various office or educational settings.	4.76	Excellent
4. The innovated retractable whiteboard meets performance criteria and functional requirements.	4.82	Excellent
5. The innovated retractable whiteboard is crafted in a sustainable method and eco-conscious quality of material used.	4.73	Excellent

Table 8 presented the data pertaining to the innovated retractable whiteboard conformance to product standard. The aggregated mean values communicated clear and concise insights as to how the selected respondents excellently rated the product. The respondents gave an excellent rating on the statement

that said the retractable whiteboard meets the desired requirements in terms of size, features, functionality, and performance in an educational setting with an aggregate mean of 4.7. The respondents also find its adherence to the need to tailor varied learners excellent given the aggregated mean value of 4.75. Defined by its mobility, the selected respondents find the retractable whiteboard excellent with a mean value of 4.76, as it can be stationed with great stability in various office or educational setting. In addition, the retractable whiteboard's adherence to performance criteria and functional requirements allow it to obtain an aggregated mean value of 4.82 which is directly translated as excellent from its selected respondents' point of view. And, as it was crafted in a sustainable method and eco-conscious quality of material used, an aggregated mean of 4.73 was obtained which respondents excellently rate.

Table 9. Reliability

Statements	Aggregate Mean	Interpretation
1. The materials used assure sturdiness of the retractable whiteboard.	4.65	Excellent
2. The innovated whiteboard aids in the interactive and effective discussion.	4.6	Excellent
3. The retractable whiteboard is resistant to wear and tear.	4.82	Excellent
4. The whiteboard remains clear and legible even after repeated use.	4.7	Excellent
5. The innovated retractable whiteboard functions well.	4.76	Excellent

Table 9 presented the respondents' assessment on the innovated retractable whiteboard's reliability. It can be gleaned from the data that all the criteria pertaining the reliability of the whiteboard were interpreted by the selected respondents as excellent. An aggregated mean of 4.65 was obtained in the indicator that the materials used assure sturdiness of the innovated whiteboard. The whiteboard also excellently serves its performance role as it aids in the interactive and effective discussion. Apart from that, the selected respondents find the whiteboard excellently reliable as it is resistant to wear and tear and that writings remain clear and legible even after repeated use with aggregated mean values of 4.82 and 4.7. And, respondents find the innovated product output reliable in serving its purpose for it functions well.

Table 10. Durability

Statements	Aggregate Mean	Interpretation
1. The way how elements of retractable whiteboard are attached shows a solid and well-engineered fabrication.	4.68	Excellent
2. The woods that constitute the frame are fairly coated with paint to protect from infestation.	4.8	Excellent
3. The innovated retractable whiteboard has high resistant to staining, thus have longer serviceability.	4.65	Excellent
4. The retractable whiteboard can sustain heavy use in educational environments.	4.68	Excellent
5. The retractable whiteboard is resistant to environmental factors.	4.76	Excellent

Table 10 showed the respondents’ assessment on the innovated retractable whiteboard as to its durability. As shown in the data, the different key points pertaining to the durability of the whiteboard were viewed excellent from the selected respondents. With an aggregate mean value of 4.68, they find the retractable whiteboard excellent as to how its elements were attached showing a solid and well-engineered fabrication. Having the woods that constitute the frame fairly coated with paint, the selected respondents as to the test of durability rated excellent for it protects the board from infestation. In addition, the innovated retractable whiteboard with high resistant to staining and its ability to sustain heavy use in educational environments obtained aggregated mean values of 4.65 and 4.68 showing little difference yet the same excellent interpretation of data. Moreover, the selected respondents find the whiteboard’s durability excellent for its resistance to the environmental factors which no one held control. It obtained an aggregated mean value of 4.76.

Test on the Level of Acceptability of the Innovated Retractable Whiteboard

Table 11. Perceived Usefulness

Statements	Aggregate Mean	Interpretation
1. The retractable whiteboard can accommodate different users.	3.9	Highly Acceptable
2. The whiteboard serves as a multifunctional tool for presentations, and note taking.	4	Highly Acceptable
3. The innovated whiteboard helps users engage in interactive learning sessions, and workshops.	4	Highly Acceptable
4. The innovated retractable whiteboard helps users increased productivity to accomplish task efficiently.	4	Highly Acceptable
5. The whiteboard can be used for offices, classrooms, and conference rooms.	3.9	Highly Acceptable

Legend:

X	SUM		
%	Percentage		
S	Statement		
3.25 – 4.0	HA	Highly Acceptable	
2.50 – 3.24	A	Acceptable	
1.75 – 2.49	FA	Fairly Acceptable	
1.00 – 1.74	NA	Not Acceptable	

As revealed in the data, all the criteria under the level of acceptability as to its perceived usefulness, responses were interpreted as highly acceptable. With an aggregated mean of 3.9 which was translated as highly acceptable, the retractable whiteboard can accommodate different users. The selected respondents also find the innovated whiteboard highly acceptable with an aggregate mean value of 4 in its served purpose as a multifunctional tool for presentation and note taking and its ability to help users engage in an interactive learning sessions and workshops, and in an increased productivity rate. And, as the retractable whiteboard can be used for offices, classrooms, and conference rooms, its perceived usefulness obtained an aggregate mean value of 3.9 which was translated as highly acceptable by the selected respondents.

Table 12. Perceived Ease of Use

Statements	Aggregate Mean	Interpretation
1. Ease and simplicity of design and service is provided.	3.8	Highly Acceptable
2. The pedal that drives the innovated whiteboard height adjustment is located based on a convenient handling.	3.9	Highly Acceptable
3. The adjustment on height of the retractable whiteboard is done in a circular motion, driving the pedal and allowing an up and down height adjustment.	3.88	Highly Acceptable
4. The adhesive whiteboard surface is easily replaceable.	3.96	Highly Acceptable
5. The whiteboard design facilitates easy maintenance and cleaning.	3.92	Highly Acceptable

Table 12 presented the summary on the respondents' assessment on the innovated retractable whiteboard as to its perceived ease of use. As depicted in the table, highly acceptable interpretations were obtained based on its calculated means. With the provision of the ease and simplicity of design and service, it obtained an aggregated mean of 3.8. Having the pedal that drives the height adjustment positioned at a convenient handling, an aggregate mean value of 3.9 was obtained. Apart from that, the pedal that was driven in a circular motion, allowing an up and down height adjustment, the selected respondents gained a calculated aggregate mean of 3.88 which was translated as highly acceptable. More than that, the selected respondents find the whiteboard highly acceptable because its adhesive surface is easily replaceable and the design facilitates easy maintenance and cleaning. It had its calculated aggregate means of 3.96 and 3.92, respectively.

Table 13. Perceived Users Satisfaction

Statements	Aggregate Mean	Interpretation
1. The retractable whiteboard provides visual clarity.	3.8	Highly Acceptable
2. The interactive and visual nature of the whiteboard helps users engage with course material for better comprehension.	3.94	Highly Acceptable
3. The retractable whiteboard features serve its purpose, consequently ignite compelling user experience.	3.9	Highly Acceptable
4. The aesthetic design of the retractable whiteboard complements with its usability.	3.88	Highly Acceptable
5. The whiteboard mechanisms enhance user safety and reduce risk.	3.97	Highly Acceptable

Table 13 has shown the respondents' assessment on the innovated retractable whiteboard as to its perceived user's satisfaction. As shown in the data, the different key points were viewed as highly acceptable from the selected respondents. The respondents find the whiteboard highly acceptable as it provides visual clarity. It garnered an aggregated mean of 3.8. The interactive and visual nature of the whiteboard helps users engage with course material for better comprehension obtained an aggregate mean of 3.94 which was translated as highly acceptable. And, its features serving its purpose,

consequently compelling user experience, complementing with its usability and enhancing user safety while reducing risk, the selected respondents viewed the board highly acceptable. It obtained aggregated mean values of 3.9, 3.88, and 3.97, respectively.

Summary of Findings

This study aims to understand the profile of the respondents and assess the innovative retractable whiteboard's technical requirements, performance level, and acceptability at the Cebu Technological University-Pinamungajan Campus.

Given that the university lives up to the essence of technology while providing a nurturing and environment-friendly setting, the researchers were able to establish a product that would help catch and sustain the attention of students, as well as encourage engagement.

The study's respondents were Bachelor of Industrial Technology students and faculty at CTU-Pinamungajan Campus, with the highest number of ninety-three (93). Male respondents, totaling sixty-seven (67), dominated the respondents, with the majority ranging in age from 19 to 24.

With the traditional and fixedly attached boards for lecture use, the researchers developed and evaluated the innovative whiteboard. We obtained an aggregated mean value ranging from 4.21 to 5.00 for its technical requirements related to design, features, cost, ergonomics, and fabrication, indicating strong agreement.

The selected respondents found the innovative retractable whiteboard excellent in the test on its performance. We obtained means ranging from 4.21 to 5.00 regarding the whiteboard's quality, aesthetics, conformance, reliability, and durability, indicating an excellent performance level.

Furthermore, when tested for acceptability at the CTU-Pinamungajan Campus, the selected respondents provided summarized responses that indicated a highly acceptable interpretation. We tabulated and computed the data, revealing scores ranging from 3.25 to 4.00.

Conclusion

The researchers observed the challenges of capturing students' attention and encouraging engagement within the classroom setting. In response, they developed an innovative retractable whiteboard designed to create an inclusive and dynamic learning environment. Based on the extensive study and data obtained through a literature review and surveys, the researchers concluded that the innovative retractable whiteboard is highly functional, effective, and excellent at serving its intended purpose. The whiteboard demonstrated superior performance across various dimensions, including quality, aesthetics, conformance, reliability, and durability, as well as high levels of user satisfaction and acceptability among students and faculty.

The findings indicate that the retractable whiteboard significantly enhances student engagement, fosters improved learning outcomes, and supports a collaborative educational environment. The positive feedback and high aggregate mean values across multiple performance indicators underscore the whiteboard's technical adequacy and practical benefits. This innovation exemplifies the potential of integrating mechanization and technological advancements into educational tools to create a more conducive and interactive learning atmosphere.

The innovative retractable whiteboard, meeting the needs of its users and deemed highly acceptable, offers a promising solution for modern educational settings. It stands as a testament to the value of innovative thinking in addressing traditional challenges within the academic community. The study emphasizes the development and adjustment of educational instruments to align with emerging pedagogical demands and student requirements.

In other words, the innovative retractable whiteboard has proven to be a valuable addition to the CTU-Pinamungajan Campus, offering an effective means to enhance teaching practices and student engagement. This study provides a foundation for future research and development in educational technologies, emphasizing the critical role of innovation in shaping the future of learning environments.

Recommendation

Based on the findings of this study, the researchers recommend several steps to further improve the innovative retractable whiteboard and its implementation. Firstly, the researchers recommend exploring alternative materials to maintain the product's quality and durability. This may involve testing different substances that offer greater resilience and cost-effectiveness without compromising the whiteboard's functionality. Secondly, it is important to examine the population size that the innovative retractable whiteboard can effectively cater to, ensuring that its benefits are scalable and can accommodate a diverse range of classroom settings. We encourage future researchers to conduct further studies that focus on developing new ways to promote interactive and effective discussions within the classroom. This could involve integrating advanced technological features or creating more adaptable design variations to meet various educational needs. Lastly, exploring other suggested design modifications for the whiteboard's fabrication could lead to even greater usability and user satisfaction, ensuring that the product remains at the forefront of educational innovation.

DOCUMENTATION



The picture showed the fundamental parts of carpentry for our research output, such as measuring, cutting, assembling of materials, and wood working.



The pictures showed the execution of the welding process for the mechanical parts of retractable whiteboard. Then this was further polished for better finishing



These pictures showed the phase when the distribution of survey questionnaire was made and the tabulation, analysis and interpretation of data was performed



Final Product

References

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