Instructional Interactive Display and Tool Storage Module

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ABSTRACT

This research addresses the challenges encountered by educators and learners who continue to rely on conventional blackboards that lack essential features such as compartments, drawers, and tool storage. These limitations restrict teachers' ability to effectively demonstrate procedures and concepts, consequently affecting students' learning outcomes. To address these challenges, an instructional interactive display with an integrated tool storage module was designed and developed, specifically tailored to support the needs of both teachers and students during practical activities and laboratory sessions. The study involved teachers and students from a university in Davao City, with a total of 30 respondents, comprising 5 teachers/instructors and 25 students. Data were collected through electronic survey questionnaires administered via Google Forms. The primary objective of the project was to develop an instructional interactive display and tool storage module that enhances the teaching learning experience by emphasizing functionality and durability. Findings from the collected data reveal that the developed module significantly improves the instructional process by offering a highly functional and durable solution. Overall, this study contributes to the advancement of instructional materials and provides practical insights for improving educational practices.

Keywords: Interactive Display, Tool Storage Module, Instructional Process, Practical Activities, Educational Improvement

INTRODUCTION

Due to ongoing social changes, teaching methods have been constantly evolving. In recent years, the focus has shifted from being teacher-centered to student centered, encouraging students to take an active role in learning and developing skills. However, traditional instructional materials often create a significant gap between theory and practical application, leading to a lack of engagement and active learning. Hands-on learning, particularly within the framework of Civil Construction Technology (CCT), has proven to be the most effective method for understanding subjects deeply. Thus, it enhances students' analytical and creative thinking skills. Wang (2022) at Syracuse University, New York, highlights the distinction between modern and traditional teaching, noting that it extends beyond methods to the clash of new and old deas. Traditional education, which was teacher centered and text centered, contrasts sharply with modern education's goal of inspiring creative thinking. Modern education views the teaching process as highly creative and increasingly incorporates technological advancements. A variety of teaching aids, instructional materials, and technological products now offer teachers more options in their teaching styles. Both learning styles have their advantages and disadvantages, which is why the proposed product merges both approaches to create an innovative solution. This tool functions as both a whiteboard with storage (traditional learning) and a built-in television (modern learning).

In Negros Oriental State University, Barrera (2022) underscores the crucial role of instructional materials in developing students' skills in SHS-TVL schools. The lack of sufficient instructional resources hampers students' learning progress, highlighting the need for enhanced and innovative instructional resources. This study aligns with Barrera's findings, emphasizing that the proposed product can serve not only as a conventional instructional resource but also offers additional features to assist both learners and teachers in improving the teaching-learning experience.

Moreover, in some schools in the Philippines, specifically in Cagayan de Oro, Quilinguing (2023) reported that over the past decade, there has been a significant increase in the school-age population, coupled with a shortage of school sites. Consequently, due to the lack of classrooms and learning materials, various classes have been conducted outside, such as in school gymnasiums, kiosks, and fields. Addressing this issue effectively involves innovative solutions, such as using an instructional interactive display with wheels. This tool enables easy maneuvering and mobility, allowing teachers to transport educational materials and resources to outdoor teaching spaces. Such flexibility ensures that learning can take place wherever students are, whether in a traditional classroom or outdoors, thus maximizing the use of available space and enhancing the overall educational experience.

In Sta. Cruz National High School, Paredes-Baan (2021) highlighted the frequent inadequacy of instructional materials, particularly for Practical Research. There is a notable scarcity of reference materials that could make the course more comprehensive and suitable for the students' level. The development of supplemental materials for this subject poses a significant challenge due to the heavy workload of subject teachers and the lack of funding and time to support it.

Therefore, there is a pressing need for the development of instructional materials. This study addresses this need by creating an instructional tool that will benefit both teachers and students. The instructional tool developed through this study aims to enhance the available learning references and support the teaching and learning process. Additionally, it seeks to simplify lessons for learners and help them build a strong foundation of knowledge and skills for the course. Moreover, while extensive research exists on the impact of instructional materials and teaching methods on student performance, there is a notable gap in understanding the effectiveness of innovative tools as instructional materials. Most studies focus on traditional materials and their influence on cognitive processes, leaving the benefits and challenges of innovative tools underexplored. Integrating tools like the Instructional Interactive Display and Tool Storage Module into learning materials enhances both students' cognitive and psychomotor skills, which are essential for hands on learning. This product aims to make hands on learning more accessible, fostering active classroom engagement, students' analytical and creative thinking skills and supporting both teachers and students in their educational experiences.

Statement of the Problem

This project research aimed to help students/teachers & trainers learn the Civil Construction Technology shop using this innovative instructional interactive display and tool storage module. Specifically, this study answered the following objectives:

1. Develop an instructional interactive display and tool storage module as instructional material;

2. Test the project in terms of functionality and durability.

3. Revise defects found during testing

Theoretical and Conceptual Framework

The study is supported by the theory of Situated cognition proposed by John Seely Brown, Allan Collins, and Paul Duguid (1989). Situated cognition is a theoretical approach to human learning that supports the idea that learning takes place when an individual is doing something. Moreover, this is an approach to understanding cognition that emphasizes the role of the environment and context in shaping and influencing cognitive processes. The theory posits that knowledge and learning are not isolated within an individual's mind but are rather distributed across the person, their environment, and the activities in which they are engaged.

Conceptual Framework

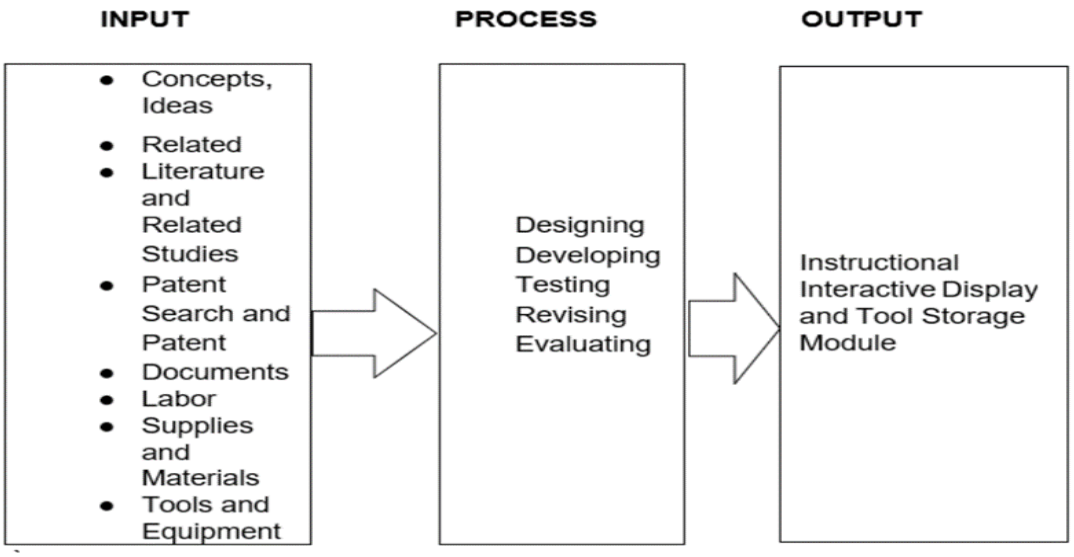


Figure 6. Conceptual Framework of the Study

METHODOLOGY

Research Design

This research utilized a descriptive developmental research design to guide the measurement of the relevant variables. The design facilitated the assessment of variable levels and the identification of specific data pertinent to the study. This approach ensured the application of suitable statistical treatment and analysis for a comprehensive examination of the research data. Gillaco (2014) defines the descriptive method as a means of exploring factual information about a current situation, emphasizing description, comparison, analysis, and interpretation of existing data. Creswell (2014) described descriptive research as a process of steps used to collect and analyze information to increase our understanding of a topic or issue. Developmental research stands distinct from straightforward instructional development, representing a systematic investigation into the creation, construction, and evaluation of instructional programs, processes, and products. In contemporary instructional technology, developmental research is recognized as a methodology utilized by researchers aiming to establish an empirical foundation for creating instructional and non-instructional products and tools, as well as for developing new or improved models that guide their development (Ibrahim, 2016).

Locale of the Study

This research was conducted in one of the Universities in Davao City with selected students from the College of Education, selected instructors from College of Technology and selected teachers from the TLE department.

Research Instruments

Table 9. Scale for the Test of the Level of Functionality

Range of Means	Scale	Descriptive Label	Interpretations
4.20 – 5. 00	5	Very High	The means that the items in the functionality of Instructional Storage Module is always observed.
3.40 – 4.19	4	High	The means that the items in the functionality of Instructional Storage Module is oftentimes observed.
2.60 – 3.39	3	Moderate	The means that the items in the functionality of Instructional Storage Module is sometimes observed.
1.80 – 2.59	2	Low	The means that the items in the functionality of Instructional Storage Module is seldom observed.
1.00 – 1.79	1	Very Low	The means that the items in the functionality of Instructional Storage Module is never observed.

The researcher adapted and modified the survey questionnaires, In this study, the researchers employed a 10 item survey questionnaire, consisting of five questions to assess functionality and five questions to assess durability, to collect and analyze data and document any processes throughout the project. The questionnaire was validated by professors/instructors from both College of Education and College of Technology at the University of Southeastern Philippines and selected Dep-Ed TLE teachers from Davao City National High School. The structured questionnaire was evaluated using the following scale.

Table 10. Scale for the Test of the Level of Durability

Range of Means	Scale	Descriptive Label	Interpretations
4.20 – 5. 00	5	Very High	The means that the items in the durability of Instructional Storage Module is always observed.
3.40 – 4.19	4	High	The means that the items in the durability of Instructional Storage Module is oftentimes observed.
2.60 – 3.39	3	Moderate	The means that the items in the durability of Instructional Storage Module is sometimes observed.
1.80 – 2.59	2	Low	The means that the items in the durability of Instructional Storage Module is seldom observed.
1.00 – 1.79	1	Very Low	The means that the items in the durability of Instructional Storage Module is never observed.

Data Gathering Procedure and Data Analysis

Listed below were the procedures followed in conducting the study.

1. Formal requests seeking approval were submitted to the CCT program head to secure consent for the participation of two (2) BTVTED instructors from University of Southeastern Philippines, three (3) TLE teachers from Davao City High National High School and twenty-five (25) Civil Construction Technology CCT students. 2. A validated questionnaire, obtained from the faculty of the College of Education, was employed. 3. Meticulously crafted questionnaires were distributed to the designated respondents for assessment purposes. 4. A thorough examination of the collected data followed, with the questionnaires being gathered for subsequent analysis and interpretation upon completion. The data collection process involved obtaining responses through the Survey Questionnaire to uncover the implications of the newly developed Instructional Interactive Display and Tool Storage Module. Additionally, comprehensive testing was carried out to validate its functionality, ensuring a thorough evaluation of the Instructional Interactive Display and Tool Storage Module.

Ethical Considerations

Ethical considerations play an important role in research. The researcher-conformed to the research objectives of authentic knowledge, truth, and error prevention. Accountability, trust, mutual respect, and fairness must be shared by all parties involved in a study (Priya, 2017). The consideration of ethics in research, as well as in general, is of prime importance. As a result, researcher must understand the fundamentals of ethical research and how they may impact research. The researcher also ensured adherence to the universal ethical principles for the protection and promotion of the dignity of the respondents. The ethical considerations have nine elements, namely, social value, informed consent, risks, benefits and safety, privacy and confidentiality of information, justice, transparency, qualification of researcher, adequacy of facilities, and community involvement, and these following considerations were observed carefully by the researcher in gathering the data.

RESULTS AND DISCUSSIONS

This chapter discusses the study's results, including the tabular presentations and narrative presentation of findings. Moreover, this part of the paper discusses the summary of the findings.

Descriptive Analysis

Table 13 below are the mean scores for the Functionality items of Instructional Interactive Display and Tool Storage Module with an overall mean of 4.63 described as Very High Functional, which indicates the consistency of the responses of the respondents. The table results show that the Very High Functional descriptive label could be marked to the rating given by the respondents in most of the items. The respondents always note the items in Instructional Interactive Display and Tool Storage Module Functionality. This means further that the respondents believed that the parts and features of the project are Very High Functional. The cited overall mean was the result gathered from the computed mean scores of all functionality items. In item number 1, The whiteboard can be used for writing, with 26 respondents, or a total of 86.7% rated it 5, and 4 respondents or 13.3%% rated it 4, with a mean of 4.86, item number 1 is interpreted as Very High functional. For item number 2 The TV rack holder can carry the television to hold it securely, 20 respondents or 66.7% rated it 5, and 8 respondents or 26.7% rated it 4, while 2 respondent or 6.7% rated it 3 with a mean of 4.6, which the item number 2 is interpreted as Very High functional. In item number 3, The storage compartments of the back part with attached LED lights can accommodate different hand tools, 19 respondents or 63.3% rated it 5, and 10 respondents, or 33.3% rated it 4, while 1 respondent or 3.3% rated it 3 with a mean of 4.6, the item number 3 is interpreted as Very High functional. For item number 4, The tool storage front can be used as a drawing table, 16 respondents or 53.3% rated it 5, and 13 respondents or 43.3 % rated it 4, while 1 respondent or 3.3% with a mean of 4.5, the item number is interpreted as Very High Functional. In item number 5, Caster wheels enable smooth rolling movements, allowing easy maneuvering of the learning board from one place to another, 20 respondents or 66.7% rated it 5, and 9 respondents or 30% rated it 4, while 1 respondent or 3.3% rated it 3, the item mean is 4.63, as interpreted as Very High Functional. The evaluation of the project resulted in the top one (1) highest rating and the one (1) lowest rating. The findings of the study reveal that the project is Very High functional. 1. The whiteboard can be used for writing. The study showed that the following needs improvement. 2. The tool storage front can be used as a drawing table. Through these congregated data, the overall mean was 4.63 which has a remark of Very High Functional and also expresses that the concept of this technology could be more materialized.

Functionality of Instructional Interactive Display and Tool Storage Module

Table 13. Mean Score

Functionality of Instructional Interactive Display and Tool Storage Module	Overall Mean	Descriptive Label
1. The whiteboard can be used for writing.	4.86	Very High Functional
2. The TV rack holder can carry the television to hold it securely.	4.6	Very High Functional
3. The storage compartments of the back part with attached LED lights can accommodate different hand tools.	4.6	Very High Functional
4. The tool storage front can be used as a drawing table.	4.5	Very High Functional
5. Caster wheels enable smooth rolling movements, allowing easy maneuvering of the learning board from one place to another.	4.63	Very High Functional
Overall Mean	**4.63**	**Very High Functional**

Table 14 below are the mean scores for the Durability items of Instructional Interactive Display and Tool Storage Module with an overall mean of 4.64 described as Very Durable, which indicates the consistency of the responses of the respondents. The table results show that the Very Durable descriptive label could be marked to the rating given by the respondents in most of the items. The respondents always note the items in Instructional Interactive Display and Tool Storage Module Durability. This means further that the respondents believed that the parts and features of the project are Very Durable. The cited overall mean was the result gathered from the computed mean

scores of all durability items. In item number 1, The tool storage part has a minimum capacity of 15 kg and can hold up to 20 kg, with 17 respondents, or atotal of 56.7% rated it 5, and 12 respondents or 40% rated it 4, while 1 respondent or 3.3% with a mean of 4.53, item number 1 is interpreted as Very Durable. For item number 2, The Instructional Interactive Display and Tool Storage Module is made of aluminum tubular with rivet anchorage, 22 respondents or 73.3% rated it 5, and 7 respondents or 23.3% rated it 4, while 1 respondent or 3.3% rated it 3 with a weighted mean of 4.7, which the item number 2 is interpreted as Very Durable. In item number 3, The Instructional Interactive Display and Tool Storage Module is equipped with a holder for support during transport, 19 respondents or 63.3% rated it 5, and 9 respondents, or 30% rated it 4, while 2 respondent or 6.7% rated it 3 with a weighted mean of 4.56, the item number 3 is interpreted as Very Durable. For item number 4, The material is corrosion-resistant, ensuring longevity and durability, 25 respondents or 83.3% rated it 5, and 4 respondents or 13.3 % rated it 4, while 1 respondent or 3.3% with a weighted mean of 4.8, the item number is interpreted as Very Durable. In item number 5,The Instructional Interactive Display and Tool Storage Module can support a minimum total weight of 45 kg, specifically: 10 kg for a television, 20 kg for teaching and hand tools, and 15 kg for its overall weight, with a maximum capacity of up to 75 kg., 20 respondents or 66.7% rated it 5, and 9 respondents or 30% rated it 4, while 1 respondent or 3.3% rated it 3, the item weighted mean is 4.63, as interpreted as Very Durable. The evaluation of the project resulted in the top one (1) highest rating and the one (2) lowest rating. The findings of the study reveal that the project is Very Durable. 1. The material is corrosion-resistant, ensuring longevity and durability. The study showed that the following needs improvement. 2. The tool storage part has a minimum capacity of 15 kg and can hold up to 20kg.Through these congregated data, the overall mean was 4.64 which has are mark of Very Durable and expresses that the concept of this technology could be more materialized.

Durability of Instructional Interactive Display and Tool Storage Module

Table 14. Mean Score

Durability of Instructional Interactive Display and Tool Storage Module	Mean	Descriptive Label
1. The tool storage part has a minimum capacity of 15 kg and can hold up to 20 kg.	4.53	Very Durable
2. The Instructional Interactive Display and Tool Storage Module is made of aluminum tubular with rivet anchorage.	4.7	Very Durable
3. The Instructional Interactive Display and Tool Storage Module is equipped with a holder for support during transport.	4.56	Very Durable
4. The material is corrosion-resistant, ensuring longevity and durability.	4.8	Very Durable
5. The Instructional Interactive Display and Tool Storage Module can support a minimum total weight of 45 kg, specifically: 10 kg for a television, 20 kg for teaching and hand tools, and 15 kg for its overall weight, with a maximum capacity of up to 75 kg.	4.63	Very Durable
Overall Mean	**4.64**	**Very Durable**

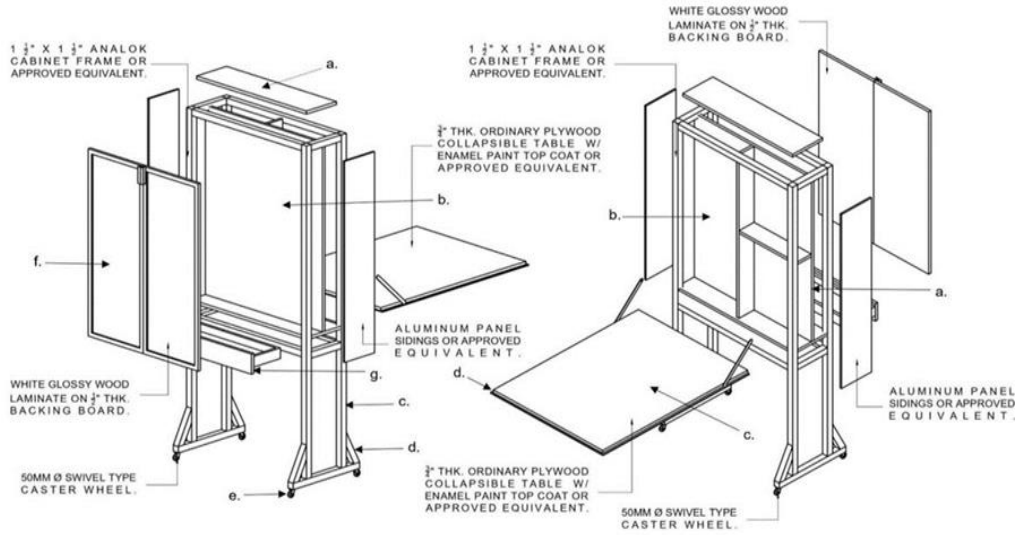
Structure of the Project

This includes the features of the (Instructional Interactive Display and Tool Storage Module, parts, functions, and interrelationships of the project.

Legend:

Front	Back
a. Top	a. Division of Front and Back
b. TV compartment side	b. Tool Compartment
c. Cabinet Stand	c. Drawing Table/Flap Door

d. Brace e. Wheels	d. Lock and Handle
f. White Board	
g. Cabinet drawer/table	



Features:

1. Design. The project is made of Tubular aluminum and PVC board which is used as instructional material and has excellent durability, has built in Glossy wood laminate, which is designed for white board material as writing surface. 2. Collapsible Drawing Table. It serves as a specialized surface and table for educational purposes. 3. Hydraulic lifter. Refers to a mechanism used to assist in the opening and closing of cabinet doors or lids. 4. TV Rack holder. A Device specifically designed to securely hold the television in place. 5. Heavy duty caster wheels with lock. Can be movable and transferable to one place. 6. Tools Storage. Stores common hand tools. 7. Drawers. Utilized as a storage for writing and lecturing materials (chalk, whiteboard marker, eraser).8. LED lights. To give the storage some ambiance and lighting. 9. Outlets. For convenient access to power electricity during class discussion. 10. Handle with Lock. To secure the television and carpentry tools and materials.

Table 15. Parts of the Instructional Interactive Display and Tool Storage Module

Parts and Specification	**Function**
Instructional Interactive Display and Tool Module	Is an instructional model that effortlessly integrates practical storage solutions with dynamic learning surfaces. It bridges the gap between storage and instructional tools, encouraging dynamic and engaging learning experiences.
Aluminum Frame	Aluminum frames are installed in cabinet corners to reinforce the structure and improve stability.
Whiteboard/ Glossy wood laminate	Teachers use it as a teaching tool not only for writing but also for other tasks, like sketching or making diagrams.
Television Compartment	Stores the television.
TV Rack Holder	A device specifically designed to securely hold a television in place.

AC outlet	For convenient access to power electricity during class discussion
Tool Storage	Stores common hand tools.
Cabinet Knob	Provide a convenient grip or drawers handle for doors and opening and closing cabinet
Steel Slide Lock	To secure carpentry tools and materials
Collapsible Drawing Table	It serves as a specialized surface and table for educational purposes.
Tool Compartment	Used to organize and store light-weight tools.
Tool Hooks	Used to hanging, organizing, and securing tools.
LED lights	To give the storage some ambiance and lighting.
Side Cabinet Handle	A handle that is easy to grip the side of the Instructional Interactive Display and Tool Storage in terms of carrying the device from one place to another.
Drawer	Utilized as a storage location for educational resources and materials such as markers, erasers etc.
Aluminum Cabinet Stand	Provides strength and stability while keeping the overall weight of the stand relatively low
Aluminum Brace	Used to strengthen the storage module frame and prevent it from sagging or collapsing under the weight of its contents.
Caster Wheels	Used for transfer from one place to another.

Final output of the fabricated research project

SUMMARY OF FINDINGS

The evaluation of the Instructional Interactive Display and Tool Storage Module revealed its exceptional functionality and durability in achieving its intended purpose. The overall assessment results showed impressive ratings for functionality and durability, indicating a strong consensus among respondents about its high performance in both areas. However, among the five questions related to functionality in the survey, item number 4 received a slightly lower rating. This item highlighted a minor issue regarding the size of the drawing table, with respondents suggesting it should be wider and include a supporting leg. Similarly, within the durability category, item number 1 received a slightly lower rating. This item pointed out a minor concern about the maximum capacity of the tool storage, with respondents recommending that the stored tools be lighter in weight if possible. Despite these minor observations, the consensus underscores the device's very high functionality and durability. Its ability to effectively support teaching activities in civil construction technology confirms its status as a highly functional educational tool.

CONCLUSION

Based on the findings of the study, it can be concluded that the product is: First, the Instructional Interactive Display and Tool Storage Module was developed as an instructional material in which instructors and students could use it as a tool to maximize learning experience, fulfilling the first objective. Secondly, in testing its functionality, the following: Whiteboard, TV rack holder, storage compartments, LED lights, tool storage and caster wheels are all highly functional parts of the product. While testing its durability, the researchers did an actual demonstration in front of the panelists by putting on heavy metal tools exceeding the maximum capacity of 20 kilograms, thereby meeting the second objective. Thirdly, the two steel slide locks were placed at the upper part of the tool storage cover, the handle was transferred at the top part of the whiteboard, the TV stand was replaced with a TV rack holder, two side holders (one each side) were attached to enhance the product's mobility and the leg braces were properly repositioned. Hence, revisions were implemented to address and revise any defects identified during testing, accomplishing the third objective.

RECOMMENDATIONS

The researchers tried to make the product successful yet there are still areas that need to be developed. The following are the recommendations concerning the study. Instructors/Trainers. The study offers instructors and trainers a valuable tool to enhance their teaching strategies. By integrating the creative storage learning board into their curricula, educators can create dynamic and engaging learning environments. Students/Trainees. Students and trainees are the primary beneficiaries, gaining hands-on experience using the storage learning board. This approach promotes active participation, critical thinking, and problem-solving skills. School stakeholders. The study also benefits parents, teachers, and government officials. Parents can be confident that their children are receiving a high-quality education equipped with essential skills. Government officials might recognize the value of this study and allocate resources to promote the integration of interactive learning tools in schools. This initiative can enhance technology literacy among students and help close educational gaps. Industries. This study acts as a catalyst for innovation in the education sector, encouraging the adoption of new technologies and interdisciplinary approaches. Also, industries can add features that can improve the product itself such as a metal folding at the back for additional support to the drawing table. Future researchers. Can build on these findings to create new ideas, technologies, and methodologies that further advance educational practices, contributing to the broader knowledge base in instructional design and educational technology.

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