ISSN No:-2456-2165

Design and Development of Dual-Purpose Drafting Table

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Abstract:- This study is to develop a dual-purposed drafting table (DPDT) to do dual drafting tasks in the same place on one table without transferring it to another room to minimize time, space, and cost. The research was conducted at Surigao State College of Technology (SSCT), Surigao City, and there were two respondent groups involved in the study, 11 technology instructors and 40 students of SSCT. A descriptive method was used in the study where both respondent groups examined the effectiveness in terms of functionality that includes ease of operation, provision of comfort and convenience and user-friendly aesthetic values; efficiency in terms of health safety protocol; and energy saving. The study's findings have shown that the DPDT has a great help in maximizing space and time to do dual drafting tasks. The functionality of DPDT, which includes ease of operation, provision of comfort and convenience and user-friendly, aesthetic values, efficiency in terms of health safety protocol, and energy saving of the model, was described as Very Effective **and highly accepted. Thus, it is recommended that the study be applied in the DPDT in drawing and architectural drafting shops and computer laboratories. The administration is requested to extend their support to the project for production, application, dissemination, and application for patenting and publication.**

Keywords:- *Technology Development, Dual-Purposed Drafting Table, Descriptive Method, Perceptions*

I. INTRODUCTION

➢ *Background and Rationale*

The Technical Drafting - National Certificate (NC) II is one of the qualifications in the Technical Education and Skills Development Administration (TESDA) program. In this program, the trainees will be allowed to earn an NC II after passing the competency assessment. In the assessment, the trainees must prepare a building plan using manual drafting and AutoCAD in a limited time. They also transfer from the manual drafting room to the computer laboratory room since the two rooms are situated separately. The time element during the transfer of the laboratory rooms was one of the observations encountered by the trainees why they failed to pass the assessment due to time.

Astonkar et al. (2015) mentioned that using multifunction tables or furniture is space-saving and that using two tables to apply the two methods in the preparation of drawing plans can occupy more space in the workplace. Spatguro.com also pointed out that the physical aspects of a workplace environment directly impact the employees' productivity, performance, health and safety, comfort, concentration, job satisfaction, and morale. An improper and unfavorable workplace environment leads to work stress. It also causes errors committed by the employees. The two drafting tasks can be done in the same place and in a short period of time, and it is a cost-saving in furniture production, specifically the drafting table.

In Architectural engineering firms, especially in the planning department, as well as in the colleges and universities offering technology courses; technical drafting, architecture, and engineering, the drafting table is one of the essential types of equipment in the preparation of working plans as one of the most critical documents in every infrastructure project. Janani J. et al. (2020) state that drafting tables are essential to have it the right way, such that it is the user-specific, user-friendly, and prized possession of any designer.

Moreover, Janani J. et al.(2020) added that the reason drafting tables are tilted is mainly due to their evolution in furniture history which was mainly due to the limits of humans' physical reach (ergonomics) and also his ability to see (visual perception). The tilt is necessary to allow for closer inspection of detailed areas that would otherwise be far away from our eyes and hands on a flat surface. Moreover, Salazar et al. (2014) stated that the need for foldable furniture sets for small bedrooms is assumed to increase since more people (primarily young people) live in small apartments. This project tries to meet this need by designing a furniture set that offers the user good comfort and functional features while taking as little space as possible. The overall design, mechanisms, and ergonomics are essential when designing such a product. Thus, Nasser (2013) revealed that multi-functional furniture could be utilized in small living spaces in underprivileged communities worldwide. This will be used in the communities to reduce and eliminate tribulations resulting from poor living conditions. Not only does the furniture help the living conditions in these poverty-stricken environments, but it also might help to empower these communities.

In addition, there are two methods to prepare drawing plans. Firstly, it is by the used manual drafting using a drawing table. Manual drawing is still important even if we are now in the computer age because of the clarity that can be achieved by being able to see all shapes, sizes, and angles on one sheet, the ability to bring creative style and

ISSN No:-2456-2165

expression to drawings, and a degree of depth and weight that can be easier (https://www.designingbuildings.com). Secondly, computer applications like AutoCAD, Sketchup, 3dsMax, Solid Works, etc., could be done on the computer table. AutoCAD is significantly faster than the traditional method of manual drafting. It accelerates the task of preparing a bill, reports, scaling, etc. of content (https://www.alphacadservice.com). These two methods could be done by one person who is an expert both in manual drafting and by the use of computer applications, but it needs additional time to transfer from one table or office to another.

To address the present problem, designing and developing a dual-purpose drafting table (DPDT) is now introduced. It is designed to do dual drafting tasks in the same place and at the same table without transferring to another room. It could minimize time or time-saving, space-saving in the workplace, and cost-saving. The DPDT will be evaluated to its level of acceptance: Functionality includes ease of operation, Provision of comfort and convenience, User-friendly, Aesthetic values, Efficiency in terms of health safety protocol, and Energy saving. The identified respondents will make this evaluation. Thus, the evaluated and tested DPDT could also be utilized in the colleges and universities offering technology courses, technical drafting, architecture, and engineering. Instead of using two rooms or laboratories for manual and computer applications, it would be in one centralized laboratory room. Lastly, it would also be used as a reference by future researchers.

➢ *Objectives of the Study*

Generally, the study aims to:

- To design Dual-Purposed Drafting Table (DPDT)
- To construct the designed Dual Purposed Drafting Table (DPDT)
- To evaluate the (DPDT) based on its acceptance level: Functionality, Aesthetic values, Efficiency in terms of time-saving; space-saving-health safety protocol; energy-saving; cost-saving, and Durability.

➢ *Theoretical/Conceptual Framework*

Figure 1 shows the flow of the research study. As a schema, it is incorporated into the following sub-scheme: input, process, and output. As presented in the framework, the input carried the information from the existing studies, course syllabi in the college of technology, management problems encountered in technology courses, and drafting technology, engineering, and architecture. The process involves preparing the drawing plan for the DPDT using manual drawing and computer-aided drafting software like AutoCAD and Sketchup. It also includes how the DPDT develops and is constructed. Finally, the output will be the evaluation and testing of the DPDT.

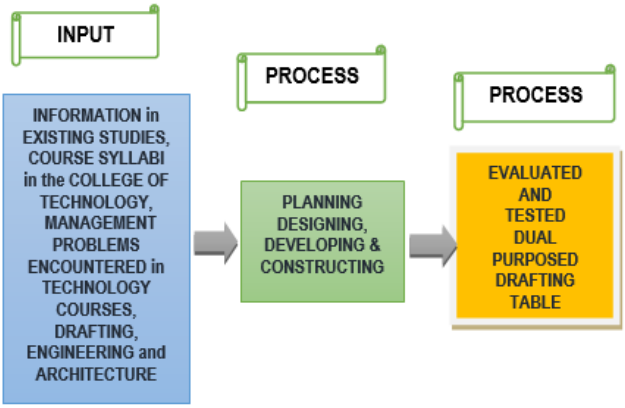

Fig 1:- A conceptual framework of the project

II. RESEARCH METHODOLOGY

This research used the descriptive developmental research method.

A. Design Consideration:

In designing DPDT, the following factors have been considered:

- Space Requirement-Standard sizes of the design part should be observed, like the space for the computer unit and its accessories and the drawing board area;
- Standard dimensions- The approved measurements must be followed;
- Safety-Sharp edges of the design should be removed, and avoid toxic and poisonous chemicals like thinner, paint, etc. Use PPE if necessary;
- Quality of materials used. The materials to be used should pass the quality standard; and
- Strength and durability- Quality of workmanship and craftsmanship will be observed during the construction of the DPDT.

B. Development:

This section presents the stages or phases of how the design DPDT is developed or constructed right after the procurement of the needed materials:

Stage 1. It is the preparation of the appropriate tools and equipment to be used in the construction of the DPDT;
Stage 2. Measuring activities. It should be performed accurately and based on the approved drawing plan;
Stage 3. The double-checking of the measurements and markings. In this stage, apply the carpenter's theory-" Measure Twice, Cut at Once." It is essential to avoid wasting labor and materials;
Stage 4. The cutting operation using the appropriate cutting tools, and the accuracy will be observed;
Stage 5. The cleaning and sanding of the pieces of materials;
Stage 6. Assembling the pieces of materials to form the DPDT and planning using the appropriate fastening materials;

ISSN No:-2456-2165

Stage 7. Cleaning the surfaces of the constructed DPDT again; and
Stage 8. Application of finishing materials like paint, shellac, or varnish. The standard procedure for applying the finishing materials should be observed in this stage. The constructed Dual-Purposed Drafting Table is ready for evaluation and testing.

➢ *Architectural Design*

- *Design of the DPDT:*

This section presents how the DPDT is being designed. In this stage, several sketches are made to develop ideas for creating the DPDT. Moreover, computer applications like AutoCAD and Sketchup apps are planned particularly on how to prepare the working plans like the Isometric, pictorial drawings, and orthographic drawing, which contains the top view, front view, right side views, and connection details. These details are carefully evaluated and considered in the design of DPDT, particularly on switching the drafting or drawing table to a computer table and vice versa.

➢ *Graphical Architecture of The Project*

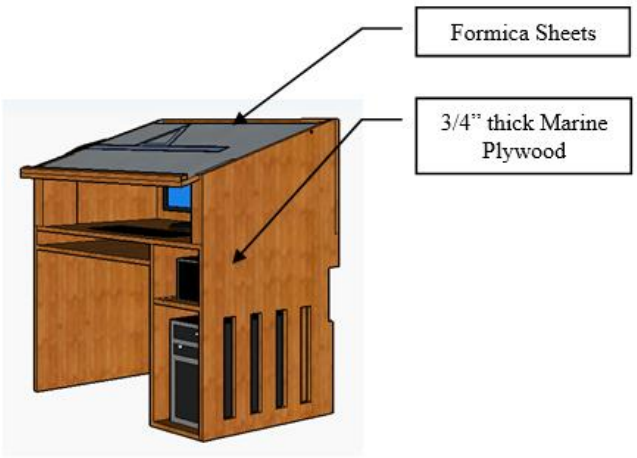

Fig 2:- **ISOMETRIC VIEW** (as Drawing Table). It shows the output of the design.

Fig 3:- The PICTORIAL or **ISOMETRIC VIEW** (as Computer Table). It shows the output of the design.

The Top View. It shows the form and dimensions of the upper portion of the DPDT. It also indicates the location of the computer monitor, keyboard, and other computer accessories if it is used as a computer table.

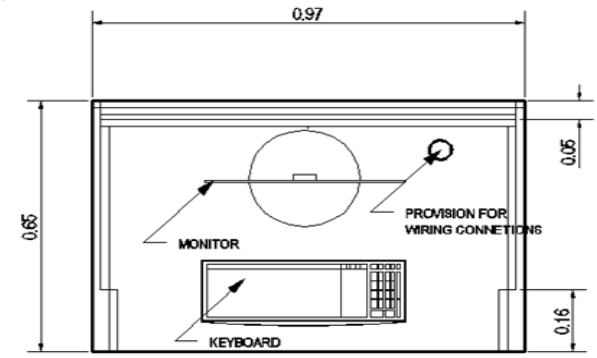

Fig 4:- TOP VIEW

The Front View. Shows overall and staggering dimensions of the height and the materials to use in the construction of the DPDT. It also includes the computer monitor's location, UPS, and the CPU.

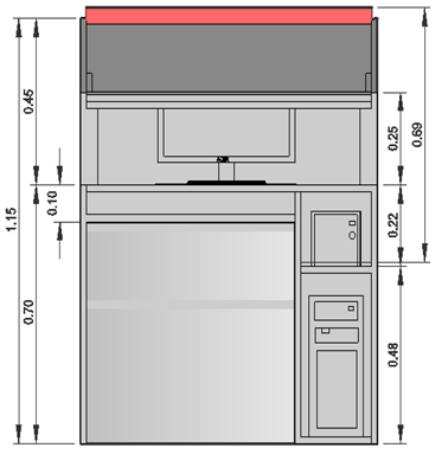

Fig 5:- The FRONT VIEW

Right Side Views. It shows the length of the inclined drawing board when it is used as a drawing table and the material to be used.

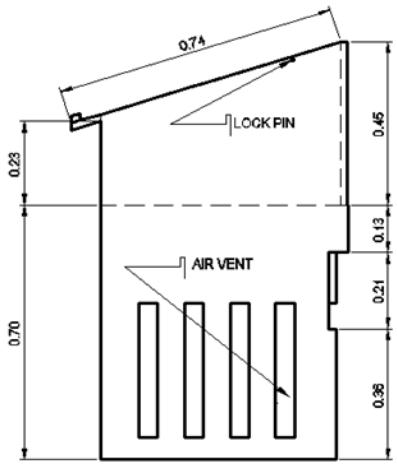

Fig 6:- The RIGHT SIDE VIEW

❖ *Connection Detail*

It shows the parts that connect the board to the computer table to function as a drawing board. The 3/4" inches marine plywood is used with Formica at the upper surface and placed in the drawing board case, which is located at the front of the table when used as a computer table. In switching into a drawing or drafting table, the drawing board is lifted from its case until the folding edge where the piano hinge is attached aligns to the upper edge of the drawing board case. It will be folded until it reaches the required incline slope as a drawing board.

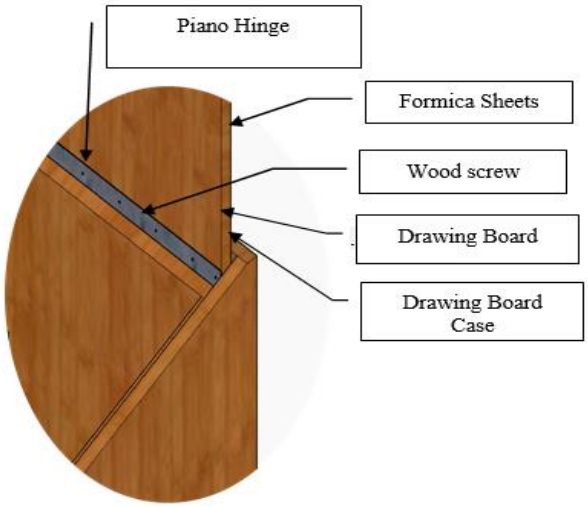

Fig 7:- CONNECTION DETAIL

➢ *Graphical Architecture of the Project*

C. Evaluation of the DPDT:

This design of this DPDT study must be assessed or evaluated based on its level of Effectiveness: Functionality, Aesthetic values, Efficiency in terms of health safety protocol, and energy saving. There were eleven technology instructors and forty students of Surigao State College of Technology - Surigao City campus as respondents to this study.

➢ *Design of Questionnaire:*

A researcher-made survey questionnaire was used in this study. The questionnaire comprises three parts. Part A deals with the judgment of functionality that includes: Ease of operation, Provision of comfort and convenience, and User-friendly. Part B deals with the Aesthetic Value that has color appeal, the design's attractiveness, and proportion. Part C deals with the efficiency of health safety protocol (Social distancing) and energy-saving.

➢ *Selection of Respondents:*

This evaluation's respondents are 11 technology instructors and 40 students in Surigao State College of Technology - Surigao City Campus, Surigao City, Philippines. The respondents were selected randomly, and social distancing was always observed during the evaluation.

➢ *Evaluation Procedure:*

The respondents will rate the newly constructed DPDT as effective in terms of functionality, aesthetic values, efficiency in health safety protocol, and energy saving. Respondents will rate the effectiveness of DPDT by putting a check mark (/) in the column opposite to the question asked regarding the efficacy of the DPDT. The effectivity rating marks the number from 1 to 4, with the corresponding meaning opposite to its number:

4 - Very Effective
3 - Effective
2 - Low Effective
1 - Not Effective

➢ *Data Treatment and Analysis:*

- *Analysis of Variance (ANOVA)*

The data were analyzed using analysis of variance (ANOVA), and the significant effect of each factor was separated by Tukey's pairwise comparison post hoc (Least Significance Difference) test at a 5% level of significance.

❖ *Operation and Testing Procedure*

Simple operations were conducted using this DPDT by following the steps:

- Pictorial drawings showing the steps on how to convert the computer table into a drawing table:

Step 1. Pull up the drawing board from the drawing board case located at the rear portion of the table.

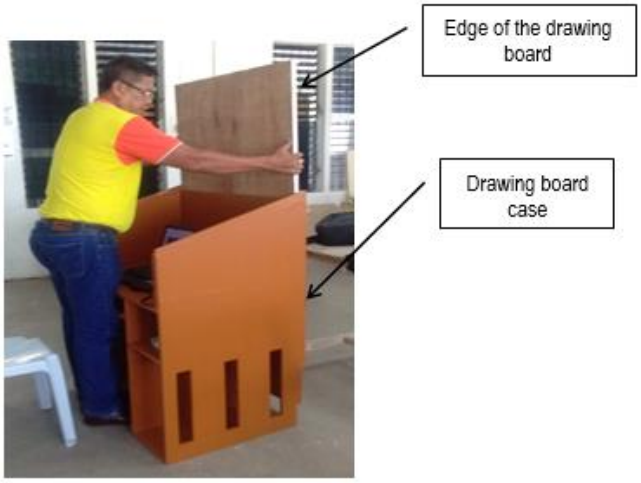

Fig 8:- Illustration for step 1

Step 2. Pull up the drawing board from the drawing board case located at the rear portion of the table until the line of the piano hinge will align to the folding edge as indicated in the drawing.

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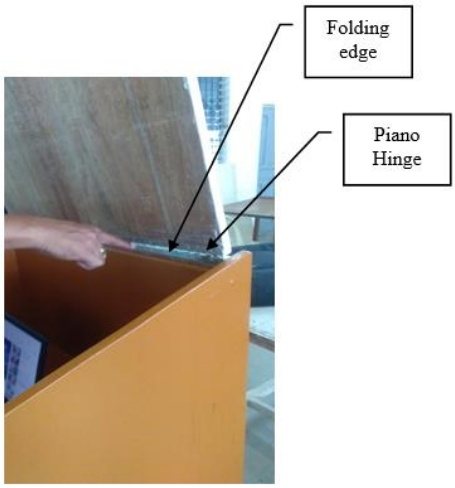

Fig 9:- Illustration for step 2

Step 3. Fold the drawing board carefully and fit it into the board holder on both sides of the table.

Fig 10:- Illustration for step 3

Step 4. Put the drawing instruments like T-Square and Triangle and the computer table is now converted to drawing tableland ready to used.

Fig 11:- Illustration for step 4

Note: To convert the drawing or drafting table to a computer table just simply invert the steps.

III. RESULTS AND DISCUSSIONS

Table 1 presents the respondents' perception of the utility model's effectiveness in terms of its functionality "as to ease of operation." The technology instructors rated with a weighted mean of **3.91, while students rated** with **3.98**. This result describes the utility model as **Very Effective " as to ease of operation." Regarding the** "Provision of Comfort and Convenience," the technology instructor rated with a weighted mean of **3.82 while the student respondents rated with 3.65**, which was described as **Very Effective. However, regarding its " User-Friendly**," the instructors rated **3.82**, while the students' respondents rated 3.68, which was also very effective. This result means that both the instructors' and students' respondents confirm the model's effectiveness in terms of its functionality. These results also imply that the utility model has effectively performed its purpose.

Area of Concern	Technology Instructors n=11				$\bar{x}$	VD	Students n=40				$\bar{x}$	VD
	4 VE	3 E	2 LE	1 NE			4 VE	3 E	2 LE	1 NE		
As to Ease of Operation	10	1	0	0	**3.91**	VE	39	1	0	0	**3.98**	VE
As to Provision of Comfort and Convenience	9	2	0	0	**3.82**	VE	26	14	0	0	**3.65**	VE
As to User-friendly	8	3	0	0	**3.00**	VE	27	13	0	0	**3.68**	VE
Average Weighted Mean	**3.58**						**3.77**					
Interpretation	**Very Effective**						**Very Effective**					

Table 1:- The effectiveness of the Model in terms of Functionality

As shown in Table 2, the respondents' perception of the model's effectiveness in terms of Aesthetic Value, "As to Color Appeal," the technology instructors rated with a weighted mean of 3.64 while the students rated with 3.68, which means Very effective. Regarding the "Attractiveness of the Design," technology instructors rated with a weighted mean of 3.73, and the student respondents also rated 3.70. This result describes that both, technology instructors & students, agreed that the model is Very Effective in terms of its Attractiveness to the Design. Moreover, the respondents also rated with the weighted mean of 3.91 for the technology instructors and 3.98 for the student respondents, which describes that the model is Very Effective "As to the proportion of the Design. Thus, technology instructors and student respondents agreed and confirmed the model's effectiveness in terms of Aesthetic value.

Area of Concern	Technology Instructors n=11				$\dot{x}$	VD	Students n=40				$\dot{x}$	VD
	4	3	2	1			4	3	2	1		
	VE	E	LE	NE			VE	E	LE	NE		
As to Color Appeal	7	4	0	0	**3.64**	VE	27	13	0	0	**3.68**	VE
As to the Attractiveness of the design	8	3	0	0	**3.73**	VE	28	12	0	0	**3.70**	VE
As to the Proportion of the design	10	1	0	0	**3.91**	VE	39	1	0	0	**3.98**	VE
Average Weighted Mean	**3.76**						**3.79**					
Interpretation	**Very Effective**						**Very Effective**					

Table 2:- The Effectiveness of the Model in terms of Aesthetic Value

As shown in Table 3, the perception of the respondent on the effectiveness of the model in terms of Efficiency, "Ease of observance to health protocol (Social Distancing)", the technology instructors rated with a weighted mean of 3.91 and the students' respondents rated with 3.95 which describes as Very Effective. Regarding "Energy Saving," the technology Instructors rated with a weighted mean of 3.86, and the students' respondents also rated with 3.90. Both the Technology Instructors and Students respondents describe the model as Very Effective in terms of energy saving. Concerning the "Easy to Operate and maintain its functionality," the Technology Instructors rated with a weighted mean of 3.91, and the student respondents rated with 3.98, meaning that both respondents describe the model as Very Effective in terms of "Easy to Operate and maintain its functionality." Therefore, technology instructors and student respondents agreed and confirmed the model's effectiveness in terms of Efficiency.

Area of Concern	Technology Instructors n=11				$\dot{x}$	VD	Students n=40				$\dot{x}$	VD
	4	3	2	1			4	3	2	1		
	VE	E	LE	NE			VE	E	LE	NE		
As to Ease to Observance of Health Protocol (Social Distancing)	10	1	0	0	**3.91**	VE	38	2	0	0	**3.95**	VE
As to Energy Saving	9	2	0	0	**3.82**	VE	37	3	0	0	**3.85**	VE
Average Weighted Mean	**3.86**						**3.90**					
Interpretation	**Very Effective**						**Very Effective**					

Table 3:- The Effectiveness of the Model in terms of Efficiency

A. Project Capabilities and Limitations

Frequently, in every development, innovation and fabrication have their advantages and disadvantages. This project is intended to prepare drawing plans for buildings and infrastructure projects and other related drafting tasks in both manual and computer applications.

➢ *Advantage:*

- Doing dual drafting tasks at the same place and table without transferring to another room.
- It can minimize the time-consuming or time-saving.

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➢ *Disadvantage:*

- It needs little effort to pull the drawing board from the drawing board case in switching from the computer table to the drawing or drafting table.

B. Findings

The Respondents' perceptions of the model were described as Very Effective regarding its functionality" as to ease of Operation." Both respondents, Technology Instructors, and students rated the model with a weighted mean of 3.91 and 3.98, respectively. Regarding " the provision of comfort and convenience," respondents' perceptions described the model as Very Effective with a weighted mean of 3.81 for the Technology Instructors and 3.65 for the students' respondents. These results implied that the model was very effective in its functionality in terms of provision of comfort and convenience. With regards to the "User-Friendly," the respondent rated **3.82** and 3.68, respectively, which also described the model as Very Effective in terms of its User-friendly model. These findings mean that the respondent confirms the model's effectiveness in terms of functionality.

On the effectiveness of the model as to Aesthetic Value "As to Color Appeal," Technology Instructors and Students respondents described the model as Very Effective with a weighted mean of **3.64 and 3.68, respectively**. Regarding " the Attractiveness of the Design," respondents' perceptions also described the model as Very Effective with a weighted mean of 3.73 and 3.70 as rated by both Technology Instructor and Students respondents. As to "Proportion of the design," respondents rated with a weighted mean of 3.91 for the technology Instructor and 3.98 for the students, which also describes the Model as Very effective in terms of its Proportion and design.

The perception of the respondents on the effectiveness of the model in terms of Efficiency "Ease of observance to health protocol (Social Distancing)," the respondents describe the model as Very Effective with a weighted mean of 3.91 and 3.95 of both Technology Instructors and students respondents, respectively. Regarding "energy saving," the respondent also described the model as Very Effective with a weighted mean of 3.86 for the Technology Instructor and 3.90 for the Students respondents. For the "Easy to operate and maintain its functionality," both respondents described the model as Very Effective in terms of Easy to operate and maintain its functionality having a weighted mean of 3.91 and 3.98 by the Technology Instructors and students, respectively, which described as Very Effective.

These findings showed that the perception of the respondents` Average weighted mean of the model's effectiveness in terms of functionality was 3.58 and 3.77 for Technology Instructors and students respondents, respectively. While the average weighted mean on the model's effectiveness in terms of Aesthetic Value was 3.76 and 3.79 for the Technology Instructors and students' respondents. Moreover, the Average weighted mean of the model's effectiveness in terms of efficiency was 3.86 and 3.90 for the Technology Instructors and students' respondents, and it was described as Very Effective. These findings mean that both respondents confirm the model's effectiveness.

IV. CONCLUSION

Based on the findings, the newly Developed Dual-Purposed Drafting Table (DPDT) greatly affects the respondents' performance regarding its functionality, aesthetic values, and efficiency in terms of health safety protocol and energy saving. The results described that the DPDT was very effective and highly accepted by the respondents, both the technology instructors and students.

RECOMMENDATIONS

- The newly developed Dual-Purposed Drafting Table (DPDT) be piloted and utilized in drawing and architectural drafting shops and computer laboratories in the College of Technology.
- The administration is requested to extend their support to the project for production, application, and dissemination.
- The newly developed DPDT will be applied for a patent and publication.

REFERENCES

[1]. Ai-saleh, K.S., et.al. Ergonomically Adjustable School Furniture for Male Students. Acad. J., 8 (13), pp. 943-955, 2013.

[2]. Astonkar, Dhiraj V., Kherde, Sanjay M.(2015).Development in Various Multipurpose Furniture's by Using Space Saving Approach. On (IRJET) Volume: 02 Issue: 06 | Sep-2015. pp. 260

[3]. Janani, J., et.al.(2020). Design Studios ft. The Perfect Drafting Table. Vol10, Issue 6, (Series-IV) June 2020, pp. 57-68

[4]. Kolhe, Amol M.,et. al. Development of Foldable Seating Device Useful in Public Places. on ISSN:2319- 3182, volume-1, Issue-2,2012,pp 9-13.

[5]. Nasser, Farah (2014). Multi-Function Furniture for Underprivileged Communities: A Milestone in Sustainable Development. Purdue University Purdue e-Pubs, pp.5

[6]. Salazar, et.al (2014). Design of Furniture for Small Places Following Inclusive Design. University of Skovde, pp. 2

[7]. Website:
https://www.designingbuildings.com
http://www.mindtools.com
http://www.spatgur.com