Gorga : Jurnal Seni Rupa
Vol 13, No 2, (2024) 780-787
ISSN 2301-5942 (print) | 2580-2380 (online)
https://dx.doi.org/10.24114/gr.v13i2.62820
Available online : https://jurnal.unimed.ac.id/2012/index.php/gorga

Knockdown Work Desk: Enhancing Design Student's Activities in Limited Spaces

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***How to cite*:** Arifin, A. N., Andrianto, A., & Ramawisari, I. (2024). Knockdown Work Desk: Enhancing Design Student's Activities in Limited Spaces. *Gorga : Jurnal Seni Rupa*, *13*(2), 780-787. https://dx.doi.org/ 10.24114/gr.v13i2.62820

Article History : *Received: August 20, 2024. Revised: August 30 , 2024. Accepted: December 27, 2024*

ABSTRACT
With the increasing population, residential land is becoming more limited, including accommodations such as boarding houses, which are commonly used by students, including design students. Observation of design students at Telkom University revealed that the average size of boarding house rooms ranges from 9-12 m², equipped with facilities like wardrobes, bathrooms, and floor desks to support studying. However, these conditions pose challenges for design students due to their specific activities, such as sketching, using laptops or PCs, and creating mockups or models. The lack of supporting facilities in such limited spaces can hinder the productivity of design students. Furthermore, preliminary data shows that design students have a high level of mobility in terms of relocating residences, requiring an ergonomic work desk that can support their activities and mobility within limited space and access. Therefore, an ergonomic work desk with a knockdown system is needed to enhance flexibility and adaptability in constrained spaces and access, supporting the activities and mobility of design students. This research employs a qualitative approach with the User-Centered Design methodology. Data collection techniques include interviews, participant observation, questionnaires, documentation, and literature reviews. The study resulted in a work desk designed with ergonomic dimensions and a knockdown system to accommodate the specific activities of design students within limited space and mobility constraints.

KEYWORDS

Boarding Houses
Design Students
Work Desk
Limited Spaces
Knockdown System

INTRODUCTION

According to data from Badan Pusat Statistika in 2022, the number of university students in West Java reached 859,997 (Badan Pusat Statistik, 2022). As the student population increases, the demand for temporary housing, such as boarding houses, also rises, further limiting available land. Therefore, maximizing space utilization in limited areas becomes a crucial solution. Providing minimalist and efficient housing is an effective step to address land scarcity without compromising urban space (Utama et al., 2023). In response to this phenomenon, a practical solution is to optimize space in small accommodations like boarding houses, which are often chosen by students as temporary housing due to their proximity to campuses. Boarding house rooms are typically sized 3x3, 3.5x3, or 3x4 meters and are equipped with a bed, wardrobe, private bathroom, and floor desk (Ratu Nisrina et al., 2024). To support activities and mobility within boarding house rooms, well-designed furniture is essential.

Each student has different needs for space and facilities, such as design students who engage in specific activities like cutting, measuring, trimming, creating 3D designs on a laptop or PC, and making mockups. As their activities become more complex, the demand for adequate facilities also

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increases. However, the need for sufficient space and facilities for these activities often conflicts with the limited workspace available. Based on questionnaires and observations among design students at Telkom University, it was found that 90.7% live in limited-space accommodations, with 71.6% in boarding houses and 19.4% in rented homes. A total of 74.6% of students have relocated 2-4 times. Boarding house rooms typically measure 3x3 to 3x4 meters, with narrow stairway access of 65-75 centimeters, making it challenging to carry large items. Additionally, 83.3% of students prefer working on assignments in their boarding house rooms to save costs and find peace, but 61.2% feel their work desks are inadequate to support their activities, which reduces productivity and comfort. The availability of appropriate supporting facilities can significantly impact user productivity (Yasari, 2023).

The data and findings indicate that the majority of design students face limitations in terms of inadequate work desk facilities, space, and access. These factors hinder their activities, driving the need for effective use of work desks that support the specific activities of design students and offer flexibility during mobilization within limited spaces and access. Therefore, the ideal furniture solution to address these issues is implementing a knockdown system. A knockdown system allows furniture to be easily assembled and disassembled, providing the flexibility and scalability needed in limited spaces (Andrianto, 2022). Additionally, knockdown furniture also facilitates ease of mobilization (Pambudi, et al., 2024).

In addition to the knockdown system implemented to support activities and mobility, adding a storage feature to the work desk becomes an added value to enhance its functionality in supporting the specific activities of design students. This is because, based on observations, there are not many existing work desks with a knockdown system that incorporate storage features. An existing study was conducted by comparing and identifying available products (Pambudi et al., 2024). Moreover, the work desk is a part of the workspace that, when examined more closely, can encourage work areas that go beyond just the surface of the desk, accommodating different types of activities.

This study aims to design a knockdown work desk equipped with storage to support the specific activities of design students and provide flexibility in terms of mobility. Design activities are fundamentally intended to offer solutions to existing problems (Wibawa & Suci, 2021). Thus, the proposed design is expected to enhance the comfort and productivity of design students while optimizing the use of limited space. Additionally, this study aims for the work desk product to provide long-term and sustainable benefits for design students in the future.

METHOD

In the writing of this research on the design of a knockdown work desk to support the activities of design students, a qualitative research method with a case study approach was used. The case study was conducted through an in-depth approach, analyzing specifically the institution and groups of individuals within a certain time frame or period.

1. Data Collection Techniques

1) Participant Observation: Conducted by observing and actively participating in the use of boarding house facilities by design students, which are the subjects of the research. A total of 8 boarding house locations were involved in the data collection process, where various aspects such as boarding house facilities, room size, workspace area, and work desk facilities were observed and measured.
2) Interviews: Conducted by asking several questions to 8 design students to gather data on the issues and specific needs that can support the requirements of design students..
3) Questionnaire: Conducted using the Google Forms platform with 120 design student respondents. The questionnaire was designed to gather more specific data regarding issues in the use of work desks in boarding houses, the needs of design students, preferred materials, colors, and additional features that can enhance the functionality of the work desk.
4) Literature Study: Data collection involving the analysis of similar products and the gathering of theoretical data that serves as a reference for the design research.

2. Design Methodology

The design methodology used is the UCD (User Centered Design) method, which consists of

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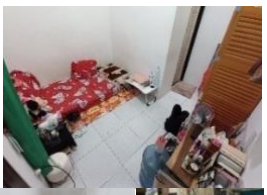
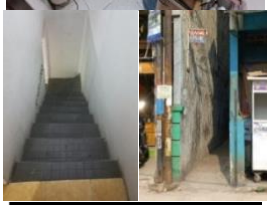
planning the human-centered process, specifying the context of use, specifying user and organizational requirements, providing product design solutions, and evaluating the design against user requirements. UCD is a method that focuses on the user experience and user needs, which will then be identified to address problems in a product, ultimately leading to the development of a product that can solve these problems and meet user needs

RESULT AND DISCUSSION

In the application of the User Centered Design (UCD) methodology, which uses the user as the reference for design development based on user experience, observations were made on the activities and spaces of design students, and the results are presented in the table below:

Table 1. Field Observation Results

No	Image	Description
1	  	**Location:** Kost Bunda (Kab. Bandung) **Spesification:** Ukuran kamar 3x4 meter, dengan fasilitas kasur, meja kerja lesehan, dan kamar mandi. **Notes:** Access to the second floor is quite narrow, with a stair width of 65 cm, which makes it difficult to move items such as a work desk, and it has a workspace area of up to 130x125 cm.
2	  	**Location:** Kost 28 (Kab. Bandung) **Spesification:** The room size is 3x3 meters, with facilities including a bed, floor work desk, wardrobe, and a bathroom.. **Notes:** Access to the boarding house location is considered narrow, passing through an alley that is 70 cm wide, along with the room. Additionally, the staircase is quite small, with a width of 70 cm and walls on both sides of the staircase forming an 'L' shape, which limits the mobility of large items. Each room has a workspace area of up to 125x120 cm.

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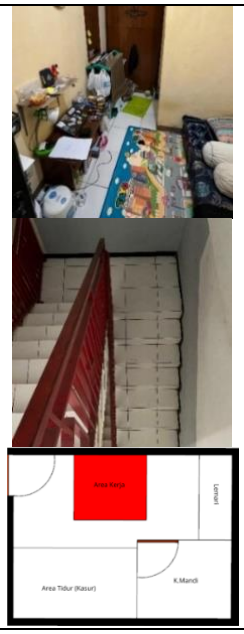
3		**Location:** Kost Gallant (Kab. Bandung) **Spesification:** "Access to the boarding house location is considered narrow, passing through an alley that is 70 cm wide, along with the room. Additionally, the staircase is quite small, with a width of 70 cm and walls on both sides of the staircase forming an 'L' shape, which limits the mobility of large items. Each room has a workspace area of up to 125x120 cm." **Notes:** The staircase to the second floor is quite small, with a width of 65 cm, and it has a workspace area of up to 135x120 cm.

The table above shows that the average room size of design students' boarding houses is 3x4 meters, with narrow staircases measuring 65 cm in width and similar facilities, resulting in limited space and facilities to support design activities. Interviews with 4 design students and a questionnaire distributed to 67 students from interior design, visual communication design, and product design programs revealed that most students often engage in large-scale drawing, cutting and assembling mockups, and material exploration. Many students prefer completing assignments in their boarding houses to save costs and seek a quieter environment. However, another issue identified is the lack of adequate facilities provided by most boarding houses, such as work desks that do not meet ergonomic standards, impacting productivity and effectiveness. Thus, the design of a knockdown work desk aims to accommodate the needs of design students in limited spaces. The knockdown system, which can be assembled and disassembled, is considered adaptable to user needs in confined spaces and restricted access areas (Andrianto & Chalik, 2021).

In addition, the observation results also examined the volume of objects commonly used by design students, as presented in the following table:

Table 2. Object Volume

No	Object	Volume
1	Laptop	14 inches – 15 icnhes
2	Skecth book	A4 (21 x 29,7 cm) – A3 (29,7 x 42 cm)
3	Cutting mat	A2 (60 x 45 cm)
4	Tablet	10,86 inches – 12,9 inches
5	Pencil box/marker	15 x 13,5 cm
6	Handphone	6 – 6,5 inches

The application of the UCD design methodology in the design of the knockdown work desk serves as a reference and a directed parameter in the design process. The implementation of the UCD method is outlined in the following table.

Tabel 3. The application of User Centered Design (UCD)

No	User Centered Design (UCD)	Applicatiom
1	**Plan the human centered process**	The research focuses on design students, followed by an analysis of their problems and needs. Users are the primary subjects in the process of developing the design plan and

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		product testing, with data collection conducted as previously described.
2	**Specify the context of use**	3.1. Based on the analysis of activities and space of the research subjects, it was found that the lack of supporting facilities for the specific activities of design students can affect productivity, and there are spatial limitations in the mobilization process.
3	**Specify user and organizazional**	3.2. Based on the problem identification of the research subjects, user needs were identified as follows: • A work desk that supports the specific activities of design students • A work desk that is effective for use in limited space; • A work desk that facilitates easy mobility during relocation or moving to a new residence.
4	**Product design solution**	The general concept of this work desk design is to facilitate the activities of design students in limited spaces and simplify mobility with a knockdown system, while still considering ergonomic values.
5	**Evaluate design against user requirement**	Using UCD as the design methodology, the design results are then subjected to feasibility testing oriented towards users, specifically design students, to assess the product's alignment with the needs of design students.

Through the user needs identification phase, which is analyzed and formulated based on the UCD method, the Terms of Reference (TOR) can be determined as a guideline in the design process. The aspects of the TOR include user description, design considerations, design limitations, and product description, as presented in Table 3.

Tabel 4. Term of References

No	Term of References (TOR)	Description
1	**User Description**	• Design Students; • Average middle to upper income; • Reside in boarding houses/rented rooms/and other spaces with limited access.
2	**Design Considerations**	• Desk size that meets ergonomic standards, which, when applied, can improve work productivity, specifically 120x60x75 cm; • Implementing a knockdown system that facilitates the needs of design students for effectiveness in limited spaces and mobility; • Lightweight and durable materials that also contribute to sustainability.
3	**Design Limitations**	• The designed product should facilitate the specific activities of design students; • Implementing a knockdown system; • Designed with box storage for organizing and storing the work desk modules; • Using blockboard as the main material with HPL finishing and 3x3 cm hollow steel for the desk legs; • Minimalist style with neutral colors and wood patterns.
4	**Product Description**	This work desk is designed with a knockdown system, measuring 120x60x75 cm, suitable for design students in limited spaces and access. The desk consists of modules that are easy to assemble, with features such as storage boxes, a portable folding desk on the top table, and hooks for hanging containers. The top table is divided

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into two parts, each 60 cm, allowing the desk size to be adjusted to 120x60x75 cm or 65x60x75 cm, depending on the available space or work area. The materials used are lightweight blockboard and 3x3 cm hollow steel for sturdiness. The desk has a minimalist style with neutral colors and a wood pattern.

Based on the determined Terms of Reference (TOR), the work desk is designed with a knockdown system, divided into several modules that can adjust to the user's needs and simplify the assembly process. The work desk will be designed with an overall size of 120x60x75 cm, consisting of modules for the knockdown system, compartments or box storage, and two top table sections, each measuring 60 cm. This is presented through the creation of alternative sketches made manually based on the analysis results (Yuda et al., 2022). In this study, 6 sketches were created and are presented in the images below:

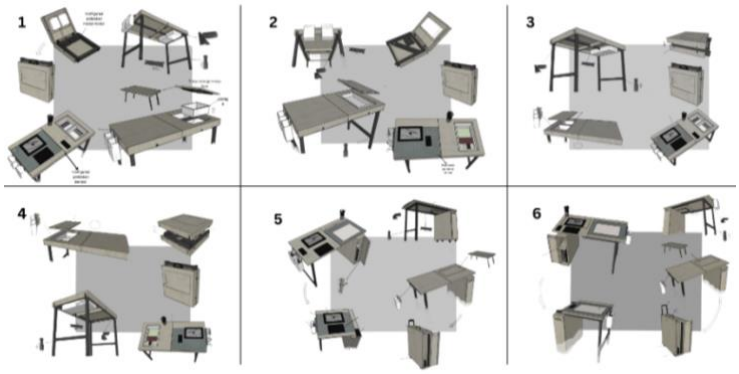

Image 1. Work Desk Alternative Desk
(Personal Document, 2024)

Alternative sketches were scored for design suitability based on the composition of function, ergonomics, and system (Eliyana, et al., 2023), with classification and categories measured using a Likert scale. The weighting resulted in sketch 5 having the highest score, classified as "good," and categorized as "feasible." However, sketch 5 requires refinement on the hanging container hook section, which was then formulated into the final design:

Image 2. Work Desk Final Design
(Personal Document, 2024)

The final design image above displays the final design of the work desk with a configuration that supports the desk's functions, including features and usage configuration. The desk size is made according to the analysis outlined in the Terms of Reference and is designed to accommodate items commonly used by the user. This is shown in the image below, which illustrates the configuration of item placement:

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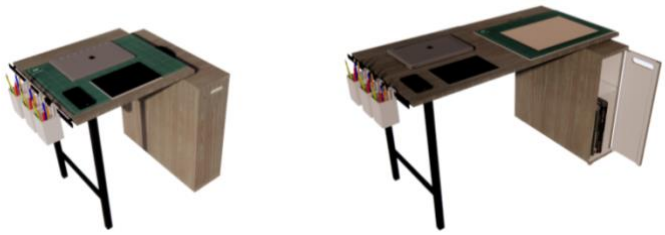

Image 3. Item Placement Configuration
(Personal Document, 2024)

CONCLUSIONS

This research results in a product design for a work desk with ergonomic dimensions and the implementation of a knockdown system to support design students' activities in limited spaces. The study is based on identified problems, which include specific user activities, limited space, high mobility, and observations and analysis of existing products that are insufficient to support design students' activities in small areas. These issues were identified through data collection methods including observation, interviews, questionnaires, literature review, and documentation. The findings were then translated into a work desk design that integrates a knockdown system, aimed at providing a solution for design students to perform specific activities efficiently in limited spaces. However, recommendations for future research include further exploration of materials to optimize the weight and structural strength of the desk, as well as deeper exploration of features to refine the design and better meet user needs.

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