Gorga : Jurnal Seni Rupa
Vol 14, No 1, (2025) 336-344
ISSN 2301-5942 (print) | 2580-2380 (online)
https://dx.doi.org/10.24114/gr.v14i1.65553

Available online : https://jurnal.unimed.ac.id/2012/index.php/gorga

Exploration of Organic Mushroom Forms in the Design of Aesthetic and Functional Nakas

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***How to cite*:** Sari, D. M., Sasmita, R. F., Rohiman, R., Adi, A. W. Z. Y., & Wijaya, M. P. (2025). Exploration of Organic Mushroom Forms in the Design of Aesthetic and Functional Nakas. *Gorga : Jurnal Seni Rupa*, *14* (1), 336-344. https://dx.doi.org/ 10.24114/gr.v14i1.65553

Article History : *Received: May 6, 2025. Revised: May 30, 2025. Accepted: June 30, 2025*

ABSTRACT

Modern furniture design is increasingly focusing on aesthetics, functionality, and sustainability. One of the innovative approaches to furniture design is biomimicry, which is adapting the natural shape of the mold into the design of the product. This study explores the visual characteristics of mushrooms to be applied in the design of aesthetic and functional nightshades. The research method used is qualitative. Literature studies, observation of fungal shapes, sketch experiments, 3D models, and prototyping were carried out to understand the structure and texture of fungus. Some of the types of fungi observed are *Agaricus bisporus*, *Pleurotus ostreatus*, and *Ganoderma lucidum* which have potential in furniture design. The data analysis technique used is ergonomics analysis. The ergonomic analysis of the design of the mushroom organic shaped nightstand emphasizes the fit between aesthetics and function. The results of the study show that the organic form of the mushroom can be effectively adapted in the design of the nightshade, optimizing aesthetics and ergonomics. The design sketches were developed based on biomimicry principles, then tested through digital models and prototypes made of mycelium and sustainable wood. Functionality tests prove that this design not only enriches the visual value of the furniture but also improves the space efficiency as well as the durability of the product. In conclusion, the exploration of the organic forms of mushrooms in nightstand design offers an innovative solution for the furniture industry by combining natural aesthetics, ergonomics, and sustainability. With a biomimicry approach, this design can be a reference for the development of furniture products based on natural inspiration that are more innovative and environmentally friendly.

KEYWORDS

Exploration, Furniture design, Mushroom, Nightstand, Functionality

INTRODUCTION

In the development of contemporary furniture design, the search for new forms that are innovative, aesthetic and functional is increasingly becoming a necessity. Designers no longer only emphasize the value of the product, but also explore the potential of natural (organic) forms that have visual uniqueness and sensitivity to the environment. The biomimicry approach, which is to imitate shapes and systems from nature, is now a widely used strategy in the world of design, including product and furniture design (Utomo & Haryanto, 2019).

One natural form that offers exploration potential is mushrooms. The structure of the fungus has unique characteristics: soft curvature, dynamic growth, and diverse shape configurations. Beyond its uniqueness, the shape of the mushroom also reflects harmony, visual balance, and ergonomic potential that supports user comfort. The trend of organic form-based design including mushroom

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shapes is becoming increasingly relevant in today's furniture design, especially in the context of sustainability and space efficiency (Andarini, 2024; Fadhilla, 2022).

However, based on the literature studies that have been conducted, there has been no research that specifically develops the design of nightstand type furniture that is directly inspired by the shape of the mushroom, both in the context of visual aesthetics and functional aspects. Previous research has generally discussed the application of organic forms in general, or only limited to other product categories such as chairs and lamps (Usop, 2019). This is the *research gap* that this study wants to fill.

A nightstand, as a complementary piece of furniture in a bedroom or living room, is often considered secondary, even though its function is quite vital: storing personal belongings, maintaining the neatness of the space, and strengthening the interior atmosphere. Unfortunately, nightstand designs on the market tend to be monotonous—boxy, linear, and functional without considering a natural aesthetic approach. In fact, the flexible and naturally flowing shape of the mushroom has the potential to provide aesthetic and ergonomic added value for nightstand products.

With the increasing demand for design that is not only aesthetic but also conceptual, the design of nightstands based on the exploration of mushroom shapes is an innovative approach that has not been widely explored. This research is here to answer the question of whether the shape of the mushroom can be adapted into a functional nightstand design without losing its beauty and practicality? How can this approach differentiate from conventional nightstand designs?

Some studies support that organic forms, especially of elements such as mushrooms, can create an emotional closeness between the user and the product because they are natural and non-aggressive. In interior design, curved shapes are known to give a sense of calm and comfort compared to rigid and sharp shapes (Sutanto & Saputri, 2017). Therefore, this approach is believed to not only provide aesthetic value but also *a better* user experience.

In addition to the visual aspect, the shape of the mushroom can also be reviewed in terms of ergonomics. Its natural arch and asymmetrical shape give it flexibility in regulating volume and storage space. This allows for the creation of a nightstand design that is more responsive to the needs of everyday users, as well as having a different visual appeal (Adiani et al., 2023).

With the advent of digital manufacturing technologies such as 3D printing and eco-friendly material processing, experimental approaches to mold shapes are becoming increasingly feasible. This means that obstacles in realizing unconventional forms can now be overcome with the help of the latest production technologies (Muttaqien & Adiluhung, 2023;Pambudi et al., 2024).

Therefore, this research is not only important to add to the treasure of furniture design based on organic shapes, but also as a response to the market's need for products that are aesthetic, innovative, and sustainability-oriented. The design of the nightstand inspired by the shape of the mushroom will be tested in its aesthetic aspects, ergonomics, and material potential in supporting a contemporary lifestyle that is environmentally conscious.

With this background, this research aims to design aesthetic and functional nightstands based on the organic form of mushrooms, as well as answer the void of literature and design practices in this domain. It is hoped that the results of this research can contribute to a more meaningful and useful nature-based furniture design approach.

METHOD

The method used in this study is a qualitative method. This approach aims to explore the visual characteristics of mushrooms, biomimicry design principles, and design techniques that can be applied in furniture design. This research was carried out in several stages as follows: Literature Study and Design Reference, Observation and Analysis of Mushroom Shapes, Sketch Experiments and 3D Models, Prototypes and Functionality Tests, Design Evaluation and Analysis.

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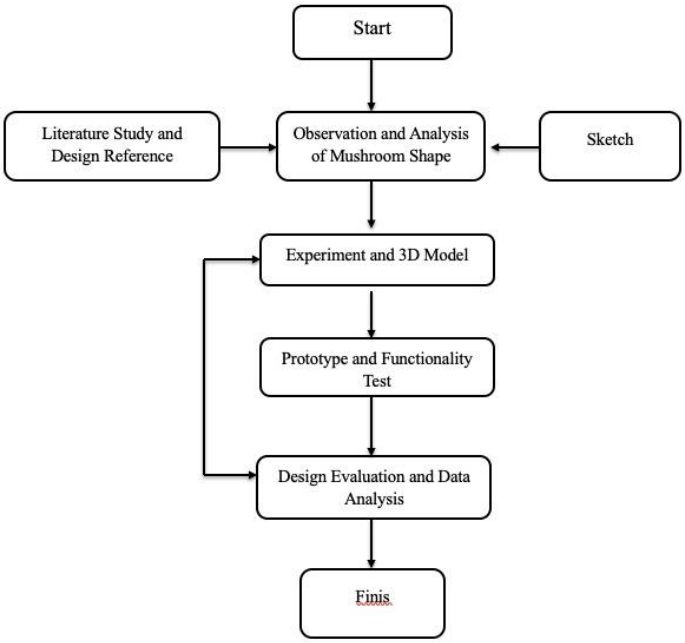

Figure 1. Research flow chart

1) Literature Study and Design Reference: at this stage it aims to collect theories, principles of organic design, and shape inspiration from scientific sources and visual references. Information from books, journals, and organic furniture catalogs is used to understand how natural shapes such as mushrooms can be adapted into product designs.
2) Observation and Analysis of Mushroom Forms Carried out through direct observation of various types of mushrooms. Focus on the characteristics of the hood shape, texture, stem structure, and symmetrical patterns. The results of the observations were analyzed to identify aesthetic and ergonomic potential in the context of nightstand design.
3) Experiment Sketches and 3D models are forms inspired by mushrooms visualized through manual sketching and 3D digital exploration. These experiments help explore various interpretations of shapes and test the visual suitability and structure of the design.
4) Prototype and Test The best design functionality is selected to be made in prototype form using real materials. Tests are carried out on functional aspects such as sturdiness, comfort, and nightstand storage capacity.
5) Design Evaluation and Analysis. The prototype is critically tested in terms of aesthetics, ergonomics and production. Evaluation was carried out to refine the design to reflect the inspiration of the shape of the mushroom but still be functional and efficient in manufacturing.

Data collection techniques are carried out through literature studies and observations. The literature study aims to obtain a theoretical foundation on the organic shape, biomimicry, and visual character of fungi as the basis for design analysis. Direct observations are made of different types of fungi in the natural environment to document their structure, texture, and color. The data were analyzed qualitatively through reduction, morphological categorization, and aesthetic and functional evaluation. This approach allows the translation of the shape of the mushroom into an aesthetically pleasing and functional nightstand design.

The data analysis technique used is ergonomics analysis. The ergonomic analysis of the design of the mushroom organic shaped nightstand emphasizes the fit between aesthetics and function. The design should take into account the height of the surface (40–60 cm), the width (35–55 cm), and the comfort of use in a sitting or lying position. The shape of the mold needs to be modified to be stable and safe, avoiding sharp corners and ensuring the compartment is easily accessible. Ergonomic principles such as neutral posture, optimal reach, and stability are applied to support user comfort.

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Despite the unique shape of the mushroom, the design must remain intuitive and functional in order for it to be used practically in interior spaces without sacrificing artistic value

RESULT AND DISCUSSION

1. Study of Organic Shapes of Fungi in Furniture Design

Transformation is a term derived from the English language, namely transformation which means change (form) with a more formal explanation related to geometric typology (Garry, 1990). In the book Poetic Of Architecture, Theory of design, transformation is described as the modification of form in which a form can reach its highest peak by responding to various influences from within and outside (Antoniades, 1990). The transformation principle gives an opportunity for a designer to define a prototype model whose structure can be changed through various manipulation methods to respond to the situation and scope of the design. The change in the shape of the design this time uses morphological transformation.

Morphological transformation refers to changes in shape, dimensions, and structure in organisms, including plants, animals, or other living things, that occur as a reaction to the environment or the need to adapt. These changes can occur in parts of the body, such as modifications to the shape of leaves, roots, or beaks in plants and animals. Based on the results of observations, one of the plant forms was taken, namely mushrooms. This shows that the shape of the mushroom has great potential as a furniture design inspiration due to its unique and natural characteristics. Some of the mushroom shape patterns that can be applied in nightstand design include Umbrella mushroom (Agaricus bisporus). Here is an example of an umbrella mushroom.

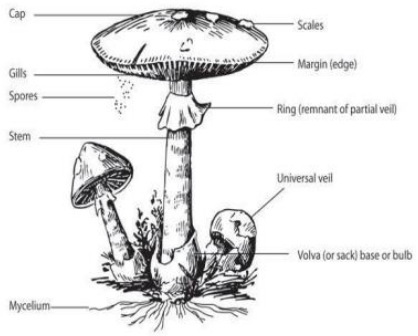

Figure 1 Umbrella Mushroom Structure (Sumber : Pinterest)

Umbrella mushrooms with a curved shape accompanied by a sturdy stem structure are the inspiration for nightstand legs (Yuliawati et al., 2021). The mushroom hat part allows the transformation of the shape into a top *table plus suburban* accents around the top table with the adaptation of Lampung cultural elements of bamboo shoots motif (Sukanadi et al., 2018). The bamboo shoot motif was chosen because of the iconic design in the filter cloth from Lampung which contains symbolic and philosophical meanings. The following is the motif of bamboo shoots.

Figure 2 Pucuk Rebung Motif

This design is similar to a bamboo shoot, and is usually decorated with gold or silver threads. Bamboo shoots symbolize hope, growth, and strength that arises from within (Nur, 2021). Next is the oyster mushroom (Pleurotus ostreatus) which is shown in the following picture.

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Figure 4 Tiram Mushroom (Sumber : blibli.com)

Oyster mushrooms have a stacked shape that can be applied in the design of shelves or storage compartments. The shape of the tube tends to be convex allowing for a fairly wide transformation of the storage drawer design. Using *a* round shape of a drawer handle such as an oyster mushroom hat and the original matching color (Nugroho, 2023). Spacious storage space in the form of drawers is very helpful in tidying up and organizing various items, from clothes, supplies, to accessories. The large drawers provide the ability to store more items regularly. The picture of the lingzhi mushroom (Ganoderma lucidum) is in the following picture.

Figure 5 Ling Zhi Mushroom

Lingzhi mushroom (Ganoderma lucidum) has a unique texture that can be used as a reference in material selection and surface finishing. Improving the aesthetic appearance and providing protection to wooden furniture is the goal in the finishing process. The use of the material in the form of the chosen liquid is paint. This material is easy to apply to various surfaces of wooden furniture, both flat and curved (Prasetyo, 2019). Some of the commonly known types include PU (Polyurethane), NC (Nitrocellulose), melamine, and water-based finishes (materials that combine water and resin during their application). The dark brown, reddish and glossy color of lingzhi mushroom gives an elegant and strong impression. The spray finishing technique is used because the result of this finishing tends to be smooth and the quick process ends with a transparent finish, such as varnish or oil coating, giving the wood a natural look while protecting from external elements such as water and UV rays (Arifin, 2020).

2. Sketches and 3D Models

The stages of developing a furniture concept include various steps, starting from determining needs to improving the design. Generally, these steps consist of *sketching ideas*, research, concept development, visual creation, and assessment (Dewi & Darmastuti, 2021; Sukanadi et al., 2018). Sketching is the initial stage in the process of visualizing ideas, which aims to explore the organic forms of mushrooms as the main inspiration in nightstand design (Rohiman et al., 2022). Through manual drawing activities, designers try to translate mushroom characteristics such as natural curves, surface textures, and shape proportions into a furniture concept that not only has high aesthetic value, but also meets the functional aspect. This stage becomes the basis for the development of the next design, as well as a means to test possible shapes, structures, and details relevant to the character of

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the product to be produced (Yuliawati et al., 2021).

Furniture design sketches can be used as a basis for creating more detailed working drawings and as a guide in the production process. The initial stage in making furniture determines the carving method, which is to create a sketch of the carving on the object to be worked on. This sketch serves as a reference in the subsequent engraving process. It is important to pay attention to design and integration so that the final result looks harmonious and visually appealing. The following are the sketch stages of the visualization process of nightstand furniture design ideas:

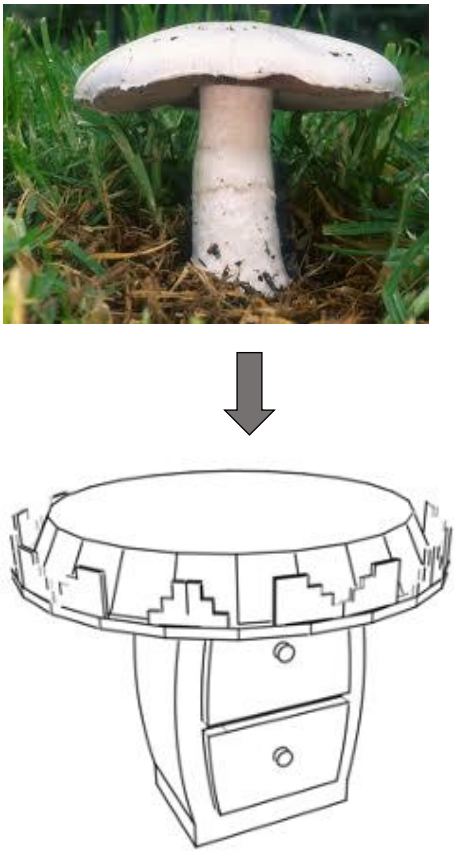

Figure 6. Conceptual Sketch

After the engraving pattern is designed, the next step is to mark the pattern on the surface of the furniture using a marking tool. Furniture making requires a good strategy to ensure that all stages run well. One of the crucial aspects of the furniture manufacturing process is setting a workable timeline.

3. Prototype Creation and Ergonomics Evaluation

Prototyping is the stage of realization of design concepts in physical form that aims to test the functionality, structure, and aesthetics aspects of the designed nightstand. Prototypes are made using materials that resemble the final material to provide a real picture of the shape, dimensions, and proportions of the design (Permanasari, 2023). After the prototype is completed, an ergonomic evaluation is carried out to assess the extent to which the design is able to meet the needs of comfort and ease of use. This evaluation includes the height of the nightstand surface, the size of the storage space, the stability of the structure, as well as the interaction of users with the product in the context of daily activities. The results of this evaluation are the basis for refining the design towards a more ergonomic and visual final product in the form of working drawings in the form of projections (Pratama, 2024). A projection image is an image of an object that appears intact with a certain point of view. Axonometric projection images can be created by rotating objects so that objects can be seen from all three dimensions in one view. The following is a projection image of the working image of

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idle furniture:

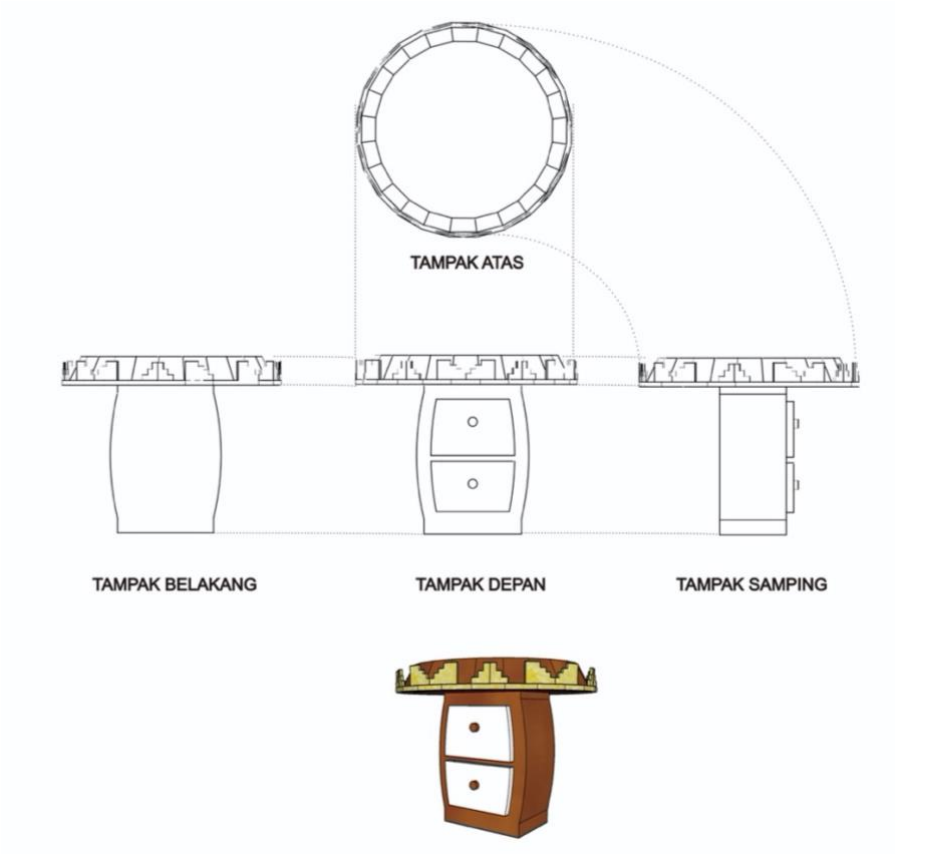

Figure 7. Orthogonal images

The prototype of the nightstand was made using a combination of solid wood and a fungus-based composite material (mycelium). The test results showed that the structure of the podium legs based on the shape of the umbrella mushroom had good stability. The use of mycelium-based materials improves the sustainability and aesthetics of the surface. The multi-level design of the umbrella mold provides flexibility in the storage of goods. User tests show that the design is ergonomic and comfortable to use in everyday activities.

4. Functionality and Aesthetic Analysis

Functionality and aesthetic analysis was carried out to evaluate the extent to which the design of the nightstand not only meets practical needs as storage furniture, but is also able to present visual value that is in harmony with the concept of organic design. In terms of functionality, aspects such as storage capacity, structural stability, ease of access, and the proportion of dimensions to users are the main focus of the assessment (Nugroho, 2023). Meanwhile, from the aesthetic side, the analysis includes the observation of the overall shape, organic lines inspired by the morphology of the fungus, color harmony, and the unity of visual elements that support the natural and artistic character of the product. In a design stage, a prototype is needed to evaluate whether the product is suitable for its function. Prototype is an initial model or initial design of a product or system that is made to test concepts, design, and functionality before mass production. Here is a prototype picture of the nightstand design:

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Figure 4. Modelling result picture

With this approach, nightstand design is not only seen as a utilitarian object, but also as a visual artifact capable of enriching the atmosphere of the space and reflecting the culturally inspired aesthetic values of nature

CONCLUSION

Based on the results of shape exploration, design, prototyping, and user evaluation, it can be concluded that mushroom organic form inspiration can make a significant contribution in creating a nightstand design that is not only functional but also has high aesthetic value. The morphological characteristics of the mushroom such as soft curves, natural textures, and unique structure are successfully translated into ergonomic furniture shapes that have strong visual appeal.

In terms of functionality, the design has met the basic needs of users as a stable, secure, and accessible storage place. In terms of aesthetics, the use of organic lines, natural color selection, and harmonious design proportions give a natural and contemporary impression that strengthens the character of nature-based interior design. Through this design approach, the product not only fulfills a utilitarian role but is also able to become a medium of visual expression that enriches the atmosphere of the space and supports the sustainable design movement inspired by nature.

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