

A Study on the Awareness of Biomimicry among Students and Practitioners around Klang Valley

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Received: 1 February 2021 / Accepted: 15 May 2021 / Published online: 30 July 2021

Abstract

The purpose of this study is to introduce the biomimicry design approach in educating future designers. The objectives are to define biomimicry design, to discover the characteristics of nature that influences biomimicry design and to develop the criteria and design consideration of Biomimicry influenced design. This process is meant to remind designers of the benefits nature has to offer in helping to solve many of the problems that society is currently grappling with today. In order to determine the understanding of biomimicry, the direct method have been implemented in terms of the biomimetic design process; applying the six stages: (1) Defining, (2) Analyzing, (3) Observing, (4) Selecting, (5) Implementing, and (6) Evaluating. Overall, this thesis is meant to encourage designers to think differently, forcing them to innovate, experiment, push and adapt their designs further than ever before. The objective at hand is to create good design that has also the potential to benefit mankind, the world and everything that encompasses it.

Keywords - awareness of biomimicry, biomimicry, nature-based design.

1. Introduction

Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies (Azzi* and Beyrouthy, 2015). The goal is to create products, processes, and policies which are the new ways of living that are well-adapted to life on earth over the long haul. There are three types of biomimicry - one is mimicking form and shape, another is emulating a process, for example, the photosynthesis process of conversion in a leaf, and the third is mimicking at an ecosystem's level, like building a nature-inspired city (J.M. Benyus,1997; Anwar et al., 2018). It also can be supported by (Roco, 2003), Nature provides a database of several solutions that already work and thus serve as models for inspiration. Biomimicry involves learning from and emulating biological forms, processes, and ecosystems tested by the environment and refined through evolution. Biomimicry can be applied to solve technical and social challenges of any scale (Emily, 2015).

2. Methodology

In the process of collecting data for this research topic, several methods were used by the researchers such as sampling and analysis methods (Anwar, 2016). In terms of questionnaire distribution, qualitative and quantitative methods were combined. Both methods are very important in gathering all the data to answer the research question. The target groups for this study are the final year art and design master students. This is since this group of students is exposed to the knowledge of biomimicry. All these methods (Anwar et al., 2015) help the researchers to see the level of the student's understanding of the design approach regarding biomimicry.

2.1 Data Collection

2.1.1 Observation

This method is required in the process of collecting information in relation to the study of biomimicry design application. Observation should be done carefully in this study for the researchers to find out the process from the beginning and the end of how the design process works. The observation methods are divided into two types, namely direct observation, and observation mediator, from the perspective of the researcher to see and hear what is happening throughout the observation. Regarding this study, the researchers note, examine, listen and gather all the information related to the history of biomimicry, biomimicry ideation design process or anything else that occurs during activity design biomimicry. Meanwhile, the observation method is a process in which mediator researchers make observations on the information materials of audio and video recordings. Observations have been made in several places related to the research topic for data collecting purposes. The first observation was made at the Universiti Teknologi Mara on the 22nd of May 2017 at 11.00 am. Observations were made on the results of process for ideation design and perspective about biomimicry. The second location is Sistem Televisyen Malaysia Bhd. (TV3) located in Shah Alam. The survey was done on the 23rd of May 2017 at 2.00 pm. These observation sessions from the designer shows how deep is their understanding and how they develop idea through biomimicry.

2.2.2 Questionnaires

In the process of collecting data, the technique used is quantitative method. Questionnaire method is applied in this research to acquire a better understanding of the public perception in the application of biomimicry. This method is conducted to perceive the acceptance of the public regarding the topic. The questionnaire questions are distributed to entry level designers (beginners; master level students). The question is given the option to mark the answers.

2.2.3 Interview

The researchers conduct this method by interviewing several individuals associated with biomimicry directly and indirectly for more information about biomimicry and designs that have been produced (Anwar et al., 2015). Interviews also involve forms that have been prepared to complement the information obtained. All interviews were recorded in detail for data collection. In addition, the question of individual's opinions on the acceptance of the understanding of biomimicry is collected to be used as data. Individuals selected for this session were selected ranging from beginner to field experts based on the criteria related to the research topic.

3. Result and Outcome

From the data collection of the questionnaires distributed, we can conclude that the entry level designers (beginner respondent group) lack the understanding and familiarity of the term.

Majority have experience with nature inspired design yet only study the surface level i.e; the form and shape of the subject matter.

A prominent amount of the respondents is largely unsure of the term and the approach itself as the common answer generated are not sure, indicating a lack of exposure to the term and idea of biomimicry.

From the findings of the pilot test, we can conclude that the practitioners and lecturers (mediocre and expert

respondent's group) have indeed fully understood the theory and can easily explain and demonstrate the approach.

The best method to fully develop a holistic criteria and design consideration of biomimicry inspired design from the observation of the pilot test conducted.

- i. Research and comprehend the subject from all three aspects (form, process, ecosystem)
- ii. List down all the imperative data
- iii. Refine the ideation through the design development process by taking into account the aspects of biomimicry to be highlighted.
- iv. Construct a design criteria and design consideration of biomimicry inspired design through all the data collected.

In reference to the result of the first and the second method, the similarities are indeed blatant as both groups of respondents have experience with the approach only the notion of biomimicry is indeed alien as such terms are often confused with nature inspired design.

Design Consideration when producing a biomimicry design:

In biomimicry design, it is important to emphasize the design consideration during the design process. Design consideration highlights how; biomimicry design gives an impact to the environment, what are the best principle to be applied in producing Biomimicry design, the benefit for the end user and how the design solves complex human problem.

According to The Biomimicry Institute (2015), there have nine impacts of environment to consider when designing biomimicry designs which are:

- i. Nourishing Curiosity is to bring new solution to the design where the designers are innately curious, and biomimicry provides the opportunity to learn about life's water, energy, and material use strategies, and broadens the design solution space.
- ii. Going beyond Form is a biomimicry practice by focus on a sustainability strategy, creating structure that fit form to function and material efficient as well-adapted to their environment.
- iii. Giving Permission to Play is like gives a creativity into design process so that people will experience creative environment.
- iv. Disrupt Traditional Thinking is an opportunity to explore new solutions and brainstorm opportunities to solve challenges in new and innovative ways.
- v. Accomplish Multiple Needs with One Simple Gesture is a multi-functional design that could accomplish multiple function like a nature concept, there are no single purpose tools.
- vi. Are Well-Adapted to their Context and Climate is a leverage cyclic processes such as the change of seasons and manufacturing with readily available materials and energy to minimizing costs.
- vii. Emulating and Enhancing Ecosystem Services is a creating an environment that "fit in" again and contributes to the ecosystems by considering on carbon footprint, energy production, and habitat creation.
- viii. Leveraging Collaborative Synergies is a rethinking the design or system to cultivate collaborative relationships that save resources, energy, and cost for the project and the community at large.
- ix. Embodying Systemic Resilience is a how nature confers resilience on its systems, incorporating diversity and embodying resilience through variation, redundancy, and decentralization so that life on Earth is the epitome of resilience; adapting and changing itself to fit its context for billions of years.

Jenine Benyus (1997) have laid down the 6 basic laws of biomimicry design principle which are:

- i. Follow nature's principle such as embrace diversity, use free energy, self-assemble, optimize rather than maximize, cross-pollinate, use nature-friendly material and process, enhance the environment, and engage symbiotic relationship.
- ii. Perform well like thing just work well by doing a good design guide.
- iii. Conserve energy by emulating the efficiency energy-saving that can reduce the energy use in product.

- iv. Use just material it needs by minimize the amount materials while maximizing the effectiveness of product.
- v. Recycle its waste which is learn how to transform technological waste and
- vi. See the product in different light by creating an opportunity for innovation.

4. Conclusion

From the research conducted, we can deduce that the initial hypothesis addressing the method used by entry level designers to emulate nature have indeed been focused mainly on the aesthetics (form and shape) whereas the holistic approach to bio mimicry is to study a full emulation of nature which engages at least three levels of mimicry: form, process, and ecosystem (Benyus, 2008, p.40).

As a conclusion, the approach of biomimicry should largely be exposed to the students at an earlier stage of design education to improvise their knowledge and let them explore not only from the (form and shape) but to actually develop and refine their ideation skills In a holistic manner to solve many of man's complex problems through the deep study of how nature has perfected many of her methods in solving the problems we currently face, from air pollution, waste management, energy conversion and many more. As the approach of Biomimicry is accepted everywhere due to its effective properties, a collaboration with students from other array of background from engineering to medicine should be established to further broaden the horizon of possibilities. From the data collection, we can see that currently, many final year design students are unfamiliar with the term Biomimicry thus a rampant effort should be attested to create a wave of new intellectuals who are ready to visual the world of design in a whole new perspective and able to approach solutions with a more detailed perception.

Although the data maybe constrained due to many limitations, the results gathered can help many future researchers understand the current level of comprehension from beginners to practitioners of how an approach can be alien yet at the same time, can revolutionize the school of ideation with a detailed guideline of introduction into the creation of a design criteria and consideration in utilizing nature's full potential. Therefore, through the study on the awareness of biomimicry among students and practitioners around Klang Valley the researchers hope that the data obtained can be helpful to future designers in gaining a new approach to design thinking. The attempt on doing this research is to develop a guideline for the criteria and design consideration of Biomimicry influenced design for the future designers.

Acknowledgements

Alhamdulillah first and foremost we would like to thank our supervisor Dr. Rasmadiyah bin Anwar for his guidance from the beginning until the end of our research. We would like to acknowledge the generous participation in the completion of this research. This study was conducted in the Faculty of Art & Design, Universiti Teknologi MARA. Fully appreciate for providing the facilities, equipment, and expertise to completing this research. Special thanks to the FSSR research initiative group for the assistance given for the research can be carried out successfully

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