

DESIGN OF MINI PLANTS WITH SELF-WATERING FEATURES USING ENVIRONMENTALLY FRIENDLY MATERIALS

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Abstract

The urban community's concern for health continues to increase and can be proven by the 10-15% growth of health insurance, the birth of the Indonesian Gardening community and other healthy lifestyle communities. Water pollution is a major factor causing health problems, because indoor air pollution is 2-5 times (Vidyautami, et al., 2015) worse than outdoors and humans spend 90% of their activities indoors. NASA scientists in the 80s conducted a study of the role of plants in the room to eliminate organic chemicals in the water by simply placing air purifier plants in a room with a height of 20 cm making a very large reduction for water pollution. But it is not easy to care for these ornamental plants when they are placed in a room. Obstacles to moving ornamental plants from the yard into the room include, in addition to adjusting the types of plants, a pot that can be adjusted to the conditions of the room is also needed. In this design the author aims to be able to make a pot that can adjust to the busyness of the urban community that can facilitate the process of plant maintenance every day.

Keywords : eco-friendly, planter, plants, workspace, self-watering

Preliminary

Nowadays awareness of healthy lifestyles is starting to increase in Indonesia especially Jakarta. Humans begin to think about the health of their bodies by maintaining a healthy diet, exercising regularly, and going on a healthy diet.

Lifestyle reflects the whole person who interacts with the environment. Lifestyle is defined in WHO 1998, namely life style is a way of living based on identifiable patterns of behavior which are determined by the interplay between an individual's personal characteristics, social interactions, and socioeconomic and environmental living conditions. Individual lifestyles, which are characterized by individual behavior patterns, will have an impact on an individual's health and subsequently on the health of others.

Some of the main causes behind poor health conditions are illness, improper eating patterns, stress, unhealthy lifestyles and lack of air cleanliness. And polluted air is one of the five most dangerous causes in the world. Air pollution occurs indoors and outdoors, and what is harmful is indoor air pollution occupies the third position of environmental factors affecting environmental health that affect human health (Lisyastuti, 2010), with indoor air quality 2-5 times worse than in outdoor (Vidyautami, et al., 2015).

Reported by Guardian, research conducted by Dr. Chris Ksatria and colleagues from Exeter University, revealed that worker productivity increased by 15% after his desk was decorated with plants. They have studied productivity and ornamental plants on their desks for 10 years.

NASA scientists in the 80s conducted a study of the role of plants indoors to remove organic chemicals in the air and that way was enough to put an air purifier plant in a room with a height of 20cm making a very large reduction to air pollution phenomenally. The presence of plants in the room can help regulate the amount of CO₂ levels that are reduced by about 10% in air-conditioned rooms and 25% in rooms without ACz

In its application, graphic design can also create visual media that can provide change and provide solutions to problems that are happening in society, both health, social, religious, political and cultural issues. One of the writer's main focus in making this Final Project is a campaign that aims to reduce the problems that occur in the health sector in the community, namely Stunting.

According to a book published by the National Team for the Acceleration of Poverty Reduction, entitled 100 Priority Regencies / Cities for Intervention of Little Children (2017: 5), states that *Stunting* is a condition of failure to thrive in children under five (babies under five years old) as a result of chronic malnutrition so that the child is too short for his age. Malnutrition occurs since the baby is in the womb and in the early period after the baby is born but, the condition of stunting only appears after the baby is 2 years old. Stunted and severely stunted toddlers are toddlers with length (PB / U) or height (TB / U) according to their age compared to the standard WHO-MGRS (Multicentre Growth Reference Study) 2006 standard. While the definition of stunting according to the Ministry of Health (Kemenkes) is a toddler with a z-score of less

than -2SD / standard deviation (stunted) and less than -3SD (severely stunted).

Toddlers / Baduta (Babies under the age of Two) who experience stunting will have a level of intelligence that is not optimal, making children more vulnerable to disease and in the future can be at risk of decreasing levels of productivity. In the end, stunting will be able to hinder economic growth, increase poverty and widen inequality.

Actually the government itself has been very concerned to prevent this, the government has launched an integrated stunting prevention intervention program involving cross ministries and institutions, named 1000 Priority Stunting Handling Villages in 2018, established 100 districts in 34 provinces as priority locations for stunting reduction. This number will increase by 60 districts in the following year. It is hoped that this cross-sectoral collaboration can reduce the stunting rate in Indonesia so that the Sustainable Development Goals (SDG) target in 2025 can be achieved, namely a reduction in the stunting rate to 40%, (Didik Budijanto, 2018: iv).

But the lack of public knowledge related to the problem of stunting makes this problem has not ended until now. The government and the community should be able to work together to prevent stunting. Therefore to support and help the community and the government solve the stunting problem, by choosing to make a Non-Commercial Saving Nutrition Campaign Design in the Prevention of Pregnancy Stunting as the main topic of the author's Final Project.

Children are the nation's assets in the future. It can be imagined, how the condition of Indonesian human resources in the future if at present there are many Indonesian children who suffer from stunting. It is certain that this nation will not be able to compete with other nations. It is indeed not a short time to solve the Stunting problem in Indonesia, it really needs help from various parties in terms of financial and education, in order to be able to compete equally with other developed countries. Therefore to support the social movement to solve the problem of stunting in Indonesia, the author plans to make a Non-Commercial Savings and Nutrition Savings Campaign in the Prevention of Stunting During Pregnancy.

Product Design Review

Understanding of the product according to Siswanto Sutojo (2009: 133) states that "The product is a departure point for marketing success". While other definitions according to Kotler and Keller (2009: 4) states "Product is everything that can be offered to the market to satisfy a desire or need, including physical goods, services, experiences,

events, people, places, property, organization, information and idea".

Product design is a field of design expertise that studies and plans disposable materials, which are produced industrially. Product design emphasizes its main attention on the relationship between humans as users and products as things to use. The emphasis is on reciprocal relationships involving considerations covering technical, functional, psychological and market aspects. So the development of the design of a product requires adequate insight into materials, production processes, human behavior and social, cultural and economic demands. A product besides being demanded not only has a technical, economic or just a fulfillment of physical needs, but is also expected to be able to answer the demands for symbolic functions, beauty, comfort and beauty.

Misha Black from the Royal College of art London argues that product objects are not just efficiency in the mechanism and the economy, but must also pay attention to moral factors, social and environmental impacts. Product design consists of two words, namely design and product according to a large Indonesian dictionary, design means a framework or design. While the product means the goods or services that are made and added to use or its value then in the production process becomes the final result of the production process.

In conclusion, product design is one element of advancing the industry so that the products of the industry can be accepted by the public, because the products they get are of good quality, affordable prices, attractive designs, get guarantees and so on.

Product design is related to form and function. The design of the form relates to the planning and appearance of the product. While the design of the function relates to how the product can be used. Product design is the most important thing, because the opportunities that new products have are often amazing. Where at a time, a new product can increase twice or three times the turnover of a company / agency concerned.

Review of Plant Pots

A potted plant is a container where flowers or other plants are planted and raised. Formerly, and still exists today, flower pots made of terracotta. Flower pots are now also made of plastic, wood, stone or sometimes recycled materials.

These potted plants are available in various forms, functions and materials. At first glance the function of the pot is all the same, to put plants into a pot. But do you know if there are actually 5 types of pots and each has its own function (Basuki, 2003):.

Eco-Friendly Review

According to Mita Purbasari (2000: 12-119), Product design with the concept of Eco-Friendly aims to develop environmental awareness both in the product and its processes. The application of this concept involves a specific framework aimed at considering environmental issues and is also a challenge for practitioners engaged in product design both in design and in manufacturing. But in the past, the impact on the environment was ignored during the product design and processing process. This is difficult to change just like that because it reminds of the manufacturing process that already exists and has been running for a long time, it is not possible to experience changes quickly and significantly which actually has positive aims to effectively balance the environment.



Figure 1
Sustainable Design

Air Purification Plants

According to a study conducted by the United States Space Flight Agency (NASA) and several scientists including Dr. BC Wolverton Ph.D, there are some plants that can remove dirty air or as an absorber of toxic gases, such as carbon monoxide contained in cigarette smoke. Hazardous substances that can be absorbed by special air purifier plants include formaldehyde, ammonia, benzene, carbon monoxide, nitrogen monoxide, and can be reduced by planting the following plants in pots and placed in homes and public spaces.

Causes of Air Pollution

1. Natural activity

Natural activities Natural activities that occur in nature can cause air pollution in the atmosphere. Dirt- manure produced by livestock contains methane compounds which can increase the temperature of the earth, global warming. A similar process in the nitrogen cycle in the atmosphere. In addition, natural disasters such as the eruption of Mount Brpi produce plant ash. Forest fires that occur well will produce carbon dioxide in large quantities that can pollute the air and are harmful to animal and

human health. (Air and Health Pollution Teaching Materials, 2006).

2. Human activity

Activity - human activities are now increasingly out of control, advances in industry and technology bring a negative side to the environment because it is not handled properly.

Clay Review

Bowles (1991), defines clay or clay as deposits having particle sizes smaller or equal to 0.002 mm. Clay with a microconic size up to submicroconist is formed from the weathering of the rock constituent chemical elements. Terzaghi (1987), clay or clay will be very hard in a dry state, and not easily peeled only with fingers. Clay or clay have very low permeability and are plastic at moderate moisture content. Clay or clay is a complex silica hydraaluminium with the chemical formula $Al_2O_3 \cdot nSiO_2 \cdot kH_2O$ where n and k are numerical values of molecules that are bound and vary for the same period.

Design Review

Design etymologically, the term design comes "from earlier" some absorption of language, namely the word "designo" (Italian) which grammatically means picture. According to Page design is defined as an imaginative leap from present reality towards future possibilities. (Jones, 1980: 2).

Understanding of design according to JB Reswick is: creative activities that involve the creation of something new and useful that did not exist before. Yasraf further explained, thus design is a creative-progressive activity with the product, whose final product is novelty and difference. (Pilliang, 2008: 384).

Product Standardization

Product standardization is the determination of basic boundaries in the form of specifications of goods produced from manufacturing. Product standardization is very important in maintaining the quality of a product. Among the norms that must be considered in designing a product is Anatomical or bodily norms require dimensions or space in doing activities. There are so many anatomical norms, the author in the search for data only presents norms that are related to the design of garden furniture table chairs. Anatomic norm aims to aim that furniture as a support activity can really function properly. Usability There are several definitions of usability. The first definition is conveyed by the International Standards Organization (ISO 9241-11) which defines usability as " the extent to which a product can be used by certain users to obtain certain goals

with effectiveness, efficiency, and satisfaction in the context of usage and norms Aesthetics is a branch of philosophy that relates with the nature of beauty, art, taste and with the creation and appreciation of beauty. This is more scientifically identified as a study of censorship or sensory emotional values, sometimes called an assessment of sentiment and a broader sense, scholars in the field define aesthetics as "critical reflection on the arts, culture of the old fund". Aesthetics is related to axiology, branches of philosophy, and is closely related to the philosophy of the art of aesthetic studies in new ways to see and observe the world.

Research Methods

Research time

The research was carried out for four months namely in September - December 2019 to be able to strengthen this design process. This research took approximately five months, the process of collecting data sourced from office workers at Innovation Factory Jl. HR Rasuna Said No No.Kav. X-2 No. 5, RT.9 / RW.4, Kuningan Tim., Setiabudi District, South Jakarta City and the Indonesia Design Development Center are located at Letjen S. Parman St No.112, Grogol, Grogol petamburan, West Jakarta City, Jakarta 11440.

This research was conducted from 11 September 2019 to 28 December 2019.

| Kegiatan | | September | Oktober | November | December | Januari | Februari |
|----------------------|--------------------------|-----------|---------|----------|----------|---------|----------|
| Identifikasi Masalah | wawancara | | | | | | |
| | Observasi | | | | | | |
| Pengumpulan Data | Data wawancara | | | | | | |
| | Teori & Tinjauan Pustaka | | | | | | |
| | Data observasi | | | | | | |
| Analisa | Target Market | | | | | | |
| | Warna | | | | | | |
| | Ukuran | | | | | | |
| Pembahasan | Material | | | | | | |
| | Konsep Desain | | | | | | |
| | Brainstorming | | | | | | |
| | Developing | | | | | | |
| | Detailing | | | | | | |
| Pembahasan | Final Desain | | | | | | |
| | Mockup | | | | | | |
| | Prototype | | | | | | |

Table 1.
Activity Time Table

Research sites

This research is located in the Jakarta area. The location of this study was chosen because pollution is increasing in metropolitan cities caused by several factors such as vehicle fumes, and many building constructions. So this results in the majority of urban communities such as office workers feeling less productive and easily stressed while in the office.

Reported by Guardian, research conducted by Dr. Chris Ksatria and colleagues from Exeter University, revealed that worker productivity

increased by 15% after his desk was decorated with plants. They have studied productivity and ornamental plants on their desks for 10 years. But it is not easy to care for these ornamental plants when they are placed in a room. Obstacles to moving ornamental plants from the yard into the room include, in addition to adjusting the types of plants, a pot that can be adjusted to the conditions of the room is also needed.

As for it all related to the research conducted by the author, which concerns the life of the city & users of the product to be the author of the design.

Starting from the problem that the author found in potted plants in space. Where many people have difficulty in terms of plant maintenance due to the need for most plants to be watered every day, making those who are "busy" become lazy to make plants as a hobby. With the aim of solving this problem, the writer can find out the benchmarks for designing the product, knowing the circumstances, experiences, processes and knowledge and looking for all opinions before designing the product, which will be interconnected with one another to get the appropriate research results. .

Research methods

In designing potted plants with eco-friendly concepts and the addition of self-watering features. The author uses the media strategy in the form of qualitative methods as the author's method of conducting research. Qualitative approach is an approach that has a natural setting which is an important tool in the form of data sources directly from the author. In this case the descriptive qualitative approach is more concerned with the process rather than the result of the tendency to analyze data inductively.

According to Sugiyono (2007: 1) in the book Understanding Qualitative Research, Prof. Dr. Sugiyono explained that, "Qualitative research methods are research methods used to examine natural object conditions where the researcher is a key instrument, data collection techniques are triangulated, data analysis is inductive, and qualitative research results emphasize more on the meaning of generalization" .

Still in the same book Sugiyono (2007: 3) explains, "Qualitative methods are used to get in-depth data, a data that contains meaning. Meaning is actual data, definite data which is a value behind visible data "

Meanwhile according to Moleong (2010: 6) in his book Qualitative research methods explain that, "Qualitative research is research that intends to understand the phenomena about what is experienced by research subjects". In the book, the main points of research methodology are Ir. M. Iqbal

Hasan (2002: 34) explains, "case studies are research on the status of research subjects who are pleased with a specific or typical phase of the whole personality."

From some of the descriptions above, the researcher interprets that case studies in qualitative research are appropriate methods or methods to answer the phenomenon of a deeper research problem on an object of research. In connection with this study, the author wants to examine how the design of potted plants with eco-friendly concepts and the addition of self-watering features.

Data collection technique

Data collection techniques are the most important step in research, because the main purpose of research is to get data. according to Sugiyono (2007: 209) when viewed in terms of data collection methods or techniques, the data collection techniques can be done by observation, interview, questionnaire and documentation. But in this study the data collection techniques carried out by researchers are through three methods, namely:

1. Observation

Observation aims to observe the subject and object of research, so researchers can understand the actual conditions. Observations are non-participatory, ie the researcher is outside the observed system.

2. Interview

Esterberg in Sugiyono (2007: 211), defines the interview as a meeting of two or more people to exchange information and ideas through questions and answers, so that meaning can be constructed on a topic. With interviews, the researcher will find out more in depth about the informants in interpreting the situations and phenomena that occur, where this can not be found through observation. In conducting interviews, researchers prepare research instruments in the form of written questions to be asked, and record what is raised by the informant, therefore the types of interviews used by researchers include structured interviews.

3. Documentation

The document is a record of events that have already passed. Documents can take the form of writings, drawings, or one's monumental works (Sugiyono, 2007: 213). Research results from observations or interviews will be more credible if supported by the relevant documents.

Results And Discussion

Design concept

From the analyzes that have been done before, it is obtained the desired potted plant design concept in this research with several derivative concepts such as Minimalist, Eco-friendly & suitable

design for the Urban community. Then from some of these derivatives produced several design criteria to support the desired design concept. The following are the concepts that will be applied to the design of mini plant pots with self-watering features made from environmentally friendly materials

Mood board

Moodboard is a collection of concepts that become a single entity that visualizes a character in the process of designing a product. The concept for this design the author combines a minimalist organic form. with colors inspired from nature.



Figure 2
Moodboard

Styling Board

The following is a comparison of concepts and products between one and another so that they find concepts that are truly in accordance with the results of interviews, observations & documentation that have been done by the author.



Figure 3
Styling Board

Brainstorming The design

Below are the results of brainstorming done by the author in the process of designing mini plant pots with self-watering features made from environmentally friendly materials

1. The process of brainstorming a sketch of a plant pot, based on the analysis that has been done



Figure 4
Brainstorming Sketch

Developing and Detailing

The following are the results of developing along with the detailing process of the pelengkap components in the design of mini plant pots with self-watering features made from environmentally friendly materials.

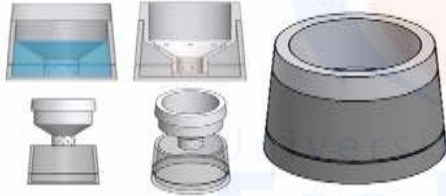


Figure 5
3D model

Self Watering System

The following are the results of developing the self-watering system and its complementary components and how to use plant pots

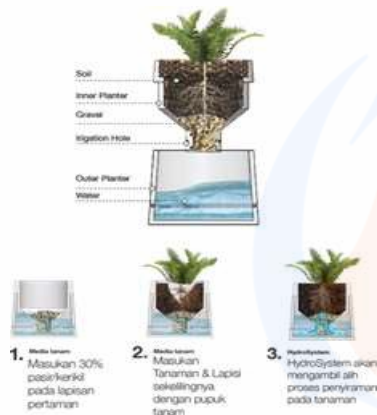


Figure 6
Self Watering System

Color Selection

The following application is the choice of colors for plant pot products, with the glaze technique on keramiak products, the authors chose a neutral color which turned out to be the most favorite color for people to apply to the room. Neutral color is no longer a new trend used indoors. Colors such as black, white, and gray have actually been widely used since ancient times by people for specific purposes



Figure 7
Color Ceramics

Final Design

The following are the results of the selected designs, along with a mechanism system that will be applied to the design of potted plants with eco-friendly concepts and the addition of self-watering features. Figure 8 Final 3D Model



Figure 8
Final Desain

Engineering drawings

The following is a technical drawing as a dimension measuring medium in the design of plant pots with eco-friendly concepts and the addition of self-watering features

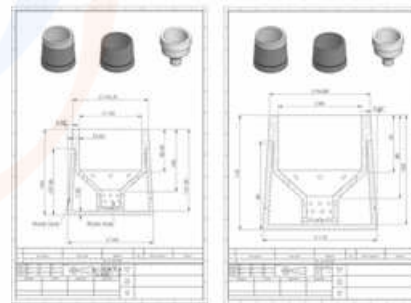


Figure 9
Technical Drawing

Production process

There are several stages of the production process that must be done to make a ceramic product, namely:

Material Processing

The purpose of processing this material is to process raw materials from various materials not ready to use into ceramic materials that are ready to use. In this material processing there are certain processes that must be carried out including reducing grain size, filtering, mixing, stirring, and reducing water content. Reducing grain size can be done by pulverizing or grinding with a ballmill. Screening is intended to separate material with non-uniform size.

Formation

The stage of designing potted plants with an eco-friendly concept and the addition of self-watering features using a rotary technique, follows the formation process:



Figure 10
Formation

Drying

After the ceramic object has been formed, the next step is drying. The main objective of this stage is to remove the plastic water that is bound to the ceramic body. To avoid drying too fast which will cause cracked ceramics, in the early stages ceramics should be aerated in the room / not exposed to direct sunlight, a drying machine can be done.



Figure 11
Drying

Grading

Glazing is the stage that is carried out before burning the glaze. Ceramic objects biscuit glaze coated by dipping.



Figure 12
Grading

Combustion

Combustion is the core of making ceramics where this process converts fragile masses into solid, hard, and strong masses. Combustion is carried out in a furnace / furnace high temperature. There are several parameters that affect the combustion results: sintering temperature, furnace atmosphere and of course the minerals involved (Magetti, 1982). During combustion, the ceramic body experiences

several important reactions, loss / emergence of mineral phases, and weight loss.



Figure 13
Combustion

Final Product Results

Following are the final results in the process of designing potted plants with eco-friendly concepts and adding self-watering features.



Figure 14
Final Product Results

Product Details

The following is a picture of product details as media info about product details starting from the name, variation, size & weight of the product.



Figure 15
Product Details

Examples of Product Use

The following are examples of the use of potted plants with eco-friendly concepts and the addition of self-watering features.



Figure 16
Example of Product Usage

Conclusion

The conclusion of this design is to answer the formulation of the problems mentioned in Chapter 1, which will then be explained further with a few points below, as follows:

1. Based on the foundation of the problem obtained by the author can make a pot that can adjust to the busyness of the urban community by adding a self-watering feature as a maintenance solution in the daily maintenance of plants, which can facilitate the process of plant maintenance every day.
2. To facilitate the office table in accordance with the company's operational standards such as placing a flower pot on a work table, the authors make a pot design using plants that emphasize the aesthetic aspects of the product in addition to the psychological effects on workers in the office and can clean the air in the room. Although not up to 100% but it is evident from the research that the author did so that it can absorb pollutants in the room naturally using sansevieria plants and other plants as main filters in absorbing air pollutants in the room.

Suggestions for the results of this study apart from being a means to improve the quality of potted plant products, efficiency in plant care and support in reducing environmental impact pollution, the author provides a large input for the development and manufacture of new prototypes for plant pot products that are oriented to the needs of urban communities. Suggestions for further research include the following:

1. The development of product design, especially plant pots oriented to urban

communities, must have quality, cost and environmentally efficient standards

2. The results of this study can be input, reference, and reference for designers, professional associations and the Government in improving the competitiveness of products based on creative industries.
3. For further researchers, these results can also be used to start a new business in the field of product design.

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