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Material Ergonomics on Application of Wooden Floors in the Interior of the Workspace Office

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ABSTRACT

Workspace from an office interior and requires serious management related to its use. This research aims to use space-forming elements in the workspace's interior design using wood flooring as parquet. The focus is on the choice of wood use concerning the elements in its application. This research rests on the assumption that wood material choice for the workspace floor has met safety, comfort, and beauty requirements. The hope is that with these three conditions' fulfillment, the office's activities can run smoothly, safely, and pleasantly. The method used in this research is a descriptive qualitative method. An approach puts forward a description based on field observations and documentation to describe the research object's situation. This study aims to reveal aesthetic, comfort, and safety studies of wooden floors in the workspace interior with their advantages and disadvantages.

KEYWORDS

Workspace Office Wood Floor

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1. Introduction

1.1. Background

This study is based on the author's interest in wood material related to its use for the floor in the workspace because space is forming an office element. Focus attention on whether there are problems that arise when implementing in shaping space in an office. As we all know, the office is the main support tool for someone to do their job. For that, there is a need for a clean and tidy office interior design. The office atmosphere can be more focused and concentrated because the office workspace is a room where space users will spend much time carrying out their activities.

The workspace is one of the spaces to find inspiration to organize our future. Therefore, we must ensure that our workspace can support these activities properly. An important factor in creating a workspace is using wood as the work floor for our convenience work. The bed in a workspace is an important component in an office interior. Choosing wood flooring will make a perfect and elegant difference compared to other flooring materials. Using wood flooring will also get comfort and natural effects and have an expensive artistic value. Creating a comfortable atmosphere in the office's workspace, of course, will make us more relaxed and excited in carrying out our daily work. Different design touches in the workspace will create a fresh and new feel when we work. Natural elements from wooden floors make the workspace's interior design not boring, feels warm, and does not cause pressure at work.

In this study, we focus our attention on the use of flooring materials at PT Pupuk Indonesia as a model considering the space users' comfort and safety. Models are necessary because every creativity requires a model (Sunarto 2015, 289-90; 2020, 108-10). The material in question is warm, soft, with an attractive texture, and has extraordinary durability, and the material is wood or solid parquet. Therefore, it is very important to research parquet wood flooring in this study because wood flooring in the workspace can help solve the ergonomic problem of materials from aesthetics, comfort, and safety.





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This article has three kinds of contributions to the development of Interior Design knowledge. The first is to provide direction in applying theoretical and practical studies in the field of interior design. The next contribution is to provide material for consideration for teachers in interior design to improve design disciplines. Third, contribute ideas to improve learning outcomes and improve education quality, especially for the Interior Design Study Program students.

1.2. Problem Identification

The problem is the wooden floor material applied in the workspace, which is an obstacle for users who wish to increase the comfort, safety, and aesthetics of space's interior; however, given the floor material's nature, that impacts making noise in its use. Then, the problem arises regarding what types of wood are suitable for use as workspace floors? Moreover, what obstacles will appear in designing the interior design related to using the wood material's comfort and safety?

Given the limited time, some of the existing problems are determined only on the issues discussed in this study. The problem is limited to the wood used on the workspace floor in the office. Based on the explanation above, the writer determines the research problem to studying workspace wood flooring at PT Pupuk Indonesian in this study.

1.3. Research Urgency

The urgency of research is to find new knowledge, develop knowledge and test the truth of experience. The methodology is a path that researchers must take to obtain broad and relevant knowledge (Hadi 2001, 10). This research's urgency is important considering the research on the ergonomics of wood for office workspace floors needs to get serious attention because of its use related to aesthetics, comfort, and safety for space users in carrying out daily activities workspace. In this applied research, the author tries to solve the problems faced in the use of wood flooring in the office space of PT Pupuk Indonesia, Jakarta. This research study's approach is descriptive qualitative, which describes the ergonomic condition of the wood on the floor of an office workspace through observation and documentation, in describing the research object, observing the problems that occur, then finding out the things that cause problems in the ergonomics of the wood flooring material.

After obtaining the theories as to the basis for the research, further observations were made to find out factual data on the state of the workspace floor material, then classified the data to make it easier to identify existing problems. Furthermore, the field data obtained is then analyzed by adhering to the relevant literature related to the application of floor materials to the interior of the workspace, in general, to conclude the factors that cause the problem. In this study, the output has high urgency because it has implications for interior design education from ergonomic wood flooring research. The speed and consequences of this will appear in the conclusions presented.

2. Literature Review

2.1. Understanding of the Floor

The floor is one of the most important elements in an interior. The base is the lower limit for the interior of a room. The floor stretches out horizontally. Applying various materials to the bed varies, using different floor heights and applying the form's essence. Various building materials appear in designing a space. We need special attention in determining the building material for the floor, especially in terms of space function, user character type, atmosphere creation, safety, and maintenance.

Wood is a forest product from natural resources. In this advanced technological situation, wood is a raw material whose processing to become goods is very easy (Dumanauw 1990, 1). The shape of wood has warm, soft properties and a very attractive and unique surface. Most of the solid wood floors are on the subfloor, consisting of chipboard, plywood, or hardboard (John McGowan, John & Dubern 1991, 100). Ching Francis revealed that floors are the flat, level base planes of interior space. The floor is a flat surface and is the basic surface of the inner room, is the base as the physical support, and is the visual base for the building's shape. Since the floor area supports our building activities, the

floor must be structurally appropriate and resistant (Ching Francis 2010, 162). The following table describes the characteristics of some commonly used floor materials as follows on the next page:

| No. | INGRE DIENTS | CHARACTERISTICS | STRENGTHS | WEAKNESSES |
|-----|-----------------|--|--|---|
| 1 | Ceramic | Easy installation, cheap, and widely sold in stores/depots | 1. The price is relatively cheap | 1. Easy to break |
| | | | 2. Easy maintenance | 2. Noisy |
| | | | 3. Easy to clean | |
| | | | 4. It has a variety of sizes, colors, | |
| | | | and patterns | |
| | | | 5. It has stain resistance. | |
| | | | 6. Durable | |
| 2 | Granite | The material is more exclusive, expensive with better quality than ceramics | 1. The size can be more than 60×60 cm and can even reach 100×100 cm. | If the granite's quality is not good, the dirt will be difficult to clean. |
| | | | 2. Not easily bouncy. | Requires extra care than ceramic because it is easily dull. |
| | | | 3. The grout joints are not too wide, so the granite looks more luxurious and looks unified. | 3. It takes a special knife for cutting because it is hard and thick. |
| | | | 4. It Does not require special materials for installation. | 4. Expensive. |
| | | | 5. Has high resistance and scratch resistance. | 5. Colors cannot be the same. The calculation is needs. Excess can cause color differences in the combustion process. |
| | | | 6. Give the impression of luxury to the house. | 6. Limited colors and patterns. |
| | | | 7. With a larger size, the room looks wider. | |
| 3 | Marble | The floor material is genuine natural stone. The cut shape on a large sheet has a distinctive texture. Typical motifs are quite expensive. | 1. Unlimited size. | Marble is difficult to clean when exposed to dirt. |
| | | | 2. Not easily bouncy. | It needs extra care compared to ceramics because it is easily dull and has to be polished again. |
| | | | 3. The grout joints are smaller, so they look cohesive. | 3. Requires a special knife because it is hard and thick. Once installed, the marble must be polished again. |
| | | | 4. With a larger size, the room looks wider. | 4. Prices are relatively expensive. |
| | | | 5. Marble can store cold for a long time so that it can cool the room. | 5. Color depends on nature. |
| | | | 6. Fireproof and better able to withstand heavy loads than other types. | |

| No. | INGRE DIENTS | CHARACTERISTICS | STRENGTHS | WEAKNESSES |
|-----|-----------------|--|---|---|
| 4 | Terrazzo | Floor materials are powder, flakes, or fragments of granite, marble, glass, or stone. | Has a variety of colors and motifs. | 1. Must be paired by a professional in their field. |
| | | | 2. It Does not cause allergies. | 2. Easily mossy when exposed to water continuously. |
| | | | 3. Has a high enough strength. | 3. It is uncomfortable to walk with bare feet. |
| | | | 4. Not flammable. | |
| 5 | Tegel | It is formed from a mixture of cement and concrete sand. Soft cement was poured over it to make it smooth, up to 1 inch thick, heavy enough to lift. | 1. The price is relatively cheap. | 1. Floor tiles, if exposed to acid (vinegar), Floor tiles will leave an imprint /stain that is difficult to clean. |
| | | | 2. Easy installation. | 2. Quite heavy. |
| | | | 3. It Gives a cool impression. | |
| 6 | Parquet | Material made of wood (sawdust or synthetic wood), with cuts and thicknesses according to the length and width of the floor | Parquet floor is softer, so it is safe for toddlers. | Not resistant to water, high absorption. |
| | | | Cleaner, dirt does not stick well for people with dust allergies. | 2. Requires good care. The basic material of wood is more easily damaged mainly due to humidity and weather conditions. |
| | | | 3. Does not absorb cold, good for people with rheumatism. | 3. Has limited variants of patterns and colors. |
| | | | 4. Can not be broken/cracked. | 4. Installation costs are more expensive than ceramics because they are much more expensive than ceramics. |
| | | | 5. Cannot be stained. | 5. The process must use a special blade which is quite expensive to cut granite. |
| | | | 6. Soundproof. | |
| 7 | Epoxy | An epoxy floor is a floor coating with epoxy paint, neat and shiny: suitable warehouse, factory, workshop, or workshop. | Has a variety of colors and patterns. | 1. Not resistant to scratches unless there is another layer on top. |
| | | | 2. Can be made according to the room. | 2. Easy to crack. |
| | | | 3. The surface looks neat, clean, and shiny. | 3. UV can cause discoloration |
| | | | 4. It does not absorb water and is not slippery. | |

Fig. 1. Characteristics of Floor Materials

The table above shows that wood/parquet has advantages over other floor materials from aesthetic elements; it is comfortable and safe to use. Besides, wooden / parquet floors are easy to maintain and economically affordable.

2.2. Aesthetic Elements, Comfort and Security

Interior design must contain aesthetic elements that refer to design principles such as proportion, space scale, balance, space harmony, unity and variety of space, space rhythm, space emphasis, and things such as beauty space accessories. Aesthetics is a combination of science and philosophy. The origin of the word aesthetics is from the Greek aisthetikos or aishtanomai, which means to perceive with the senses (Kellerman 1977, 18). This understanding is also related to the Greek term aesthetic, which means observation. Feldman sees aesthetics as a science of observation or science of senses, referring to sense impressions. Likewise with J. Addison, combining aesthetics with taste theory. Aesthetics, as a science, rests on observation activities using the five senses, namely (1) eyes as a sense of sight, (2) the nose as a sense of smell, (3) the ear as a sense of hearing, (4) the tongue as a sense of taste, and (5) skin as a sense of touch (Dickie 1989, 219).

The beauty requirement is to create an attractive space atmosphere by processing floor materials and colors that consider function and aesthetic factors because floors are also an important design element in space. Its shape, color, pattern, and texture will determine how far it creates an impression in area, defines space boundaries, and acts as a visual base for other elements in the visible space.

2.3. Ergonomic Requirements for Public Space Floors

Interior design is planning, arranging, and designing the room in a building, which meets the needs for shelter and shelter, determines and organizes activities, nurtures aspirations, and expresses ideas, actions, appearance, feelings, and personality (Ching Francis 2010, 46).

Based on the standardization rules applied by the American National Standards relating to general requirements for accessible interiors (General Requirements for Accessible Interior), the general criteria for flooring for high-intensity public places include prerequisites: health and safety/health and safety, construction/construction, physical strength, and appearance/appearance (Reznikoff 1989, 206). Health and safety criteria include the following criteria: flammability, ability to reduce light reflectance, slipperiness, and surface flatness (Sri Ambarwati 2007, 21).

Regarding construction engineering requirements, laying the floor is above the underlayment or cement leveling place. The floor installation is on a leveled cement surface. In other words, the floor construction's basic character is a mixture of cement and sand, which is a reinforcing layer for the building. The floor material application is strong in withstanding many activities (Ching Francis 2010, 163). Beauty requirements serve to create an attractive space atmosphere by processing floor materials and colors that consider function and aesthetic factors because floors are also an important design element in space. The shape, color, pattern, and texture will determine how far it creates an impression in the room, defines space boundaries, and acts as a visual base for other elements in the visible space.

3. Results and Discussion

From the observations made by the author, factual field data were collected, which would be the basis for analyzing existing problems. The research scope is the leadership's office, consisting of the main director's room, the secretary's room, the large meeting room, the discussion room, the waiting room, and the lobby/receptionist. The following is the plan for the layout of the PT. Pupuk Indonesia is made according to needs and to function and have an attractive appearance, as follows:

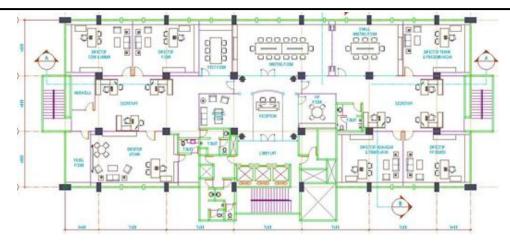


Fig. 2. Layout of Workspace (Personal Docs Resources)



Fig. 3. Floor Plan (Personal Docs Resources)

From the survey results in the field and working drawings, the authors can find physical data on the floor of the PT Pupuk Indonesia in the following table:

| No | Room Name | Room Dimension (M2) | Floor Material | Motive-Color | Remarks |
|----|------------------------------|---------------------------|----------------|------------------|-----------------|
| 1 | Lobby/Receptionist | 34,23 | Marble | Plain White | Slab |
| 2 | 1 St Living Room | 15.53 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 3 | 2 nd Living Room | 15.46 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 4 | Corridor Room | 33.78 | Marble | Plain White | Slab |
| | | 14.81 | Granite | Red Black | Slab |
| 5 | 1 st Secretary Room | 42.08 | Marble | Plain White | Slab |
| | | 14.61 | Granite | Red Black | Slab |
| 6 | 2 nd Secretary Room | 38.45 | Marble | Plain White | Slab |
| | | 14.61 | Granite | Red Black | Slab |
| 7 | Large Meeting Room | 65.404 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 8 | Small Meeting Room | 21.357 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 9 | President Director's Room | 64.911 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 10 | 1 St Director's Room | 40.152 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 11 | 2 nd Director's Room | 44.572 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |

| No | Room Name | Room Dimension (M2) | Floor Material | Motive-Color | Remarks |
|----|----------------------|---------------------------|--------------------|------------------|-----------------|
| 12 | 3 St Director's Room | 44.32 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 13 | 4 st Director's Room | 46.326 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 14 | 5 st Director's Room | 41.013 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 15 | 6 st Director's Room | 41.12 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 16 | Archive Room | 11.56 | Homogenous Tile | Plain White | 1x69x60cm |
| 17 | Prayer Room | 9.24 | Homogenous Tile | Plain White | 1x69x60cm |
| 18 | Toilet Room | 30.358 | Ceramics | Plain Gray | 1x69x60cm |
| 19 | Pantry | 5.78 | Ceramics | Plain Gray | 1x69x60cm |
| 20 | Mess Room | 21.257 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| | Total | 710.93 | | | |

Fig. 4. Physical Data of PT. Pupuk Indonesia (Source: Personal Data)

| No | Room Name | Room Dimension (M2) | Floor Material | Motive-Color | Remarks |
|-------|----------------------|---------------------------|----------------|------------------|-----------------|
| 1 | 1 St Living Room | 15.53 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 2 | 2 nd Living Room | 15.46 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 3 | Large Meeting Room | 65.404 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 4 | Small Meeting Room | 21.357 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 5 | President Director's | 64.911 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| | Room | | | | |
| 6 | 1 St Director's Room | 40.152 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 7 | 2 nd Director's Room | 44.572 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 8 | 3 St Director's Room | 44.32 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 9 | 4 st Director's Room | 46.326 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 10 | 5 st Director's Room | 41.013 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| 11 | Mess Room | 21.257 | Teak parquet | Brown Wood Grain | 15x90x190-300mm |
| Total | | 420.302 | | | |

Fig. 5. Physical Data of Wood Floor Space PT. Pupuk Indonesia (Source: Personal Data)

The observations show that the total working floor area of PT Pupuk Indonesia area is 720 M2. In the table above, the site that uses wood/parquet and other ceramics are 710.93 M2. The use of wood/parquet flooring for workspace reaches 420,302 M2 or 60% of the total floor area, and the use of other ceramic floors for work and circulation areas is 290.93 or 40%. The following is an analysis of floor materials based on indicators of aesthetics, comfort, and safety as required by ergonomic considerations in the application of materials, as follows:

3.1. Wood Floor Materials on Aesthetic Elements

A floor gave the surface of parquet sheets or wood will provide a rich, warm sheen (Richards 1997, 52). Some of the materials used for floor finishing will affect the formation of space's atmosphere, including floor covering materials that give a warm atmosphere, such as carpets, parquet, wood paths, and wood fibers (Suptandar 1991, 29).

In considering the aesthetics associated with floor materials, four things need attention. First, the application of wooden floor patterns and floor color patterns is for the workspace of the main director, directors, large meeting rooms, small meeting rooms, dining rooms, and discussion rooms covering an area of 420 M2. Second, the analysis of aesthetic elements needs to measure the pattern composition and floor color's processing. Third, the floor pattern uses a straight diagonal double brick pattern, with a regular nad, with a wood color pattern. Fourth, the wood accent can provide the perfect appearance or visualization. However, the motifs, colors, and wood accents still feel very dominant even though they are only decorative elements.

The wood color's dominance can provide a firm and formal emphasis to be suitable for office nuances. Wooden floors in the workspace can balance the room temperature and feel more comfortable on the feet' soles because the wood has fine fibers and patterns. Besides being able to create warmth in the room, wooden floors can add to an activity's aesthetic value in the office. Apart

from offering the comfort and beauty of the wood texture, another advantage of wood material is that it can make the room feel warmer and natural.



Fig. 6. Floor Pattern with Wood Color Motive (Source: Private Document)

3.2. Wood Floor Materials on the Element of Comfort

Wood as a floor has properties that support comfort, namely warmth to the feet (Fischer-Uhlig, Horst & Jeni 1996, 28). A good work environment will make workers feel comfortable. If workers or employees feel comfortable at work, productivity will certainly increase. Increased productivity will indirectly increase company profits. Many factors affect work comfort. One way is to create it through planning a good physical office environment (Maryati 2008, 148).

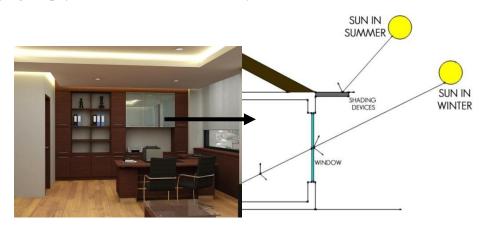


Fig. 7. Workspace with Sunlight Openings (Source: Private Document)

To understand the relationship between wood flooring and the element of comfort, we must consider several things. Performing analysis to measure the comfort element quantitatively is difficult because it involves many factors. Analyzing comfort is by looking at several things, especially from applying materials that can directly interact with sunlight entering the room. Sunlight comes in because of the window openings on each side of the building. This condition has met the criteria because there is integration with wood and textured parquet floors. This integration is necessary to not cause glare in the middle of the room, which can interfere with a comfortable view. Wooden parquet floors can absorb heat and reduce sound and bring a sense of comfort when on it (wood floor); feet will feel much more comfortable, especially when the room's cold temperature is functioning.

3.3. Wood Floor Materials and Security Elements

Floors are the flat, level base planes of interior space (Ching Francis 2010, 162). The floor is a flat surface and is the basic surface of the inner space, is the base as the physical support, and is the visual base for the building's shape. Since the floor area supports our activities in the building, the floor must be appropriate and hold constructively, as in the detailed image below:

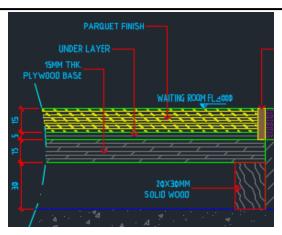


Fig. 8. Details of Wooden Floors (Source: Private Document)

Constructive requirements in applying floor materials in the office also follow the rules and according to the specified requirements starting from the following stages:

- 1. Cleaning the work floor / screeding to ensure that the parquet floor is not damp and porous in the future,
- 2. Installation of solid wood beam bearings to connect the work floor
- 3. Installation of 15 mm plywood covered with wooden frames in several parts
- 4. Installing an underlayer between the ground floor and the wooden parquet floor keeps moisture from the bottom rising to the wooden parquet's top. Installation of teak parquet with a certain pattern
- 5. Each side of the wall is clamped with a hairline finish, glued together with the same material as the parquet floor/stair nosing.

4. Conclusion

Based on the results of the analysis of observational data and literature data, we can conclude as follows:

- 1. The right interior planning in an office can create a good working atmosphere. An elegant and characteristic office interior design makes employees feel at home and makes a good impression on visiting guests or clients. One thing that should receive attention in the office interior arrangement is the floor as an element that forms space. The bed can create a workspace that reflects the owner's identity and the company but has ideal properties according to their needs.
- 2. Types of flooring material selection at PT Pupuk Indonesia are homogeneous teak, marble, granite, and ceramic/tile parquet, finishing according to strength, durability, and ease of maintenance. The application of teak parquet on the side is also under its designation as a workspace area. Besides, the use of wooden parquet floors is for aesthetic reasons or the room's beauty, and the workspace will look more natural with natural wood patterns.
- 3. The floor is the lowest part of the room. It functions to shape the character and support the activities in the room. As a character builder, floors also have different psychological effects, depending on the material's use. The wooden floor will shape and create a warmer atmosphere. The room is cool as a result of the wood's heat-saving nature. Thus, wooden parquet floors are more comfortable and softer than tiled floors and floors made of marble or granite.

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Biography

Tunjung Atmadi SP was born on July 15 in Surakarta. Educational experience gained in design and art schools in Yogyakarta and Jakarta. He is currently working at Mercu Buana University as an interior design lecturer. As a design practitioner and joining the interior industry before teaching, the interior profession experience is very influential in pursuing interior design education. The development of interior materials and design trends for him is an interesting subject for studying design developments. For him, there is no gap between the professional world and the world of education.

Ika Yuni Purnama was born in Yogyakarta, June 26, 1966. She is an Interior Designer and Lecturer at the Jakarta Art Institute and an Assessor in Interior Design and Exhibition and Design Consultant. Winner of the top 10 of the poem with the theme of planting longing for Global Youth 2020 entitled Pucuk Merah. She is an alumnus of the Indonesian Art Institute in Yogyakarta, Gajah Mada University, and Semarang State University. Management of the Indonesian Interior Designers Association and core founder of the Green Building Council Indonesia and a member of The Indonesian Exhibition Companies Association - IECA/ASPERAPI. She joined the Indonesian Women's Painter Association and Sanggar Bambu, writing Biographies of Kirjomulyo's and be active at kompasiana.com. She also received an award for the *Pratisara Affandi Adikarya*, 1984 (painting), 1997 jewelry design, 1985 architectural sketches. She wrote poetry books entitled *Tuhanku Tuhamu Satu* (1983) and a book design entitled *Arstistik Finish* (2016). WA: 0818755017; Facebook: ika yuni purnama, and IG: ikayunipurnama