



PAPER CLAY FROM USED PAPER WASTE AS AN EFFORT TO OVERCOME THE LIMITATION OF CLAY MATERIALS FOR SCULPTURE PRACTICE

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ABSTRACT

The issue of environmental pollution due to household waste, office waste, agricultural waste, and livestock waste, which has become a global issue, requires a solution. One type of waste that is quite commonly found in several environmental units of the Faculty of Fine Arts and Design, ISI Bali, is used paper waste. Practical materials for the realistic sculpture course in the Fine Arts Laboratory of the Faculty of Fine Arts and Design initially used Jogja clay and plasticine as the forming materials, but over time these materials became difficult to obtain because they had to be transported from Jogja, which required a large cost to get to Denpasar. For this reason, the creation and testing of substitute materials that have almost the same characteristics or perhaps have advantages over the previous material, namely in the form of paper clay. The purpose of this research is to solve the problem of scarcity of clay practical materials and be able to overcome environmental problems, especially used paper waste in laboratories and several units within the Faculty of Fine Arts and Design ISI Bali. The creation process includes the exploration stage, the improvisation stage, and the composition stage (forming). The results of the research obtained are that clay from used paper as a practical material is very easy to obtain and produce and is much more economical when compared to sculpture soil. The characteristics of paper clay are better than sculpture soil, such as having a higher level of strength, smaller shrinkage, easier to shape and stick, and faster drying time.

1. INTRODUCTION

The advancement of science and technology demands innovative adaptation in laboratory performance. The development of the functions and uses of tools and materials is part of this implementation and adaptation process. Innovation in laboratory equipment and material utilization plays a supporting role in advancing educational outcomes indirectly.



Environmental pollution caused by household waste, office waste, agricultural industry waste, and livestock industry waste has long been a global issue requiring effective solutions. As part of our responsibility toward the sustainability of ecosystems, there must be a growing awareness to preserve the environment and a motivation to seek solutions to these problems. According to a study conducted by the United Nations, business waste contributes approximately 20% of the world's total waste, with offices being a significant contributor. An average office worker produces around 2 tons of office waste daily, including materials such as paper, plastic, and food waste. From this data, it is evident that paper waste constitutes a substantial portion of total waste. Paper waste is categorized as inorganic waste because it shares similar characteristics with other inorganic materials such as plastic.

Based on the data above, paper waste is a major contributor to inorganic waste, making it a potential material for processing and recycling into more useful products. In fact, it takes one tree to produce 16 reams of paper, and approximately three tons of wood to produce one ton of paper. Meanwhile, trees are essential oxygen suppliers that sustain life on Earth.

Observing the abundance of office paper waste, the author was motivated to create a practical material made from recycled paper processed into clay for use in sculpture practice, particularly in the Realis Sculpture course. The materials used in this course at the Fine Arts Laboratory, Faculty of Fine Arts and Design, initially consisted of Jogja clay and plasticine. Over time, these materials have become increasingly difficult to obtain due to transportation constraints from Yogyakarta to Denpasar, which involve significant costs. Therefore, the author sought to find an alternative material with similar or even superior characteristics one that is easy to obtain, environmentally friendly, and economically viable.

Through a series of experiments, a material with high strength was developed. This material effectively addresses the scarcity of practice materials and environmental concerns, particularly the problem of used paper waste in the campus environment. Used HVS paper is readily available from various campus units, where it is often discarded and not yet utilized productively. The waste paper is processed into pulp using a paper grinder, which serves as the primary processing tool. Additional materials include white glue (Fox glue), flour, cornstarch, and a lubricant (such as dish soap or cooking oil). This mixture is known as clay. Clay is a soft-textured crafting material that can be shaped into various creative forms. It is used in courses such as Realis Sculpture, Anatomical Sculpture, and Multimedia Art.

2. METHODS

The method used in this study refers to Hawkins' theory of creation in the book *Creating Through Dance*, translated by Hadi (2003), which includes exploration, improvisation, and forming (composition).

2.1 Exploration Stage

Exploration in this context represents the initial step of creation. This stage includes thinking, imagining, feeling, and responding to objects that serve as sources of creation. Along with the creative process, during exploration, the creator also goes through the stages of preparation, incubation, illumination, and verification as proposed by Wallas, as follows:

- a) **Preparation** is the stage of gathering information or data needed to solve a problem. At this stage, there is no fixed or definite direction yet, but the mind explores various alternatives. Divergent thinking and creative thinking are crucial at the preparation stage.
- b) **Incubation** is the stage when an individual seemingly temporarily detaches from the problem, meaning they do not consciously think about the problem but "incubate" it in the pre-conscious

mind. As reported in biographies and accounts of artists and scientists, this stage is essential in the emergence of inspiration. Inspiration, which serves as the starting point for a new discovery or creation, originates from the pre-conscious region or arises in a state of full unconsciousness.

- c) **Illumination** is the stage of insight or *Aha-Erlebnis*, when inspiration or new ideas emerge, along with the psychological processes that precede and follow the emergence of these ideas.
- d) **Verification**, also called the evaluation stage, is when the new idea or creation must be tested against reality. This requires critical and convergent thinking. In other words, the process of divergence (creative thinking) must be followed by convergence (critical thinking). Spontaneous thinking and attitudes must be followed by selective thinking. Total acceptance must be followed by critique. Intuition must be followed by logical thinking. Courage must be accompanied by caution. Imagination must be followed by reality-testing (Damajanti, 2006).

In relation to this creation process, exploration was carried out through surveys/observations and documentation of the practical material applications considered representative of this research. During the observations, data were collected, including photographs and important information concerning the availability of types of practical materials. Additionally, information was sought through references or books relevant to this study.

2.2 Improvisation Stage

The improvisation stage provides greater opportunity for imagination, selection, and creation than the exploration stage. This stage allows for more freedom, increasing the degree of personal involvement. Improvisation enables various experiments with material selection and the discovery of artistic forms to achieve the integrity of the results obtained.

At this stage, the focus was on experimenting with recycled paper clay as the material for achieving collage techniques applied to iron constructions with woks assembled using wire mesh in such a way that they could serve as a painting base with modified spatial dimensions to express creative ideas, in line with the concept of nature being realized (cited from the creative works of lecturer Drs. I Made Bendi Yudha, M.Sn). The combination and formulation of recycled paper clay can be described as follows:

Table 1. Combination Formulas of Recycled Paper-Based Clay

NO	Material						Notes
	Paper Pulp	Fox Glue	Cornice	Wheat Flour	Sunlight Soap	Water	
1.	2 kg	1 kg	1 kg	1 Kg	As needed	As required	

After trials of the above mixture formulation, the optimal result for application as a painting medium was obtained with the following ratio: 2 kg of paper pulp, 1 kg of Fox glue, 1 kg of Cornice, 1 kg of wheat flour, and additional ingredients as complements, such as Sunlight soap and water as needed. The selection of this mixture aims to ensure that, after drying, the material possesses strong adhesion, fully covering the supporting wire. The resulting strength reaches approximately 80% of the bonding strength of Pese (cement) on wire and iron surfaces, thereby preventing or delaying damage due to rusting. The functions and advantages of each component in the mixture are as follows:

- a) Paper Pulp is obtained through the paper pulping process using a grinding machine and recycled HVS paper (office paper). This material functions as a fiber reinforcement for the media formulation, analogous to the role of gravel in a cement or concrete mixture. The maximum proportion of this component should not exceed 50%.
- b) White Fox Glue serves as a binder to hold the components of the mixture together. Its proportion is approximately 20%.
- c) Cornice is a white powder commonly sold at building supply stores, usually applied to walls and ceilings as an adhesive, filler, or to smooth gypsum surfaces. When mixed in the correct proportion, cornice accelerates and improves the drying process. Due to its quick-drying properties, it is added last to facilitate application on wire mesh surfaces. The recommended proportion is 20%.
- d) Wheat Flour can be replaced with other flours such as rice flour. Its function is to perfect the mixture, making it more plastic and smooth. The ideal proportion is 20%.

2.2.1 Material Preparation:

- a) Paper pulp
- b) White Fox Glue
- c) Wheat Flour
- d) Cornice
- e) Sunlight Soap
- f) Water

2.2.2 Equipment Preparation:

- a) Bucket: Used to hold water and mix the materials.
- b) Trowel: Used to mix materials and to apply or plaster the mixture onto the wire surface.
- c) Palette: Used to smooth surfaces after plastering or applying the paper mixture.
- d) Grinder with circular sandpaper attachment: Used to smooth the dried paper surface in preparation for final sanding.

2.2.3 Mixing Process:

- a) Weigh all ingredients according to the specified ratios. It is essential to follow the proper mixing order to achieve the best result. After preparing the container, first add the paper pulp, ensuring it has been adequately pressed to remove excess water. Next, add the White Fox Glue and mix thoroughly until homogeneous.
- b) Then, add wheat flour according to the ratio (20% of the total mixture) and mix it in evenly. Subsequently, add Sunlight soap as needed to prevent the mixture from sticking to hands; this also helps inhibit bacterial and fungal growth on the finished paper clay. Finally, add cornice (20% of the total mixture) and mix until uniform. The mixture is now ready for use (adapted from the paper clay application by Putra Jaya, 2010).
- c) Once the material is prepared, iron constructions with welded wire mesh combined with iron pans are coated with the paper clay mixture, which can then be covered with Gesso or Modeling Paste. This serves as a painting base ready for painting and strength testing. The application of Gesso or Modeling Paste on the canvas surface ensures a stronger, more durable, and comfortable painting foundation that is less prone to cracking, damage, or peeling.
- d) After the base layer dries, it is ready to be painted using spontaneous imaginative designs to express creative ideas that support the intended concept of the artwork.

2.3 Forming (Composition)

The forming stage is the process of materializing (executing) the work after various types of experimentation have been conducted. At this stage, the execution of the work involves spontaneous sketches applied onto a canvas surface that has been blocked with a dark color.

To continue the forming process toward achieving a refined shape, comprehensive control is maintained while adding details to the parts intended to be emphasized. This ensures that the final work achieves the desired form, representing the visual concept and ideas proposed. The materials and tools used include the construction framework for the base as well as the canvas materials.



Figure 2.1 Basic Construction of Painting Before Clay Applied (made from recycled pulp)
(Bendi Yudha Dok. 2017)

Material: Welded pan with a combination of filter wire and iron plate



Figure 2.2 Iron Construction with Different Size Griddles
(Bendi Yudha Dok. 2017)



Figure 2.3 Materials Used as the Canvas Base
(Bendi Yudha Dok. 2017)

The materials used as the basis of the canvas to cover the iron construction, namely in the form of dough/formula, consisting of blender paper/pulp mixed with wood glue, rice flour, cornise, and water and after the base of the canvas is dry, then coated with white *Gesso* paint and *Modeling Paste* to cover the clay pores, also to obtain artistic texture effects.



Figure 2.4 Clay Bonding Process on Skillet Construction with Combination of Filter Wire and Iron Plate
(Bendi Yudha Dok. 2017)

Material: Welded pan with a combination of filter wire and iron plate



Figure 3.5 Results of *Clay* Attachment to Pan Construction with a Combination of Filter Wire and Iron Plate, Then Sun-dried
(Bendi Yudha Dok. 2017)

Material: The pan is welded with a combination of filter wire and iron plate then stacked with Clay so as to cover the pores of the filter wire.

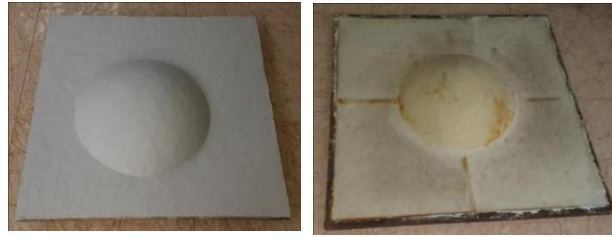


Figure 3.6 Clay Drying Process Attached to Iron and Pan Construction with Solar Heat Energy to Dry
(Bendi Yudha Dok. 2017)

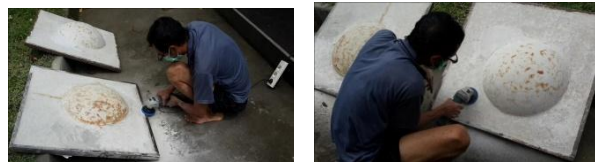


Figure 3.7 The Process of Smoothing the Surface of the Canvas with Grinda to Make the Canvas Smooth for Easy Coloring with Primer
(Bendi Yudha Dok. 2017)



Figure 3.8 Surface of the Canvas That Has Been Smoothed with a Grinding Tool
(Bendi Yudha Dok. 2017)

3. RESULTS AND DISCUSSION

Making clay from waste paper as a practical material is very easy to get and of course very economical, compared to using soil. The comparison of the quality of the two materials can be described in the following table:

Table 4.1 Comparison of Soil and Paper Clay Material Characteristics

Aspects	Clay (natural)	Paper clay (from pulp)
Base Ingredients	It is made of natural materials, which are very fine, plastic, and soil-like rock particles.	Made from pulp, water, and other binding materials, such as glue, cornis, flour and lubricants
Texture	It tends to be sticky, smooth and slippery when wet, rough and dusty when dry.	It is very lightweight, slightly textured due to the paper fibers, and easier to shape when it is still wet.
Strength	It is hardened, dense and quite strong, but can crack if the drying process is not complete and breaks due to impact. It can	It is stronger and more flexible than ordinary clay. Cracks are also easy to patch when dry. It is strong enough to be hit because there are fibers.

	be harder when heated to a high temperature in the furnace	It can harden at room temperature.
Shrinkage	It tends to shrink more as it dries, which can lead to cracking.	It has paper fibers that function as a reinforcer, so shrinkage is very minimal and the risk of cracking is smaller.
Craftsmanship	It requires more meticulous craftsmanship techniques, such as <i>wedging</i> to remove air bubbles, so that they do not burst when burned.	The paper fibers present make it easier to stick and connect the dry parts separately.
Drying process	It takes a long drying time and sometimes has to be burned at high temperatures to become hard and permanent.	Hardened only by aerating at room temperature (<i>water dry</i>). Some types can also be burned.
Final result	Once burned, it will be hard and heavy ceramic or pottery.	The result is lightweight, strong, and can be painted after drying.
Use	Suitable for making traditional crafts such as pottery, pottery, and burnt sculptures.	Suitable for lighter handicrafts, such as dolls, light sculptures, and ornaments.
Elasticity:	Low, tends to retain shape after being pressed	Has fibers that provide extra strength
Heavy	Heavier due to the density of the material	Lighter than conventional clay
Crack Resistance	Easy to crack in abnormal drying temperature changes	Less cracking than regular clay, both dry and burned
Flexibility	It is a bit difficult to form in conditions that are somewhat lacking in water and too wet, requiring special skills such as mastery of pottery or ceramic techniques	It is easier to shape and easier to repair in the technique of making sculptures using a frame

From the description of the table above, it can be concluded *that paper clay* has advantages over Sculpture Soil which is commonly used in practice. This has been proven from several works by lecturers and students who conduct research and practice in the laboratory.



Figure 4.1 By Dr. Tjok Udhiana Nindhia Pemayun



Figure 4.2 Multimedia Sculpture Course Student Work



Figure 4.3 Guest Works from Japan

4. CONCLUSION

The use of waste paper into paper clay has proven to be an innovative solution to overcome the limitations of sculpture soil practicum materials at the Laboratory of Fine Arts, Faculty of Fine Arts and Design ISI Bali. Through a creation process that includes the exploration, improvisation, and forming stages, the paper clay produced has superior physical and technical characteristics compared to conventional sculpture soil.

This material is more economical, easy to obtain, and environmentally friendly because it utilizes paper waste that was previously unused. From the results of trials and applications, paper clay shows high strength, low shrinkage, is more flexible and lightweight, and dries quickly without the need for burning. This makes paper clay very effective in learning activities and sculpture practicums, both for students and lecturers.

In addition, this research also contributes to efforts to manage paper waste in the campus environment, as well as fostering ecological awareness and creativity in the use of alternative materials. Thus, paper clay from waste paper not only serves as a substitute for sculpture soil, but also as a form of sustainable innovation in art education that supports the principles of circular economy and environmental friendliness.

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