



JOURNAL OF COMMUNITY SERVICE IN SCIENCE AND ENGINEERING

P-ISSN: 2962-1003 E-ISSN: 2962-0767

Homepage jurnal: <http://jurnal.untirta.ac.id/index.php/JoCSE/>



Introducing the manufacture of composites made from natural fillers as craft products for housewives

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ARTICLE INFO

Article history:

Submitted 1 July 2023

Reviewed 10 July 2023

Received 1 August 2023

Accepted 20 August 2023

Available online on 1 October 2023

Keywords:

Manufacture, composite, natural material, key chain.

Kata kunci:

Manufaktur, komposit, bahan alam, gantungan kunci.

ABSTRACT

Community service activities to introduce composite manufacturing filled with natural materials as craft products for homemakers in Metro Cendana Housing, RT 01 and 02, Kebondalem Village, Purwakarta District, Banten, have been carried out. The product is a key chain made from epoxy resin as a matrix and dried leaves/flowers/twigs as a filler to reduce natural waste. The ratio of epoxy resin to catalyst is 2:1. Using freshly picked leaves/flowers will result in the color of the leaves/flowers fading. This service activity aims to introduce composite materials through a demonstration of making key chains from composite materials and filling out a questionnaire to evaluate the actions that have been carried out. Respondents' ages varied from 20 – over 60 years. 100% of respondents stated that this activity was very inspiring and helpful, and 23% were interested in making this key chain craft a business venture because there was no capital to start this business independently.

ABSTRAK

Kegiatan pengabdian pada masyarakat dalam upaya pengenalan manufaktur komposit berpengisi bahan alam sebagai produk kerajinan ibu rumah tangga di Perumahan Metro Cendana, RT 01 dan 02, Kelurahan Kebondalem, Kecamatan Purwakarta, Banten telah dilakukan. Produk yang dibuat adalah gantungan kunci terbuat dari resin epoksi sebagai matriks dan daun/bunga/ranting kering sebagai filler/pengisi sebagai salah satu cara untuk mengurangi limbah alam. Rasio resin epoksi dengan katalis adalah 2:1. Penggunaan daun/bunga yang baru dipetik mengakibatkan warna daun/bunga akan menjadi pudar. Kegiatan pengabdian ini bertujuan untuk mengenalkan material komposit melalui demonstrasi pembuatan gantungan kunci berbahan komposit dan mengisi kuesioner untuk evaluasi terhadap kegiatan yang sudah dilakukan. Usia responden bervariasi dari 20 – diatas 60 tahun. Responden sebanyak 100% menyatakan bahwa kegiatan ini sangat menginspirasi dan bermanfaat serta terdapat 23% responden berminat menjadikan kerajinan gantungan kunci ini sebagai salah satu usaha bisnis karena belum adanya modal untuk memulai usaha ini secara mandiri.

Available online at <http://dx.doi.org/10.36055/jocse.v2i2.21438>.

1. Introduction

Composite materials are something normal for an engineer. For ordinary people, especially housewives, what do they have in mind about composite materials? These materials exist in everyday life in their environment, for example, water tanks/tanks, composite boards, composite panels, fiberglass doors, window frames, motor vehicle components, sports equipment, and blades/propellers. The word composite comes from the English "composite," which means combination. The basis for forming composite material is that two or more materials have different properties that will be combined, namely the matrix and reinforcement/filler/reinforcer. Composites are divided into three types based on their matrix: metal matrix composite, ceramic matrix composite, and polymer matrix composite [1]. In this activity, a polymer matrix composite will be introduced, where the matrix is resin and the filler is dry leaves/flowers/twigs, which can be found around the activity location. Resin is a chemical substance that is slightly thick, tends to be transparent, does not dissolve in water, and will harden more quickly or slowly, depending on the type of resin. Epoxy resin hardens more slowly than polyester resin [2].



Based on research data, as many as 52% of respondents in Kebondalem Village are housewives with varying levels of education from junior high school to master's/doctoral degrees. 2% of respondents had a junior high school education, 32% had a high school education, 20% had a D3 education, 34% had a bachelor's degree, and 12% had a master's/doctoral degree [3]. The condition is an opportunity for researchers to introduce composite materials and carry out demonstrations of manufacturing/making composites into craft products, which can be an alternative business and improve the economy of housewives in the area.

Several handicrafts from composite materials such as key chains, brooches, and refrigerator magnets have been developed in several areas, such as in the Riverside community, Suko village, Sukodono subdistrict, Sidoarjo district using the casting method [4]. The process of making resin souvenirs using silicone molds to empower the youth of Selo, Boyolali, has also been carried out targeting the tourism sector [5]. Making key chains from resin filled with leaves, beads, shellfish, and preserved insects in Jaharun A village, Galang sub-district, Deli Serdang Regency for 6th-grade elementary school students has been carried out to improve science and technology skills and abilities [6]. Using the hand lay-up method, composites using coconut fiber waste, agave sisal fiber, and hibiscus stem fiber in the Buleleng area have been carried out to produce composite materials as a basis for vocational school students to master composite manufacturing technology [7]. This service activity will introduce composite materials and make key chains from composite materials by housewives in Metro Cendana Housing RT 01 and 02, Kebondalem Village, Purwakarta District, Banten. The materials prepared by the mothers were dry leaves/flowers/twigs found around where they lived.

2. Method

The tools and materials needed for the service activity of making key chains are epoxy resin, catalyst, wax/mirror glaze, special silicone molds for key chains, dry leaves/flowers/twigs, digital scales, plastic cups, wooden sticks for stirring, key chain rings, gloves, mask, and pliers. This community service activity consists of several stages, namely the preparation stage (includes scouting the activity location, socializing the program with partners, discussing with partner groups regarding detailed activity plans, obtaining permits, and training preparations), the second stage (implementing presentations on composite materials and entrepreneurial opportunities for craft products, discussions and demonstrations on making key chain craft products made from composite materials), the third stage (technical assistance which includes monitoring the quality of key chain products made by the participants present), the fourth stage (evaluation of activities by distributing questionnaires after the activity is carried out and processing data obtained). The flow diagram for making key chains is shown in Figure 1 with the following stages:

- a. Mix the epoxy resin: catalyst with a ratio of 2:1, then stir slowly until the solution is homogeneous, around 5-10 minutes, let stand for a moment,
- b. Prepare molds and dry branches/flowers/twigs as filler,
- c. Smear the mold with wax/mirror glaze, then arrange the dry leaves/flowers/chains on top of the mold,
- d. Pour the resin + catalyst mixture onto the mold containing dried leaves/flowers/chains, leave in the open air for 24 hours,
- e. Remove the molding and install the key ring.



Figure 1. Stages of making a key chain.

3. Results and Discussion

Clean production Before the activity began, the research team distributed flyers to the participating mothers to make it easier to explain the process of making key chains, as seen in Figure 1. The resource person visually showed the tools and materials used because it turned out that the participating mothers who attended did not know what it would look like. Resin and catalyst, as well as a particular silicone mold for key chains, the final product of which has a ring mounting hole, as seen in Figure 2(a) and Figure 2(b). The resin and catalyst must be stirred slowly for 5-10 minutes to be homogeneous and not create air bubbles when molded, and no air is trapped in the final product. However, from all the experiments carried out by the participating mothers, air bubbles still appeared, as seen in Figure 3(a).



Figure 2. (a) Visual demonstration of resin and catalyst; (b) Key chain silicone mold shape.

The use of fresh leaves/flowers/twigs that have just been picked at the activity location does not provide an excellent final product because the color of fresh leaves/flowers will change color when exposed to the resin+catalyst mixture, as shown in Figure 3(b). The pink euphorbia flowers that have just been picked will turn brown after the print dries and hardens. Likewise, the purple butterfly pea flowers will turn transparent, and the originally green leaves will also fade to brownish. The change is because the leaves/flowers experience pigment degradation when the resin + hardener mixture is poured, which undergoes a curing process (the process of forming cross-links) where an exothermic reaction occurs which generates heat so that when the mold is held, it feels warm [8-10].

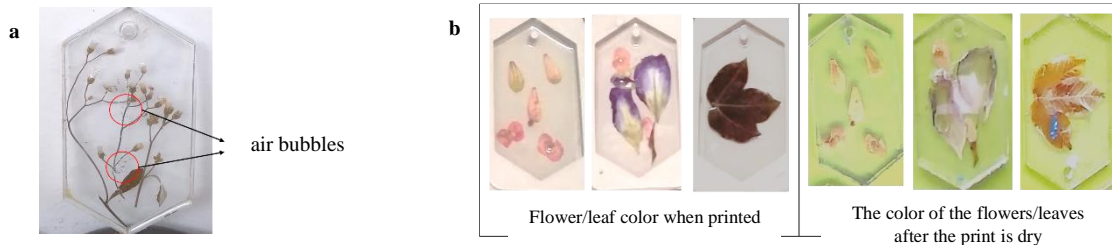


Figure 3. (a) Air bubbles in the product; (b) Color changes in newly picked leaves/flowers as filler.

After leaving it until the resin hardens and can be removed from the mold, the next step is to install the ring into the hole of the final product. To install the ring into the hole, use pliers to join the ring so that the ring does not slip out of the hole. The final product that the participating housewives successfully made can be seen in Figure 4(a), and a photo of the participating mothers after the activity ended can be seen in Figure 4(b).



Figure 4. (a) Final key chain product; (b) Group photo.

The research team distributed questionnaires to be filled out by the participating mothers (respondents). The type of questionnaire distributed is a closed questionnaire with multiple-choice questions, so respondents can only answer questions with the available choices. A total of 22 respondents filled out the questionnaire that was distributed. The contents of the questionnaire are divided into four parts to find out:

- Characteristics of the participating mothers (age and occupation),
- Mothers' knowledge about the types of materials found in their daily environment,
- How to make and the difficulties faced when making key chains,
- Find out mothers' interest in entrepreneurship with key chain craft products.

The ages of respondents varied; as many as 9% of respondents were between 20-30 years old, 45% of those aged 30-40 years, 41% of those aged 40-50 years, and 5% of those aged more than 60 years as seen in Figure 5. a. One hundred percent of the respondents who attended were housewives. Respondents are familiar with metal and plastic materials, but only 95% of respondents know about composite materials, especially polymer composites, as shown in Figure 5(b). The response is possible because the image given in the questionnaire still contains metal material, namely the ring attached to the end of the key chain.

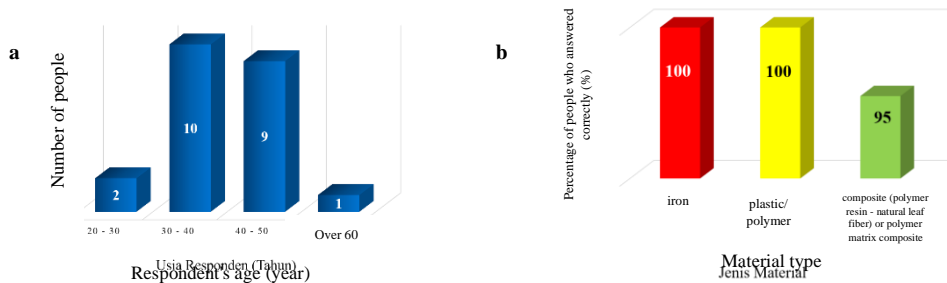


Figure 5. (a) Age of respondents; (b) Respondent's knowledge of the types of materials around them.

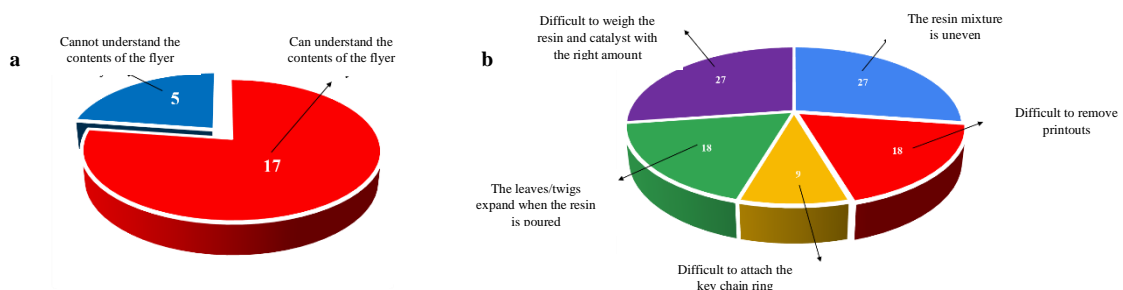
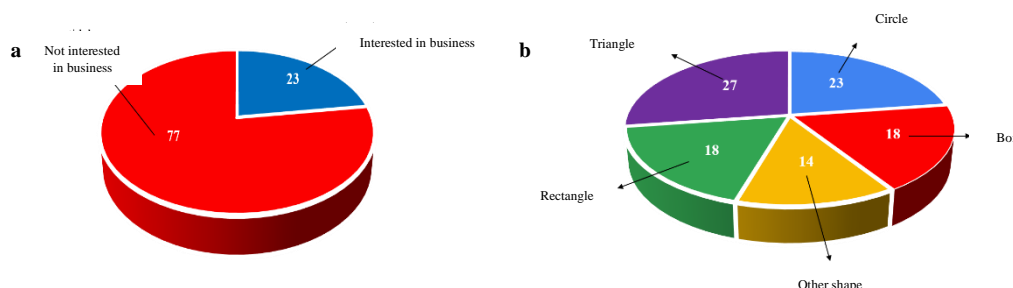


Figure 6. (a) Respondents' understanding of the flyer's contents; (b) The difficulties experienced by respondents when making key chains.

From the flyers given, the Research Team wanted to know whether respondents could understand the instructions contained in the flyers whose contents were the same as in Figure 1. A total of 5 people (23%) of respondents did not understand the stages of making key chains listed on the flyers that had been distributed; the rest, as many as 77% of respondents, could understand the contents of the flyer, as seen in Figure 6.a. There were several difficulties experienced by respondents when making key chains. As seen in Figure 6(b), respondents had difficulty weighing the resin and catalyst until they showed the correct figure of 27%. Difficulty removing the print and floating leaves/twigs when printed were 18% each, and difficulty installing the key chain ring was 9%.

Even though 100% of respondents stated that they were inspired and found this helpful activity, as seen in Figure 7(a), only 23% were interested in making key chains an independent business. They may think the capital costs of tools and raw materials are prohibitive and don't have the costs to start this activity. Respondents also have a preference for the shape of the key chain. As shown in Figure 7(b), 18% of respondents liked square and square shapes each, 27% liked triangular shapes, 23% liked round shapes, and 14% liked other shapes.

**Figure 7. (a) Respondents' understanding of the flyer's contents; (b) The difficulties experienced by respondents when making key chains.**

4. Conclusion

Community service activities have been carried out to introduce composite manufacturing filled with natural materials as a handicraft product for housewives. The product is a key chain made from epoxy resin as a matrix and dried leaves/flowers/twigs as filler. The leaves/flowers/twigs must be dry so as not to change color when printed. This activity includes an introduction to composite materials, a demonstration of making key chains, and filling out a questionnaire regarding the activities that have been carried out. Respondents were housewives with an age range of 20 – over 60 years. 100% of respondents stated that this activity was inspiring and helpful, but only 23% were interested in making this key chain a business for housewives.

Acknowledgement

The research team would like to express their thanks to the women at Metro Cendana Housing, RT 01 and 02, Kebondalem Village, Purwakarta District, Department of Metallurgical Engineering, Faculty of Engineering and Institute for Research and Community Service (LPPM) Sultan Ageng Tirtayasa University for the internal service grant provided has been entrusted to the research team.

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