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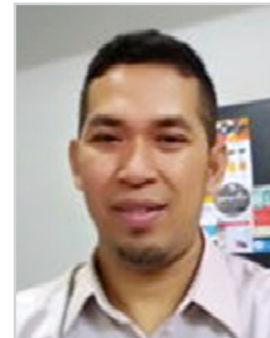
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Production efficiency in handicrafts manufacturing on the example of decorative ceramics: the use of training for making craft products made of glass fiber reinforced concrete

Abstract. This study aims to determine the benefits of training in making decorative pots with GFRC material to increase production time efficiency. The glass fiber reinforced concrete (GFRC) is a material technology in the manufacture of handicrafts using a mixture of cement, milk, and glass fiber. Training to make handicrafts from GFRC material is one alternative to increase the efficiency of ornamental pot products. This study used the descriptive qualitative method. The research was carried out in a special area of Yogyakarta by involving 20 members of the Indonesian Furniture and Handicraft Industry Association (ASMINDO) Yogyakarta. Data were obtained by direct observation of the training activities carried out. The data were analyzed using the Miles and Huberman model, namely data reduction, tabulation, data presentation, and concluding. The results showed that the training was carried out by considering the curriculum, training materials and methods, experimental processes, and production efficiency. Participants were able to make four new pot models according to the trend of craft product design. New models and manufacturing methods can be used as a reference to produce shapes and finishes. The participants felt the benefits and applied this technique in the craft production process. Therefore, the effectiveness of productivity and the economy and welfare can be increased in MSMEs in Yogyakarta.

Keywords: Handicraft; Productivity; Decorative Pot; SME; Pot Production; GFRC; Training; Group

JEL Classifications: B00; C02; C20; J31

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Ефективність виробництва у ремісництві на прикладі виробництва кераміки: використання тренінгу з виготовлення ремісничих виробів зі склофібробетону

Анотація. Це дослідження спрямоване на визначення переваг навчання виготовлення декоративних горщиків зі склофібробетону підвищення ефективності виробничого часу. Бетон, армований скловолокном, є матеріальною технологією виготовлення виробів ручної роботи з використанням суміші цементу, молока та скловолокна. Навчання виготовлення виробів ручної роботи зі склофібробетону є однією з альтернатив підвищення ефективності виробництва декоративних горщиків. У цьому дослідженні використовувався описовий якісний метод. Дослідження було проведено в спеціальному районі Джок'якарти за участю 20 членів Індонезійської асоціації меблевої та ремісничої промисловості Джок'якарти. Дані були отримані шляхом безпосереднього спостереження за навчальними заходами, що проводилися. Дані були проаналізовані з використанням моделі Майлза та Хубермана, а саме скорочення даних, табулювання, подання даних і висновків. Результати показали, що навчання проводилося з урахуванням навчальної програми, навчальних матеріалів і методів, експериментальних процесів й ефективності виробництва. Учасники змогли виготовити чотири нові моделі горщиків відповідно до тренду крафтового дизайну. Нові моделі та методи виробництва можуть використовуватися як зразок для виробництва форм та обробки. Учасники відчули переваги та застосували цю техніку в процесі ремісничого виробництва. Таким чином, ефективність продуктивності, економіки та добробуту може бути підвищена у ММСП у Джок'якарті.

Ключові слова: ремесло; ремісництво; продуктивність; декоративний горщик; МСП; виробництво горщиків; бетон, армований скловолокном; склофібробетон; тренінг; група.

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Эффективность производства в ремесленничестве на примере производства керамики: использование тренинга по изготовлению ремесленных изделий из стеклофибробетона

Аннотация. Это исследование направлено на определение преимуществ обучения изготовленному декоративных горшков из стеклофибробетона для повышения эффективности производства декоративных горшков. Бетон, армированный стекловолокном, представляет собой материальную технологию изготовления изделий ручной работы с использованием смеси цемента, молока и стекловолокна. Обучение изготовлению изделий ручной работы из стеклофибробетона является одной из альтернатив

повышения эффективности производства декоративных горшков. В данном исследовании использовался описательный качественный метод. Исследование было проведено в специальном районе Джокьякарты с участием 20 членов Индонезийской ассоциации мебельной и ремесленной промышленности Джокьякарты. Данные были получены путём непосредственного наблюдения за проводимыми учебными мероприятиями. Данные были проанализированы с использованием модели Майлза и Хубермана, а именно сокращения данных, табулирования, представления данных и заключения. Результаты показали, что обучение проводилось с учётом учебной программы, учебных материалов и методов, экспериментальных процессов и эффективности производства. Участники смогли изготовить четыре новые модели горшков в соответствии с трендом крафтового дизайна. Новые модели и методы производства могут использоваться в качестве эталона для производства форм и отделки. Участники почувствовали преимущества и применили эту технику в процессе ремесленного производства. Таким образом, эффективность производительности, экономики и благосостояния может быть повышена в ММСП в Джокьякарте.

Ключевые слова: ремесло; ремесленничество; производительность; декоративный горшок; МСП; производство горшков; бетон, армированный стекловолокном; стеклофибробетон; тренинг; группа.

1. Introduction

Decorative pots are handicraft products that are produced mainly by the craftsman community. MSMEs in the craft sector grow and develop in the form of the home industry. Handicraft industry players understand social relations and management to add insight into how craft production works. This contributes to the creative industry that can be developed in entrepreneurship in the craft sector (Ayaganova et al., 2019; Hill, 2021). Furthermore, crafts can be one of the regional characteristics for the emergence of new designs as a representation of the character of unique products sourced from the inspiration of local history and culture tailored to consumer needs (Rofieq et al., 2019).

The potential for handicrafts is found in several regions in Indonesia. In the beginning, handicraft-producing areas had the habit of making products adapted to the natural conditions around them. Generally, it is a process of migration to new environmental conditions. Handicraft products function to meet their daily needs, gradually becoming a professional manufacturing business activity in the trading world (Razgon et al., 2021). Exploration forms from shared social activities to produce handicrafts as a challenge to become a livelihood from migration and mobility in handicraft production activities (Clifford Collard, 2021).

MSMEs are a group of potential economic actors, and it can be seen that the creative economy is developing, which is mostly engaged in handicrafts (Hardiyanto et al., 2020). The handicraft industry has absorbed much labor. The important role of handicraft businesses in improving the economy in several regions in Indonesia is very significant. Kasongan Yogyakarta ceramics, Jepara wood carvings, Pekalongan batik and so on have developed well. This craft area is a potential and resources for handicraft production with a value chain of several handicrafts from upstream to downstream (Steshenko et al., 2019). The value chain is a potential part that can be utilized to increase the retention of economic value (Lee et al., 2021).

The export of handicrafts in Indonesia is one of the national potentials. The export value of handicrafts reached 829 billion USD. Crafts are preferred commodities and play an important role in Western Europe (Łożyński, 2020). Ornamental pot craft industry products generally have a pretty good market, both local and export markets. The craft market adapts to the evolving contemporary mindset for convenience for consumers. Therefore, evaluation is needed to build and find a good market strategy from consumers about authenticity and resonance (Schauman et al., 2021). Other handicraft products in the local market include serving major cities in Indonesia, such as Jakarta, Surabaya, Medan, and others. Export markets include America, France, Holland, Germany, Spain, Italy, Korea, Japan, Australia, etc. Generally, handicraft products are home accessories, decorative pots, furniture, wall décor, tableware, etc.

Good artistic quality from the exploration of materials and manufacturing techniques continues to be pursued so that MSMEs in the craft sector continue to develop. The synergy between artistic managers who understand the nature and attributes of artistic creativity through aesthetic theory and the phenomenon of creator identity impacts structured management practices in the company (Szostak & Sulkowski, 2021). Its creation, production, and distribution activities contribute to the production system and the market for handicrafts. This encourages the growth of employment opportunities and, at the same time, a means of economic development for the sustainability of better handicraft products (Maldonado et al., 2020).

Craft standardization and increased productivity are, in turn, correlated with economic improvements (Fragnoli, 2021). Production efficiency becomes important when mass production requires delivery deadlines. Equipment status, production efficiency determines the quality of the resulting product. The use of technology can increase labor productivity and increase the company's production results (Parkhomchuk et al., 2019). Technology can provide dynamic control in timeliness and craft production processes (Y. Zhang, 2020). It often happens that handicraft products have weaknesses in standardization of technical quality and size, especially in large quantities to meet global demand. Weak identification of materials, production equipment, and finances causes unique characters in craft products. This weakness often occurs in handicraft production business activities. This causes weak competitiveness, so efforts are needed so that handicraft products can meet product quality and timeliness of completion. The application of technology to accelerate production through the application of information technology and improvement of corporate governance can increase competitiveness in company performance (Laksito & Ratmono, 2021). Therefore, to accelerate the acceleration of craft performance, it is necessary to have structured technology training to increase the efficiency of production speed. Holistic craft technology training provides benefits relevant to literacy and cultural access for the community (González-Martín, 2021). So, the training of making handicrafts made from GFRC is one way out so that craftsmen have knowledge and skills in making these crafts.

GFRC training is an alternative way in the craft sector to maximize the production process. The thermal properties of GFRC are often used in energy consumption as the construction of wood is easy and profitable (Peng et al., 2021). GFRC is known in the Indonesian handicraft world since 2009. GFRC is used to produce handicrafts with a special composition, namely adding milk to the main ingredients of cement and glass fiber. This technique was first used in Indonesia to make relatively large statues. In its development, the GFRC technique became popular for producing ornamental pots. The use of GFRC can provide efficiency, speed of production, and quality of handicraft products. Therefore, GFRC training is one of the educations for craftsmen about printing techniques made from GFRC to produce decorative pots. This study aims to determine the benefits of training in making decorative pots with GFRC material to increase production time efficiency. Training to make handicrafts from GFRC material is one alternative to increase the efficiency of ornamental pot products. This GFRC training can provide new skills for ornamental pot craftsmen to improve handicraft products to meet standards.

2. Research Methods

The research method uses a qualitative description. This study describes the training process, including the curriculum, teaching materials, practices, and the resulting product. Data were obtained by direct observation of the training activities carried out. Curriculum development steps are carried out in a systematic and structured manner. Comprehensive training of participants to master the workings of shaping with GFRC materials from work examples through the design of decorative pot shapes applied to real shapes. The curriculum is used as a training guide to achieve the transfer of knowledge and skills. Systematic guidance and use with new technologies and knowledge-based on artificial intelligence. The teaching material is a whole theory introducing practice, which combines modern and postmodern design theory according to practical needs. The development of traditional culture needs to pay attention to the transfer of knowledge from the global world to contemporary design (Kim, 2021). Practice is the primary material in this training, covering model making, mold making, and printing of GFRC products (Arif & Kuzminova, 2021; Sewruk, 2020). Data analysis used the Miles and Huberman model, namely data reduction, tabulation, data presentation, and concluding. The efficiency scheme for decorative pots made from GFRC can be seen in [Figure 1](#).

The research was carried out in a special area of Yogyakarta by involving 20 members of the Indonesian Furniture and Handicraft Industry Association (ASMINDO) Yogyakarta. Each group works on a new design, starting from the modelling process to finish. The experimental results show the concentration of shape and dynamic motion effects and show the orientation of the production speed (X. Zhang et al., 2020). Four groups produced four new designs in the form of decorative pots. Each stage is evaluated to find its advantages and disadvantages. The flow of practice for making GFRC in training can be seen in [Figure 2](#).

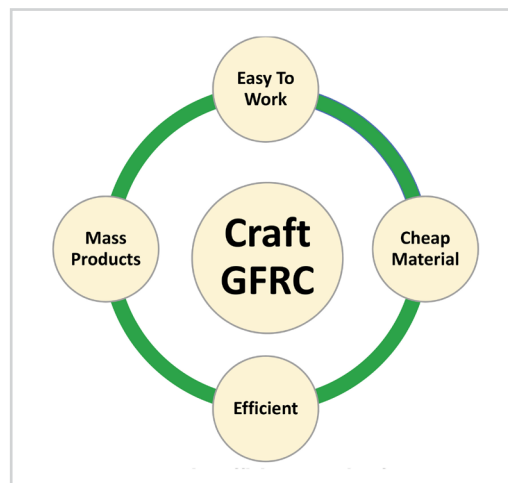


Figure 1:
Print efficiency made of GFRC
Source: Timbul Raharjo (2021)

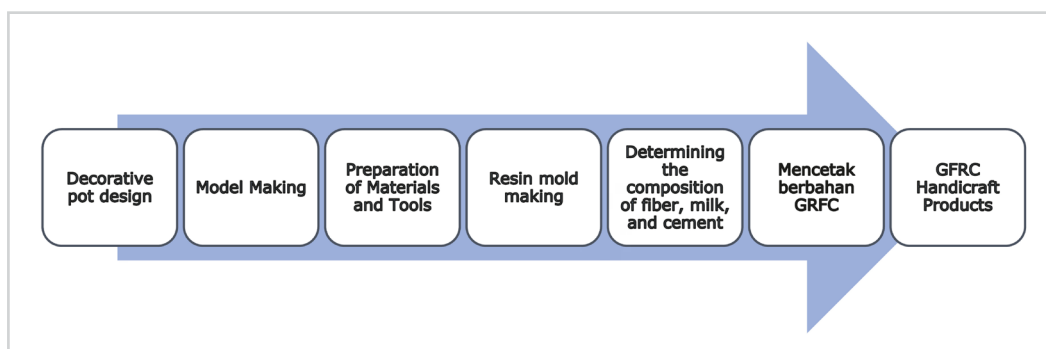


Figure 2:
The flow of practice for making GFRC
Source: Timbul Raharjo (2021)

This method was developed as the basis for the GFRC training process with 15.12% theory and 84.88% practical work. Practical work is the main menu in this training so that the skills of making this craft can be mastered and practiced directly. This training selects instructors who have competence and experience in modelling, GFRC printing, and craft industry regulation.

3. Results and Discussion

This training significantly impacts craftsmen to create new creativity, especially innovation, production, and market opportunities. Developing new products with new technology and other supports can increase company productivity (Sitabutr & Pimdee, 2017; Susilowati et al., 2020). Craftsmen can apply the production process using GFRC materials. The composition of the GFRC material used to make decorative pots can be seen in Table 1.

Introductory theory material to explain GFRC, cement plays a significant role in manufacturing decorative pot products. The core of GFRC is craft materials with the composition of cement, glass fiber, and milk. The composition must be balanced. The more fiber added, the less the strength of the cement, and the more cement, the easier it is to crack (Respati & Santoso, 2020). Hence, energy absorption index and toughness of compressive loading, split

Table 1:
GFRC material composition for decorative pot crafts

No.	Material	Percentage
1	Cement	60
2	Milk	30
3	Glass Fiber	10
Total		100

Source: Compiled by the authors

tensile, and bending. Generally, the composition of GFRC as raw material in sheet form is sold in building shops. This material was first used in Indonesia due to the experiment of Timbul Raha-rjo and Pambudi Sulistyono in 2008. Furthermore, this material is widely used to make decorative pots in Java-Bali Indonesia. The application of GFRC has been shown to increase productivity in export commodity ornamental pot crafts.

The training activities were carried out for 64 hours, divided into 8 hours of theory and 56 hours of practice making pots made from GFRC. Thus, participants can use GFRC Engineering skills as an alternative to creating new products. Training materials and hours of training activities can be seen in Table 2.

Table 2:
Lesson Materials and Hours

No.	Theory	Lesson hours
1	Occupational health, safety and welfare	2
2	GFRC material craft knowledge	2
3	Knowledge of materials and tools	2
4	Practice making molds made of polyresin	24
6	GFRC repro practice	24
7	Finishing practice	8
8	Evaluation	2
	Total	42

Source: Compiled by the authors

Theory work safety aims to maintain the health of workers. This material must be given because craft activities absorb much labor. Every company needs to understand work safety. An important factor in creating and maintaining a safety culture by company goals that often conflict with daily work. The role of managers to always promote safety at work is to organize the safety of safe and healthy workers (Hedsköld et al., 2021). All analyses, evaluations, and solutions optimize safety for workers and other people around them and the tools used. With good work safety, productivity also increases. Thus, health Care has direct implications for productivity and indirectly has implications for company improvement (Tompa et al., 2021).

General knowledge about usability and efficiency in the work of the GFRC is provided in advance so that participants can view the function of making handicrafts made from GFRC. This can foster enthusiasm for learning this technology so that each participant can do craftwork made from GFRC with the knowledge and possibilities of making handicrafts more effective and efficient. Manufacturing technology builds performance functions with mass production capacity. This is becoming a trend in manufacturing technology development and will play an important role in manufacturing components in mass products (Fang, 2020). Material knowledge of materials and tools is delivered to understand what tools and materials need to be prepared before doing practical work. Skilled construction craft workers required real work, social interaction with co-workers, problem-solving, and tasks. Cognitive skills and ways of thinking can foster the application of practical contexts (Niiranen, 2021).

Practical work is given while providing explanations of how to practice. This method is more effective because participants do not feel bored and can work coherently. As a development model combining theory and practice adopting new technologies and techniques. Innovation to gain focus oriented to breakthrough opportunities. Product aspects of color, form, and function emphasize translating people's culture into consumption identity. Creative tools from new technologies are needed to help commercialize crafts. Urgent repositioning for frugal people's efforts, maintaining a sense for progress and socio-economic and policy growth (Dodd et al., 2021). Cooperation is needed in the idea of compatibility in completing the deficiencies in the work process (Thurnell-Read, 2021). From this collaboration, if something is not understood, you can discuss and ask the instructor directly to reach the best solution. Development of tools that can support knowledge transfer from craft practitioners to get designs according to the times. Ensure effective access to technical skills and empirical policies to be accepted by current and future customers (Martins et al., 2020). Thus, there is a dialogue and transfer of skills in this training.

Materials that are theoretical specifically for 2 (two) hours of lessons, such as work safety, GFRC knowledge, and evaluation. Training has a keen eye for success in analytically constructing and validating a culturally responsive evaluation model (Nincecic & Brasileiro, 2020). It serves as

introductory material to practical work. Practical work on making models, prints, and reproductions is carried out for 36 (thirty-six) hours of lessons. Effective in saving time the best relevant information and presenting it in a concise and easy-to-digest format (Limited & Direction, 2020). This is so that the participants can master the practical skills of making crafts using this technique. Transfer of skills from experts teaching practice in craft, design, and engineering can be achieved according to plan (Peek et al., 2021).

The design of the image as a model is made using clay. Clay has the advantage that it can be shaped by adding and subtracting so that the shape can be achieved according to the design drawing. This is done by exploring examples of immersive and performative craft techniques so that practical skills can be understood in detail (Kelemen & Hamilton, 2019). Participants can make and understand in preparing tools and materials for forming and making molds. Hence, the preparation of materials and tools is important to make crafts made from GFRC can be carried out correctly. Create, use, and reflect on new tools to familiarize practices to shape and function on work processes and technologies (Posch & Fitzpatrick, 2021). Craft tradition items can be developed with this printing technology process (Lan, 2021). The mold uses polyresin material that is relatively light and strong, able to print GFRC repeatedly. Materials in the form of fiber reinforced concrete are used to manufacture decorative pots using mold fabrication and raw materials using glass fiber reinforced low alkali cement. Mass products can meet consumer needs in global markets.

Cement is the main ingredient in GFRC crafts as a material that hardens quickly in cold conditions. Milk is a substitute material to provide strength so that it is not easily cracked and facilitates the printing process. Glass fiber is a reinforcing bone in the GFRC body. Cement and milk are mixed with water as a diluent in printing. The process is that the surface of the mold is first coated with a separator, you can use polishing, and wax is suitable as separators for easy removal and does not damage the GFRC product.

In printing the first layer of cement and milk mixture, the second layer of glass fiber is repeated according to the required thickness. The mold consists of several pieces. Each part is affixed with GFRC using a brush size of 2 (two) inches. If each mold has been filled with GFRC, put together with the same adhesive material, wait four to five hours, then carefully removed. In the following process, each connection is revised with the same dough. Blend and wait until it dries and is strong. Next is the finishing process. Finishing is an important part of the final appearance, and this must be realized because it dramatically affects the quality of the product (Dumasari et al., 2017). Finishing can use acrylic paint of the desired color. Color selection is judged as a hormonal effort. The color shows a tendency (Won & Lee, 2020) against the dominance of the most artistically advantageous. The choice of color is certainly adjusted to the color trend of developing handicraft products. Generally, monochrome colors and colors with an antique feel using the wash or dry-brush method are favored by foreign buyers. Brushstrokes with a wash technique diffusion tone give a visual quality effect. Scratch paint with arbitrary shapes based on physical media adopts material surface changes (Zheng et al., 2017).

The involvement of participants in this training project has different levels that affect the work results. Collaborative work mediates relationships between crafts and the involvement of project team workers focused on craftwork in a team to build more opportunities (González-Martín, 2021). This is so that the participants will work together, and the results will become a shared responsibility for each group. In the final stage of evaluation, discussion of participants and instructors discuss the results of their work. The instructor will review the technical and artistic aspects and the practical process of making it because the practice results show a definitive and dense version of artistic knowledge (Remond, 2020). There may be flaws in form, coating process, and final appearance. The shape of the results of decorative pots in training can be seen in [Figure 3](#).

The participants were generally enthusiastic and expressed satisfaction with the GFRC-based reproductive technique. The economic needs of each individual to organize and carry out MSME business activities are more planned to use this method of manufacture using GFRC materials. Craftsmen can reveal understanding about perfecting activities professionally in the future. Companies concerned with the development of personal training and the government's involvement, especially in employment in the craft sector, have become more involved. Participants can identify, preserve and adapt to modern pedagogical realities. An expert in the craft of creative thinking in craftwork is used as a system of knowledge and practical experience that forms human beings with integrity and multidimensionality (Chapaev et al., 2018). Can absorb new skills and



Figure 3:
Results of GFRC training in the form of pots
Source: A photo by Handoko (2021)

knowledge applied to their business. In the first month after the training, participants have applied printing techniques made from GFRC to their product designs for orders from their A, French and German buyers. Kirum has produced pots measuring 2 meters using GFRC printing techniques to serve orders for two container buyers from France, which function as decorative pots in the garden of a hotel in Dubai.

4. Conclusion

The training materials are in theory and practice, ranging from general theory, model making practice, resin molding, GFRC printing, and finishing. Training on making decorative pots made from GFRC can increase the productivity of micro, small and medium enterprises (MSMEs) in decorative pot craft effectively and efficiently. GFRC is an alternative technology in making handicrafts, cement, milk, and glass fiber are the main ingredients in making this craft. The application of GFRC to increase efficiency in handicraft work for export commodities. As a result of the training, the participants were able to create four new models of pots according to the trend of craft product design. The new model and the method of manufacture can be used as a reference for producing the shape and finishing. The participants felt the benefits and applied this technique in the production process of their craft MSMEs. Thus, the effectiveness of productivity and economy, and welfare can be increased in MSMEs in Yogyakarta and surrounding areas.

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