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## Training on Creating High-Value Patchwork Fabric Craft Products for PKK Women as an Application of Realistic Mathematics Education

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### ABSTRACT

This activity is implemented to apply the theories of plane geometry in making patchwork fabric crafts of high values and at the same time provide training for the members of PKK in Bingkat Village, Pegajahan District, Serdang Bedagai Regency. In serving the purpose, Realistic Mathematics Education may be adopted as an approach to be used to help participants comprehend the notion mathematics using real-world circumstances. In this case, the square theory is applied, giving the precise cloth cutting and sewing processes for good outputs that look nice. The seminar was scheduled to take one day, namely August 20, 2024, with the members of PKK who are in desperate need of a new business alternative because sales at Pasar Bengkel are falling. The training methods consisted of teaching the Trainees the skills to produce three-dimensional flowers from patchwork fabric and how to create Social Media Marketing of the products. Results from this training showed an increase in the N-Gain of participants' product creation skills at 0.75 and for the digital marketing, it was 0.74. Such an activity has resulted in three-dimensional beautiful flowers items and a better understanding of marketing methods among the participants. It was such an initiative that provided concrete solutions to the challenges of the partners and thus could make a very significant contribution toward local economic development. More training and mentoring are being envisioned to make sure that participants will be able to apply independently the knowledge and skills they have learned.

**Keyword:** Square Theory, Realistic Mathematics Education (RME), Patchwork Fabric Crafts, Digital Marketing, Community Empowerment

## 1. Introduction

According to BPS data, the ratio of entrepreneurs in Indonesia remains at 3.47%, or approximately 9 million people out of the total population. However, it is up from 3.1% in 2016. This rate is still lower than Singapore, which reached 8.5%. Malaysia and Thailand have also surpassed 4.5 percent. Indonesia intends to boost the rate to 3.9 - 4% by 2024. According to the Global Entrepreneurship Index (GEI), Indonesia now ranks 75th out of 137 countries, with a score of 26. The administration intends to move up to 60th. As a result, Indonesia will rely on one of its strengths: MSMEs. Based on data from the Ministry of Cooperatives and SMEs, the number of MSMEs currently reaches 64.2 million with a contribution to GDP of 61.07 percent or Rp8,573.89 trillion. The contribution of MSMEs to the Indonesian economy includes the ability to absorb 97 percent of the total workforce. And can collect up to 60.4 percent of total investment [1].

Inorganic waste is waste that cannot be decomposed, such as: plastic bottles, plastic bags, cans, and fabrics [2]. This makes it possible to make other efforts to overcome the high plastic waste that is currently growing,

one of which is by recycling to produce new products [3]. Patchwork is the leftover fabric that comes from making clothes or other garment products. Patchwork can be obtained from home tailors and even convection companies. For ordinary people, patchwork is usually considered as garbage that is not useful so that it will produce inorganic waste in the surrounding environment which will eventually disturb cleanliness and health [4]. In Indonesia there are still not many people pursuing patchwork handicrafts to be used as a business, or as a selling material. Though this patchwork is very easy to find and have at low prices and even free. However, for people who have high creativity, this patchwork can be processed into daily necessities and has its own benefits [5].

Inorganic waste from rags has several serious impacts on the environment and health if not handled properly. These adverse impacts include: 1) Damaging biota in the soil in a certain period of time such as soil organisms and fauna. Soil organisms play a role in the process of decomposition of organic matter, distribution, and mixing of organic matter and enemies for pathogens that attack plants, so soil organisms are very important in helping plant growth and productivity [6]. The focus of this service activity is green economy, namely by reusing patchwork waste into useful and marketable products.

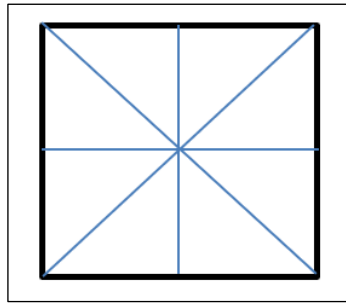
Empowerment of PKK women in this activity are a process to make housewives more empowered which can be done by holding various coaching and training in the village where the women are given teaching, skills training, and various coaching so that they can have broad knowledge, expertise, and abilities. One of the programs that can be implemented is life skills training. Through this process, it is hoped that it will be able to make them have an entrepreneurial spirit that will lead to independence in their lives and economy.

Pasar Bengkel, located on the Medan-Tebing Tinggi route, has been the main economic source for the local PKK women. They depend on the income from the sale of various souvenir products that are in demand by travelers and motorists passing through the route. However, since the opening of the Medan-Tebing Tinggi freeway, the number of visitors to Pasar Bengkel has decreased dramatically. Faster access through the freeway has caused riders to no longer pass through Pasar Bengkel, which has a direct impact on the decline in sales turnover of the traders. This condition requires PKK women to find alternative businesses to maintain and improve the economic welfare of their families.

As a solution to this problem, training was conducted on making patchwork craft products in the form of three-dimensional flowers. This product was chosen because it is easy to make, utilizes leftover fabric materials, and has high aesthetic value. In addition, this craft product can be a potential new business alternative to be sold more widely, not only depending on the local market but also through social media [7][8]. This training involves the use of science and technology (IPTEKS) in craft making and digital marketing.

This training takes the Realistic Mathematics Education (RME) approach, which emphasizes teaching mathematics in real-world circumstances. RME enables participants to grasp mathematical concepts like square cloth pattern cutting, symmetry, and product design drafting through real-world examples. In this course, the concept of square is used as the foundation for understanding how to cut fabric to the appropriate size. The square, being a planar shape, provides symmetry features that aid in pattern drafting and the creation of items with better aesthetic value [9][10][11].

Hans Freudenthal invented Realistic Mathematics Education (RME), a mathematics learning approach, in the Netherlands. This approach emphasizes the necessity of connecting mathematical principles to real-world circumstances so that mathematics is perceived as a valuable activity in daily life. In the learning setting, students are encouraged to view mathematics as a tool that may be used to solve a variety of practical problems [12][13]. A square is a flat shape with four equal sides and four right angles. A square is a simple yet adaptable geometric shape with several key qualities, including all sides being the same length and having four axes of symmetry. An axis of symmetry is an imaginary line that separates a shape or item into two identical sections. In patchwork crafts, the square is frequently utilized as the basic element in numerous patterns. The square's symmetrical shape allows for easy cutting and arrangement of the fabric into a variety of intriguing and utilitarian designs. Furthermore, square cutting of cloth reduces waste resources, allowing for more effective production.



**Figure 1.** Axis of Symmetry an A Square

Services provided are as follows: Creative Product Development Participants learned to make three-dimensional flowers from patchwork fabrics cut into square shapes [14]. The methodology was devised to transform waste fabrics into a product with commercial value. The idea of a plane shape like a square was learned in a practical way also allowed the woman participant of PKK to apply the geometrical shape handily in craft projects. (2) Product Marketing via social media: PKK women received specialized training in promoting their craft products through social media outlets like Facebook and Instagram. The training included how to take great images of their products, write clear and informative descriptions, use the right hashtags, and choose the best times to post. This is expected to help expand the marketing reach for the products beyond the region [15].

Work Procedure: (1) Identification and Analysis of Partner Needs: The initial stage was a discussion with partners to identify the main problems faced since the decline in visitors to the Bengkel Market. The results of the discussion showed that PKK women need training in making new practical products and marketing that no longer depends on the physical market; (2) Pre-test administration, measuring the level of understanding of participants before the activity takes place (3) Training on Making Three-Dimensional Flower Products: This training activity includes an introduction to the basic techniques of cutting square-shaped fabrics, drafting patterns, and sewing techniques to produce three-dimensional fabric flowers. The process began with a demonstration by the instructor, followed by hands-on practice by the participants; (4) Digital Marketing Training: In this session, product shots taken with the iPhone-with shots on how to get the best lighting and how to create a background that complements the products-were tackled. They are also taught how to write mouthwatering descriptions, use trending hashtags, and how to time posting across social media. 5. The post-test after the training to ascertain an improvement in the participants' understanding regarding the said abilities; The output is they should have produced high-value, three-dimensional aesthetically pleasing flower craft goods with a mastery of digital marketing tactics for proper values [16].

## 2. Methods

The activity was conducted in the village of Bingkat, Pegajahan District, Serdang Bedagai Regency, North Sumatra. This activity was carried out for one day, which is on August 20, 2024. The duration of training is conducted intensively to cover all material, both theoretical and practical. The session took 4 hours, proportionally divided among the delivery of material, discussions, and direct practice. To date, there are 25 women PKK in the village of Bingkat, where most members had entrepreneurial experience in the production and sale of snacks, coupled with the production and sale of simple handicraft products. However, because of their limited knowledge and skills in digital marketing, it is difficult for them to adjust to changing market conditions toward online.

This activity was conducted through training and hands-on practice. The training method was chosen to provide theoretical understanding, while hands-on practice was used to apply the theory in making craft products and digital marketing. The training materials were designed to cover two main aspects: technical product-making skills and digital marketing skills.

## 3. Result and Discussion

In the implementation of the community service program in Bingkat Village, Pegajahan District, Serdang Bedagai Regency, the results of the activity were measured in the form of an increase in participants' understanding of product creation and digital marketing measured by giving a questionnaire of 15 questions. This questionnaire was given as a pre-test before the training activities took place and a post-test was given

after the training activities. The average N-Gain for the understanding of product manufacturing was 0.75, which is in the high category (table 1), and the average N-Gain for the understanding of digital marketing was 0.74, which is in the high category (table 2).

**Table 1.** N-Gain of Product Creation Understanding

No	Question Item	Mean Pre-Test Score	Mean Post-Test Score	N-Gain	Category
1	Understanding of basic techniques for cutting square-shaped fabrics	3	4.5	0.75	High
2	Ability to cut patchwork with precision size	2.8	4.3	0.68	Medium
3	Understanding the importance of symmetry in pattern drafting	3.2	4.7	0.83	High
4	Ability to design three-dimensional flower patterns with an axis of symmetry	2.9	4.5	0.76	High
5	Understanding of petal drafting and sewing techniques	3.1	4.6	0.79	High
6	Ability to make three-dimensional flowers from patchwork independently	3	4.5	0.75	High
7	Ability to add additional ornaments to flowers	2.7	4.3	0.70	Medium
Mean				0.75	High

**Table 2.** N-Gain of Digital Marketing Understanding

No	Question Item	Mean Pre-Test Score	Mean Post-Test Score	N-Gain	Category
1	Understanding the importance of lighting in product photography	2.8	4.4	0.73	High
2	Ability to take product photos with the right angle	3	4.5	0.75	High
3	Ability to use simple apps to edit product photos	2.7	4.2	0.65	Medium
4	Understanding how to write compelling product descriptions	3.1	4.6	0.79	High
5	Understanding how to use relevant hashtags on social media	3	4.5	0.75	High
6	Knowledge of the best time to post products on social media	2.9	4.4	0.71	High
7	Understanding of interacting with potential buyers on social media	3.2	4.6	0.78	High
8	Ability to create engaging and creative marketing content	3.1	4.5	0.74	High
Mean				0.74	High

The main problem faced by the PKK women of Bingkat Village is the decline in sales of souvenir products since the opening of the Medan-Tebing Tinggi freeway which has reduced the number of visitors to Pasar Bengkel. As a solution, this training activity aims to provide new skills in the form of making three-dimensional flower crafts from patchwork as well as digital marketing strategies to expand market reach through social media such as Facebook and Instagram.



**Figure 2.** (a) Explanation of the theory of fabric handicrafts; (b) Explanation of Digital Marketing Strategies

The implementation of the solution began with technical training on making flowers from patchwork. Participants were taught from cutting square-shaped fabric, pattern drafting, sewing techniques, to the finishing stage. The basic concept of a square is used as a basis for understanding to cut the fabric with the right size, because the symmetrical nature of the square makes it easy to arrange precise patterns and create a beautiful shape in the resulting product. A square is a flat shape that has four equal sides and four perpendicular corners. This symmetry is very important in creating visual harmony in each flower arrangement, so participants can understand that size precision greatly affects the aesthetics of the final product.



**Figure 3.** (a) How to make a product with the application of the axis of symmetry theory on a square; (b) Product Making Practice

After the technical aspects of product making, the training continued with digital marketing strategies, which included: (1) e-commerce platforms for digital marketing; (2) Product photos, which include photo quality, photo time, and product details; (3) Product description, how to write product details so as to attract buyers, (4) hashtags, the use of hashtags to capture all types of customers; (5) Posting time, determining the right posting time for certain groups of buyers, as well as a periodic posting schedule. By mastering these skills, partners are expected to be able to reach a wider market, thereby increasing opportunities for online product sales.

The outputs of this activity are: (1) Three-dimensional flower products made from patchwork, this product shows the success of participants in mastering the basic techniques of making flowers from patchwork, as well as patterning and color selection skills that can increase the aesthetic value of the product. (2) Skills: Based on the results of the pre-test and post-test conducted to measure participants' understanding of the material, there was an increase in N-Gain understanding of 0.75 on flower making techniques and an increase in N-Gain understanding of 0.74 on digital marketing strategies. Improved skills in using marketing features on Instagram and Facebook, such as creating stories, using hashtags, and how to interact with potential buyers.



**Figure 4.** (a) Three-dimensional flower products made by participants; (b) group photo with all participants

In the execution of such activities, there are different driving and obstructive factors that make sure the activity went on smoothly. The driving factors were the very high motivation to learn and develop new skills, as well as full support from village officials. The obstacles included limited training time and limited internet access. As a result, not all participants were able to practice the use of social media optimally, and further training is needed in the future.

#### 4. Conclusions

Community service activities carried out in Bingkat Village, Pegajahan District, Serdang Bedagai Regency, provide solutions to the problems faced by PKK women, especially in improving the skills of making three-dimensional flower crafts from patchwork and digital marketing strategies. The training not only improved participants' understanding of aesthetic product-making techniques, but also provided important insights on marketing using social media. Through the application of square theory and Realistic Mathematics Education (RME) principles, participants were able to understand the importance of symmetry and precision in product creation, while learning in a context relevant to their daily lives.

The results of this program show that the products produced have a high selling value and can be a new business alternative for PKK women. In addition, participants showed an increase in product manufacturing skills with an average N-Gain of 0.75 with a high category, and an increased understanding of digital marketing with an average N-Gain of 0.74 with a high category. Despite some obstacles, such as time constraints and internet access, this activity has achieved its goals in empowering partners and opening new opportunities for the economy of the village community.

It is recommended to conduct further in-depth training on digital marketing, so that participants can better understand and master the use of various social media features that can help market their products effectively. Provide regular mentoring after the training to assist participants in applying the knowledge they have gained, both in making products and in marketing strategies. Collaborate with relevant parties, such as local governments, non-governmental organizations (NGOs), and other institutions to expand their marketing networks and access to resources that can support their businesses.

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