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Personal protective equipment as a measure to limit disability among ironworkers in maros regency

Suharni. A.Fachrin[a], Alfina Baharuddin[a*], Fatma Jama[b], Hukma Ratu Purnama[c], Yuliati[a], Ella Andayanie[a]

[a] Public Health Study Program, Universitas Muslim Indonesia, South Sulawesi, Indonesia
[b] Nursing Study Program, Universitas Muslim Indonesia, South Sulawesi, Indonesia
[c] Faculty of economics and business, Universitas Muslim Indonesia, South Sulawesi, Indonesia

Corresponding Author:
Alfina Baharuddin, Public Health Study Program, Universitas Muslim Indonesia, South Sulawesi, Indonesia. Email: alfina.baharuddin@umi.ac.id

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ABSTRACT

Amidst the onslaught of modernisation, traditional handicrafts continue to hold a unique appeal. One such craft is blacksmithing. Blacksmiths, despite their high level of skill in producing handicrafts, often face significant health and safety risks due to exposure to heat, the use of heavy equipment, and direct contact with hazardous materials. Observations at the partner site revealed workplace accidents, including burns (35.8%), contact with hot iron (58.7%), and being struck by iron materials (35%), which were attributed to the nature of their work. Based on these issues, community service activities were conducted in the form of education on the use of personal protective equipment (PPE) to limit disabilities among iron craftsmen. The results of the education on the benefits of PPE showed an increase in knowledge, attitude, and behavior, with pre-test results of 65%, 77%, and 85%, respectively, and posttest results of 83%, 89%, and 91%, respectively. The results of the education on the benefits of fire extinguishers showed an increase in knowledge, attitude, and behaviour, with pre-test results of 75%, 80%, and 85%, respectively, and post-test results of 88%, 83%, and 90%, respectively. It can be concluded that the effectiveness of this community service program was successful.

Keywords: Iron craftsmen; PPE; Disability Limitation.

INTRODUCTION

Manjalling Hamlet, located in Bonto Bunga Village, is renowned for its skilled blacksmith craftsmen (panre besi), making it an ideal location to explore the implementation of Occupational Health and Safety (OHS) principles. The products crafted by these blacksmiths include knives, sickles, machetes, hoes, axes, crowbars, and other agricultural tools. Despite relying on simple equipment, these skilled hands are capable of transforming solid iron into essential tools widely used by the local community, particularly those working in the agricultural sector [1] [2].

Amid the wave of modernisation, traditional handicrafts continue to possess a unique appeal. One such example is the blacksmithing craft in Moncongloe, Maros. This time-honoured skill, passed down through generations, has produced distinctive and high-quality blacksmith products. The Panre Tutu blacksmith products are highly valued for both their aesthetic and functional qualities. The beauty of their form and the durability of these products have made them popular as local souvenirs and tourist attractions. This craft also holds significant economic potential [3] [4] [5].

Before formally becoming full-fledged blacksmiths, the Paenre Tutu craftsmen primarily focused on producing handles for knives, machetes used for slaughtering, and traditional daggers (*badik*). Over time, through accumulated expertise and family-run blacksmithing efforts, they have expanded their craftsmanship to cover the whole production process, from forging blades to crafting handles and sheaths. These craftsmen represent a community group with productive economic potential, operating as small-scale enterprises. The group is engaged in small-scale blacksmith industries, producing machetes, knives, *badik*, and various agricultural tools in Manjalling Village [6] [7].

The empowerment of Micro, Small, and Medium Enterprises (MSMEs) is crucial, particularly for blacksmith artisans who process raw or semi-finished materials into valuable goods for sale. In Moncongloe District, several blacksmiths operate within a small-scale industrial scope. According to the 2022 report by the Central Bureau of Statistics (BPS) of South Sulawesi Province, the blacksmithing profession is becoming increasingly rare, with fewer individuals viewing it as a promising career.

The blacksmithing industry in Manjalling Hamlet requires approximately 30–50 kilograms of iron as raw materials for each production cycle, purchased at a unit price of Rp13,500 per kilogram. Thus, the total capital required for the procurement of raw materials ranges from Rp 4,050,000 to Rp 6,750,000. Daily, blacksmiths can produce around 20 semi-finished products, and over the course of a month, they can yield 30–50 semi-finished products. However, the production of finished goods is limited to approximately 3–5 units per day. Blacksmith products are an integral part of community life, serving various functions across agriculture, household needs, cultural practices, and economic activities. A single knife blade is sold at a price ranging from Rp 15,000 to Rp 20,000. A machete blade designed for women is also priced at Rp15,000 to Rp20,000, whereas a machete blade for men is marketed at Rp40,000 to Rp50,000. The income generated per product marketing cycle ranges between Rp1,000,000 and Rp2,000,000.

Products such as machetes and knives are distributed and sold beyond South Sulawesi, reaching other regions across the country. The community of Manjalling Hamlet has been involved in blacksmithing for generations. It considers the blacksmithing industry a key driver of the local economy, as it provides significant income and contributes to family welfare. Support and development for the blacksmithing sector can be facilitated through training programs, apprenticeships or comparative study visits, mentoring, and the provision of production equipment to help increase profitability [8] [9] [10] high proficiency in producing handcrafted goods, blacksmith artisans often face significant health and safety risks due to prolonged exposure during the forging process, operation of heavy equipment, and direct contact with hazardous materials. Often, individuals face serious health and safety risks due to exposure during metal-burning processes, the use of heavy equipment, and direct contact with hazardous materials. Observational data from the partner location indicated that work-related accidents have occurred, including burn injuries (35.8%), exposure to hot iron (58.7%), and injuries from forged metal impact (35%) due to the nature of the work. In response to these issues, a community service initiative was implemented in the form of Personal Protective Equipment (PPE) Education, as a disability limitation strategy for ironcraft workers [11] [12] [13].

METHODS

The stages of the community service activities include:

Socialization Phase

1. Finalization of the program and work plan involving the PKM (Student Creativity Program) team and students
2. Conducting Focus Group Discussions (FGDs) to align perceptions regarding the planned program
3. Preparation of materials and equipment required for the implementation of the PKM activities
4. Preparation of educational materials and briefing sessions for the PKM team

Figure 1: Partners and students involved

Training Stage

Lecture Method

In the Lecture Method, material related to K3 management and nursing was presented. 15 people attended this Lecture Method. Before the material was presented, we administered a pre-test in the form of a questionnaire. We presented the material, and at the end of the event, we administered a post-test using the same questionnaire as the pre-test. From the analysis of the pre-test and posttest results, the impact of the lecture method

on improving workers' knowledge of OSH management, business management, and marketing can be observed.

Demonstration Method

In the Demonstration Method, guidance is provided on the proper use of personal protective equipment (PPE), fire extinguishers, and other tools, as well as maintenance procedures, ensuring that workers use and maintain them with full awareness and understanding.

Figure 2: Socialization of PPE activities

Technology Implementation Stage

Implementation of technological tools

1. Implementation of appropriate iron cutting technology
2. Implementation of personal protective equipment, e.g., fire extinguishers, protective clothing, boots,
3. Implementation of protective eyewear against iron welding rays
4. Implementation of nursing management for prevention
5. Education related to clinical nursing management
6. Education related to wound nursing management

Figure 3: K3 Tools Provided To Partners

Mentoring and evaluation stage

1. After the activity is completed, the indicators used include interest and the ability to continue transferring technology for the operation and use of workbench equipment and K3 equipment.
2. Training and guidance in optimizing the use of metal-cutting machines and bench drills to address the challenges faced by metalworkers and ensure the sustainable utilization of these tools.
3. Workers can engage in productive activities that benefit business owners while generating income from services and the production of knives, machetes, or other

similar items. All of this is expected to create a mutually beneficial relationship among all parties, enabling the community to achieve equitable income and welfare levels.

Partner Participation

1. Partners' openness in providing the necessary information related to resolving priority issues.
2. Partners' willingness to provide a venue when activities are carried out in accordance with the program created by the proposing team and approved by the partners.
3. Active participation in every activity carried out.
4. Willingness to maintain the tools provided by the proposing team.
5. Participating in the implementation of evaluation and monitoring activities

Evaluation of Program Implementation and Sustainability in the Field After the PKM Activity is Completed

Monitoring and Evaluation

Monitoring and evaluation activities will be carried out six times.

1. Phase 1 evaluation will be conducted to assess the level of mastery (basic) of all activities to be implemented in collaboration with partners.
2. Evaluation stage 2 is conducted to measure the progress of activity achievements and output targets.
3. Evaluation stage 3 is conducted after the entire series of training and practice activities. If the desired level of success has not been achieved, the parts that are still lacking or unfulfilled need to be improved or repeated.
4. Evaluation stage 4 is Monitoring of Business Management Understanding.
5. Evaluation stage 5 is Monitoring of the use of welding goggles.
6. Evaluation stage 6 is Monitoring of the use of fire extinguishers.

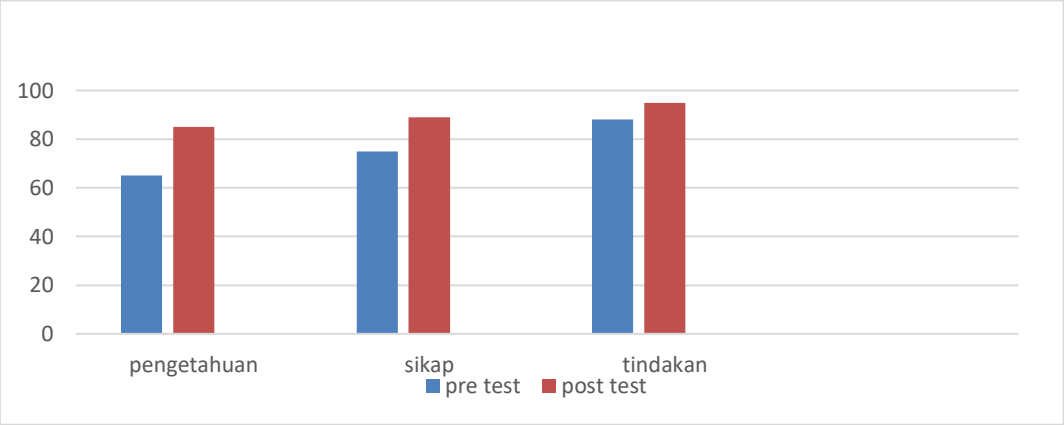
Program sustainability phase

1. The sustainability of the community partnership program is ensured through collaboration between the proposing team and the Community Service Institution, to enable the widespread marketing of partner products and thereby improve the community's economy.
2. This activity can serve as a role model for other business actors in supporting local SMEs and can be continued through community entrepreneurship services.
3. Additional employees may be hired if the products are in demand in the market.

RESULT

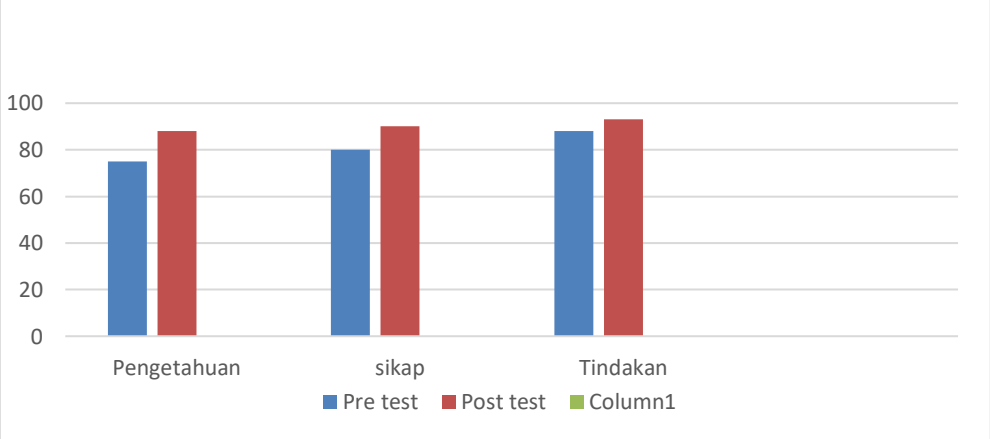
The PKM DIKTI team conducted interviews with the PARTNER before implementing the activity to identify the challenges faced during their work. From the interviews, three main challenges were identified: first, the need for additional workbench tools to facilitate the sharpening of blades, machetes, or kitchen knives; second, the lack of complete personal protective equipment for Health and Safety at Work (K3); and third, the need for training in basic financial reporting. Based on these issues and challenges, the PKM DIKTI team directly provided equipment, including a bench drill, grinder, and metal sanding cutter, to assist in sharpening blades, machetes, and kitchen knives. The OSH protective equipment provided includes fire extinguishers, gloves, boots, and firefighting equipment. Additionally, training was conducted on basic management techniques for establishing a small business. Next, a simple management training session was conducted to help improve the small knife-making business. Kitchen knife

makers in Bonto Buga Village, Moncongloe District, Maros Regency, South Sulawesi, together with lecturers and students from the Faculty of Public Health, UMI



Graph 1 Education on the benefits of fire extinguishers

Based on graph 1, there was an increase in education regarding the benefits of fire extinguishers, with pre-test results for knowledge, attitude, and action being 65%, 77%, and 85%, respectively. In contrast, posttest results for knowledge, attitude, and action were 83%, 89%, and 91%, respectively.



Graph 2 Education on the Use of Fire Extinguishers

Based on graph 2, there was an increase in education regarding the benefits of fire extinguishers, with pre-test results for knowledge, attitude, and action being 75%, 80%, and 85%, respectively. In contrast, posttest results for knowledge, attitude, and action were 88%, 83%, and 90%, respectively.

Table 1 Educating iron craftsmen partners on the benefits of PPE

Resukt	Lowest value	Higest value	Maximum value	Average value	deviasi	P-value
Pre test	19	26	29	20,13	3,45	0,001
Post test	27	29	30	21,15	5,75	

Table 1 presents the results of PPE use following measurements taken through pre-tests and post-tests conducted before and after the education was implemented. The pre-test results showed the lowest value of 19 and the highest value of 29, with an average of 20.13. The pre-test standard deviation was 3.45, indicating variation in values among participants.

DISCUSSION

The use of personal protective equipment (PPE) is a crucial step in mitigating disabilities among iron craftsmen (panre besi) in Maros Regency. Given the high risks involved in the traditional process of manufacturing iron products, the proper use of PPE can reduce the potential for accidents and long-term health problems.

Knowledge is closely related to education, where it is expected that someone with a higher level of education will also possess extensive knowledge [14]. However, someone with a low educational background does not necessarily have low knowledge. Knowledge improvement is not only obtained through formal education but also through non-formal education. In this study, when examining the educational background of the respondents who had completed high school (SMA), their knowledge was broadly categorised as insufficient. This aligns with the concept that an individual's knowledge about an object contains both positive and negative aspects, and these two aspects determine an individual's attitude toward a particular object [15] [16].

Insufficient knowledge of Occupational Safety and Health (OSH) in the workplace makes it difficult for individuals to identify potential hazards around them, thereby making it challenging to determine actions to control such hazards. Therefore, an individual may become less vigilant toward risks that may arise from their behavior while working. Attitude is a relationship between cognitive, affective, and conative components that Influence understanding, feeling, and behaviour toward an object [17]. Attitude does not refer to behaviour or action, but rather an individual's readiness to react to certain objects [18].

Various factors influence the positive attitude of respondents. These factors include information from health workers or occupational safety and health (OSH) officers, as well as socio-cultural factors such as imitating friends, neighbours, or role models. Similarly, blacksmiths working in the burning, cutting, and finishing processes should remind each other about OSH in the workplace. The actions of blacksmiths in Bonto Bunga village are considered quite good, as this is due to education and awareness campaigns regarding the use of personal protective equipment (PPE) conducted by the local government.

CONCLUTION

Overall, the socialisation activities on the use of PPE for iron workers were successful, as evidenced by measurements taken through pre-tests and post-tests conducted before and after the education was implemented. The pre-test results showed a range of scores from 19 to 27, with an average of 20.13. The standard deviation of the pre-test was 3.45. These results confirm the effectiveness of this PKM program.

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