

Solutions to Preventing Mistake in Building Electrical Installation and Maintenance In Urban Area Based on Skills Training

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ABSTRACT

Electricity plays an important role in the functionality of a building. To ensure the required electrical competencies are met, it is essential to provide appropriate training. Therefore, this community service program based on the needs of the assisted village aimed at providing training to potential dropout youths, equipping them with skills in operating and maintaining building electrical installations, enhancing awareness regarding the importance of proper and correct electrical installations, and fostering energy-independent village. The training included several stages namely preliminary study, planning, implementation, mentoring, monitoring and evaluation. The results of the activity showed that the participants of the training obtained operational as well as building electrical system maintenance skills. These acquired competencies led to the improved standard of living, increased welfare, and the prevention of hazards resulting from errors in electrical installation and maintenance within the village of Giri Mekar. The outcome of this community service activity was that in the assisted village a number of skilled installer cadres had emerged, possessing skills in the operation and maintenance of building electrical installation systems.

Keywords: *building electrical system, electrical installation training, and operational skills, assisted villages.*

1. INTRODUCTION

Bandung Regency is part of the Bandung metropolitan development area, which has an area of 176,239 km² with a population of 3,415,700 people (Basic Data for Development Planning in 2013)(**Kurniasih, Rodiah, and Komariah 2014**). The increasing development of the Bandung Regency and the very rapid population growth due to both birth and urbanization, demands the development of this regency area both for residential and industrial purposes to its suburbs(**Ramli et al. 2020**). industry and housing. With the increasingly dense population, especially the productive age in this region, it can indirectly have a social impact, namely the increasing number of youths who have dropped out of school and have not found work due to the lack of knowledge and skills possessed(**Kustija, Surya, and Fahrizal 2022**). Seeing

the real conditions in the field that the increasing number of youth in the area in Girimekar Village has problems in the lack of skills they have (**Surya and Kustija 2022**), this happens because there is no skill or skill development (**Surya and Kustija 2023**), especially for those who are of productive age, so they find it difficult to get jobs and indirectly the unemployment rate in this region is increasing (**Ravyts et al. 2019**). In order to improve this situation, it is necessary to take action or efforts to develop knowledge and skills in the community (**Huang et al. 2011**). Skills training, especially in the field of electrical installation, is given as an effort to improve the ability of community members to face demands and changes in the surrounding environment (**Jalinus et al. 2018**). The provision of training for the community aims to empower, so that community members become empowered and can actively participate in the change process (**Batsurovska 2021**). Training can help people or communities to apply the knowledge and abilities they already have (**Wahyuningsih, Darmawan, and Hamid 2021**).

Designers, installers and inspectors of electrical installations are required to comply with the safety and health provisions for their workers in accordance with the applicable occupational safety and health laws and regulations (**Chinyere, Clement, and Tobias 2020**). The purpose of the enactment of these regulations is to ensure the safety of humans, livestock and property, as well as the main requirement that electricity supply can be carried out safely, reliably and environmentally friendly (**Kustija, Nur Adillawati, and Fauziah 2017**). Along with the development of time and the increasing demand for electricity, both in rural and urban areas, electrical installations for buildings have also undergone changes, both in quality and quantity (**Dwiaji, Nurato, and Dwiaji 2019**). Namely, the decreasing quality of electrical installations, and changes in the quantity of the load points, as a result of the changes both greatly affect the feasibility of the installation and the safety of the users (**Steedman 1988**). As a result of improper installation can cause accidents such as short circuit electricity or fire. One of the efforts that can be done to suppress the occurrence of fires is the use of cables and safety devices that are in accordance with the standards for both the installation area and the voltage capacity used (**Pinto, Nunes, and Sousa 2020**). In view of this, it is necessary to make an effort to increase the awareness of contractors and installers who are authorized to install electrical installations (**Al-Saidi et al. 2022**), who must really pay attention to the use of standard electrical installation equipment and the correct connection system, must follow the regulations set by the government (**Flin et al. 2018**).

2. METHOD

The methodology of this service program will use the Participatory Methodology with the Demand Responsive Approach. Theoretically, the participatory methodology will provide opportunities for the community to actively collaborate with community facilitators starting from initial planning, implementation activities to monitoring and evaluation stages. To foster and produce young cadres who have skills in the field of operational and maintenance of building electrical installations, a gradual approach is carried out that can stimulate mentality among youth dropping out of school, namely as follows:

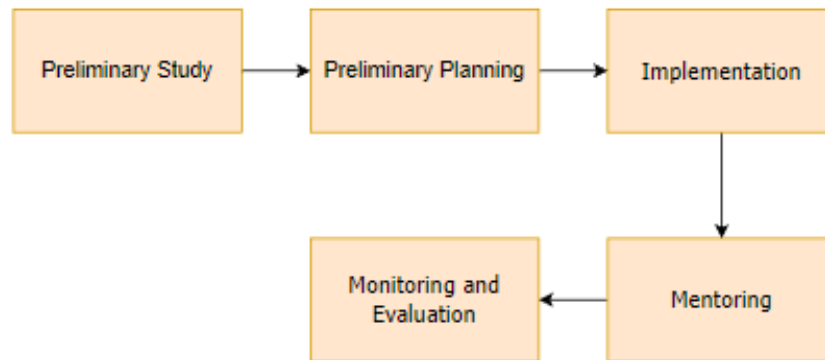


Figure 1. Stages of The Training Model

Based on Figure 1 it can be described as follows

- 1). Preliminary studies include collecting data on building developments in an area, knowing the existing conditions of electrical installation installers, the number of youth who have dropped out of school and have the potential to be trained, the basic education of youth to be trained, and the competencies to be carried out.
- 2). aims to make youths understand in depth the basics of an electrical installation, starting with the ability to identify equipment and the main components of an electrical installation, how to make a simple one-line diagram, and apply in real terms from a one-line diagram to an implementation drawing.
- 3). intended for youth to learn how an installer can apply his skills starting with making planning diagrams, making implementation diagrams and budget plans that will determine the amount of costs that must be incurred.
- 4). encourage independent cadres who have electrical installation skills and provide business opportunities for youth and youth in the field of electrical installation so that they can improve their standard of living and welfare.
- 5). the process of stabilization and business development plans in the field of electrical installation in the future. For long-term goals, the sustainability of the coaching program, it is proposed to establish an electrical installation center as a forum for developing products and services in the field of residential electrical installations.

3. RESULTS AND DISCUSSION

3.1 Preliminary Studies

At this stage, as many as 25 out of school youths were selected who were delegates from various selected RWs who would later be trained and fostered to master skills in the operational and maintenance of building electrical installations. All of these participants will be given training on how to connect good cables, techniques for connecting cables, switches, contact boxes with a load (light) that is powered by electricity and can use various installation components so that it becomes a good and correct installation circuit according to standards. and work safety. The training which was held in the Girimekar Village Office Hall, Cilengkrang District, Bandung Regency for several times, was followed enthusiastically by the participants, most of whom were young people so that it was hoped that they could become independent installer cadres who could provide their skills to the surrounding community. The instructors

involved were the Partnership-based PKM Fostered Village Team consisting of the Assisted Village PKM Team also assisted by field technicians from D3 Electrical Engineering students, FPTK UPI to directly guide and supervise the implementation of installation training in the field. At this stage, the PKM team of the assisted villages and assisted by instructors from students conducts coaching for youth and youth groups by conducting training on the operation and maintenance of building electrical installations properly and providing direction on how to develop the skills of this installer to be a successful business. support the family's economy.

3.1.1 Differences Between Academic Learning (Non-Vocational) and Vocational Learning

Vocational learning is unique in terms of the competencies to be achieved which include three aspects, namely; cognitive, affective and psychomotor.

Cognitive relates to theoretical concepts, working principles of equipment while affective relates to work attitudes, ranging from preparation, accuracy (time, measuring tools and tools, components), work safety (PPE, stages and sequence of work), and discipline, psychomotor skills hands on, according to the rules of installation, neatness, and efficient time.

In vocational learning there are theoretical learning, simulations, and hands-on practicums, different from other science learning in general, practicum is related to proving theory. As in the competence of installing electrical installations, it is supported by several mutually supportive subjects including physics, work safety, electrical circuits. The learning approach can be in the form of lectures, discussions, problem base learning, and base learning projects, tailored to the content being taught.

Problem-based learning is a method that introduces participants to a case that is related to the material discussed. Participants will then be asked to find a solution to solve the case/problem. The difference between problem-based learning and project-based learning is that in problem-based learning, the solutions offered do not have to be in the form of products.

Project Based Learning is a learning method that uses projects/activities as a medium. This method requires participants to be able to explore, assess, interpret, synthesize, and provide information to produce various forms of learning outcomes. Project-based learning or project-based learning is a student-centered learning model to conduct an in-depth investigation of a topic.

Vocational skills training in achieving one competency can use a combination of several learning approaches. In the base learning project, participants are given a project to measure the achievement of the competencies that must be possessed and the resulting projects are divided into 2 major categories, namely; accepted or rejected. Acceptance criteria can still vary based on the accuracy of the resulting project, timeliness, tidiness, and aesthetics. So that the evaluation of the vocational has its own uniqueness, one of which is the competency test.

3.2 Planning

At this stage, planning is carried out by determining what equipment will be used, determining how many light points and sockets will be installed in the installation and planning how much power will be installed later, also the number of tools and materials that will be used is calculated. prior to electrical installation.

3.3 Implementation

to master electrical installation technology are given intensive training under the guidance of instructors from the PKM team in the village. At this stage, participants who are ready to be given training starting from making drawings of planning electrical installations, making drawings of installation wiring, practicing it by making electrical installations according to the planning drawings that have been made previously, participants take an active role in designing and making installations assisted by instructors from the PKM team of the assisted villages. Documentation during the activity can be seen in Figure 8.



Figure 8. Activity Implementation

3.4 Mentoring

The participants continue to be monitored for their progress and the PKM team of UPI assisted villages intensively, so that participants get assistance and technical assistance in the field directly from experienced instructors. During this mentoring period, participants are also given cases related to proper and correct installation (problem based learning) . To find out how far the progress of participants in absorbing the knowledge and skills that have been learned, the instructor provides a direct case that must be done by the participants, namely repairing the electrical installation of the Meeting Building and Musholla in the Girimekar Village Hall, Bandung Regency (project based learning) .

Continuing the mentoring process for the training participants, namely youth and youth groups to be able to improve and develop their skills in mastering the installation and maintenance techniques of building electrical installations. For those who already have sufficient proficiency and skills, the team will bring in a team from the Indonesian contractors and electricity association (AKLI) to provide exams/tests for those who are ready and provide certificates of professional expertise for participants who have passed the exam to be given.

3.5 Monitoring and Evaluation Stage

This monitoring and evaluation is carried out primarily to find out and measure the progress made by the trainees in mastering the theory and application of installation. The evaluation carried out in this Partnership-based PKM-Based Village activity was in the form of direct discussions with the youth and youth groups that were fostered and also discussions with the PKM lecturer team. What are the obstacles in carrying out this activity and the solutions to overcome them. Participants also always provide valuable input for the lecturer team so that the PKM activities of the fostered villages can run well. The follow-up of the coaching activities

carried out was in the form of training to increase the skills of youth and youth organizations regarding the business opportunity to open an electrical installation center which became a forum for the gathering of village independent installer cadres.

Based on the results of monitoring and evaluation of a number of cadres who were trained to become village installers who have a role to assist the village in seeking to improve and install residential electrical installations in the Girimekar village area . The PKM team selected and selected about 7 cadres of installers who were ready to be deployed to help the village with problems related to electrical installations.

4. CONCLUSIONS

Based on the results of the partnership-based PKM activities in the Assisted Villages that have been implemented, the following conclusions can be drawn:

1. Public perception and awareness regarding the installation and maintenance of building electrical installations needs to be of concern to all parties, because generally many residents do not know the importance of maintaining security and safety from the dangers of electrical installations that are installed if they do not meet the established standards.
2. Skills in terms of operational skills and maintenance of building electrical installations for youth in an area are one of the solutions to reduce unemployment and can create new jobs/entrepreneurs for residents so that the standard of living and the economy of local residents increases.
3. In an effort to create an energy independent village, especially electrical energy, every region or village should have a cadre of installers who are the mainstay of the village.
4. The role of Universities in providing knowledge and motivating each region or village needs to be continuously improved so that a targeted village development pattern and the creation of a model of fostered villages are expected to be realized.
5. The role of DKM and the local government in providing facilities and motivating the training of the assisted villages needs to be continuously improved in order to create a good and harmonious relationship as well as mutual support from all related parties as well as in applying religious guidance.

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