IMPLEMENTATION OF TESLA BI (TEKNOLOGI ENERGI SURYA LINTAS ANTAR BIDANG ILMU) ON FUTURISTIC SEATING AT TLC (TEACHING AND LEARNING CENTRE) AMARI

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ABSTRACT

TESLA Bi on Futuristic Seating at TLC Amari is an innovative project that combines renewable energy technology with futuristic design in seating facilities. This initiative aims to provide energy sustainability solutions in educational facilities, especially at the TLC Amari. TESLA Bi focus is the use of solar energy as the main power source. This futuristic seat integrated with technology is designed to utilize solar panels that can store and distribute electrical energy to support educational activities and improve energy efficiency in public spaces. The project involves a cross-disciplinary approach, including energy technology, architectural design, and environmental science, with the aim of creating environmentally friendly and functional innovations. As a result, the seat is not only comfortable and aesthetic, but also serves as an alternative energy source that can be used for.

Keywords: TESLA-Bi, renewable energy, energy efficiency, tlc amari, ministry of education and culture grant

INTRODUCTION

TLC Amari is the object and beneficiary of the CPE (Community Partnership Empowerment) Grant provided by the Ministry of Education and Culture of the Republic of Indonesia as shown in figure 1. It is known that the analysis of the situation shows the economic level at the middle to lower level so that this program proposes to increase the level of partner empowerment in the social aspect of the community, namely improving the quality of service, and the production aspect, namely increasing product diversity.

Figure 1. TLC Amari

TLC Amari was established on July 23, 2014, based on the Decree on the Establishment of Schools in number 3281/2014 issued by the Ministry of Education, Culture, Research and Technology. The results of the interviews with

partners are 2 (two) aspects that are priority problems, namely the social aspect of the community and the production aspect that we put forward as follows:

- Low level of knowledge and skills related to the use of renewable energy, especially solar energy. Most of the target partners have limited understanding and this has the potential to hinder the potential to utilize solar energy effectively and efficiently.
- The lack of electrical terminal points as well as inappropriate and inadequate placement of points are serious obstacles in the application of renewable energy.
- Do not have the skills to maintain and manage the solar energy system.
- Lack of innovation in the development of environmentally friendly products related to renewable energy.
- Product development, multidisciplinary integration, especially between electrical engineering and product design to achieve the success of an effective and efficient product innovation and development process.

Table 1. Techno-economic analysis before solar PV installation

Energy Charge Before PV Installation

Month	Energy Purchased (kWh)	Peak Demand (kW)	Energy Charge (IDR)
January	6638.73	24.63	9.590.972 IDR
February	5885.86	22.98	8.503.303 IDR
March	6862.17	23.81	9.913.781 IDR
April	6538.63	24.69	9.446.359 IDR
May	6582.76	23.21	9.510.117 IDR
June	6577.83	23.41	9.502.984 IDR
July	6634.74	25.03	9.585.203 IDR
August	6924.27	23.30	10.003.490 IDR
September	6551.62	23.43	9.465.122 IDR
October	6608.71	22.39	9.547.605 IDR
November	6410.59	26.21	9.261.385 IDR
December	6708.77	22.86	9.692.154 IDR
Annual	78924.67	26.21	114.022.477 IDR

Table 2. Techno-economic analysis after the installation of solar power plants

Energy Charge After PV Installation

Month	Energy Purchased (kWh)	Energy Sold (kWh)	Peak Demand (kW)	Energy Charge (IDR)
January	5794.14	15.07	24.63	8.356.650 IDR
February	5115.12	7.13	22.98	7.383.122 IDR
March	5886.60	5.72	23.81	8.498.997 IDR
April	5558.00	5.67	24.69	8.024.312 IDR
May	5574.69	11.63	23.21	8.042.834 IDR
June	5604.35	9.44	23.41	8.087.735 IDR
July	5581.90	8.17	25.03	8.056.494 IDR
August	5819.23	10.97	23.30	8.396.737 IDR
September	5460.29	7.66	23.43	7.881.283 IDR
October	5546.13	6.93	22.39	8.005.984 IDR
November	5514.09	5.62	26.21	7.960.930 IDR
December	5812.62	6.01	22.86	8.391.856 IDR
Annual	67267.16	100.03	26.21	97.086.936 IDR

Table 2 shows the results of the techno-economic analysis before the installation of solar PV. Table 3 shows the results of techno-economic analysis after the installation of solar PV. On that basis, Solar Power Plant (SPP) is able to optimize solar energy as a backup supply of electricity (Qirom et al., 2023; Wahyuddin et al., 2022; Wibowo et al., 2023; Windarta et al., 2023). Users of the benefits of SPP technology have also given positive responses based on publications from (Malik et al., 2023; Silaban et al., 2023; Silalahi & Novantoro, 2023). The information shows cost savings of up to 15.6% and is an improvement towards environmentally friendly green technology.

The paper content includes abstract, introduction, method, results and discussion, conclusion, and references. The paper can be completed with acknowledgment.

Based on the results of research that has been published (Malik et al., 2023; Silaban et al., 2023; Silalahi & Novantoro, 2023) in the field of Electrical Engineering, Universitas Mercu Buana, experimental-scale research has been carried out in the laboratory on the development of SPP, in addition to the field of Product Design at Universitas Mercu Buana (Dinata & Noer, 2020; Ramadhan et al., 2019; Ramadhan & Dinata, 2020) has also produced futuristic publication works. Based on the results of the research of the proposer team, the solution offered to TLC Amari partners is the right reinforcement for integration between fields of science in the hope of achieving the integration that is to be solved. (Ipung et al., 2023; Nugraha et al., 2023; Sartika et al., 2023).

This proposal supports government programs mandated in Law Number 30 of 2007 concerning Energy (Nomor, 30 C.E.), namely supporting sustainable national development, increasing national energy security, optimizing energy resource management, increasing public access to energy, developing the capabilities of the domestic energy industry and energy services, improving the professionalism of human resources, creating jobs, and maintaining the sustainability of functions environment. This activity also shows the connection between MBKM (Merdeka Belajar Kampus Merdeka) and KPI (Key Performance Indicators), including:

- Increase the diversity of concentric products in the use of energy-efficient and environmentally friendly resources and enrich the student learning experience.
- Knowledge of energy utilization and maintenance skills of solar-based futuristic seats.
- Improve skills in developing innovative futuristic product designs for academics and partners to engage in the innovation and implementation of future technologies.
- Creating added value for society and empowering them to compete in an increasingly complex global market.

Overall, this program aims to provide benefits to partners, producing students and lecturers who are skilled, creative, and concerned about social and environmental issues.

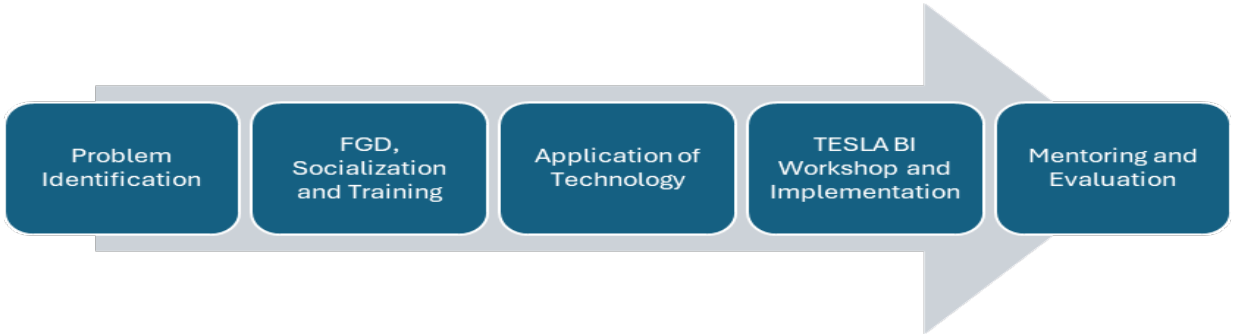

Figure 2. Stages of activities

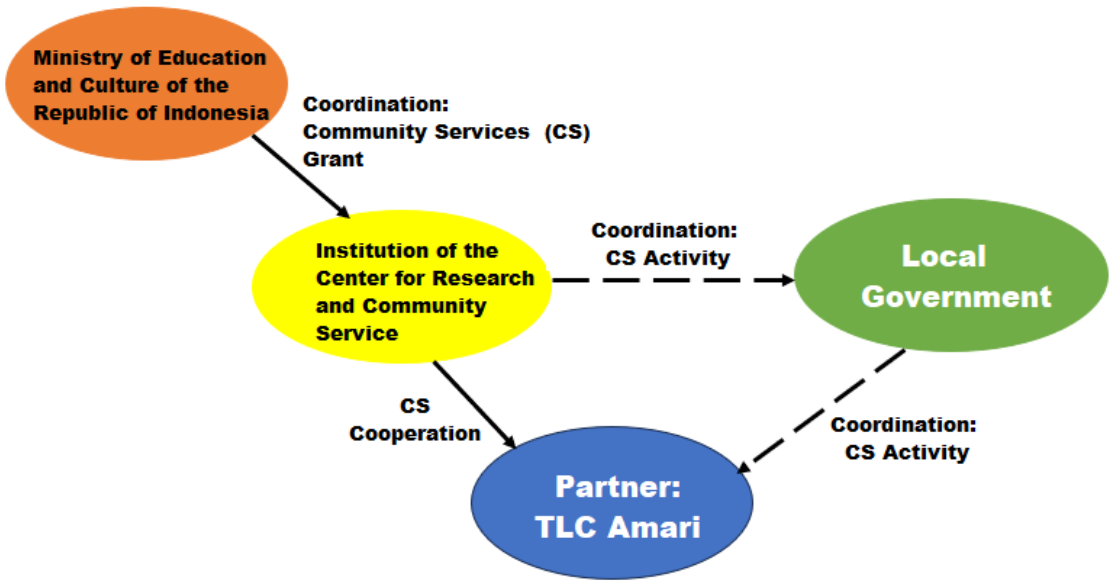

Figure 3. Flow of CPE program activities

METHOD

Figure 4 shows the stages of program activities which are comprehensively explained as follows:

- Carry out training and learning programs on renewable energy, especially solar energy.
- Develop adaptive technology that is easy to install, manage and easily accessible at partner locations with minimal electrical terminal points.
- Collaboration between electrical engineering and product design in developing innovative products through workshops, seminars, which facilitates the exchange of ideas and knowledge between fields.
- Conduct continuous monitoring and evaluation of the implementation that has been adopted.

The proposed method requires cooperation between institutions to support innovative and sustainable product development (Imelda U. V. Simanjuntak et al., 2024; Lukman Medriavin Silalahi et al., 2023; Simanjuntak et al., 2023) which is shown in figure 5.

The target of partners is an economically unproductive group of people. The results of Amari's TLC identification can address priority issues and improve the use of renewable energy and product design effectively and sustainably. In addition, this will also contribute to the achievement of the KPIs that have been set out in the community partnership empowerment program.

Figure 4. TESLA BI design activities

RESULTS AND DISCUSSION

Figure 5 shows the results of the TESLA BI seating design, as well as the results of the implementation of the activities that have been carried out as follows:

- The design of TESLA BI is determined based on the results of identifying the needs and potential of

maximum energy locations to be able to operate lights, as well as electronic devices.

- The Focus Group Discussion (FGD) activity has been held on Saturday, September 7, 2024 starting from 09.30 – 13.00 WIB which is explained in the order of events contained in table 3.

Table 3. FGD schedule

Time	Activity Description	Performers
09.30 – 10.00	Participant Registration	Student: Fahrul
10.00 – 10.10	Opening	Student: Reza Fachmi
10.10 – 10.30	Remarks from the TLC Amari	Dra. Hj. Dahlia
10.30 – 10.45	Submission of material related to TESLA BI design	Rizky Dinata, S.Ds. MA
10.45 – 11.00	Submission of Materials related to energy utilization	Muhammad Hafizd Ibnu Hajar, ST. M.Sc
11.00 – 12.00	Discussion and Q&A	Muhammad Hafizd Ibnu Hajar, ST. M.Sc and Participants
12..00 – 12.15	Introduction to the TESLA BI Framework	Students dan Lecturer
12.15 – 12.30	Closing	Students: Fahrul

Figure 5. Results of FGD activities

Thus, the proposed solutions offered in the community partnership empowerment program can be seen in table 4.

Table 4. The proposed solutions offered in the community partnership empowerment program

Problem	Solutions	Achievements
The level of community empowerment from the social aspect of society	Improving the knowledge and skills of partners to become skilled workers related to the use of solar energy.	[1] Installation of TESLA BI. [2] 100% increase the participation of partner participants in seminars and workshops related to the use of solar energy. [3] 100% increase the understanding of partner participants about the basic concepts of solar energy, its benefits and how to use it in daily life
	Providing easy access to understanding of solar-based futuristic seating design technology.	[1] Futuristic seating is installed. [2] 100% of partner participants attended seminars and workshops on futuristic seating. [3] 100% increase the understanding of partner participants on the concept, benefits, and application of solar-based futuristic seating technology and product design.
	Improve understanding of the maintenance and management of technology on solar-powered futuristic seats.	[1] Successfully conducted socialization on how to maintain and manage TESLA BI [2] 100% of partner participants participated in seminars and workshops on TESLA BI maintenance. [3] 100% increase partner participants' understanding of common methods of care, management, troubleshooting, and preventive measures.
The level of community empowerment from the aspect of production.	Concentric Product Diversification: on a solar-based futuristic seat.	[1] 100% improve the variants and design quality of products that have been successfully developed based on functionality criteria. [2] 100% increase in innovation in the implementation of TESLA BI. [3] 100% increased interest and adoption of the product as a market response to TESLA BI product design. [4] 100% increase Amari's TLC to manage TESLA BI efficiently and environmentally friendly.
	The application of multidisciplinary science to develop futuristic seating products based on solar power.	[1] 100% increase collaboration with diverse educational backgrounds and expertise in developing TESLA BI products that include aspects of electrical engineering and product design. [2] 100% increase in innovation and creativity of TESLA BI products reflecting the application of multidisciplinary disciplines in designing unique and effective solutions. [3] 100% increase the success of TESLA BI products in meeting user expectations. [4] 100% increase the adoption and implementation of environmentally friendly TESLA BI products.

CONCLUSION

Based on the results of the evaluation of the implementation of the activities that have been carried out, it is concluded that participants can understand and implement the use of TESLA BI after socialization and training. Furthermore, participants were able to understand the definition, history, variety of applications and simple training on solar energy education and its application. Of the total training participants, 100% of the participants were satisfied with the benefits of the socialization and workshops held.

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