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Education on Solar Cell Technology to Increase Clean Energy Literacy in Cileles Village, Sumedang

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ABSTRACT

Indonesia is in the process of transforming its energy system to reduce its dependence on fossil fuels and lower greenhouse gas emissions. This effort aligns with SDGs 7 and the national target of achieving a 23% share of renewable energy shared by 2025. However, low community energy literacy remains a significant obstacle, as seen in Cileles Village, Sumedang, which has considerable but underutilized solar energy potential. This community service program aimed to strengthen energy literacy and awareness of renewable energy by providing education on solar cell technology through a Participatory Action Research (PAR) approach. This activities included preparation, interactive learning, practical demonstrations using a solar cell model, and evaluation through pre- and post-tests. Implemented in August 2025 with 30 participants, the program successfully increased understanding of clean energy and encouraged interest in renewable energy adoption.

Keywords: *Clean Energy, Solar Cell, Community Service, Energy Literacy, Cileles Village*

1. INTRODUCTION

An energy crisis is currently underway in various parts of the world. This crisis can be overcome through increased energy literacy, as energy literacy can realize energy-saving behavior. Behavior change towards energy saving at the individual and household level is a crucial part that affects the reduction of carbon dioxide emissions **(Coyne, B., Lyons, S., & McCoy, D., 2018).** Energy literacy is part of the life skills necessary for the community to face the energy crisis. Good energy literacy influences public awareness in using energy efficiently **(Wan Mohamad, W. N. A., & Osman, K., 2022).**

In encouraging the clean energy transition and national Nationally Determined Contribution (NDC) targets, the Indonesian Government is carrying out collaborative movements that involve grassroots movements **(Tunjung Wijanarka, Ni Nyoman Clara Listya Dewi, 2024)**. This agenda aligns with the Sustainable Development Goals (SDGs) **(Bappenas, 2021)**, specifically Goal 7: Affordable and Clean Energy , and the target of a 23% New and

Renewable Energy (NRE) mix by 2025, as affirmed in Presidential Regulation No. 22 of 2017 on the National Energy Plan (RUEN) **(nn, 2017),** and further supported by Ministerial Regulation No. 10/2025 concerning the Energy Transition Towards Net Zero Emission Indonesia **(Iryanti, 2025).** At the provincial level, West Java Regional Regulation No. 2 of 2019 on the Regional Energy Plan (RUED) encourages the utilization of local energy potential, including solar energy **(nn, 2019).**

However, at the village level, the implementation of these policies still encounters significant obstacles, particularly due to the low level of community energy literacy. Indonesia's available solar energy resources are far greater than all other energy resources combined **(Silalahi, D.F. Blakers, A., Stocks, M., Lu, B., Cheng, C., Hayes, L, 2021).** Although Indonesia has vast renewable energy potential, this great potential has not been optimally utilized **(Adzikri, F., Notosudjono, D., & Suhendi, D, 2021).** Cileles Village, Jatinangor District, Sumedang Regency, has high solar energy potential but has not been optimally utilized. Village development is highly dependent on the availability of appropriate human resources, finance, facilities, and energy **(Wahyu, S., Hariansyah, S., Lestari, M. D., & Sukma, P., 2022).** Dependence on conventional electricity is still dominant, while knowledge about solar cell technology and other clean energy is very limited. To protect the region from the environmental impact caused by the use of fossil-based electricity, renewable energy alternatives need to be developed **(Wahyuddin, K., Rohana, Roid, F., & Al Farizi, R., 2022).**

This community service activity is part of the University's Tridarma mission, designed to bridge the energy information gap and increase energy literacy through interactive socialization and demonstration of solar cell technology using a learning model. The target participants include youth organizations, local SMEs, and residents. In this activity, the role of students and academics is to assist in the development of renewable energy to enhance national resilience **(Yoice Ocktovina Soroeday, Rudy Laksmono, Irdam Ahmad, Ulul Azmi, 2024).** The use of communicative and contextual Indonesian is considered capable of bridging the community's understanding of technical information **(Mutaqqi, F., et al., 2025).**

2. METHOD

This community service activity employed a qualitative approach utilizing the Participatory Action Research (PAR) method. The choice of PAR was strategic, as it emphasizes the active involvement of the community as subjects in both the learning process and the identification of solutions to local energy challenges. This ensures the outcomes are contextual and directly address community needs. The overall initiative aligns with the University's core Tridarma mission, carried out with a distinctly participatory and educational approach. The activity was officially held on Tuesday, August 5, 2025. It took place at the Widyatama University Living Lab, which is physically situated in Cileles Village, Jatinangor District, Sumedang Regency.

A total of 30 participants were involved in the activity. These participants represented various key segments of the local community, including members of the youth organization (Karang Taruna), local Small and Medium Enterprise (UMKM) actors, and general residents of Cileles Village as seen in Figure 1.

Figure 1. Cileles village area, Jatinangor, Sumedang district, West Java

The stages of the community service activity are illustrated in Block Diagram in Figure 2.

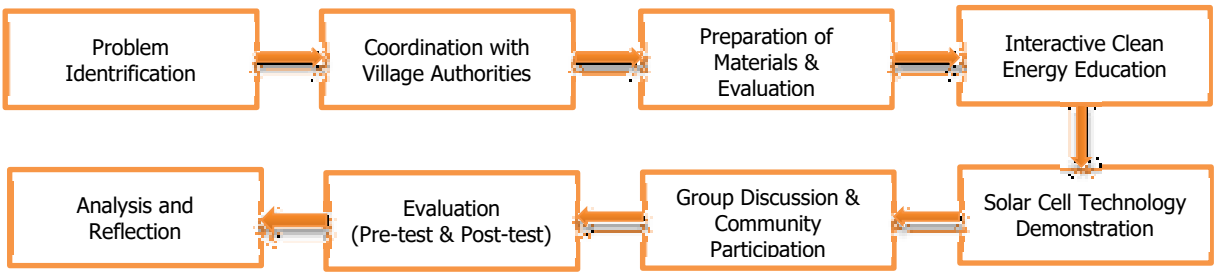

Figure 2. Activity Stage

Activity Stage Description is as follow:

1. Problem Identification
   Initially, we observed that the population had limited energy knowledge and a restricted understanding of renewable energies. First observations and informal discussions with the villagers revealed that the village's solar energy potential was not being optimally utilized.
2. Coordination with Village Authorities
   The team collaborated with village leaders to make sure the program aligned with local needs. This process involved securing official approval, choosing participants, and finalizing the schedule and venue for the activities.
3. Preparation of Materials and Evaluation Tools
   Learning materials on clean energy and solar cell technology, as well as precision models to support practical learning, have been developed. Pre- and post-training tests have also been developed to assess participants' knowledge.
4. Interactive Clean Energy Education

Delivery of material in the form of socialization about the energy transition, the importance of clean energy, and solar cell technology through interactive presentations, case studies, and group discussions adjusted to the level of community literacy.

5. Solar Cell Technology Demonstration
   To help participants clearly grasp how solar energy is transformed into electrical power, a solar cell mock-up was presented, offering both visual and hands-on explanation of the process.
6. Group Discussion and Community Engagement
   Group discussions encourage active participation and allow participants to ask questions, exchange insights, and consider how solar cell technology can be applied in everyday life and in local businesses.
7. Evaluation (Pre-test and Post-test)
   Pre-test and post-test were used to measure the level of energy literacy understanding, before and after the socialization. In addition, data was collected on the interest in adopting clean energy and participant involvement during the activity.
8. Analysis and Reflection
   In the final phase, evaluation results are analyzed to determine the program's effectiveness. Feedback from participants provided insights like a barriers, potential opportunities, and suggestions for strengthening future efforts in community energy education.

3. RESULTS AND DISCUSSION

The community service activity executed in Cileles Village was a focused educational effort. The core content was delivered through socialization sessions about the ongoing energy transition, underscoring the vital importance of clean energy, and introducing solar cell technology.

To ensure effective knowledge transfer, the material was presented in multiple engaging formats; Interactive Presentations, Case Studies, Group Discussions

Crucially, the entire delivery method was tailored to the community's literacy level to ensure the technical information was accessible and easily understood by local residents. These dynamic sessions, which can be seen in Figure 3 of the original document, served as the primary mechanism for increasing energy literacy in the area.

(a)

(b)

(c)

(d)

Figure 3. a. Interactive Socialization Activity; b. Participants' Enthusiasm During the Introduction Using the Learning Model; c. Case Study; d. Group Discussion)

3.1 Increase in Energy Literacy

The pre-post test results showed a significant increase in participants' understanding of the concept of clean energy and solar cell technology. Before the activity, only 35% of participants understood the basic principles of solar cells. After the activity, this figure increased to 90%. This indicates that the community-based educational approach is effective in increasing energy literacy.

The evauation instrument consisted of the following statements:

1. Participants understand the difference between fossil fuels and renewable energy sources.
2. Participants understand the concept of clean energy and its environment advantages.
3. The participant is aware of the renewable energy potential available in the village area.
4. The participant understands the working principle of solar cells in converting solar energy into electrical energy.
5. Participants can identify the key parts of a solar power system, such as panels, batteries, and inverters.
6. The participant is familiar with examples of solar cell applications in daily life.
7. The participant shows interest in using solar cell technology as an alternative energy source.
8. The participant believes that the use of solar energy can reduce household or business electricity costs.
9. The participant is willing to recommend the use of solar energy to other community members.
10. The participant perceives that the material and demonstration delivered during the activity were clear and relevant to community needs.

Table 1 presents the results of the pre-post test as follow.

Table 1. Pre-post test results

No	Understanding Indicator	Average Score (%)		Keterangan
		Pre-Test	Post-Test	
1	Recognizing the concept of renewable energy	42	91	Significant increase
2	Knowing how solar cells work	38	89	Technical understanding increased
3	Understanding the benefits of clean energy	40	92	Environmental awareness increased
4	Attitude towards the use of alternative energy	41	90	Positive change in attitude occurred
5	Interest in adopting solar cell technology	39	88	Interest in technology adoption increased

The overall impact of the community service activity on the participants' understanding of clean energy concepts is clearly demonstrated by the stark contrast between the average pre-test and post-test scores for all 30 participants.Average Pre-Test Score: 40%

Specifically:

1. The Average Pre-Test Score for all participants was 40%. This initial score reflects a low baseline understanding of renewable energy and solar cell technology among the community in Cileles Village.

2. Following the interactive education and demonstration sessions, the Average Post-Test Score soared to 90%.

This significant gain confirms that the visual demonstration method, specifically using a learning model (maket), was highly effective. It successfully transformed abstract concepts (such as the principles of solar cells and the energy transition) into concrete and easily memorable knowledge for the general public. The substantial increase in scores—from 40% to 90%—is empirical proof that the community-based, participatory educational approach is successful in boosting energy literacy.

Meanwhile, the high level of satisfaction with the material delivered reached 95%. This high level of satisfaction was critically supported by two key pedagogical choices. First, the material was delivered using communicative and contextual Indonesian, which is crucial in bridging the gap between technical information and community understanding. Second, the program successfully incorporated elements of local wisdom and relevance within the specific area where the activities took place. By contextualizing the concepts of clean energy and solar cells within the local needs and environment of Cileles Village, the team ensured that the information was not only easily accessible but also relevant and directly applicable to the daily lives of participants and local businesses. This dual approach significantly increased understanding and positive reception of the educational content.

3.2 Enthusiasm and Participatory Response of the Community to Clean Technology

The high level of participant enthusiasm served as a crucial qualitative indicator of the activity's success. During the practical demonstration session, attendees were highly engaged; they

proactively approached the learning model, asked detailed technical questions, and displayed significant interest in the solar cell technology.

This shift from passive reception to active participation was particularly evident during the discussion session. Participants didn't just absorb the information; they actively contextualized the technology with their own needs. Their interest in solar cells was clearly demonstrated by the potential applications they suggested; Night lighting; Battery charging for devices like phones and emergency lights, and ; Small-scale use to support SMEs (Small and Medium-sized Enterprises), such as beverage outlets, cooperatives, and roadside stalls.

These suggestions reveal a key finding: a newfound awareness of the economic benefits of solar cells. The community recognized that this technology is not just environmentally friendly but can also actively increase the productivity of local businesses. Ultimately, this demonstrates that effective energy literacy goes beyond simply increasing knowledge; it successfully encourages a positive change in attitude and behavior toward more prudent energy consumption.

3.3 Identification of Challenges, Opportunities, and Collaboration Potential

Energy literacy is fundamental to the success of any national energy transition. Without a proper and adequate understanding of the concepts involved, communities are likely to reject change or perceive new technologies, such as solar cells, as overly complicated and irrelevant to their daily lives. Therefore, implementing effective strategies to increase energy literacy must be an integral part of national energy policy. Moreover, energy literacy serves as a powerful empowerment tool. It transforms communities from passive energy consumers into active subjects in sustainable development.

This type of community activity directly aligns with the national policy direction to promote energy decentralization and the effective utilization of local potential. By enhancing the capacity of village communities, these efforts directly contribute to achieving the national New and Renewable Energy (NRE) mix targets and the broader goal of reducing carbon emissions. Crucially, the outcome supports the government's vision of creating energy-independent villages. These villages are not merely dependent on external energy supplies but are equipped to manage energy resources locally and sustainably.

4. CONCLUSIONS

This community service project achieved significant success, directly supporting various national and global energy initiatives. Specifically, the activity actively promoted the implementation of the Sustainable Development Goals (SDGs), particularly Goal 7: Affordable and Clean Energy. Furthermore, the activity reinforced the mandates outlined in the National Energy Master Plan (RUEN) (Presidential Regulation No. 22/2017) and the Regional Energy Master Plan (RUED) (West Java Regional Regulation No. 2/2019), which emphasize clean energy transitions and the utilization of local potential. Most importantly, the program contributed to strengthening the essential concept of energy-independent villages, empowering local communities to manage their own sustainable resources.

The core educational objective was achieved with remarkable results: the Cileles Village community's understanding and awareness of solar-based clean energy significantly improved, as evidenced by a 90% increase in participants' knowledge after the intervention. This success was primarily due to the effective methodology employed. The participatory outreach method,

combined with demonstrations using practical learning models (mockups), proved highly effective in transforming abstract technical concepts into concrete knowledge that is easily applicable to the general public. This effectiveness is further demonstrated by the exceptional 95% satisfaction rate with the material presented. This was significantly supported by the communicative use of Indonesian and the application of local wisdom relevant to the area where the activity took place.

More than simply transferring knowledge, this activity underscored the fact that energy literacy is a fundamental foundation for building an energy-conscious community that is empowered to face complex sustainability challenges. The program generated genuine interest, enabled mapping of real-world challenges specific to Cileles, and successfully sparked collaborative ideas for future solar technology implementation in the village.

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LIST OF REFERENCES

Adzikri, F., Notosudjono, D., & Suhendi, D. (2021). Strategi pengembangan energi terbarukan di Indonesia. *Jurnal Manajemen Teknologi, Universitas Muhammadiyah Yogyakarta.*

Bappenas, K. P. (2021). Peta Jalan SDGs Indonesia Menuju 2030.

Coyne, B., Lyons, S., & McCoy, D. (2018). The effects of home energy efficiency upgrades on social housing tenants: evidence from Ireland. *Energy Efficiency, 11(8)*, 2077–2100.

Iryanti, D. (2025). *5 poin utama Permen No. 10/2025: Transisi energi menuju net zero emission.* Environment Indonesia.

Mutaqqi, F., et al. (2025). Bahasa Indonesia dalam literasi energi. *Jurnal Studi Multidisipliner, 9(5)*, 112–130.

nn. (2017). *PERATURAN PRESIDEN REPUBLIK INDONESIA NOMOR 22 TAHUN 2017 TENTANG RENCANA UMUM ENERGI NASIONAL.*

nn. (2019). *PERATURAN DAERAH PROVINSI JAWA BARAT NOMOR 2 TAHUN 2019 TENTANG RENCANA UMUM ENERGI DAERAH PROVINSI JAWA BARAT TAHUN 2018-2050.*

Silalahi, D.F. Blakers, A., Stocks, M., Lu, B., Cheng, C., Hayes, L. (2021). Indonesia's Vast Solar Energy Potential. *MDPI Energies 2021, 14, 5424*.

Tunjung Wijanarka, Ni Nyoman Clara Listya Dewi. (2024). PERAN PEMERINTAH INDONESIA DALAM MENDORONG TRANSISI ENERGI MELALUI SOUTH-SOUTH AND TRIANGULAR COOPERATION. *Indonesia Journal of Intenational Relationship (ijir)*, 287-313.

Wahyu, S., Hariansyah, S., Lestari, M. D., & Sukma, P. (2022). Pembangunan Desa sangat tergantung pada adanya ketersedian sumberdaya manusia, finansial, fasilitas, dan energi yang sesuai kebutuhan. *Dedikasi: Jurnal Pengabdian Kepada Masyarakat*, 53-62.

Wahyuddin, K., Rohana, Roid, F., & Al Farizi, R. (2022). Edukasi pemanfaatan sumber daya listrik energi terbarukan pada masyarakat desa. *Mejuajua: Jurnal Pengabdian Pada Masyarakat, 3(1)*, 19-23.

Wan Mohamad, W. N. A., & Osman, K. (2022). A Systematic Literature Review on Citizen Awareness of Energy. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, 7(10), e001803. https://doi.org/10.47405/mjssh.v7i10.1803.

Yoice Ocktovina Soroeday, Rudy Laksmono, Irdam Ahmad, Ulul Azmi. (2024). PERAN MAHASISWA DAN AKADEMISI DALAM PENGEMBANGAN ENERGI TERBARUKAN UNTUK MENDUKUNG KETAHANAN NASIONAL. *Jurnal Ilmu Pengetahuan Sosial*.