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Solar-Powered Highschool Library Information System Design and Implementation

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Abstract: *A school library is important in education, especially in high schools to support day-to-day operations. The purpose of this community service is to develop and install a solar-powered Library Information System for the State Highschool No. 6 Cirebon (SMA Negeri 6 Cirebon), Indonesia, in which the existing library operations were done manually. First, for the library database server, a small-size Raspberry Pi is utilized with a SLiMS library automation system installed and run over the school's local network. Then, a sufficient energy resource is required to run the computer system; in this case, to support running the Raspberry Pi device. For this, a solar panel set-up is installed at the school to generate the electric power as the renewable energy resouce. Packages of solar panels with the battery are easily found in the online Indonesian marketplace, and this made the implementation of solar energy could become faster. In addition, a series of academic seminars is also held to support the library system operation as well as the school teachers.*

Introduction

Renewable energy is an alternative solution for today's various energy sources, and solar energy is one of them. Packages of solar panels with the battery are easily found in the online Indonesian marketplace, and this made the implementation of solar energy in Indonesia could become faster. Solar panel technology is widely implemented in lighting (Fadli et al., 2022), especially with LED lamps. Sufficient energy is required to run a computer system; in this case, adequate electrical power is required to support running a Raspberry Pi device.

A school library is important in education, especially in high schools. Multiple library

collections must be recorded and maintained to support day-to-day operations—existing library operations found in a manual system, from guestbooks to book circulations. A library management system was required to support all these library types of operations to make the school library easier to maintain.

SMA Negeri 6 Cirebon (State High School No. 6, Cirebon, West Java, Indonesia) is a public high school in West Java – Indonesia, and this was the first time for Sampoerna University to have a community service opportunity in this school. We provided a small-scale dedicated server in the form of Raspberry Pi with micro USB power (Raspberry Pi, n.d.) to be placed in the school library. This server had a SLiMS library automation system installed and run over the school's local network. SLiMS library system has many helpful features (Nugraha & Wicaksono, 2021) and has been implemented in some high school libraries (Loneli Costaner et al., 2020; Mahedy, 2015; Puteri et al., 2022; Suryanto, 2019) with different successful approaches.

Not only implementing the library system in the school, but academic seminars with two topics were also held to support the library system's soft launching. The launch of this library system encouraged all parties to continue developing the school library in a relatively not short period.

Method

This community service activity used a qualitative method with an Internet-based literature study and discussions with school library librarians, power experts, and library experts for about six months. Community service activities are shown in Figure 1.

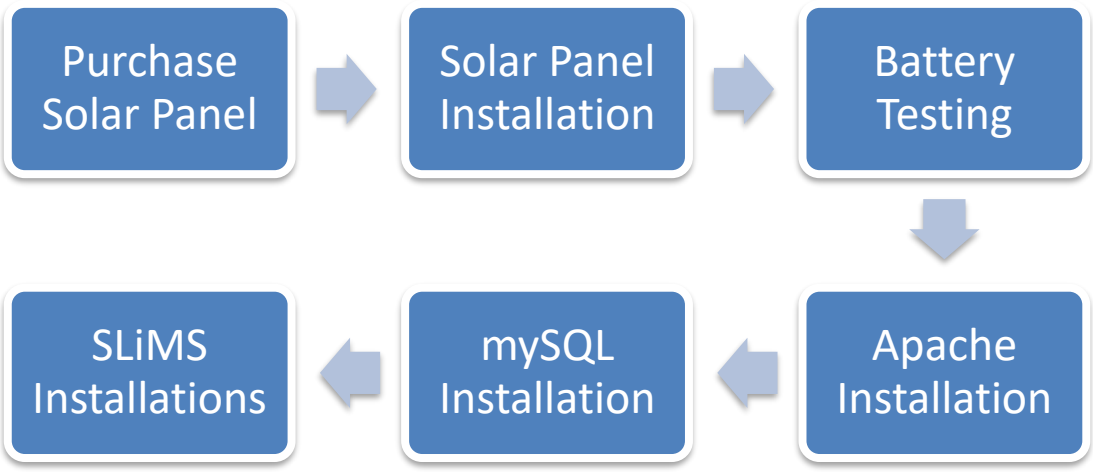

Figure 1. Community Service Activities

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We did some research for solar panels with adequate electricity input and output to support the Raspberry Pi device, and in between, require a battery to support the operations. We purchased one package of the solar panel and the battery after looking at the technical specification, especially the power output that can come from the USB port. The solar panel and the battery were purchased from one of the online marketplaces in Indonesia. Solar panel and battery tests are shown in Figure 2.

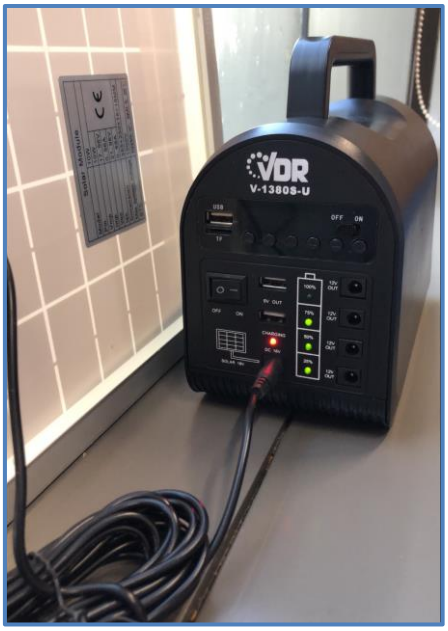

Figure 2. Solar Panel and Battery Tests

The solar panel with battery was then installed, and we did the solar panel and battery testing for about three days. After that, the Raspberry Pi device was then connected to the battery for power testing to ensure that the Raspberry device was stable enough to run the operating system.

The next step was installing the Apache and MySQL database on the Raspberry device operating system. Once these two have been completed, the library automation system is installed and configured. The students did these installation processes. After completing these installations and configurations, we did the system simulations on the Local Area Network. A laptop computer and the Raspberry device were connected to the wireless networks in the same C class IP address v4 network, as shown in Figure 3.

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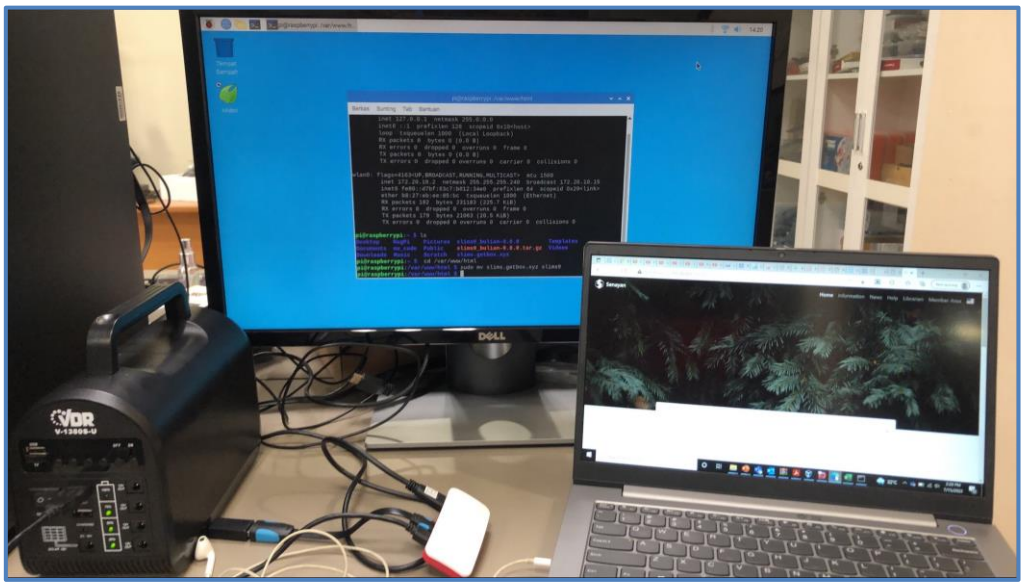

Figure 3. SLiMS Configuration and Testing

The browser on the laptop computer can access the web service in Raspberry Pi by seeing the screen of the SLiMS system. The library system was tested by accessing the main page system, searching some books, accessing administrator pages, adding sample users, adding sample books, and ensuring all features and functionalities worked well. The system was ready to be implemented in the school.

Result

The Library automation system has been successfully installed on a Raspberry Pi machine as a server. This device has been connected locally to the internal school library through the Local Area Network via wireless. A desktop PC as a client is currently connected to the server via a switch by wired for optimal connection. The Raspberry Pi machine currently has the power supply through the solar panel for primary and the existing electricity backup power through the PLN. Figure 4 shows the implemented library system in the school library.

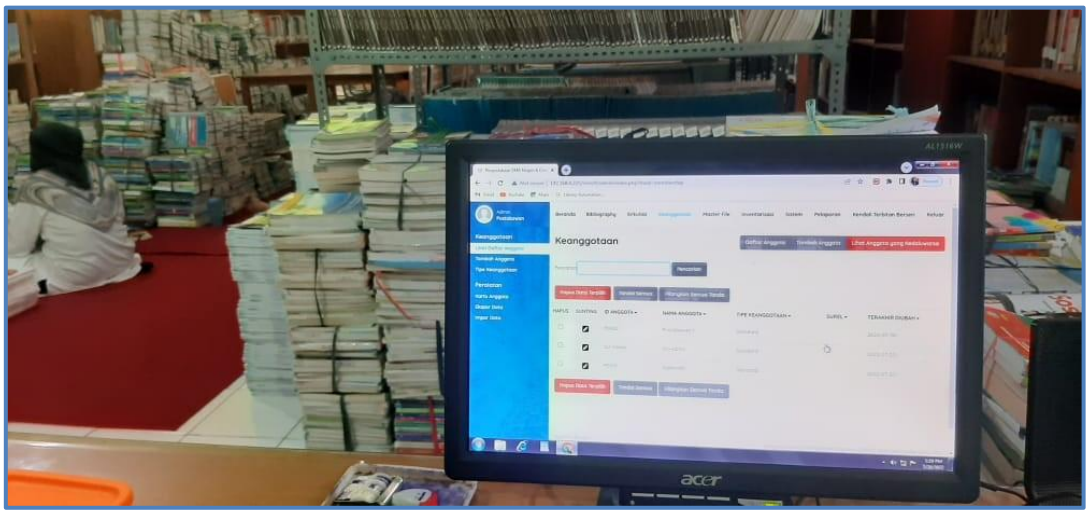

Figure 4. SLiMS System Implementation in the School Library

We also conducted a series of academic seminar during the library system launching event held in the spacious school teachers' room. The topics were: Application of Science and Technology on New and Renewable Energy in Indonesia and Learning Physics and Mathematics Through Web Simulation. Participants in this academic seminar were high school teachers as shown Figure 5.

Figure 5. Academic Seminars

Discussion

Table 1 shows the activities done in this community service program. The Raspberry Pi, Solar Panel, and barcode scanner have been procured and delivered to the school library. All hardware and software installations were also completed, as well as the the network testing. The solar panel with the library system was firstly implemented on July 19, 2022, and then launched on the next day, July 20, 2022, in the school library of SMA Negeri 6 Cirebon. The Library system launching was performed after the academic seminar on the same day as internal socialization to all teachers and school management. The launching event was carried out by cutting the yellow rice tumpeng, as shown in Figure 6. Therefore, all activities have been completed. As a future plan, a training program for the librarian to operate SLiMS Library System will be conducted.

Tabel. 1 Community Service Activities

#	Activity	Status
1	Procure Raspberry Pi	Completed
2	Procure Solar Panel Package	Completed
3	Download and Install Web Service and Database	Completed
4	Download and Install SLiMS Library System	Completed
5	Device and Network Testings	Completed
6	Placed Raspberry Pi and Solar Panel Package in Library	Completed
7	LAN Configuration and Client/Server Connection	Completed
8	Library System Launching	Completed
9	SLiMS Library System Training	Future plan

This library system launching and the two topics of the academic seminar were also covered by the local media and published in online news and on YouTube. Library assistance (Hasan Syaiful Rizal et al., 2022), a series of library development training (Noprianto & Rismayeti, 2021), and generating a manual book (Wandy et al., 2021) would be excellent future activities to improve the library services at school.

Figure 6. Library System Soft Launching Ceremony

Conclusion

The library infrastructure to support the library management system has been adequately set up, the server has already been configured, the network has been locally established, and the library management system has been implemented. It is currently running for book data input. In addition, a series of academic seminars had been conducted as part of the community service program at SMA Negeri 6 Cirebon.

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