Smart Cupboards at Community Learning Activity Center Wiyata Utama

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ABSTRACT

To address security issues at PKBM Wiyata Utama, the Mercu Buana University (UMB) community service team proposes replacing conventional lockers with smart lockers that use electromagnetic automatic lock technology and special codes. These smart lockers are connected to a microprocessor that controls access to the cupboard doors, allowing only authorized users to open them. The proposed solution aims to provide a safer and more reliable way to address locker security problems and will be shared through mass media and community service journals to raise awareness about the benefits of adopting Smart Cupboards. This initiative has the potential to improve the value system, promote the application of science and technology, and contribute to increasing security and tranquility while educating about positive values for collective progress.

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INTRODUCTION

The locker security issue at Community Learning Activity Center Wiyata Utama remains unresolved due to the continued use of conventional lock systems. However, the need for lockers is essential as the students are often busy and require a secure place to store their belongings. To address this, the proposal suggests replacing conventional lockers with smart lockers equipped with advanced security measures such as electromagnetic automatic lock technology, unique codes, fingerprint sensors, or smart cards. This innovative approach aims to significantly enhance locker security and reduce the risk of losing items. The proposed solution involves implementing smart cupboards that allow access only to authorized individuals within the premises of Community Learning Activity Center Wiyata Utama.

FIGURE 1. Overview of the smart cupboards on offer

Figure 1 illustrates the automatic lock integrated into each cupboard door. It utilizes a generated password after locking, allowing only those with the password to open and close the cupboard.
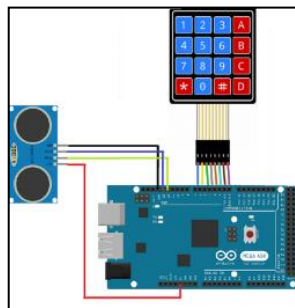

FIGURE 2. Block diagram of an electromagnetic lock

Figure 2 above depicts a block diagram of the cupboard keypad design. The diagram includes a Keypad, solenoid, and HC-SR04. The Keypad triggers the Arduino Mega 2560 to execute a command to open the device with a password, enabling the solenoid to open the cupboard door. The working principle involves connecting the input devices to the Arduino Mega 2560. The Keypad is connected to the Arduino Mega 2560 using a jumper cable, directly linked to the PWM pin on the Arduino Mega 2560, while the HC-SR04 is connected to the Arduino Mega 2560 (Solihati et al., 2020) on the Trig and Echo pins.
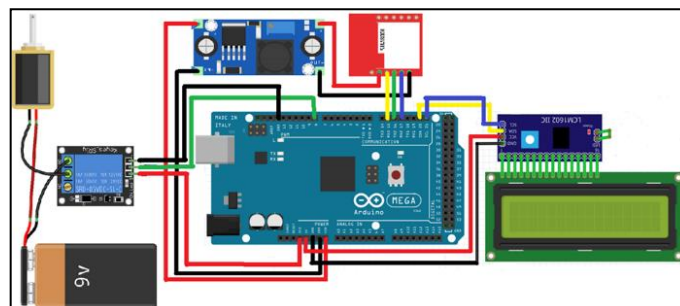

FIGURE 3. Hardware design for electromagnetic automatic locks

Figure 3 showcases the complete hardware output design, including the display on the LCD screen. The LCD displays a unique code representing the homeowner's characteristics awaiting a package of goods. Additionally, the LCD with additional I2C is connected to the SDA, SCL, 5V, and GND ports. The use of I2C, a serial IC component, helps conserve ports on the LCD and Arduino Mega 2560. This automatic lock theory is supported by research (Permana & Rohayati, n.d.; Putra et al., 2023; Rahadiansyah et al., 2021; Saputra et al., 2022; Sopyan & Noviansyah, 2023; Wicaksono & Talma, 2018).

The adoption of smart locker technology at Community Learning Activity Center is crucial for achieving several primary goals. It will significantly improve security by providing tighter and more efficient access control, ensuring the safety of items inside, and creating a sense of security for students and service users. Additionally, the implementation of smart lockers aims to create a sustainable learning environment, supporting learning infrastructure, and reducing the crime rate within the institution. Furthermore, this initiative targets increasing environmental awareness among school stakeholders, aiming to foster a sustainable culture and active participation from all parties.

METHOD

Figure 4 are the steps taken to solve this problem. First, the chairman and members of the implementation team discuss technology needs with partners and prioritize the most important problems to solve. Mapping the problems in West Java and develop a plan based on a survey that supports the smart cupboard system. Next, the implementation team creates a picture and plan for the smart cupboard and identifies the necessary equipment to purchase. Then the team assembles automatic locks and procures cupboards according to the plan. They also develop a code system to connect with users who receive a code to use.
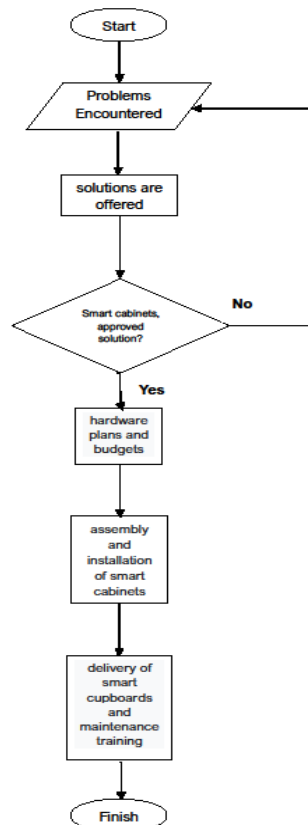
FIGURE 4. Flow diagram of smart cupboard community service activities

After finalizing the design, the team requests funds from and, upon receiving the funds, purchases materials and assembles everything. Smart cupboards are installed at the Community Learning Activity Center Wiyata Utama school, and a plan is made to inform students and staff about the installation and maintenance of the smart cupboards.

Partners are engaged to assess the progress of the activities, and reports such as posters, videos, and scientific articles are created. Students involved in the project receive a certificate and SKP points by documenting their work for ten days and maintaining a logbook, which is required for graduation.

The community service and partner participation plan involves several key stages and steps. In the first month, collaboration with the UMB electrical team and partners will be crucial. The second month will entail the purchase and installation of Smart Cupboards packages at Community Learning Activity Center Wiyata Utama by the Mercu Buana University community service team and partners. The third month will focus on smart cupboard installation training at Wiyata Utama, followed by report generation by the Mercu Buana University community service team in the fourth month. The subsequent four months will involve the PKM Journal publication process by the Mercu Buana University community service team as reference(Fidowaty et al., 2022; Silalahi et al., 2023; I. U. V. Simanjuntak et al., 2023).

On the training day, the morning will be dedicated to the smart cupboard inauguration event at the Community Learning Activity Center. The afternoon will feature various activities, including distributing questionnaires before training, module division, smart cupboard knowledge training, installation, and a question and answer session. The day will conclude with the distribution of questionnaires after training, sharing certificates, and a brief 20-minute meal break for eating together, followed by a group photo session.

RESULTS

The training activities will be held in person for one (1) day on Monday, 13 May 2024, commencing at 10:00 WIB and concluding at 17:00 WIB. Below, you will find figure 5 featuring photos from the activities.

FIGURE 5. Smart cupboard community service activities 13 May 2024

The activity proceeded smoothly and was well-received by the participants. Subsequently, a questionnaire was completed to enable the Mercu Buana University community service team to assess the activity upon its conclusion, as outlined in table 1.

TABLE 1. Questionnaire points

No.	Pernyataan	Skala Penilaian	
		Harapan	Kinerja
1.	Perencanaan pengabdian masyarakat yang dilakukan oleh para dosen UMB telah sesuai dengan kebutuhan para mitra pengabdian		
2.	Perencanaan pengabdian telah dilakukan sesuai standar K3 bagi mitra pengabdian		
3.	Pelaksanaan pengabdian dilakukan sesuai kaidah metode ilmiah		
4.	Pelaksanaan pengabdian dilaksanakan dengan memperhatikan K3		
5.	Hasil pengabdian sesual dengan perencanaan pengabdian		
6.	Hasil pengabdian sesuai dengan solusi yang diharapkan oleh mitra		
7.	Hasil pengabdian dapat dimanfaatkan secara maksimal		
8.	Pendanaan pengabdian telah dirasakan cukup memadai bila dibandingkan dengan hasil yang diharapkan		
9.	Penetapan tata kelola di Universitas Mercu Buana mampu menciptakan keunggulan yang kompetitif		
	Saran dan masukan dari Mitra: Skala Penilalan Harapan Kinerja		

After the successful completion of the opening community service event, participants were organized into pre-arranged training classes. These classes were conducted concurrently, maximizing the efficient use of time and resources. Both before and after the training, a comprehensive questionnaire was administered to assess the activity's impact based on specific criteria.

DISCUSSION

No.	Name	answers									score	Value
		1	2	3	4	5	6	7	8	9		
1	Respondents 1	4	4	3	4	3	3	4	4	4	33	91,67
2	Respondents 2	4	4	3	4	3	4	4	4	4	34	94,44
3	Respondents 3	3	4	4	3	3	2	2	2	3	26	72,22
4	Respondents 4	4	4	4	4	4	4	4	4	4	36	100,00
5	Respondents 5	4	4	3	3	4	4	4	3	3	32	88,89
6	Respondents 6	4	4	4	3	4	4	4	3	3	33	91,67
7	Respondents 7	4	4	3	4	3	4	4	3	4	33	91,67
8	Respondents 8	3	4	4	4	3	4	2	3	3	30	83,33
9	Respondents 9	2	1	2	3	4	3	3	4	2	24	66,67
10	Respondents 10	4	4	4	4	4	4	4	4	4	36	100,00
11	Respondents 11	4	4	4	4	4	3	4	4	4	35	97,22
12	Respondents 12	3	3	3	3	3	3	3	3	3	27	75,00
13	Respondents 13	3	3	3	3	3	3	3	3	3	27	75,00
14	Respondents 14	4	4	3	4	4	4	4	4	3	34	94,44
15	Respondents 15	4	3	4	4	4	4	4	4	4	35	97,22
									Rerata		31,67	87,96
									Min		24,00	66,67
									Max		36,00	100,00
									Std		3,90	10,84
									Var		15,24	117,58

Once the data was collected and processed, participant satisfaction was found to be 87.96%, with a minimum value of 24, a maximum of 36, a standard deviation of 10.84, and a variance of 117.58. The detailed results of the questionnaire are depicted in figure 6 below.
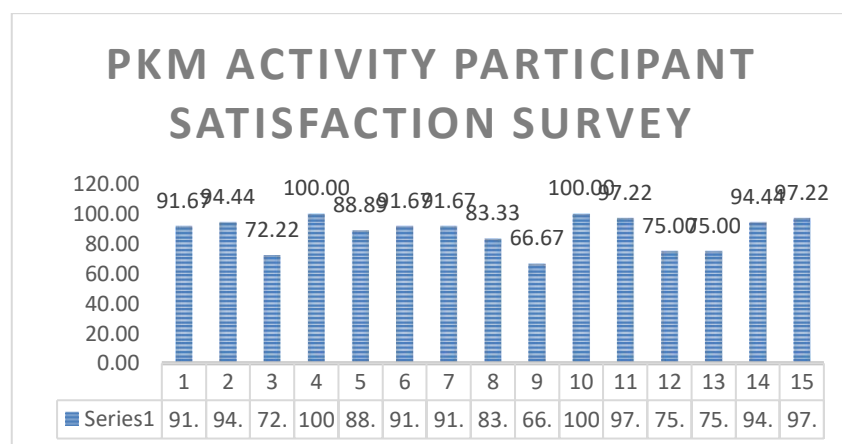

FIGURE 6. Participant questionnaire graph

The feedback received also emphasizes the desire for similar service programs to be conducted regularly within specific intervals, as they bring significant benefits to the local community.

CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation results of the " Smart Cupboards at Community Learning Activity Center Wiyata Utama" activity, several conclusions can be drawn. Participants demonstrated an understanding and ability to implement the working principles of automatic locks on lockers in school activities post-training. They also showed comprehension of the features of automatic key cupboards in public and private modes. Furthermore, participants displayed enthusiasm for using the automatic key cupboard application. Of all the training participants, 87.96% expressed satisfaction with the training benefits, despite the short duration. Among the eleven questionnaire points, less than 13.04% expressed dissatisfaction, attributing it to the challenge of grasping new technology in a limited time frame. Considering the numerous benefits for both participants and the Mercu Buana University community service team, it is vital to implement similar activities on a sustainable basis. It's worth noting that this activity has been ongoing for several years, as evidenced by the published activities (I. U. V Simanjuntak et al., 2022; Uli et al., 2022; Uli Vistalina Simanjuntak et al., 2022). Additionally, there is a recurring suggestion to extend the duration of the training to enhance the effectiveness of knowledge transfer. Increasing the number of trainers will facilitate more in-depth discussions and engagement among participants during training sessions. Extending the training duration and augmenting the number of trainers will notably enhance the depth of discussions and engagement among participants, ultimately resulting in more effective knowledge transfer.

ACKNOWLEDGMENTS

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