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Internet of Things Education Teaching and Learning Centre Harapan Bunda School Jakarta

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Abstract

The DC (Domestic Cooperation) CS (Community Service) program proposes IoT (Internet of Things) training, which aims to educate trainees to get to know the latest internet-based technology supported by accompanying instructors in their fields of expertise based on the approach of published research results, especially in electrical engineering, and conduct educational counseling on variations and models to support IoT. The training participants were students at TLC (Teaching and Learning Centre) in Harapan Bunda, Jakarta. Initial observations showed the participants' interest in IoT technology, so the contribution is support for improving the quality of skilled labor to be aligned with industry needs. This CS method includes showing the results of scientific publications, providing IoT material, simple coding training, and simple practice. This CS activity is expected to make the participants able to understand the concept of IoT and practice the application of IoT in everyday life. The measurement of the percentage of training success is a satisfaction survey questionnaire. The CS activity resulted in a satisfaction percentage of 93%, and it was hoped that the CS program could be carried out regularly and be of benefit to students who need additional skills as a future provision.

Keywords: Internet of Things, Coding, ICT, Education Training, Survey

INTRODUCTION

The concept of IoT (Internet of Things) is currently popularly discussed by practitioners and academics in the field of technology because it emphasizes the vision of a global infrastructure that connects physical objects using IP (Internet Protocol) so that it is possible to communicate and share information (Adriansyah et al., 2020; Budiyanto et al., 2020; Silalahi, 2021). IoT was first introduced by Kevin Ashton in 1999, referring to "uniquely identifiable objects and their virtual representations in internet-like structures", thus making him the inventor of IoT (Han, 2012; Uzelac et al., 2015). The continuous development into NoT (Networks of Things) proposed by Voas on a system built in IoT consisting of five (five) things, among others (Voas & others, 2016):

- Sensors are electronic components that measure physical properties such as sound (Budiyanto et al., 2022), weight (Budiyanto, 2021; Silalahi et al., 2019), humidity, temperature (Budiyanto, Silaban, et al., 2021; Silalahi, Jatikusumo, et al., 2022; Silalahi & Amnesta, 2021),

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and acceleration (Budiyanto et al., 2020; Silalahi, Ikhsan, et al., 2022). Sensors also transmit data such as RFID (Radio-Frequency Identification), Internet access, and/or can output data based on specific events (Kamble, 2022; Occhiuzzi et al., 2019).

- A communication channel is a medium for data to be transmitted, for example, a physical channel via USB (Universal Serial Bus), wireless, wired, and others. (Budiyanto, Silalahi, et al., 2021; Silalahi, Budiyanto, Silaban, et al., 2021).
- Aggregators are software applications based on mathematical functions that transform groups of raw data into intermediate aggregated data. Raw data comes from any source. Aggregators have two actors to consolidate large volumes of data into smaller amounts:
  a. Clusters are abstract groupings of sensors (along with the data they output) that can appear and disappear instantly.
  b. Weight is the ability of certain sensor data to influence the aggregator's computation.
- DT (Decision Trigger) is responsible for creating the final result required to fulfill certain NoT goals, specifications, and requirements. DT outputs can control actuators and transactions.
- E-Utility (External-Utility) is a hardware, software, or service product that executes processes or feeds data into the overall data flow of NoT.

IoT applications have been widely utilized in various fields such as medical services (Aileni et al., 2018; Maniktalia et al., 2022; Monge & Postolache, 2018), *smart retail*, customer service (Silalahi, Budiyanto, Simanjuntak, et al., 2021), *smart home* (Mayub et al., 2019), environmental monitoring, etc. Nowadays, the concept of IoT has been implemented everywhere into the latest learning in every vocational school and academic institution that includes the concept of IoT in its learning curriculum due to the need for skilled human resources who are able to compete and have competitive skills to face the rapid development of technology.

Then, based on the results of the situation analysis, it was observed that TLC (Training and Learning Centre) Harapan Bunda Jakarta needs the support of computer devices for learning facilities. In general, a computer is a set of electronic devices that connect materials to each other to produce information. Based on the situation analysis, the addition of computer equipment is needed so that students can obtain digital data-based information. Figure 1 shows on-site learning.

Source: Lukman (2023)

Figure 1. TLC Harapan Bunda Jakarta Learning Atmosphere

Partners who collaborate to carry out this CS (Community Service) are students, teachers, and staff of TLC Harapan Bunda Jakarta. As the partner's request to improve students' knowledge and competence in Microcontroller and Electronics subjects, he submitted a request

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for knowledge sharing on IoT Education Training and Survey at TLC Harapan Bunda School Jakarta as a provision for student competence to face the era of industrial automation. The target audience is 5–10 people. From the description of the situation analysis above, the formulation of the problems faced by partners includes:

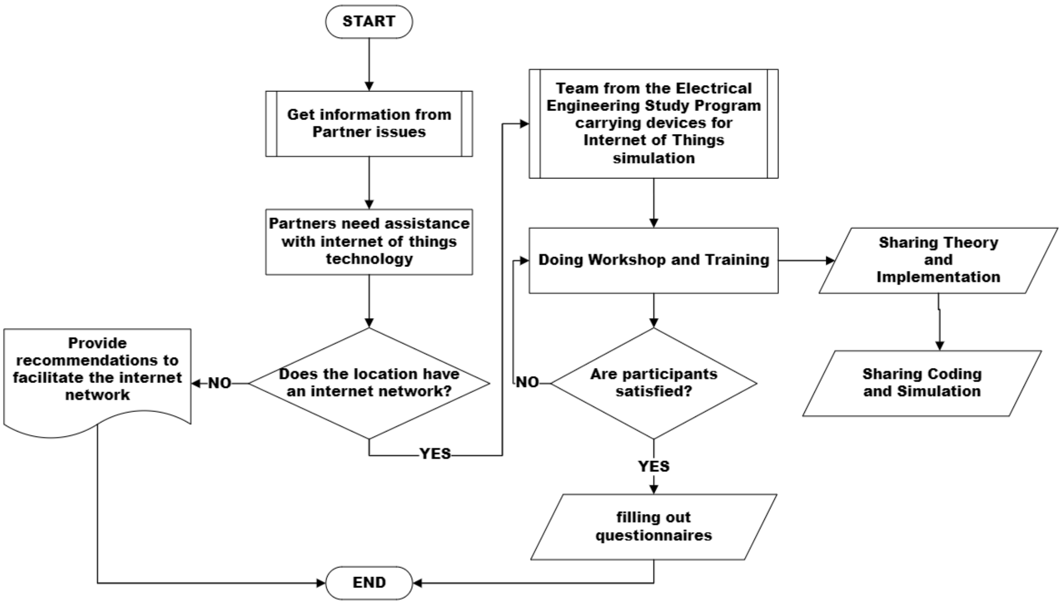
- It is necessary to provide positive and useful activities for students, teachers, and staff towards the understanding and insight of science and technology.
- It is necessary to provide knowledge about IoT using Arduino IDE tools and simple design.
- Simple project-based coding skills are needed to foster the interest of CS participants.

The benefits of this CS for Harapan Bunda Jakarta TLC participants in terms of service quality are, of course, this training supports a skilled community and prepares resources to face the AEC (ASEAN Economic Community) tailored to their talents and interests.

METHOD

In order to provide education to the community about Internet of Things Education Training and Survey at Teaching and Learning Centre Harapan Bunda School Jakarta, the solution design method (Figure 2) offered are:

- Stimulate students' interest in the field of electrical technology based on the application of research results and simple practical training.
- In this workshop, participants are expected to understand the theory and working principles of IoT. Then, understand the coding script displayed and perform a simple simulation of the displayed code.



Source: Lukman (2023)

Figure 2. Flowchart method

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Location and Time of Implementation

CS is held in 1 (one) day *offline,* on Tuesday, 13th June 2023 from 07.30 – 17.00 WIB. TLC Harapan Bunda is located at Swadarma Raya Street No.15, RT.7/RW.3, Srengseng, Kembangan, West Jakarta.

Target Audience

The participants of this training are the students of TLC Harapan Bunda Jakarta. It is expected that the participants will feel the impact of changes in the learning system using computer devices.

Type of Activity

The types of activities carried out are exposure to the concept of Internet of Things, carrying out practicum based on kits that have been designed and evaluation of this PPM activity, while the stages of CS activities are clearly explained as follows:

- Participants enter the classroom and obtain the module, and fill in the training attendance form.
- Theoretical explanation of the Internet of Things brought by the PPM team speaker.
- Division of groups to perform a simple coding simulation.
- Question and answer session, filling out questionnaires, and giving training certificates.

Activity Method

The method used in this service is the PAR (Participatory Action Research) method. This method combines research with sustainable action to provide alternative solutions to problems faced by partners. It is hoped that through this training it can solve partner problems to accelerate the ability of students pursuing packages A, B, and C PKBM Harapan Bunda so that graduation is in accordance with the limited time duration and support the skills of graduates in the world of work in the era of industrial technology 4.0. The expected output is that before and after the training a questionnaire will be conducted and see the difference in knowledge about the Internet of Things (IoT).

Activity Technique

Table 1 shows the techniques of the Internet of Things Education Training and Survey at Teaching and Learning Centre Harapan Bunda School Jakarta.

Table 1. Community Service Programme Activity Technique

	Description
1	Opening of CS activities in the field of Electrical Engineering and opening remarks: (duration: 30 minutes) 1. Remarks by the Head of the West Jakarta Region II Sub-Department: Mr Junaedi 2. Remarks by the Principal of TLC Harapan Bunda Jakarta: Mrs Robi'ah, S.Pd., MM 3. Remarks by the Head of the Electrical Engineering Undergraduate Study Programme of Universitas Mercu Buana: Dr Eng. Heru Suwoyo, ST, M.Sc
2	Computer handover (duration: 10 minutes)
3	Profile Presentation of Mercu Buana University's Electrical Engineering Undergraduate Study Programme (duration: 40 minutes)

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4	Photo with the Head of the Electrical Engineering Undergraduate Study Programme of Mercu Buana University, Electrical Engineering Lecturers of Mercu Buana University, Principal of TLC Harapan Bunda, TLC Harapan Bunda Students, Electrical Engineering Undergraduate Students of Mercu Buana University and Head of Region II West Jakarta (duration: 20 minutes)

Science and Technology Transfer

Science and Technology dissemination technique on Internet of Things Education Training and Survey at Teaching and Learning Centre Harapan Bunda School Jakarta are:

- Presentation of the CS module to trainees consisting of history, model, and application.
- The Internet of Things training was very enthusiastic as shown in figure 2.

Figure 2. IoT Workshop, Source: Lukman (2023)

RESULT AND DISCUSSION

Activity Result

The CS activity has been successfully implemented offline at TLC Harapan Bunda Jakarta which is shown in Figure 3. The event began with remarks from Mrs Robi'ah, S.Pd., MM as the Principal of TLC Harapan Bunda Jakarta, then remarks from Dr. Eng. Heru Suwoyo, ST, M.Sc as the Head of the Electrical Engineering Undergraduate Study Programme of Universitas Mercu Buana, and Mr Junaedi as the Head of West Jakarta Region II.

Figure 3. Activity Result, Source: Lukman (2023)

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Discussion

After the opening ceremony, then the division of participant groups according to the training classes that have been divided with the training program arrangement shown in table 2.

Table 2. Training Schedule

No	Activity	PIC
1	Workshop (duration: 60 minutes) 1. Introduction: History dan Definition 2. References Model 3. Benefit and Applications	CS Team Universitas Mercu Buana: 1. Imelda Uli Vistalina Simanjuntak 2. Agus Dendi Rochendi 3. Lukman Medriavin Silalahi
2	Questionnaire Filling (duration: 20 minutes)	Harapan Bunda Jakarta TLC Training Participants
3	Certificate Distribution (duration: 20 minutes)	Harapan Bunda Jakarta TLC Training Participants
4	Photo with training participants (duration: 20 minutes)	CS Team Universitas Mercu Buana and Harapan Bunda Jakarta TLC Training Participants

Based on the comparison of CS activity activities, it is referenced from (Simanjuntak et al., 2022, 2023). This activity is a series carried out by the team to introduce the sophistication of IoT technology.

The results of the questionnaire that has been filled in by the trainees, then analysed by the CS lecturer team at Universitas Mercu Buana, which is shown in table 3 below. The results of data processing resulted in a satisfaction of 93% with a min value. 78, max.100, standard deviation of 3.49 and variance of 12.1.

Tabel 3. Questionnaire Results

No	Nama	Questionnaire Points											Score	Value (%)
		1	2	3	4	5	6	7	8	9	10	11		
1	Respondent 1	5	5	5	5	4	5	4	5	4	5	5	52	94,5454
2	Respondent 2	5	5	5	5	5	5	4	5	4	5	5	53	96,3636
3	Respondent 3	5	5	5	5	5	5	5	5	5	5	5	55	100
4	Respondent 4	5	5	5	5	5	5	5	5	5	5	5	55	100
5	Respondent 5	5	5	5	5	5	5	5	5	5	5	5	55	100
6	Respondent 6	5	5	5	5	5	5	5	5	5	5	5	55	100
7	Respondent 7	5	4	4	4	3	4	5	5	5	4	5	48	87,2727
8	Respondent 8	5	5	5	5	4	5	5	5	5	5	4	53	96,3636
9	Respondent 9	5	5	5	5	4	4	4	5	5	5	4	51	92,7272
10	Respondent 10	5	5	5	5	5	5	5	5	5	5	5	55	100

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No	Nama	Questionnaire Points											Score	Value (%)
		1	2	3	4	5	6	7	8	9	10	11		
11	Respondent 11	4	4	4	5	2	4	4	4	4	4	4	43	78,1818
12	Respondent 12	5	5	5	5	4	4	4	5	4	5	5	51	92,7272
13	Respondent 13	5	5	5	5	5	5	4	5	5	5	5	54	98,1818
14	Respondent 14	5	5	5	5	5	5	4	5	5	5	5	54	98,1818
15	Respondent 15	5	5	5	5	5	4	4	4	4	4	4	49	89,0909
16	Respondent 16	5	5	5	5	5	5	5	5	5	5	5	55	100
17	Respondent 17	5	5	5	4	4	5	5	4	4	5	5	51	92,7272
18	Respondent 18	5	5	5	5	4	5	5	5	4	5	5	53	96,3636
19	Respondent 19	4	4	4	4	5	5	4	4	4	4	4	46	83,6363
20	Respondent 20	5	5	4	4	4	4	4	5	4	4	4	47	85,4545
21	Respondent 21	4	4	5	4	5	5	4	4	4	4	5	48	87,2727
22	Respondent 22	4	5	5	5	4	5	4	4	4	4	4	48	87,2727
23	Respondent 23	5	5	4	3	4	3	3	4	3	5	4	43	78,1818
24	Respondent 24	4	5	5	5	4	5	4	5	5	5	5	52	94,5454
25	Respondent 25	4	5	5	4	4	4	4	4	4	4	4	46	83,6363
26	Respondent 26	4	5	5	4	4	5	3	5	5	5	5	50	90,9090
27	Respondent 27	4	5	5	5	5	5	5	5	5	4	4	52	94,5454
28	Respondent 28	5	5	5	5	5	5	5	4	4	4	4	51	92,7272
29	Respondent 29	4	5	5	4	4	4	5	5	5	5	5	51	92,7272
30	Respondent 30	5	5	5	5	5	5	5	5	5	5	5	55	100
31	Respondent 31	5	5	5	4	3	5	5	5	5	5	5	52	94,5454
32	Respondent 32	5	5	5	4	5	5	4	5	5	5	5	53	96,3636
33	Respondent 33	4	4	4	4	4	5	4	5	5	5	4	48	87,2727
34	Respondent 34	5	5	5	5	5	5	5	5	5	5	5	55	100
35	Respondent 35	5	5	5	5	5	5	5	5	5	5	5	55	100
											Average		51,2571	93,1948
											Max		43	78,1818

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No	Nama	Questionnaire Points											Score	Value (%)
		1	2	3	4	5	6	7	8	9	10	11		
											Min		55	100
											Deviations		3,49236	6,34976
											Variance		12,1966	40,3194

CONCLUSIONS

Based on the evaluation results of community service activities carried out offline, it can be concluded that the training participants can understand and successfully implement the use of IoT, participants are also active in discussions to gain an understanding of the definition, history, and variety of applications. The results of the questionnaire showed that 93% of participants were satisfied with the benefits of the training, however, 7% of participants were not so satisfied. This is due to the short time to understand a new technology. Suggestions for future community service activities are the implementation of training provided in a series in a span of more than 1 day with material and difficulty levels from easy to intermediate.

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