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The Training of Implementing Artificial Intelligence, Machine Learning and Big Data in Cloud Computing

GALURA MUHAMMAD SURANEGARA, ASEP KURNIA JAYADINATA, GIA NIKAWANTI, ICHWAN NUL ICHSAN, REZA NURFAUDZAN ASH SHIDDIQ, MUHAMMAD IQBAL FAUDZAN, MUHAMMAD WILDAN SYAIFULLAH, ABDUL KHEQAL, HANE YORDA DINATA

Universitas Pendidikan Indonesia
E-mail: galurams@upi.edu

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ABSTRACT

Disruption is an inevitable consequence of rapid technological advancements. It occurs when existing human resources struggle to keep pace with the swift evolution of technology. One effective way to address this issue is by organizing training sessions aimed at enhancing skills. The Telecommunications Systems Study Program successfully held a training event designed to improve participants' skills, particularly in technology. The participants, including students from vocational high schools (SMK), expressed high levels of satisfaction with the event. The topics covered ranged from cloud computing, artificial intelligence, machine learning, to big data. The training did not merely provide theoretical knowledge but also included practical applications. This community service activity was organized by students serving as the event infrastructure team, with faculty members leading the event as the organizing committee. The participants were students from ten different vocational high schools (SMK) and took place over a period of one day, from 8 AM to 3 PM. Thanks to this training method, the student development significance value reached 33%.

Keywords: *community service, cloud computing, artificial intelligence, machine learning, big data*

1. INTRODUCTION

Current technological developments are at a stage that is causing disruption (**Prasetio, 2022).** This disruption occurs because existing human resources cannot keep up with the speed of technological development **(Yalenios & d'Armagnac, 2023).** This condition occurs globally and applies to developing countries like Indonesia. Purwakarta, one of the districts in Indonesia, has not escaped the impact of the disruption. Purwakarta is also building an intelligent city integrating information and communication technology into government governance and public services **(Gatiningsih, G, 2019).** This effort requires mastery of new technologies.

Technology that causes disruption usually leads to efficiency, productivity and innovation. The technology can generally be implemented in several different fields. So, some technologies that should be mastered are artificial intelligence, cloud computing, machine learning and big data **(Kumar Pani et al., 2022; Puttonen et al., 2019; Silva et al., 2014; Wunderlich et al., 2021).** These technologies encourage efficiency, productivity and innovation and can be applied in several fields. Then, to determine who should be given priority to master these technologies, the answer is students currently at the secondary level, such as high school or vocational school. Because at this level, the students are of working age **(BPS Purwakarta, 2024).** So, in this context, students' mastery of technology becomes crucial. Apart from disruption, students need to master artificial intelligence, cloud computing, machine learning, and big data due to increasing global investment in technology and services, widespread use of artificial intelligence in various fields, and the need to create a skilled workforce **(Chun et al., 2024).** The development of human resources in the technology field must start with secondary-level students because they are the future workforce who will drive innovation and progress. By equipping students with educational technology skills such as artificial intelligence, cloud computing, machine learning and big data, they can effectively become experts in utilising technological tools **(Suranegara et al., 2023).** This will not only improve their learning outcomes but also prepare them to contribute significantly to society's progress.

To develop the competence of intermediate-level students in this field, the UPI Campus Telecommunication Systems Study Program in Purwakarta carries out Community Service activities through training activities **(Mallik et al., 2023).** The training was entitled "Cloud Computing Fundamentals Training Program: AI, ML and Big Data". This training aims to accelerate technology mastery among students and increase secondary school students' literacy about cloud computing technology, especially in applying AI, ML technology and Big Data management. Hopefully, this training can bridge the existing technology gap, strengthen familiarity with technology, and deepen students' knowledge of technology.

2. METHODOLOGY

In this training, the participants were students from ten different vocational high schools (SMK) and took place over a period of one day, from 8 AM to 3 PM. Participants were given one day of training using the Google Cloud Computing Foundation (GCCF) platform. Each participant receives a module that is provided as the leading guide in the work process to help them understand the basic concepts of GCCF. This module is also intended as a practical guide and tool to guide participants in carrying out the practices provided by the mentor.

2.1 Preparation

At this stage, preparations are made to support the implementation of the following training activities:

a. Create practicum modules to facilitate training.
b. Determine and collaborate with schools as partners to organise PkM activities.
c. Determine the location and date of PkM implementation.
d. Involving students in implementing PkM.
e. Making invitation letters to schools and other stakeholders
f. Make design related works
g. Visits to invited schools also confirm their presence.

2.2 Implementation Evaluation

To evaluate this event, a survey was carried out at the event for participants. A satisfaction questionnaire was made for participants who had taken part in the training. The questionnaire contained an explanation of the objectives and provided material regarding cloud computing training. Questions were given to participants on a Google form at the end of the event. It is hoped that the results of this questionnaire will provide input for us to serve community service participants better in the future.

3. RESULTS AND DISCUSSIONS

3.1 Preparation

The community service team invited 20 participants from 10 middle and upper secondary schools in Purwakarta district, West Java, with a composition of two participants from each school. The initial preparation consists of two stages; the first stage consists of five steps. The first step is preparing the design and material requirements regarding cloud computing: AI, ML and Big Data. The material provided is designed to be easy to follow, so participants only need to follow the steps in the module. Second Determining the location, implementation date and rundown of the community service event. For efficiency reasons, the training was held on the UPI Purwakarta campus. Meanwhile, the date for implementing this training activity was determined as July 2, 2024. Third Recruiting an additional committee of 10 students to help organise this training event from preparation to completion of the event. Some students are involved as assistant instructors, and others support the smooth running of events in other fields. Before the training is carried out, the associate instructor is provided with special training so that he is ready to be involved in the training. The training provided is in the form of material regarding the fundamentals of cloud computing on the Google Cloud Platform, especially the Artificial Intelligence, Machine Learning and Big Data sections, which is supported by Google's SEA Adoption Manager Cloud Curriculum, namely Mrs Siti Malina. Fourth, determining the schools that were invited, in this case, the closest schools around the UPI Purwakarta campus were chosen for the reason that the schools in the district city are the top schools in the district, so it is not too challenging to be able to apply cloud computing fundamentals on Google Cloud Platforms. Some of the schools we invited were SMKN 1 Purwakarta, SMKN 2 Purwakarta, SMKN Jatiluhur, SMK Informatics Pasundan, SMK Bina Kerja, SMK Kota Ilmu, SMK YPK Purwakarta, SMKN 3 Sukatani, SMKS Purnawarman and SMKN 3 Linggabuana. And the last is mobilization of students who help carry out community service activities.

After the five activities have been completed, the second preparation stage is as follows:

1. Send invitation letters to schools, notification letters and invitations to the director of UPI Purwakarta, and notification letters to security officers and cleaning officers.
2. Socialization was carried out regarding the training event, and invitation letters were given to the ten schools.
3. Contact the schools that have been invited again to obtain confirmation of their attendance. Of the ten schools we asked, one school suddenly confirmed that it would only bring one representative because the other representatives could not attend.
4. Create certificates for participants, organisers and the committee. Next, design banners, backdrops, ID cards and training modules.

3.2 Implementation

After the preparation process, the next stage is implementation. The activity will be held one day on July 2 2024, at the Smart Classroom at UPI Purwakarta campuses. This activity started at 08:00 WIB with an official opening by the Director of UPI Purwakarta, Prof. Dr.

Yayan Nurbayan M.ag (Figure 1a), and continued with remarks by the Head of the Telecommunication Systems Study Program, namely Galura Muhammad Suranegara MT (Figure 1b) attended by a total of 10 middle and above schools consisting of 19 students, two students in each school.

(a) (b) (c)

Figure 1. Documentation of the opening event
(a) opening by the director; (b) welcome from the head of the system program; (c) participants present

Next, brief material was given regarding introducing the telecommunications systems and cloud computing study program by the Head of the Telecommunications Systems Study Program, namely Galura Muhammad Suranegara, S.Pd., MT (Figure 1b). This initial provision is essential so that participants recognise and understand the system being practised in this PkM activity. The material presented in the initial session was the History of the Telecommunications Systems Study Program, which was given to introduce the Telecommunications Systems Study Program and Introduction to Cloud Computing (figure 1c).
In the second session, participants were given a GCCF account and directed to log in by mentors. 4 assistants assist the mentor; they are students who are assistants to the head of the telecommunications systems study program (Figure 2a). Practical activities include solving problems provided by the GCCF platform (Figure 2c) and solutions to these problems. To make practicum easier, participants are provided with modules that have been prepared by the instructor (Figure 2b).

(a) (b) (c)

Figure 2. Documentation of training events
(a) Providing an account by the instructor (b) modules given to participants (c) GCCF work

The activity was closed by the Head of the Telecommunications Systems Study Program, namely Galura Muhammad Suranegara, S.Pd., MT, who also symbolically gave training certification to one of the participants. This handover was carried out by the Chief Executive

accompanied by the Head of the Systems and Systems Study Program. It is hoped that the schools that have been invited will understand the material provided.

3.3 Evaluation

To find out the responses of participants who have taken part in cloud computing training activities [AIMLAB], a questionnaire, pretest, and posttest stage was carried out for students before the last event (photo documentation session). With this evaluation questionnaire as shown in table 1-6, community service implementers get two types of data: quantitative and qualitative. There are a total of 12 (twelve) questions in the questionnaire where the answers only contain numbers, namely 1 (one) to 4 (four), with the following information: scale 1 = very dissatisfied, scale 2 = dissatisfied, scale 3 = satisfied, scale 4 = very satisfied. The questionnaire covers 3 (three) main aspects, namely material content, material delivery and practical activities. The next stage is a pretest and posttest, each consisting of 14 (fourteen) questions, which are carried out before and after the training session, including presentation material. It aims to measure initial understanding for participants who participated in training events and increase understanding after attending cloud computing training. For quantitative data, with total of 19 participants will have maximum score if the total answer is 4, which is 76 or a maximum percentage of 100%. Meanwhile, the total score obtained depends on the participants participating in the cloud computing training. If all participants score 1, the lowest number is 24, or the minimum percentage is 25%. So, the difference between the maximum and minimum percentages is 75%.

Table 1. Questions in the Questionnaire

Question	Average	Average per category
The training theme (Cloud Computing) was interesting to me	82.89	85.75
I feel that the Cloud Computing training material is fascinating to me	85.53	
Training materials are well-organized	89.47	
The training material suits my needs	80.26	
In my opinion, the instructor's time allocation for delivering the material is sufficient	86.84	
The training material is concise and clear, providing a sufficient understanding of Cloud Computing in a short time.	89.47	

Table 2. Questions in the Questionnaire

Question	Average	Average per category
The instructor mastered the material presented.	88.16	88.16
In my opinion, the time allocation for delivering material by the instructor is sufficient	84.21	
The instructor delivers the material well, and it is easy to understand and follow.	88.16	
The instructor provides discussion and provides feedback well	92.11	

Table 3. Questions in the Questionnaire

Question	Average	Average per category
The modules provided are of good quality	81.58	86.51
Modules are easy to understand.	85.53	
Assistant instructors support practical activities well	94.74	
In my opinion, the time allocation for practical activities is adequate.	84.21	

Table 4. Questions in the Questionnaire

Question	Average	Average per category
The training theme (Cloud Computing) was interesting to me	82.89	85.75
I feel that the Cloud Computing training material is fascinating to me	85.53	
Training materials are well-organized	89.47	
The training material suits my needs.	80.26	
In my opinion, the instructor's time allocation for delivering the material is sufficient	86.84	
The training material is concise and clear, providing sufficient understanding of Cloud Computing in a short time	89.47	

Table 5. Questions in the Questionnaire

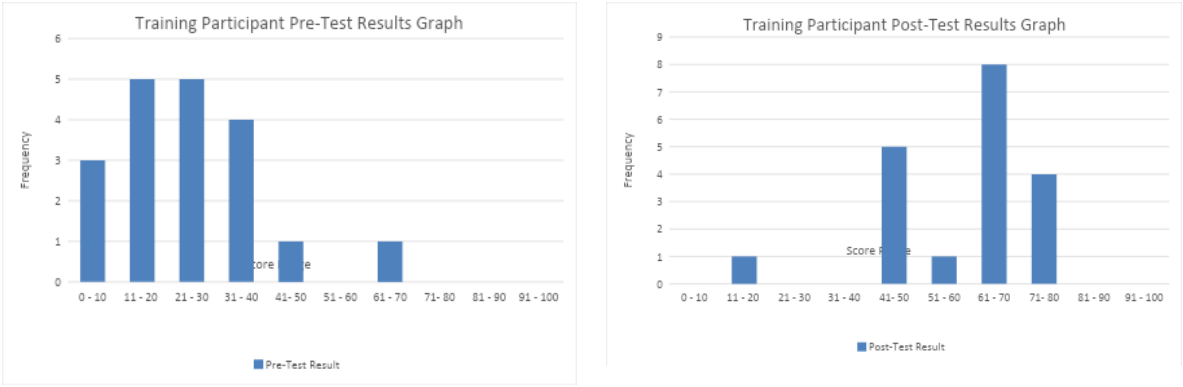
Question	Average	Average per category
The instructor mastered the material presented.	88.16	88.16
In my opinion, the time allocation for delivering material by the instructor is sufficient	84.21	
The instructor delivers the material well, and it is easy to understand and follow.	88.16	
The instructor facilitates discussions and provides feedback well.	92.11	

Table 6. Questions in the Questionnaire

Question	Average	Average per category
The modules provided are of good quality	81.58	86.51
Modules are easy to understand.	85.53	
Assistant instructors support practical activities well.	94.74	
In my opinion, the time allocation for practical activities is adequate.	84.21	

Our team implemented each question having a weight of 10 points for a total of 14 questions. The results of this analysis show that participants tend to get low scores, with an average score of 44 points and the lowest score being 10 points, while only a few participants have high scores by getting points. 110. These findings indicate significant variations in understanding before the learning material is carried out. The data diagram

shows a significant increase from the previous pretest results after presenting the material and carrying out practical activities in cloud computing training. Our analysis indicates that most participants obtained the highest score 140 points, with an average score of 100 points. Hence, this data shows significant changes and success in increasing the assessment from before presenting the material and carrying out practice. Although some obtained low scores with an average of 20 points, most participants had shown significant progress in mastering the material tested as shown in figure 3.



(a) (b)

Figure 3. Test Result Graph
(a) Pre-test results graph; (b) Post-Test Results Graph

Meanwhile, qualitative data was obtained from participants in the form of essays. Participants can write down things that are important to the participants but are not included in the twelve items available in the questionnaire, such as consumption, understanding of the instructor/committee, affordability of the training venue, facilities, etc. Then, participants can also fill in suggestions to improve the implementation of similar training. The following is some excerpt sample from the responses from the participants:

1. To be further improved in all aspects but it is already quite good;
2. Explaining the material too quickly, I suggest explaining the material more slowly;
3. Learning time in training is too fast; suggestions for improving the way the material is presented so that it is easier to understand;
4. I think participating in cloud computing training provides a lot of knowledge. I hope that UPI students can hold seminars again because the event was beneficial;
5. I think cloud computing training is quite understandable because the instructor also understands the material. Moreover, some modules make cloud computing training easier.

Based on community services review of the participants' entries, this training activity was perfect in terms of providing material and direct practice (although some suggested not to be too quick in explaining the material), but what was evaluated was time management. The PkM team had previously provided a schedule for the event. Still, there were problems from the participants and committee during the training, which took quite a long time when providing a Gmail account to provide material and practice, so the committee was a little quicker in explaining the material to the cloud computing training participants. Meanwhile, criticism and suggestions sample from participants (without adding or subtracting from what they wrote) are as follows:

1. Another level in terms of aspects;
2. nothing, I LIKE IT THANK YOU;
3. Very exciting;
4. attractive and easy to understand;
5. There is no criticism because UPI is the best.

Overall, the participants' suggestions provided positive things to PkM implementers, such as providing more time for training, hoping that this training activity would be longer so that cloud computing training participants could run well and give a more mature understanding to participants.

3.4 Evaluation

This cloud computing training event was able to run smoothly with the support of the UPI Purwakarta campus, the Deputy Director of the UPI Purwakarta campus, and the Head of the Telecommunications Systems Study Program, with all participants from Vocational High Schools (SMK) in Purwakarta who were enthusiastic about the supported cloud computing training activities with an adequate internet network available in the network laboratory, and learning platform support provided by Google. The results of the report have been published via online print media (https://bericepat.com/upi-purwakarta-cepat-ahli-cloud-computing-dengan-politik-google-cloud) and published in the headline of the offline media Pasundan Ekspres on July 3 2024. However, several things are inhibiting factors, namely limited access time for laboratory work on the Google platform, so cloud computing training participants are limited in exploring the details of building cloud computing infrastructure. This can be used as an evaluation by the training organising committee.

4. CONCLUSIONS

From the results obtained, it can be concluded that the Telecommunication Systems Study Program has successfully carried out Community Service activities. It was also concluded that students' skills can be developed practically through training activities that involve direct practice compared to only using a theoretical approach. The significance of training on student skill development is around 33%.

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