

Speedtest and Ekahau Site Survey Application Training in West Jakarta Schools 2021

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ABSTRACT

The number of complaints from students at the PKBM Wiyata Utama school in West Jakarta when accessing the internet in the library, especially during exams, is quite disturbing because it can impact their graduation. Therefore, teachers and educators in these schools need assistance to improve the performance of the access points (APs) installed and provide a good performance tailored to the school's needs. Therefore, the service team from the electrical engineering study program at Mercu Buana University (UMB) collaborated with the UMB Community Service team to improve internet quality in the Wiyata Utama PKBM school library by providing training on AP optimization application software, namely Speedtest and Ekahau site survey. Then follow with the socialization of the basics of calculating the link budget in installing an AP, then continuing with the practice of software simulation and implementation in the library. It is hoped that through this training, students at school will understand and be able to apply the knowledge of AP performance optimization for good internet quality outside the school environment. And, of course, the initial goal so that the teaching and learning process and the implementation of the exam can run well.

Keywords: Speedtest, survey Ekahau site, Access Point, PKBM Wiyata Utama library

INTRODUCTION

The presence of the industrial revolution 4.0 has brought the teaching and learning process to migrate to the digital era. Data speed requirement has become a necessity for everyone. Many studies and community service programs have supported distance learning with different platforms. As has been done by several service teams as follows: using Augmented Reality-Based Interactive Learning media among elementary school children in Bekasi (Arrum & Fuada, 2021), Application of Lectora Inspire for Elementary School Teachers in Kuningan Regency (Sutarna et al., 2021), and implementing a Village Information system to Improve Digital Literacy Skills in Taman Sari Village (Praseptiawan et al., 2021).

However, everything will not have a maximum effect if the modem access point (AP) installed at home, school, office, or a larger network does not support it (AP performance is not optimal). It is necessary to plan link budget calculations To get good AP performance. The AP specifications installed follow the room's conditions to be covered by increasing the RSL (Receive Signal Level) parameter.

Based on the indoor and outdoor coverage area, the performance of the AP is also determined by the obstacles during transmission. Titahningsih et al. (2018) calculated the link budget of the Wi-Fi network on passenger trains (Indoor) (Titahningsih et al., 2018). Furthermore, Mursidan et al. (2021) also calculated the microwave radio link budget (Outdoor) for the line of sight (LOS) and non-line of sight (NLOS) channel conditions in Mangge Village, NTB Province. (Mursidan et al., 2021).

After the design, if it is found that the performance of the AP is not optimal, proceed with the optimization stage. Several AP optimization methods have been carried out by Amanaf et al. (2019) using the COST 231 Multi wall and OBQ methods to increase the Signal Interference Ratio (SIR) and RSL parameters (Amanaf et al., 2019), Rijadi & Noprizal (2021) with a propagation model in office space with two floors (Rijadi & Noprizal, 2021), the Simulated

Annealing (SA) method (Artawan et al., 2021), the Simulated Annealing and Trilateration method (Ichwan & Hardjianto, 2021), and the One Slope Model (1SM) propagation model.)(Mukti & Sulisty, 2018).

The number of APs installed in the Wiyata Utama PKBM School library is only 1 (one) with indoor spaces. So that the wireless AP does not work optimally, here are some references to AP (indoor) optimization that are used in service in overcoming the solutions to the problems above. Rachmadini et al. (2019) optimized the AP at Mall Sumarecon Bekasi on the ground floor using the Speedtest application and Ekahau site survey (Rachmadini et al., 2019), Ekahau HeatMapper, inSSIDer and Wireless Wizard (Sirait, 2017), and Wireless InSite software, based on the calculation of path loss parameters, and received power to reduce the total cost of implementation and the effect of interference in the building (Abdulwahid et al., 2020).

Improved AP performance is also widely discussed in depth. The following is a reference that becomes material for socialization in explaining the theory of AP performance parameters. Received Signal Strength (RSS) gains were obtained from different reception points using the REMCOM wireless InSite software in the data collection and localization phases. For indoor conditions, the influence of building materials also affects the optimal signal propagation (Al-Ani et al., 2019). Singh and Sicker (2020) offer a new algorithm through numerical analysis. The optimal number of APs is matched to the optimal room length for different THz spectrum blocks to be more efficient. They are increasing Radius and using a repeater(Singh & Sicker, 2020).

Based on the theoretical description and optimization of AP above, we hope that it can help the PPM team fix one of the PKBM Wiyata Utama school library problems. The following is picture 1, which shows the condition of the Wiyata Utama PKBM School library before the community service program was held.



Figure 1. The condition of the Wiyata Utama PKBM library before the Service Program was implemented

Therefore, some of the objectives of the procurement of this service program are as follows:

1. Optimizing the AP's performance installed in the school library to support the teaching and learning process via the internet supports industry 4.0 using the Ekahau site survey and speed test applications.
2. Disseminate the basic theory and practice of applying and optimizing AP in the school environment.
3. Introducing the existence of Higher Education to the community through community service programs.

The expected output is the publication of scientific articles about community service that has been carried out.

METHOD

In the design by calculating the link budget of the wireless network to find out the maximum range of the Access Point (AP) is the following equation (Titahningsih et al., 2018):

$$R_{SL} = (EIRP - F_{SL}) + G_{Antenna} - L_{loss} \dots \dots \dots (1)$$

Keterangan :

- R_{SL} : Receive Signal Level (dBm)
- $EIRP$: Effective Isotropic Radiated Power (dBm)
- F_{SL} : Free Space Loss (dB)
- $G_{Antenna}$: Gain Antena (dBi)
- L_{loss} : Attenuation losses (dB)

After getting the link budget, the next step is to calculate the number of access points needed. AP functions as a sender and receiver of data. 1 (one) AP can serve a maximum of 30 users (users). The more users connected to the AP it will affect the more speed received by the user will decrease. The equation used to find the number of access points based on coverage area is as follows (Widyaningsih et al., 2013):

$$N_{AP} = \frac{C_{Total}}{C_{AP}} \dots \dots \dots (2)$$

Keterangan :

- N_{AP} : Number of access points
- C_{Total} : Coverage area served
- C_{AP} : Coverage area of an access point

The RSSI parameter is an indicator that measures the signal strength received by each user. However, the number of obstacles during the transmission process greatly affects the RSSI value. Other parameters are distance, barrier material, noise, multi-path fading, and other disturbances that can produce large fluctuations (Sahu et al., 2013). The relationship between the RSSI value and signal quality is described in table 1.

Table 1. Quality of RSSI (Titahningsih et al., 2018)

RSSI (DBM)	QUALITY
Better than -40	Outstanding
40 to -55	Excellent
-55 to -70	Good
-70 to -80	Fair
-80 and beyond	- Intermittent to No Operation

The signal-to-noise ratio (SNR) parameter is between signal strength and noise strength. The better the signal quality, the higher the SNR value and vice versa. Table 2. Is a grouping of the SNR (dBm) levels on a Wi-Fi network (Arnomo, 2013):

Table 2. Quality of SNR (Arnomo, 2013)

SNR (DBM) QUALITY	SNR (DBM) QUALITY
Better than 29	Outstanding
20 to 28,9	Excellent
11 to 19,9	Good
7 to 10,9	Fair
6,9 and beyond	Bad

Ekahau Site Survey Software

Ekahau is a wireless network design software innovation made by Ekahau OY that functions for Wi-Fi diagnostics to be optimized for faster spectrum analysis and more accurate and reliable data (Ekahau, 2020). The appearance of the Ekahau Site Survey application is shown in Figure 2.

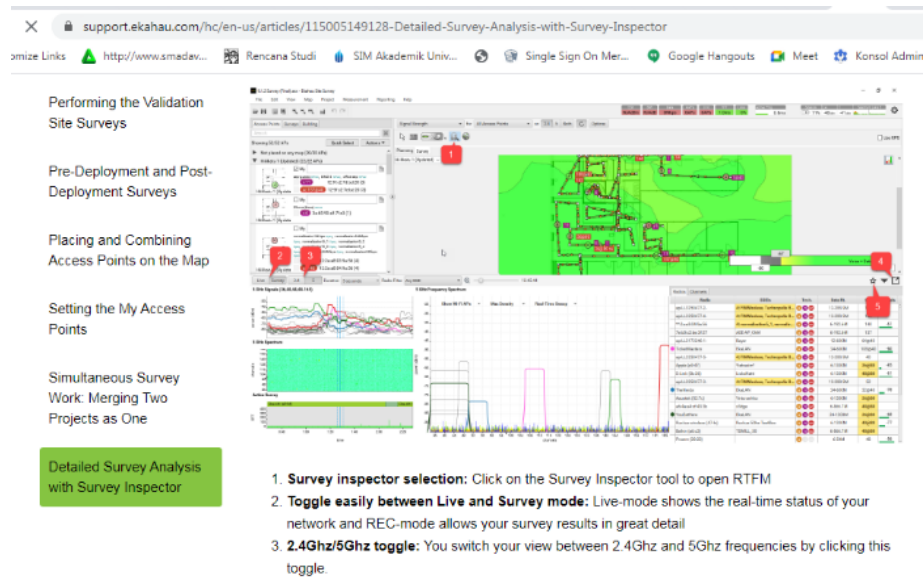


Figure 2. Ekahau Site Survey

Speedtest By Ookla

Speedtest is software to test the speed and performance of internet connections. Speedtest ookla is committed to providing transparency into network performance. Both help users assess their connection speed through the speed test app. Ookla is the global company behind speed tests, specializing in broadband network applications, data and analysis. As a result of testing across all speed test platforms, Ookla has the most comprehensive analytics on internet performance and accessibility worldwide. The company's main product is Speedtest Intelligence, used by ISPs (Internet Service Providers), operators, businesses, universities, and government agencies who share Ookla's commitment to quality and neutrality (Ookla, 2006). The appearance of the Speedtest application is shown in Figure 3.

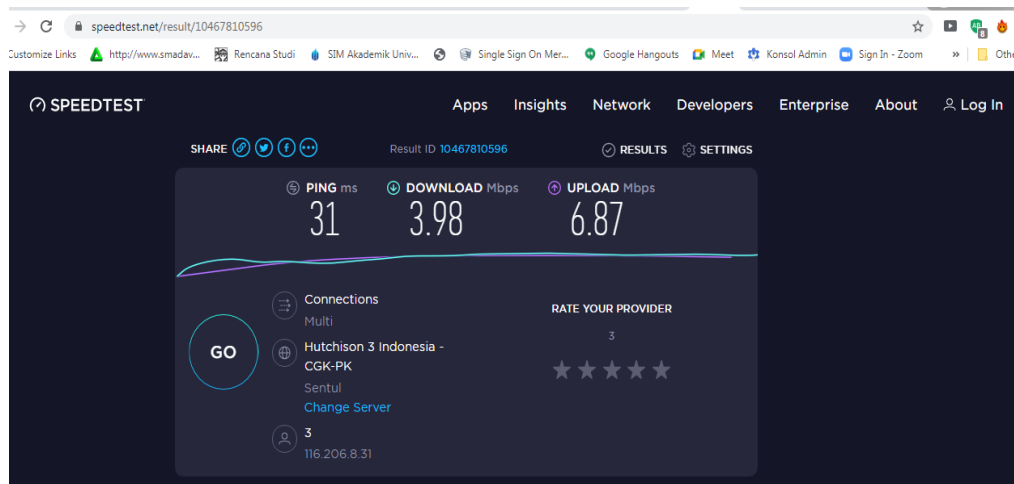


Figure 3. Speed test By Ookla

Place and Time

The location of PPM implementation takes place at the Wiyata Utama PKBM School, North Kembangan, West Jakarta. The address is in Gg. H. Naim No.25, RW.2, North Kembangan, West Jakarta in February 2020. Figure 4. is a school name card accompanied by information on the programs they provide, ranging from tutoring to equivalence packages A, B and C.



Figure 4. Location of PKBM Wiyata Utama

Activity Target

The target of the activity is schoolgirls and schoolgirls who are assisted by a team of school educators and school supervisors. Because 2020 has entered the covid-19 pandemic period, everyone can't gather in one place (room), and then all processes are carried out using the zoom application (online). Participants who attended were students, educators, officers from West Jakarta PNFI, and electrical engineering lecturers at Mercu Buana University who carried out PPM totalling 124 people.

Activity Flowchart

Figure 5. above is the sequence of PPM activities from the start of the distribution of PPM groups by the UMB electrical department secretary. So that all perform to improve the school library PKBM Wiyata Utama. The PPM team in charge of improving AP's performance then begins to develop proposals, modules and registration of training participants. After the opening remarks and the official event, continue with the theoretical explanation, installation video demo, optimization, question and answer session, and fill out the activity evaluation form.

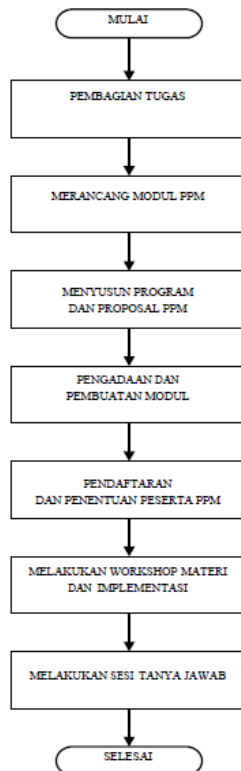


Figure 5. PPM Flowchart

Types of Activities

The nature and form of this PPM activity is a one-day seminar. The activities were divided into the first phase with an official and symbolic event between UMB and the Wiyata Utama PKBM School and the school supervisory team, then continued with the division of small classes

in implementing Ekahau site survey and speed test software training. The UMB PPM team supports optimising AP performance in the library and installing lighting, air conditioning, speakers, and others for a better library. So that schools can feel the benefits of PPM, which UMB implements in real terms. The complete sequence of events is shown in Figure 6. as follows:

SUSUNAN ACARA
PROGRAM PENGABDIAN KEPADA MASYARAKAT
RABU, 24 FEBRUARI 2021

Waktu	Kegiatan	P.I.C
07.30 – 09.00	Admit/verifikasi zoom	Julpri dan Rachmat
09.00 – 09.03	Pembukaan	MC : Hafizd
09.03 – 09.10	Menyanyikan Lagu Indonesia Raya & Mars UMB	Julpri dan Rachmat
09.10 – 09.15	Pembacaan Doa	Prof. Andi Adriansyah
09.15 – 09.40	Sambutan-sambutan: 1. Kepala Sekolah PKBM Wiyata Utama - Sri Kurnia Yuhana S.Pdi 2. Kepala Seksi PNFI - Bp. Drs Satiman MM 3. Kepala Pusat Pengabdian Kepada Masyarakat Universitas Mercu Buana – Dr. Inge Hutagalung, M.Si 4. Pembukaan acara PkM : Dr. Setiyo Budiyo, ST., MT	MC : Hafizd
09.40 – 09.45	Pemutaran Video Perpustakaan	Julpri dan Rachmat
09.45 – 09.50	Penyerahan secara Virtual Kunci Perpustakaan dan Piagam dari Ketua Prodi Elektro ke Sekolah PKBM Wiyata Utama	Bapak Dr. Setiyo Budiyo, ST.MT ke Ibu Sri Kurnia Yuhana S.Pdi
09.50 – 09.55	Penyerahan Piagam Penghargaan secara Virtual dari Sekolah PKBM Wiyata Utama ke Prodi Elektro	Ibu Sri Kurnia Yuhana S.Pdi ke Dr. Setiyo Budiyo, ST., MT .
09.55 – 10.00	Foto Bersama + Link Absensi	Julpri dan Rachmat
10.00 – 10.15	Introduction of : Wireless Sensor Network and Autonomous Robot: Speaker 1 Prof. Dr.-Ing. Mudrik Alaydrus 5” Speaker 2 Prof. Dr. Andi Adriansyah, M.Eng. 5” Speaker 3 Dr. Setiyo Budiyo, ST., MT. 5”	Moderator : Dr. Umairah
10.00 – 10.15	Introduction of : Wireless Sensor Network and Autonomous Robot: Speaker 1 Prof. Dr.-Ing. Mudrik Alaydrus 5” Speaker 2 Prof. Dr. Andi Adriansyah, M.Eng. 5” Speaker 3 Dr. Setiyo Budiyo, ST., MT. 5”	Moderator : Dr. Umairah
10.15 – 10.55	Sesi Workshop PkM Series dengan Tema "Introduction of Wireless Sensor Network dan Autonomous Robot" Keynote Speaker: Dr. Abu Ubaidah bin Shamsudin - University Tunn Hussein onn Malaysia 40” Moderator: Dr. Umairah	
10.55 – 11.15	Tanya Jawab	Moderator: Dr. Umairah
11.15 – 11.20	Penyerahan sertifikat secara virtual kepada ketiga Speaker dan Keynote speaker	Julpri dan Rachmat
11.20 – 11.25	Foto Bersama	Julpri dan Rachmat
11.25 - 11.30	Penutup	Hafizd

Figure 6. Run Down Event

RESULTS

Workshop activities are carried out in one (1) day online. This workshop activity was held on Wednesday, February 24, 2021. However, the process of repairing the school library had been carried out a month earlier. The training runs for 4 (four) hours from 07.30 - 11.30 WIB. Table 3 is the order of events as follows:

Table 3. Training Activities

NO	TOPIC
1.	Opening by MC
2.	Singing Indonesia Raya' song
3.	Welcome speech:

NO	TOPIC
	1. Headmaster PKBM Wiyata Utama - Sri Kurnia Yuhana S.Pdi 2. Section Chief PNFI - Bp. Drs Satiman MM 3. Head of PPM UMB – Dr. Inge Hutagalung, M.Si (alm) 4. Opening ceremony PkM : Dr. Setiyo Budiyo, ST., MT
4.	School library video renovation screening
5.	Virtual Award Award Ceremony from the Wiyata Utama PKBM School to the Electrical Engineering Study Program
6.	Workshop
7.	Questionnaire Filling
8.	Group Photo + Attendance Link

Materials and Equipment for Activities

The training, which is carried out online through webinars for related participants, contains theoretical material and video demo practice. Workshop materials are presented in modules, power points and simulation videos. The training is carried out interactively in presentations and class discussions.

Results of Training Activities

The PPM activity, held on Wednesday, February 24, 2021, from 07.30 – 11.30 WIB via online (zoom meeting), was preceded by remarks from the head of the Wiyata PKBM School, namely Mrs Utama - Sri Kurnia Yuhana S.Pdi (Picture 7), then from PNFI Section Head - Bp. Drs Satiman MM is the West Jakarta school supervisory body (figure 8).

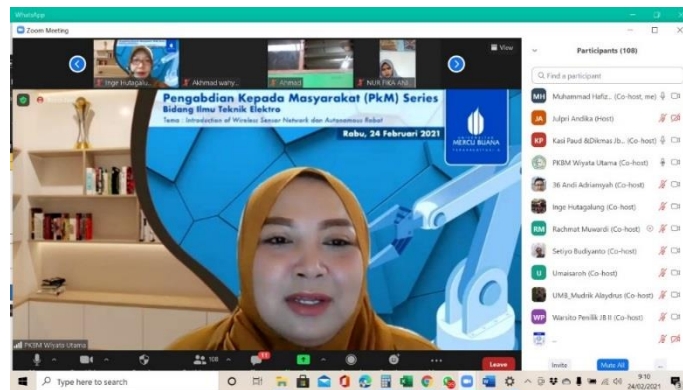


Figure 7. Welcoming words from the principal of the Wiyata Utama PKBM School - Sri Kurnia Yuhana S.Pdi



Figure 8. Welcoming remarks from the PNFI Section Head - Bp. Drs. Satiman MM

Furthermore, the remarks from the representative of the Head of PPM UMB, namely Mrs. Dr. Inge Hutagalung, M.Sc (late) (picture 9.) and the head of the UMB electrical engineering study program, Dr. Ir. Setiyo Budiyanto, ST., MT (figure 10).



Figure 9. Welcome remarks from the Head of PPM UMB : Dr. Inge Hutagalung, M.Si (alm.)



Figure 10. Opening of the PkM event: Dr. Setiyo Budiyanto, ST., MT

Figure 11. is a documentation of the renovation process of the Wiyata Utama PKBM school library, starting from the reading room, air conditioner, AP, speakers, cabinets, books and others so that school students can carry out teaching and learning activities comfortably as well as online exams.

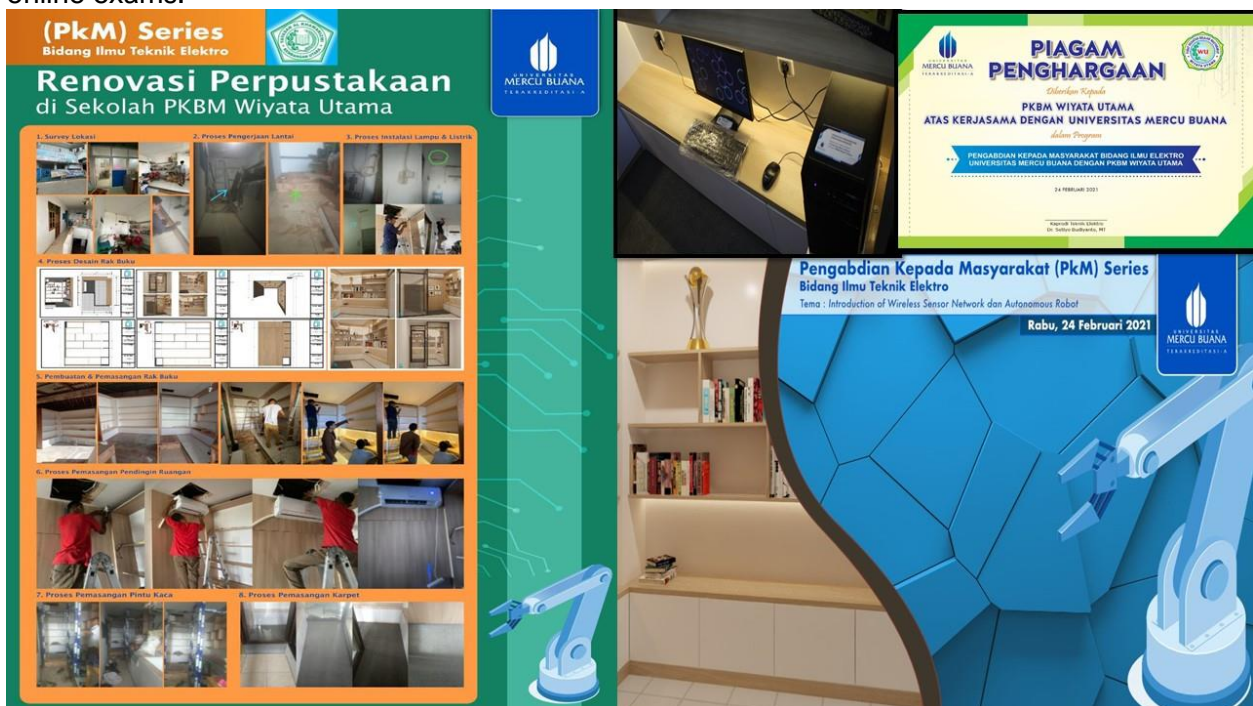


Figure 11. Renovation documentation and final results of the Wiyata Utama PKBM library



Figure 12. Documentation of activities and ends with a photo session together

Furthermore, the distribution of training classes is carried out in parallel according to the registered participants. The following is picture 12. Is documentation of online activities during the training and ends with a group photo session.

Activity Evaluation

The evaluation of the success of this training activity is based on the results of a questionnaire after the training, which includes participants, trainers, methods, facilities and consumption.

DISCUSSION

Participants

- 1) Is training participants' recruitment, number, and ability following the criteria and needs set? > 83% answered quite appropriate.
- 2) What do you think about the participants' compliance and discipline in following the training schedule that has been set? > 80% answered obediently but sometimes undisciplined.
- 3) What do you think about the participants' activities and initiatives? > 80% answered active and initiative.
- 4) According to your observations, the participants' mastery of the training material from the beginning of the training until now is at the level of 80% answered very well.
- 5) Do you think this training follows your interests and desires in developing the application of technology in the future? 80% answered yes, and I'll give it a try.

Facilitator / Trainer

- 1) In your opinion, is the ability of the facilitator/trainer to follow the criteria determined based on the need for this training? > 80% answered accordingly.
- 2) In your opinion, how did the facilitator interact in the study group? 80% answered quite well.
- 3) In your opinion, how did the facilitator explain the learning materials? 80% answered well and were easy to understand.
- 4) In your opinion, how did the facilitator use the most effective technique to help you learn? > 80% answered well and humanely.
- 5) In your opinion, what is the facilitator's ability to make presentations? > 80% answered good and interesting.

- 6) In your opinion, how is the facilitator's ability to use presentation aids? > 80% answered proficiently and quickly.

C. Method

- 1) In your opinion, the need to identify teaching methods and the preparation of teaching equipment and media at the beginning of the training is very necessary? 70% answered quite needed as initial preparation.
- 2) What is your opinion about the learning strategies applied in training? 100% answered well, participatory and humanist.
- 3) According to your observations during the training, were the teaching methods used by the facilitators/trainers in the teaching and learning process able to achieve the training objectives? 80% answered that they were able to achieve the training objectives.
- 4) According to your observations during the training, were the teaching methods used by the facilitators/trainers in the teaching and learning process able to achieve the training objectives? 70% answered that they were quite capable of achieving the training objectives.

D. Facilities and Consumption

- 1) How is the comfort of the place (activity room) in your opinion? 100% answered very well and comfortable.
- 2) What do you think about the facilities provided by the training organizer? 100% answered very well and luxurious.
- 3) What is the food quality provided by the training organizer, in your opinion? 100% answered good and fulfilled nutritional adequacy.
- 4) How is the training accommodation provided by the training organizer, in your opinion? 100% good answer and quality.
- 5) How is the transportation during the training provided by the training organizer in your opinion? ? 100% good and smooth answer.

The questionnaire results showed that there were then 80% of the participants according to their interested in the training provided. Still, only above 80% could absorb this knowledge because it only took a few hours for the training to take place.

Then above 80% of participants felt the interaction and activity of the tutor/trainer during the training. Based on the method, above 80% of participants felt that the training had achieved its goals in each participant because in a short time, understanding a new technology was not easy. And 100% satisfied and good in terms of facilities and consumption during the training.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the online implementation of the "Speedtest Application Training and Ekahau Site Survey in West Jakarta Schools 2021", which was carried out online, were concluded:

1. Participants understand the working principle of Access Point and apply it with the help of the "Ekahau Site Survey and Ookla" application
2. Participants understand the basic parameters of a wireless AP, such as RSSI as an indicator of the received signal strength. And another parameter is the Signal-to-noise ratio (SNR) as a comparison between signal strength and noise strength.
3. Participants are enthusiastic about applications that make it easier for them to understand the concept of calculating and designing wireless networks.
4. Of the total training, only 80% of the participants could absorb this knowledge due to the limited duration of the training.
5. As much as 80% of the participant's training is achieved quickly. Because Understanding a new technology was not easy.

RECOMMENDATIONS

Given the many benefits that can be obtained by the participants and the ppm team from this activity, there are several suggestions for improving future training activities, namely:

1. It is hoped that similar activities can be carried out like this as much as possible and continuously.
2. Implementation of training with a longer time
3. There are more trainers so that they can have long discussions with participants during the training.

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