



Education on Electromagnetic Waves Exposure from Smart Devices in Elementary School

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ARTICLE INFO

Article history:

Received December 20, 2022

Revised December 23, 2022

Accepted February 10, 2023

Available online February 25, 2023

Kata Kunci :

Radiasi Gelombang Elektromagnetik, Smart Device, Smartphone.

Keywords:

Electromagnetic Wave Radiation, Smart Device, Smartphone



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ABSTRAK

Kemajuan ilmu pengetahuan dan teknologi semakin canggih dan kompleks. Perangkat pintar, smartphone, tablet, dan media kompleks lainnya menandai pesatnya perkembangan teknologi komunikasi. Perangkat pintar adalah perangkat elektronik, umumnya terhubung ke perangkat atau jaringan lain melalui protokol nirkabel yang berbeda. Salah satu contoh perangkat pintar yang banyak digunakan adalah smartphone. Orang sering menggunakan smartphone sebagai alat komunikasi di era global saat ini. Akibatnya, kebanyakan orang mengandalkan perangkat ini, yang dapat membuat mereka terkena gelombang elektromagnetik yang berbahaya. Mengingat bahaya yang dapat ditimbulkan oleh smartphone bagi manusia, maka disarankan untuk membatasi penggunaan smartphone. Oleh karena itu, tujuan dari pelaksanaan pengabdian masyarakat ini adalah untuk mengedukasi masyarakat khususnya siswa dan guru di SDN 16 Bekut tentang bahaya radiasi smartphone. Hal ini dilakukan dengan mengedukasi masyarakat tentang perlunya menggunakan smartphone secara bertanggung jawab dan tidak berlebihan. Berdasarkan hasil kuisioner dan rekapitulasi hasil kegiatan ini diketahui tingkat pemahaman dan indeks kepuasan peserta kegiatan mencapai 86,45%.

ABSTRACT

Advances in science and technology are increasingly sophisticated and complex. Smart devices, smartphones, tablets, and other complicated media mark the rapid development of communication technology. Smart devices are electronic devices, generally connected to other devices or networks via different wireless protocols. One example of a smart device that is widely used is a smartphone. People frequently use smartphones as a communication tool in the current global era. As a result, most people are dependent on these devices, which can expose them to harmful electromagnetic waves. Given the dangers smartphones can cause to people, it is recommended to limit the use of smartphones. Therefore, the purpose of implementing this community service is to educate the public, especially students and teachers at SDN 16 Bekut, on the dangers of smartphone radiation. This is done by educating people about the need to use smartphones responsibly and not excessively. Based on the questionnaire results and recapitulation of the results of this activity, it was found that the level of understanding and satisfaction index of the activity participants reached 86.45%.

1. INTRODUCTION

Advances in science and technology are increasingly sophisticated and complex. The rapid development of communication technology is marked by various complicated media such as gadgets, smartphones, tablets, and others known as smart devices (Han & Cho, 2016; Vargo et al., 2021). We, as modern humans, cannot dismiss the changes that occur, but we can limit the negative impact of the developments. Responding to this condition, society must be able to keep up with changes and developments because the necessities of life are increasingly complicated. Smart devices are electronic devices, generally connected to other devices or networks via different wireless protocols such as Bluetooth, NFC, Wi-Fi, LiFi, 3G, etc., that can operate to some degree interactively and autonomously (Park, 2019; Thakur et al., 2020). One example of a smart device that is widely used by the public is a smartphone. In our current global era, smartphones are a mandatory human need since these devices are communication tools that most people frequently use (Serrano-Estrada et al., 2021; Suminar & Meilani, 2016; Vargo et al., 2021). As a result, most people are dependent on these devices, thereby posing a significant risk of exposure to harmful electromagnetic waves (Deruelle, 2020; Kohdrata et al., 2019; Moradi et al., 2016). There is ongoing scientific debate about the potential health effects of low-level exposure to the electromagnetic radiation emitted by smartphones (Choi & Choi, 2016; J. H. Kim et al.,

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2019; K.-H. Kim et al., 2016; Mertz, 2016). While some studies have suggested a possible link between exposure to radiofrequency electromagnetic radiation from mobile devices and an increased risk of certain health problems, such as cancer and fertility issues (Kesari et al., 2018; Meena et al., 2016; Negi & Singh, 2021; Sari et al., 2017). The evidence is not conclusive and many scientists believe that the levels of exposure from smartphones are too low to cause harm to humans (Hardell, 2017; Wilmer et al., 2017). The World Health Organization (WHO) states that there is currently no scientific evidence that the electromagnetic radiation emitted by mobile phones is harmful to human health (Hardell, 2017; Yan, 2018). However, more research is needed to fully understand the potential long-term health effects of prolonged exposure to this type of radiation. Likewise, electromagnetic waves are analogous to vehicles that convey information, such as voice, from a sender, such as the Base Transceiver Station (BTS) or tower, to achieve a goal (Imansyah et al., 2021; Susilawati & Supriyatno, 2020).

In this case, the recipient is a smartphone or vice versa. From its name, electromagnetic waves are waves influenced by electric and magnetic fields that produce radiant energy from one place to another (Atya & Murad, 2022; Sleptcova & Falkenbach, 2020). The energy released by electromagnetic waves is then absorbed by parts of the human body so that there is additional energy. The addition of energy causes changes in temperature in these body parts (Bhargava et al., 2019; Howell et al., 2019). Because smartphones are used in the ear area, they cause a lot of impact (Akhtar et al., 2022; Rahaman, 2017). This is because they are so close to the source, which is the brain area. The brain fluid heats up as a result of the influence of energy. Scientifically, the energy released affects health, but how much can be absorbed depends on whether the smartphone follows the standard. According to the standard, it is not harmful for a period of time (Miller et al., 2019). Despite the fact that electromagnetic waves are emitted by smartphones, many parents and children still fail to understand their effects. It is because the effects may not be immediately visible or felt (Aravinda et al., 2022; Matera et al., 2020). Given the dangers smartphones can cause to children, it is recommended to limit the amount of time spent on smartphones for both children and adults (Csibi et al., 2021). To raise awareness about the effects of smartphone radiation that can affect children's brain development (Akhtar et al., 2022; Yan, 2018). So, the purpose of implementing this community service is to provide education to the public, especially students and teachers at SDN 16 Bekut, about the dangers of smartphone radiation. In addition, it will help reduce its negative impact. This should help educate people so that they are more concerned about using smartphones wisely and not excessively.

2. METHODS

Based on the problems that have been presented in the introduction section, the solution that can be offered as a first step to overcome these problems is to provide training in the form of education on the dangers of electromagnetic wave radiation produced by smartphones and how to reduce their negative impact so that the audience is more concerned about using smartphones wisely and not overdoing it. Education program on the effects of exposure to electromagnetic wave radiation is a workshop program conducted by the Community Service team for teachers, educators, and students at elementary schools. Later, this program will be shared with the surrounding environment so that you can inform them about the long-term effects of exposure to electromagnetic wave radiation. The educational program on the effects of exposure to EM radiation from smart devices aims to participants gained an increased understanding of electromagnetic wave radiation generated by smartphones and their use in communication. Participants obtained reliable reference sources regarding the effects of radiation caused by excessive smartphone use. Participants gain insight into tips for mitigating the effects of radiation and how to prevent it.

This educational program is delivered in several material sessions with the delivery structure as introduction to smart devices. Introduction and further explanation of electromagnetic wave radiation. The use of electromagnetic radiation in communication. The impact caused by electromagnetic wave radiation produced by smartphones on the body when used excessively. Tips for reducing the influence of radiation produced by smartphones. The steps are followed to ensure that community service activities achieve optimal results conduct field observations to obtain data about the service area, sub-districts, and hamlets that can be reached to implement socialization activities. Preparation of educational activity proposals containing field orientation activity plans. Preparation of educational materials, leaflets, posters, papers, or media presentations. The entire media used is in the form of socialization material about the effect of exposure to electromagnetic radiation produced by smartphones on the body, as well as tips for reducing the long-term effects of this radiation. Conduct educational activities through lectures or counselling accompanied by question-and-answer sessions and discussions. Contains how data is

collected, data sources and data analysis methods. Method used the Community Service activity is conducted. Lecture method, the purpose of this presentation is to educate teachers, education staff, and students about electromagnetic wave radiation caused by smartphones, as well as prevention tips. Discussion and question and answer methods, participants are encouraged to ask questions and participate in discussions regarding problems related to smartphone use and basic knowledge of electromagnetic wave radiation. Demonstration method, include examples of activities that can reduce the impact of electromagnetic radiation caused by smartphones. Simulation method, conducting presentations using posters and infographics about the dangers caused by the excessive use of smartphones. In Figure 1, you can see the location in which the education activity on the Effect of Smart Device Electromagnetic Wave Radiation on the Body was held. This was. This was at SDN 16 Bekut. It is shown in figure 1 that the distance between community service partners and FT Untan is approximately 207 kilometers. If you use a car, it takes around 4 hours and 47 minutes. This activity is located in Jalan Daeng Halil Bekut Village, Kec. Tebas, Kab. Sambas, West Kalimantan.



Figure 1. Location and Distance Map from FT UNTAN to SDN 16 Bekut

3. RESULT AND DISCUSSION

Results

After exposing participants to material about electromagnetic waves, their negative impacts, and ways to reduce the negative impacts of electromagnetic waves, it is possible to measure the extent of their understanding. To determine the success of the community service program implemented by the Team, questionnaires were distributed to participants after the activity was completed. A summary of the questionnaire results can be found in Figure 2 and Table 1.

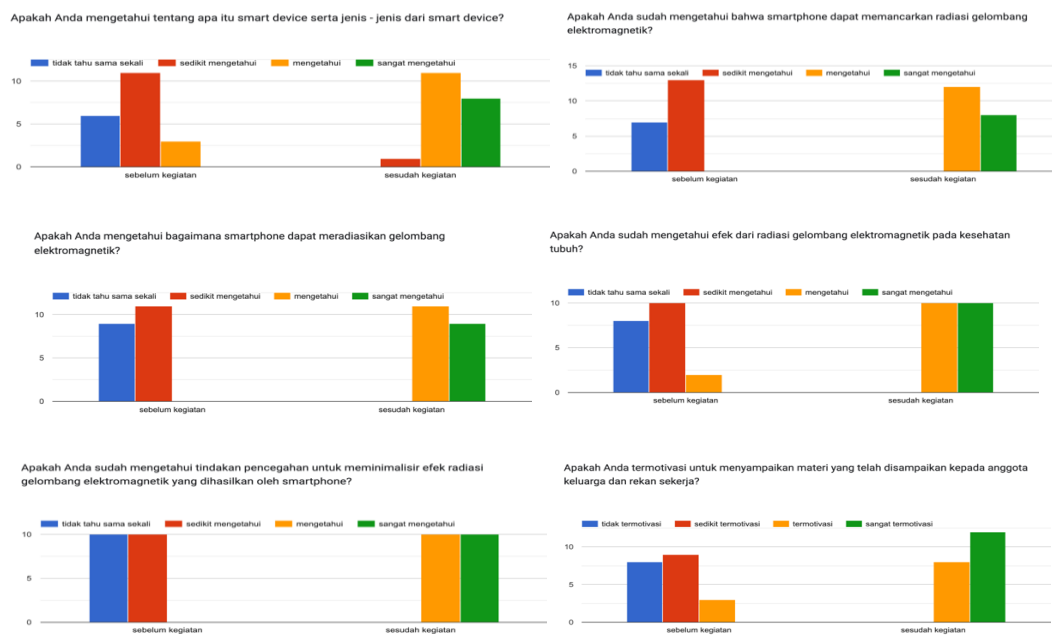


Figure 2. The Results of the Questionnaire on Participants' Understanding Before and After the Activity

Table 1. Satisfaction Index of Community Service Activity

No.	Questions	Satisfaction Index*	Percentage**	Description
1	Do you know what a smart device is and the types of smart devices?	3.35	83.75	Very Good
2	Do you already know that smartphones can emit electromagnetic wave radiation?	3.4	85	Very Good
3	Do you know how smartphones can radiate electromagnetic waves?	3.45	86.25	Very Good
4	Do you already know the effects of electromagnetic wave radiation on body health?	3.5	87.5	Very Good
5	Do you know the precautions to minimize the effects of smartphone electromagnetic wave radiation?	3.5	87.5	Very Good
6	Are you motivated to convey the material delivered to family members and co-workers?	3.6	90	Very Good
Average		3.46	86.5	Very Good

*Satisfaction's Index =

0.00 – 1.00 : poor

1.01 – 2.00 : fair

2.01 – 3.00 : good

3.00 – 4.00 : very good

**Percentage

0 – 25% : poor

26 – 50% : fair

51 – 75% : good

76 – 100% : very good

Based on the questionnaire results and recapitulation of the results above, it was found that the level of understanding and satisfaction index of the technical guidance participants reached 86.45%. This was in the very good category. Education on Electromagnetic Wave Exposure from Smart Devices at SDN 16 Bekut is well implemented, and the benefits can be reaped right away. The activity closed with a photo of the community services team with the teachers as participants in this activity as shown in [Figure 3](#), [Figure 4](#) and [Figure 5](#).

Discussion

This Community Service activity was conducted at SD Negeri 16 Bekut located in Tebas District, Sambas Regency, West Kalimantan. The educational activity was held on December 2, 2022, and participants included educators, teachers, and students of SD Negeri 16 Bekut. Through this activity, teachers and students will gain an understanding of the dangers associated with smartphone radiation and ways to reduce its negative effects on their families and friends.



Figure 3. Speaker of Educational Activities at SDN 16 Bekut

The UNTAN Faculty of Engineering Lecture Team organized this activity. The targets of this activity are teachers, educators, and students at SD Negeri 16 Bekut. Educational activities are carried out using 4 (four) approaches or methods. First, the lecture method delivers educational material about smart devices, various types of smart devices, and how these devices work. This can lead to exposure to electromagnetic wave radiation by lecturers to teachers and educators who work in elementary schools.

Afterward, it can be shared with the public and those closest to the participant to minimize radiation exposure. This program introduces teachers and students to how to use their smartphones wisely and in moderation to reduce unwanted negative impacts. The lecturer delivers the material while other lecturers serve as operators. The material presented was distributed to the participants before the presentation began, so there was no information gap between the speakers and the participants.

As a second method of interaction, the discussion method is utilised to create an atmosphere of liquidity, warmth, and insight between presenters and participants. During this discussion session, some participants were very enthusiastic about interacting with each other. During the discussion, some of the socialization participants shared their experiences and strategies for teaching and applying what they learned. However, some participants asked the speaker's opinion about the radiation impact caused by the BTS tower. This is because the participant lived next door to the BTS tower and the BTS tower itself also emitted electromagnetic radiation, which had previously been conveyed to the participants. The presenters answered these questions in the capacity of the presenters as lecturers and provided several solutions that participants could do (Dong et al., 2020; Khan et al., 2021).



Figure 4. Participants Participate in a Discussion Led by The Speaker.

Lastly, we demonstrate using examples of activities that can assist in reducing the impact of electromagnetic radiation caused by smartphones. In closing, the Community Service Team with teachers, education staff, and students participated in a group photo.



Figure 5. Photo with The Community Service Team with Participants at SDN 16 Bekut.

4. CONCLUSION

The results that can be drawn from this activity are the community service activity was positively received by the participants. Second, all strands of program activities were carried out correctly and on schedule. To reduce the negative impacts of smartphone use, the habits and discipline of the participants and community should be continuously monitored and supervised. Third, it is expected that this socialization activity will continue to take place in the form of education in schools where there are many students who use smartphones excessively. New habits will be formed to reduce the excessive use of gadgets. Last, this community service activity increases participants' awareness of the dangers posed by electromagnetic radiation produced by smartphones and how to reduce their impact.

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