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Design of an automatic hand washing device for elementary school students in Serang for enhanced Covid-19 prevention

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ABSTRACT

This community service activity aims to educate elementary school students in Serang City, especially at SDN Kewunen, about hand hygiene's importance in preventing COVID-19. The training involved making a simple automatic soap dispenser from used items such as plastic bottles and injections. With a participatory method, students were directly involved, assisted by visual guides in the form of leaflets, posters, and banners. As a result, most students succeeded in making the tools independently at home with the support of their parents and understood the importance of hand hygiene. Monitoring through surveys and teacher testimonials showed a positive response. This program improves students' skills in maintaining cleanliness and fosters environmental awareness through using used goods.

ABSTRAK

Kegiatan pengabdian ini bertujuan mengedukasi siswa SD di Kota Serang, khususnya di SDN Kewunen, tentang pentingnya kebersihan tangan sebagai pencegahan COVID-19. Pelatihan melibatkan pembuatan tempat sabun otomatis sederhana dari barang bekas seperti botol plastik dan suntikan bekas. Dengan metode partisipatif, siswa dilibatkan langsung, dibantu panduan visual berupa leaflet, poster, dan spanduk. Hasilnya, mayoritas siswa berhasil membuat alat secara mandiri di rumah dengan dukungan orang tua dan memahami pentingnya kebersihan tangan. Monitoring melalui survei dan testimoni guru menunjukkan respon positif. Program ini meningkatkan keterampilan siswa dalam menjaga kebersihan dan menumbuhkan kesadaran lingkungan melalui pemanfaatan barang bekas.

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1. Introduction

The coronavirus outbreak, or COVID-19, has been declared a pandemic by the World Health Organization (WHO) due to its alarming rate of spread and severity [1]. Since no cure has yet been found to weaken the virus, one of the most effective prevention strategies is to limit its transmission. COVID-19 can be prevented through measures such as wearing masks, avoiding direct contact with commonly touched objects [2], and frequent handwashing [3]. The simplest way to wash hands is with running water, but this method alone cannot eliminate the virus, as COVID-19 is encased in a lipid layer. This lipid layer can only be removed by washing hands with soap or using hand sanitizers. The rising demand for hand sanitizers has caused their prices to skyrocket, making them unaffordable for many. Therefore, washing hands with soap is a simpler and more economical solution [4].

COVID-19 can persist on materials such as metal, plastic, glass, and paper for extended periods. Although washing hands with soap effectively removes the virus, contamination risks remain if hands come into contact with plastic or stainless steel surfaces, such as taps, during or after washing. This poses a challenge for maintaining hygiene. COVID-19 affects people of all ages, including the elderly, adults, teenagers, and children. Generally, children infected with COVID-19 experience mild symptoms such as fever, cough, sore throat, and sneezing, which are less severe than in adults [1]. While children have a low risk of severe infection, their potential to transmit the virus to vulnerable adults or ill family members is significant. Hence, it is crucial to educate children about the dangers of COVID-19 [5].

Children aged 10–12 in elementary school are naturally inclined toward physical activities, play, and hands-on learning, which are linked to their motor skills development. Gross motor skills include actions like running, throwing, and striking, while fine motor skills involve coordination of hand and eye movements, such as stacking blocks or transferring objects between hands [6]. Skillful children tend to adapt better in school and social settings,

showcasing non-verbal social skills like helping and cooperative behavior [7]. With their developing skills, children can be engaged in collaborative efforts to create tools that help prevent the spread of COVID-19. Educational initiatives on handwashing techniques are widely available on social media and are practiced in elementary schools across Indonesia. However, introducing the concept of creating a simple automatic handwashing soap dispenser involving elementary school students has not been implemented. Through a community service program, a project was conducted to introduce and teach the construction of a simple automatic soap dispenser to elementary school students in Serang City as a measure to prevent the spread of COVID-19. The program's partner was SDN Kewunen, located in Serang, Banten.

2. Methods

The tools and materials required to create a simple automatic soap dispenser include a 1500 ml used mineral water bottle, a used printer ink syringe, screws, hot glue, and a hook hanger to mount the bottle on the wall. The steps for making this product are illustrated in Figure 1. This activity involved several stages, including a location survey, the product assembly process, a questionnaire to gather information about students' characteristics, the benefits they gained, and the challenges they faced during the production process. Additionally, the installation of the product in front of the classroom was documented and accompanied by a poster detailing proper handwashing techniques as recommended by the Indonesian Ministry of Health. Leaflets were distributed to students through their teachers to encourage them to independently replicate the product at home.

Figure 1. Steps to make a simple automatic hand soap dispenser product.

3. Results and Discussion

3.1. SDN Kawunen

SDN Kawunen is an elementary school located in Kota Serang, Banten Province. Strategically situated on Jl. Kalimaya 3, Jl. Raya Puri Anggrek Serang No. 7a, RT.8/RW.8, Teritih, Kec. Walantaka, the school serves as a partner in this community service program. SDN Kawunen plays a significant role in educating elementary-aged children in the Walantaka area. With a substantial student population, the school provides a conducive environment for community programs, especially those focused on health and hygiene. Despite adequate infrastructure for learning, the school faces challenges regarding hygiene facilities, such as the absence of automatic handwashing devices.

During the pandemic, like many other schools, SDN Kawunen struggled to maintain health protocols, particularly ensuring proper handwashing habits among students. This program aims to provide simple yet effective solutions to promote cleanliness and health within the school. With its elementary school student demographic, who are at a developmental stage for motor and cognitive skills, SDN Kawunen is an ideal location for this initiative. Guided by teachers and parents, students are encouraged to collaboratively create simple handwashing tools using recycled materials while learning the importance of hygiene in daily life.

3.2. Introduction to Material Types

Using recycled materials is not only a cost-effective alternative but also aligns with sustainability principles by reducing waste and promoting reuse in daily life. For instance, used plastic bottles, often regarded as waste, can be transformed into functional automatic soap dispensers. This activity also introduces students to various materials, such as polymers and metals, that can be utilized to create simple hygiene tools. Plastic bottles made from polyethylene terephthalate (PET) are lightweight, durable, easy to shape, and transparent [8], making them ideal for liquid soap containers. Used printer ink syringes, though simple, provide an efficient mechanism for dispensing soap without direct contact. Recycled metal screws serve as weights in the product design [9]. The ink syringes are made from polypropylene, a thermoplastic polymer that can be melted and reshaped multiple times without significant degradation [10]. This hands-on approach teaches students how physical properties of materials can be applied to practical functions, enriching their understanding of both hygiene and sustainability.

3.3. Creation and Installation of Handwashing Devices

The creation of the devices was carried out considering restrictions on face-to-face activities during the COVID-19 pandemic. The community service team developed prototypes of simple automatic handwashing devices and distributed them to partner schools, including SDN Kawunen. Leaflets and posters were provided to help students learn and replicate the devices with their parents at home. The research team prepared the prototypes as shown in Figure 2, and the completed products were handed over to the school, as illustrated in Figure 3. The devices were installed in strategic locations, such as restroom exits and classroom sinks, accompanied by posters on proper handwashing techniques (Figure 4).

a b

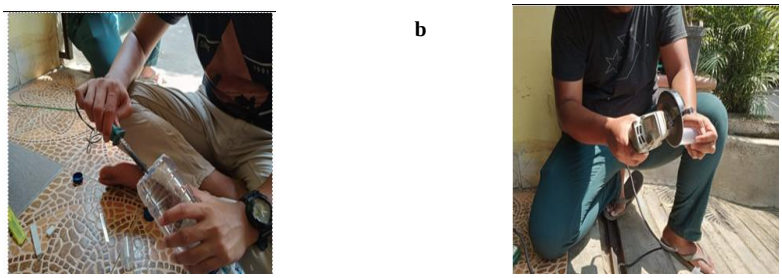

Figure 2. Making soap containers by the research team: preparing used bottles (a) cutting used syringes (b).

a b

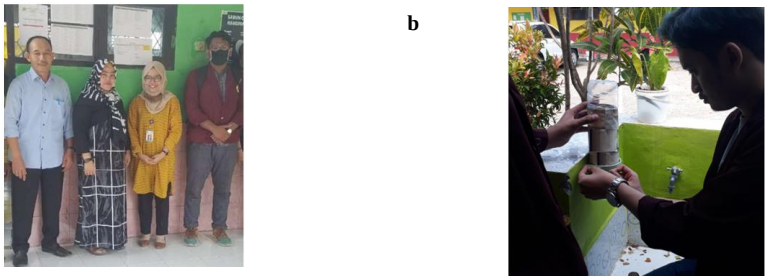

Figure 3. Product distribution to SDN Kewunen partners (a) product installation at SDN Sindangraksa (b).

a b

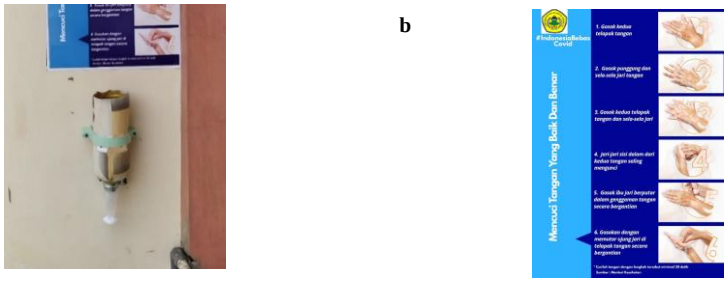

Figure 4. Products displayed (a) poster on how to wash hands properly (b).

3.4. Monitoring and Evaluation

After distributing the devices and educational materials, monitoring and evaluation were conducted to assess the program's effectiveness. A simple survey via Google Forms evaluated students' understanding of the instructions, their ability to construct the devices, and the perceived benefits. Results showed that 92.3% of participating students successfully built the handwashing devices at home with parental assistance, and 100% of respondents found the visual guides easy to understand and helpful. This indicates that the educational materials, including leaflets and posters, were effective in teaching students the importance of hand hygiene and how to create functional tools from recycled materials.

The program also educated students about the value of recycling and creative reuse of waste. Participants learned to transform items often considered trash into useful tools, fostering environmental awareness and creative thinking. Teachers at SDN Kawunen provided positive feedback, noting that the simple yet effective devices helped students maintain hand hygiene while at school. Teachers also observed an improvement in students' discipline regarding handwashing. Despite some technical challenges, such as difficulty in puncturing bottle caps during at-home construction, these obstacles were resolved with assistance from parents or teachers.

The automatic handwashing devices significantly reduced the risk of COVID-19 transmission in the school environment by eliminating direct contact with surfaces. Students only needed to press the device with the back or palm of their hand, avoiding contact with faucets or other surfaces. Additionally, the devices were inexpensive and easy to make, making them suitable for schools with limited budgets. This program also presents opportunities for further development. Feedback from students and teachers suggested improvements to the device's durability and soap-dispensing mechanism to ensure long-term functionality. Overall, this community service program not only enhanced hand hygiene among elementary students but also engaged them in practical activities that introduced recycling concepts and creativity. The program effectively built awareness about maintaining cleanliness during the pandemic and demonstrated that simple solutions can have a significant impact on health and the environment. It is hoped that this initiative can be implemented in other schools and serve as a model for similar programs in the future.

4. Conclusion

The community service program at SDN Kawunen, Kota Serang, successfully increased students' awareness and skills in maintaining hand hygiene through the creation of an automatic handwashing device using recycled materials. Most students were able to construct the device with the help of visual aids such as leaflets and posters. The device was deemed effective in promoting cleanliness at school and reducing direct contact that could potentially spread COVID-19. The program also emphasized the importance of recycling and repurposing used materials. Despite some technical challenges, the positive feedback from students and teachers highlights the significant impact of this program in supporting hygiene and health at school.

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