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Planting Bamboo Palms to Reduce Air Pollution and Maintain Lung Health in the Assalafi Al Fithrah Sub-district, Surabaya

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A B S T R A C T

Air quality in Surabaya faces serious challenges due to motor vehicle emissions, industrial pollution, and a lack of green space, which directly impact public health, especially the respiratory system, leading to diseases such as asthma and bronchitis. To address this, a community service program using lecture and simulation methods was conducted, involving 40 male and female students at an Islamic boarding school. The lecture lasted 40 minutes, using PPT and poster media, and pre- and post-test questionnaires to measure participants' knowledge improvement. Furthermore, a simulation was conducted in collaboration with the Islamic boarding school to plant bamboo palms on May 11, 2024. The results showed a significant increase in students' knowledge about the benefits of bamboo palms as an effort to prevent air pollution, with a significant difference in pre- and post-test scores ($p < 0.05$). The lecture approach accompanied by visual media proved effective in increasing understanding of the role of bamboo palms in reducing pollution in the Islamic boarding school environment, so this education successfully raised students' awareness of the importance of air pollution control efforts.

INTRODUCTION

According to Indonesian Government Regulation Number 41 of 1999 concerning Air Pollution Control, air pollution is defined as the entry or insertion of substances, energy, and/or components into ambient air by human activities, resulting in a decline in air quality to a level that renders the ambient air unable to fulfill its function. According to the World Health Organization (WHO) in 2014, in 2012, air pollution was the cause of eight total deaths worldwide, with an estimated seven million people dying that year. This figure represents a twofold increase from previous estimates, confirming that air pollution is the world's greatest environmental health risk. The WHO also stated that indoor air pollution is more dangerous than outdoor air pollution. Indoor air pollution causes 3.3 million deaths, while outdoor air pollution causes 2.6 million deaths (Organization, 2016). Indoor air pollution also causes 12% of all acute respiratory infections in children (*7 Million Premature Deaths Annually Linked to Air Pollution*, 2014). Air pollution refers to the infiltration of foreign materials or substances, whether intentional or unintentional, that disrupt the normal air composition and potentially harm health. Air pollution can originate from two main types of

sources: stationary sources such as industry, household activities, and waste burning, and mobile sources such as motor vehicles, motorcycles, ships, and so on. Mobile sources are the largest contributors to air pollution, reaching 70% of total air pollution (Islam, 2013). The fuel combustion process in motor vehicles is not as efficient as in industry (Tugaswati, 2008). Surabaya is a metropolitan city with a high number of vehicles on the road every day. According to the Air Quality Index (AQI) and PM2.5 air pollution in Surabaya, air quality in Surabaya is classified as moderate (AQI score: 63), but fluctuates, even reaching >100 on February 7-8, 2024. In fact, Surabaya is ranked 5th with the highest air pollution after Tangerang, Bandung, Jakarta, and Medan (*IQAir*, n.d.).

The primary impact of air pollution on health occurs primarily in the respiratory tract and is closely linked to respiratory diseases such as Acute Respiratory Infections (ARI), particularly those caused by SO₂ gas. SO₂ can damage the mucosal lining, increase mucus production, and disrupt ciliary movement, facilitating microbial infections in the respiratory tract (Hood Alsagaff, 2008). Approximately 20% of SO₂ gas pollution comes from industry and transportation, with coal and fuel oil being the primary sources. SO₂ can cause respiratory irritation, with levels of 5 ppm causing significant irritation, and levels of 1-2 ppm can irritate sensitive individuals or those with a history of chronic respiratory or cardiovascular disease (Zakaria & Azizah, 2013).

One of the lung problems frequently occurring in Islamic boarding schools is respiratory tract infections (Sat et al., 2015). The Assalafi Alfitrah Islamic boarding school in Surabaya, located in the northern part of Surabaya, also exhibits similar symptoms, in line with the high number of ARI cases in the city. Cases of Acute Respiratory Tract Infections (ARI) in Surabaya City reached 174,222 during the first semester, namely January to July 2023, which experienced a significant increase compared to the same period the previous year. Based on a report on the 10 most common diseases referring to ICD X until July 2023, it was found that diseases of the respiratory system contributed 21.43 percent of the total reported complaints, surpassing complaints of the digestive system which only reached 17.46 percent (Widiyana, 2023). The high number of ARI cases in Surabaya city indicates environmental issues, one of which is air pollution which is suspected of contributing to worsening and increasing the number of ARI cases.

Islamic boarding schools (pesantren) play a strategic role in educating the next generation of Muslims who are friendly and care for their environment. As Islamic educational institutions independently established by the community, Islamic boarding schools play a significant role in protecting and nurturing the environment, both now and in the future. This is because Islamic boarding schools are not only places to deepen religious knowledge but also train students to address various challenges, including environmental issues. There are four steps that Islamic boarding schools can take towards their environment: First, a policy of caring for and cultivating an environmental culture is established,

encouraging Islamic boarding schools to issue policies and provide facilities for students to maintain environmental order administratively. Second, the development of an environmentally-based curriculum, which includes the delivery of environmental material to students through an integrated curriculum or special subjects. Third, the development of participatory environmental activities, where Islamic boarding schools must be directly involved in providing environmental education to students and the surrounding community. Fourth, the management of environmentally friendly supporting facilities and infrastructure, where Islamic boarding schools must have adequate facilities and reflect environmental management efforts (Mangunjaya, 2014). By recognizing the important role of Islamic boarding schools as agents of change in people's behavior and attitudes towards the environment, it is necessary to examine the extent to which Islamic boarding schools can be examples in their participation in environmental conservation and natural resource management.

METHOD

The overall method used in the counseling session will be a two-way lecture and question-and-answer session. Prior to the counseling session, post-test sheets will be distributed to students. Students will be given time to work on the questions and then collect them. The counseling session will last approximately 45-60 minutes, followed by a 15-20 minute question-and-answer session. After completion, post-test sheets will be distributed to students to work on for 10-15 minutes and then collected. Gifts will be distributed, and the counseling session will conclude. The details of the activities presented are as follows:

1. Preparation Phase

The program preparation phase begins with surveys and discussions to obtain the necessary information to increase program target audience interest and improve the quality of the program.

2. Implementation of Counseling and Training

This community service program was held at the PP. Al Fitrah As Salafiyah Islamic Boarding School in Surabaya. The program lasted 150 minutes on Sunday, June 21, 2024. The event was attended by the person in charge of the Islamic boarding school's clinic and health department.

3. Evaluation and reporting

Evaluation and reporting include evaluating success and reporting in the form of presenting program results to the Islamic boarding school leadership, as well as writing program reports to be published in community service journals.

Time and Venue

This community service program was held at the PP. Al Fitrah As Salafiyah Islamic Boarding School in Surabaya. The program lasted 150 minutes on Sunday, June 21, 2024. The event was attended by the person in charge of the Islamic boarding school's clinic and health department.

Target Participants

The target participants were 40 male and female students at the Al Fitrah As Salafiyah Islamic Boarding School in Surabaya.

RESULT AND DISCUSSION

The results of community service on the benefits of planting bamboo palms to reduce air pollution and maintain lung health in the Assalafi Al Fithrah Islamic Boarding School in Surabaya have shown satisfactory results. This is evident from three indicators of success established by the presenter: 1. A significant increase in students' knowledge before and after the counseling session, with an average of >80% correct answers (Figure 1); 2. More than 40 students attended the counseling session (Figure 2); and 3. A bamboo palm planting simulation was implemented by students and administrators within the Islamic boarding school environment.

Students' knowledge before the counseling session indicated a lack of understanding of the benefits of bamboo palms in preventing air pollution, especially within the Islamic boarding school environment. However, after the counseling session, students using lectures and simulations significantly increased their knowledge and understanding ($P < 0.05$). Planting bamboo palms is beneficial for maintaining lung health, particularly by preventing air pollution.

Kuesioner kesehatan paru

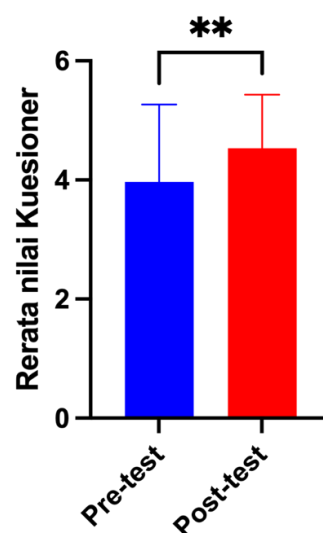


Figure 1. Results of the analysis of the average lung health questionnaire scores before and after the counseling session.

Source: Primary Questionnaire Data (2024)



Figure 2. Documentation of an outreach program on the benefits of bamboo palms for preventing air pollution and maintaining lung health.

Source: Community Service Documentation (2024)

DISCUSSION

Lung and respiratory health issues are a major global concern (Susanto, 2018). As a vital organ, the lungs require special attention to maintain their health. Maintaining lung health requires strong commitment and sustained effort (Nizaar, 2018). The surrounding environment often contains factors that can compromise lung health, such as smoking, consuming fast food, and lack of physical activity. Lung diseases take various forms, including exposure to hazardous substances in the workplace, allergies, chronic inflammation such as bronchial asthma, and chronic obstructive pulmonary disease (Nizaar, 2018).

The results of the Community Service program found an increase in students' knowledge before and after the counseling session. This was also influenced by the students' age, comprehension, and social sensitivity to environmental issues. These results align with research (Imam, 2023), which shows that adolescents have a motivation to improve a situation and a high social sensitivity, which can influence their level of knowledge. Health education in the form of counseling can change individual or community behavior toward a healthy lifestyle (Tumigolung et al., 2013). Providing accurate and precise information is crucial for adolescents in shaping their perspectives on various issues. Their attitudes can be influenced by the information they receive through knowledge, attitudes, and practices (Carolina & Tarigan, 2019).

This community service project also successfully provided knowledge about the benefits of bamboo palms for air pollution and lung health. Bamboo palms were successfully planted around the Islamic boarding school by students and administrators using a simulation approach and direct contributions, guided by the presenters. Bamboo palms, belonging to the Arecaceae family, have an extraordinary

ability to absorb various toxins, ranking higher than other plants. This plant is highly effective at absorbing toxic gases from vehicle and factory exhaust. It can absorb hazardous substances such as trichloroethylene, benzene, formaldehyde, xylene, and ammonia in large quantities. Plant propagation is carried out vegetatively through the separation of shoots. The planting medium used consists of garden soil, sand, and humus or manure in a 1:1:1 ratio (Sulistiana, 2016).

The anti-pollutant plants, initiated by students and administrators, are expected to inspire all residents of the Alfitrah Assalafiyah Islamic Boarding School to raise awareness of the importance of maintaining a clean and healthy environment.

CONCLUSION

Planting bamboo palm trees at the Assalafi Al Fithrah Islamic Boarding School is an effective solution to reduce air pollution within the school grounds. This program not only contributes to improving air quality and student health but also instills awareness of the importance of environmental protection. With this initiative, the Islamic boarding school can create a greener and healthier environment while simultaneously educating the younger generation about environmental responsibility.

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