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Increasing public awareness of probiotics and environmental issues through the promotion of fermented beverage products

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Abstract
This community service activity aimed to raise public awareness regarding the health benefits of probiotics and the importance of environmental responsibility in managing plastic waste. Awareness of healthy lifestyles, especially in the consumption of functional foods like probiotics, is still relatively low among Indonesian students. Although probiotics are proven to support digestive health, many still perceive fermented drinks such as Yakult as regular beverages without recognizing their health value. Additionally, plastic waste from product packaging remains an environmental issue. This program implemented a practical and educational approach through socialization, field observation, and an industrial visit to PT Yakult Indonesia Persada in Mojokerto on June 24, 2025. The activity involved 120 participants aged 18–30, including students and young educators. They received information about probiotics and health, observed the production process, and learned about sustainable waste management based on the 3R (Reduce, Reuse, Recycle) principles. The results showed increased knowledge and motivation among participants to adopt healthier and more environmentally conscious behavior.

Keywords: Probiotics, Fermented Beverages, Environmental Awareness, Plastic Waste Management, Community Service

Abstrak
Kegiatan ini bertujuan meningkatkan kesadaran masyarakat akan pentingnya probiotik bagi kesehatan serta pengelolaan sampah plastik secara bertanggung jawab, sebagai bagian dari upaya membangun gaya hidup sehat dan ramah lingkungan. Kesadaran akan gaya hidup sehat, terutama dalam mengonsumsi pangan fungsional seperti probiotik, masih tergolong rendah di kalangan mahasiswa Indonesia. Meskipun probiotik terbukti mendukung kesehatan pencernaan, banyak yang masih menganggap minuman fermentasi seperti Yakult sebagai minuman biasa tanpa memahami nilai kesehatannya. Selain itu, limbah plastik dari kemasan produk tetap menjadi masalah lingkungan yang serius. Program ini menerapkan pendekatan edukatif dan praktis melalui sosialisasi, observasi lapangan, dan kunjungan industri ke PT Yakult Indonesia Persada di Mojokerto pada 24 Juni 2025. Kegiatan ini melibatkan 120 peserta berusia 18–30 tahun, terdiri dari mahasiswa dan pendidik muda. Mereka mendapatkan pemahaman tentang probiotik dan kesehatan, mengamati proses produksi, serta mempelajari pengelolaan sampah berkelanjutan dengan prinsip 3R (Reduce, Reuse, Recycle). Hasilnya menunjukkan peningkatan pengetahuan dan motivasi peserta untuk menerapkan gaya hidup sehat dan perilaku konsumsi yang ramah lingkungan.

Kata kunci: Probiotik, Minuman Fermentasi, Kesadaran Lingkungan, Pengelolaan Sampah Plastik, Pengabdian Kepada Masyarakat

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1. Introduction

The growth of the soft drink industry has become one of the contributing factors to the obesity problem (Hardiansyah et al., 2019). Sugary beverages can increase body weight through calorie intake and hyperinsulinemia due to the rapid absorption of glucose (Trifosa Veronica et al., 2022). Awareness among Indonesian university students regarding the importance of a healthy lifestyle remains relatively low, particularly in the selection of functional foods such as probiotics. In fact, probiotics have been widely recognized as live microorganisms that, when consumed in adequate amounts, provide health benefits, especially for the digestive system. Khennouf et al. (2023) defines probiotics as "live microorganisms which, when administered in adequate amounts, confer a health benefit on the host."

Probiotic products commonly available on the market today use bacteria from the species Lactobacillus and Bifidobacterium (Matera, 2024). The strain Lacticaseibacillus casei Shirota (LcS) is the bacteria found in the fermented milk drink like Yakult, which has been proven to support gut health and boost the immune system (Dong et al., 2010). In this regard, Yakult serves as a popular and easily accessible form of probiotic consumption among students.

However, many students still do not understand the long-term benefits of probiotic consumption. Fermented milk drinks are often perceived merely as ordinary beverages without added health value. This reflects a knowledge gap among students that needs to be bridged through effective educational activities. One study showed that knowledge regarding probiotic and prebiotic foods is relatively low; students are familiar with Yakult but unaware of its benefits (Masrikhiyah et al., 2020). Another researcher conducted a pre-test on the benefits of probiotics among the general public, with results showing that 48.8% of participants did not know about probiotics and 23.25% were unaware of prebiotics (Sari, 2021). These facts further emphasize that practical, product-based socialization approaches have the potential to be effective when applied to students to improve nutrition literacy.

Beyond health aspects, the consumption of fermented beverage products also presents environmental challenges, particularly related to plastic waste from product packaging. Amid increasing global environmental concerns, it is important to educate students to be more aware of the environmental impacts of their consumption. Although Yakult is nutritious and beneficial, without corresponding awareness of waste management, its health benefits are imbalanced by the ecological harm its packaging may cause. Therefore, health education must be accompanied by environmental awareness and a sense of responsibility for single-use packaging waste.

Green marketing shapes awareness of environmental and health issues, encouraging industries to adopt marketing concepts that emphasize environmental and health concerns (Puspitasari et al., 2021). In this context, community service activities that integrate nutrition education and environmental awareness are highly relevant, especially for university students. This type of education not only aims to improve healthy consumption patterns but also promotes sustainable environmentally

friendly behavior. By addressing both health and environmental issues simultaneously, students can more easily understand that daily consumption habits have long-term impacts—not only on their own bodies but also on the surrounding environment.

Corporate Social Responsibility (CSR) also plays a crucial role in delivering educational messages to students. PT Yakult Indonesia Persada, as a leading probiotic drink manufacturer in Indonesia, has contributed through educational programs targeting students and the general public. Matung and Kumara (2024) note that training conducted at PT Yakult's production facility provides participants with a broader understanding not only of the probiotic drink production process but also of the importance of health and environmental stewardship. The training program allows students to directly observe the fermentation process, sanitation systems, and company waste management, serving as a concrete example of responsible business practices.

Direct educational activities through community service are also a concrete implementation of the Tri Dharma of Higher Education (Compare et al., 2022). In this approach, academics can bridge the information gap between industry and students by presenting applicable and contextual knowledge. Community-based education has proven effective in addressing students' social and cultural aspects, making messages more easily received and applied. In this participatory socialization model, students are not merely passive recipients of education, but active subjects in the behavioral change process.

On the other hand, probiotic and environmental awareness socialization activities align with the Sustainable Development Goals (SDGs). This education supports SDG 3: "Good Health and Well-being," and SDG 12: "Responsible Consumption and Production." By increasing student understanding of the benefits of probiotics and the dangers of plastic waste, a generation will be formed that makes wiser and more sustainability-oriented consumption decisions. This integrated educational approach also contributes to reducing the burden on the national healthcare system and lowering the volume of domestic plastic waste.

Poor eating habits and a lack of nutrition education have also led to rising cases of non-communicable diseases such as obesity, diabetes, and digestive disorders. Cerdó et al. (2019) asserts that consuming healthy foods, including those containing probiotics, can serve as an effective preventive intervention. Therefore, the promotion of probiotic consumption should be part of a promotive health strategy, particularly among university students as the nation's future generation.

Fermented drinks like Yakult are not only consumer products but also serve as concrete and multifunctional educational tools. Through community service activities, students are introduced to nutritional values, the importance of healthy consumption habits, and the responsibility of waste management. This not only improves students' nutrition literacy but also builds collective awareness of the connection between individual health and environmental sustainability.

Thus, the development of this journal becomes important as documentation of a community service activity that aligns health and environmental concerns in one educational initiative. It demonstrates that a simple, affordable, and product-based socialization approach can deliver a wide-ranging positive impact. Amid the proliferation of instant and low-nutrition foods, this educational method becomes a tangible solution for building healthier, more intelligent students who are mindful of their environmental future.

The objective of this community service activity is to increase public understanding of the importance of probiotic consumption for body health, particularly in maintaining digestive balance and enhancing immune function. This education is carried out through a real-product-based approach, namely fermented milk drinks like Yakult, which contain the beneficial *bacterium Lacticaseibacillus casei Shirota* (LcS) and have been scientifically proven to offer health benefits. In addition, the activity also aims to raise public awareness of the importance of managing plastic waste from daily product packaging as part of responsible, environmentally friendly behavior. Through a direct educational socialization approach, combined with field observations and an industrial tour, the community is invited to understand the connection between daily consumption patterns, personal health, and their environmental impact. With a more comprehensive understanding, this activity is expected to encourage the development of healthier, more sustainable, and environmentally conscious consumption patterns. Ultimately, the public will not only learn the theoretical benefits of probiotics but also actively engage in building a better and more ecologically responsible lifestyle.

2. Method

The implementation method of this community service activity utilized a direct educational socialization approach, combined with field observation and an industrial tour (Compare et al., 2022). The socialization took place on Tuesday, June 24, 2025, from 08:00 to 10:00 WIB, at PT Yakult Indonesia Persada, Mojokerto Factory, Malang, East Java. This event was attended by 120 participants aged 18–30 years, consisting of Company Visit Volume 1 students from Universitas Pendidikan Nasional, young educators who have an interest in digestive health and environmental issues related to PT Yakult. The implementation of this activity was permitted by PT Yakult based on Assignment Letter No. 024/PKM/ST/V/2025, with support in the form of educational facilities from PT Yakult as part of an academic–industry partnership collaboration.

The preparation phase included administrative coordination between the implementation team and the company, the preparation of educational presentation materials and observation sheets, and an internal technical briefing. On the day of the activity, the program began with a welcoming speech from a PT Yakult representative, who introduceod the company profile and its commitment to public education. This was followed by a presentation session delivered interactively via PowerPoint by PT Yakult's educational team. The material covered the history of Yakult, developed by Dr. Minoru Shirota in the 1930s, and the “Shirota-ism” philosophy, which emphasizes disease prevention through gut health. Also explained was the probiotic bacterium

Lactobacillus casei strain Shirota (LcS), which has been proven to withstand stomach acid and bile, suppress the growth of pathogenic bacteria, and strengthen the immune system through the production of butyrate in the large intestine.

After the presentation session, participants were invited to tour the production area. The production of Yakult requires five main ingredients: Lactobacillus casei bacteria, skim milk powder, dextrose, sucrose, and water. During this session, participants directly observed the Yakult production process—from LcS cultivation in sterile laboratories, mixing of liquid skim milk and glucose in large tanks, fermentation for 6–7 days, to the molding of bottles made from polypropylene (PP), which is safe and recyclable. The filling and sealing of the bottles are carried out automatically under hygienic conditions, followed by packaging in sets of five bottles and cold storage. Participants also witnessed the automatic product arrangement process in the warehouse using both machinery and human labor. Additionally, participants were informed about the quality control system through sample testing before distribution, and the storage system at specific temperatures to maintain the viability of probiotic bacteria.

The activity also provided education on the importance of managing plastic packaging waste. Participants were informed about PT Yakult's commitment to supporting the 3R movement (Reduce, Reuse, Recycle), as well as encouraged to sort household waste and support environmental sustainability. Evaluation of the activity was conducted through direct observation during the event, reflective discussions, and simple evaluation forms to measure participants' understanding. Documentation was carried out thoroughly in the form of photographs, videos, and field notes for the purpose of final reporting.

Through this socialization method, the community service activity not only provided theoretical understanding but also empirical experiences that strengthened participants' literacy in digestive health and environmental responsibility. The collaboration between academia and industry through direct education at the production site serves as an effective model for bridging scientific knowledge with real-world practices. This activity is expected to become a replicable educational program model across various regions, contributing concretely to the formation of a health-conscious and environmentally aware society.

3. Results

The socialization activity held on Tuesday, June 24, 2025, at PT Yakult Indonesia Persada, Mojokerto, successfully achieved its main objective of increasing students' awareness of the importance of probiotic consumption and concern for environmental issues. From the start, students' participation and enthusiasm were remarkably high. This was reflected in their active involvement during the Q&A sessions, group discussions, and the attention they paid throughout both the material presentation and the industrial tour. The students displayed great curiosity about the information presented and a strong desire to further explore the connections between digestive health, nutritional content, and ecological responsibility in daily consumption.

Figure 1. Educational Visit

Through educational presentations delivered by PT Yakult's education team and direct observation in the production area, students gained comprehensive and applicable new knowledge. They not only learned about the history and founding philosophy of Yakult by Dr. Minoru Shirota, but also gained technical insights into the entire production process of probiotic drinks. This included the cultivation of Lacticaseibacillus casei strain Shirota (LcS) in sterile laboratories, the mixing of raw ingredients such as skim milk and glucose, the 6–7-day fermentation process, and the final stages of packaging and product distribution.

Students also learned that the probiotic content in each bottle of Yakult offers significant health benefits, such as maintaining the balance of gut microflora, strengthening the immune system, helping to prevent digestive disorders, and supporting overall bodily resilience. This knowledge provided a new perspective for students who had previously regarded Yakult as just another ordinary beverage. Through this activity, they came to understand that each bottle of Yakult not only contains beneficial bacteria but also represents a product of complex and hygienic scientific processes, giving it high health value.

One of the most engaging moments for students was when they were introduced to Yakult's newest mango-flavored variant. In addition to tasting it directly, students received information about its nutritional content, which still retains the main probiotic benefits. Student responses to this variant were overwhelmingly positive. Many expressed interest in consuming Yakult regularly—not just because of its enjoyable taste but also due to their newfound awareness of the health benefits of probiotics.

Moreover, students received education on plastic packaging waste management and realized that Yakult bottles are made from food-grade polypropylene (PP), a recyclable and safe material. Awareness of the importance of environmentally responsible consumption became a key takeaway from this activity. Students understood that product consumption affects not only their own health but also environmental sustainability. They became more conscious of the importance of sorting waste, reducing single-use plastics, and supporting the 3R (Reduce, Reuse, Recycle) movement as a concrete contribution to environmental preservation.

During the final discussion session, students shared that the experience opened up new perspectives previously unrecognized. They not only grasped the theoretical benefits of probiotics but also experienced the production process and the social and environmental values upheld by PT Yakult. Most students felt encouraged to begin adopting a healthier lifestyle by regularly consuming probiotic products, maintaining a

balanced diet, and living cleanly. Beyond that, students also showed a strong willingness to share the knowledge they gained with others, from family and friends to the broader community. Some even expressed a commitment to becoming agents of change by encouraging those around them to adopt a healthier and more environmentally friendly lifestyle.

Overall, this socialization activity not only successfully increased nutritional literacy and environmental awareness among students but also fostered active and responsible attitudes toward daily consumption patterns. Product-based education, combined with direct experience through industrial tours, proved to be highly effective in bridging theoretical knowledge with real-world practical application. This activity demonstrates that synergy between academia and industry can yield a wide-reaching positive impact, shaping a generation that is healthy, environmentally conscious, and ready to lead change toward a wiser, more sustainable way of life (Abubakar et al., 2024).

The outreach activity at PT Yakult Indonesia Persada provided a concrete and enriching perspective that complements findings from previous studies on probiotic consumption and environmental awareness. Theoretically, probiotics are live microorganisms that confer health benefits when consumed in adequate amounts (Sarita et al., 2024). The explanations delivered during the outreach at PT Yakult heightened students' awareness—particularly those from Universitas Pendidikan Nasional—regarding the importance of good bacteria in maintaining digestive health through the consumption of Yakult (Cantika et al., 2025).

The findings of this activity, along with field observations, revealed a positive shift. After receiving direct education and participating in the industrial tour, students not only understood the conceptual definition of probiotics but were also able to connect their benefits to the practice of healthy living in daily life. Previously low awareness levels, as revealed in past studies, proved to be significantly improvable through an applied, product-based socialization approach. This activity effectively bridged the gap between theory and practice.

Field data further demonstrated that experiential learning—such as observing fermentation processes, sanitation systems, packaging, and waste management—created a more holistic and contextual understanding. These findings align with those of Matung and Kumara (2024), who asserted that industry visit-based training can foster both nutritional and ecological awareness.

Nevertheless, some gaps remain—particularly in the consistency of applying these values in everyday life after the event ends. While participants were highly enthusiastic during the activity, the long-term impact on probiotic consumption behavior and waste-sorting habits still requires follow-up. This underlines an important point: a one-time educational session may not be sufficient to create lasting behavioral change. Instead, it requires sustained campaigns and active involvement from student communities to foster ongoing motivation and reinforcement.

From an environmental awareness standpoint, this activity also succeeded in connecting daily consumption habits to their broader ecological impacts. Berame et al., (2022) emphasize that environmental awareness is the result of one's understanding and attitude toward the balance between humans and nature. Field observations support this, as students began showing sensitivity toward plastic waste issues and engaged in discussions about concrete steps to reduce their ecological footprint—such as sorting waste and supporting environmentally friendly products. This demonstrates that through empirical experiences, students are capable of internalizing sustainability values that were previously understood only in the abstract.

Table 1. Comparison Before and After the Community Engagement

Aspect	Before the Activity	After the Activity
Awareness of Probiotics	Low; most students perceived Yakult as an ordinary beverage without understanding its health benefits.	Significantly increased; students understood the role of probiotics, especially *Lactobacillus casei* strain Shirota, in maintaining gut health and immunity.
Environmental Awareness	Low; students lacked understanding of the connection between consumption habits and environmental impact, especially regarding plastic use.	Increased; students learned about food-grade polypropylene (PP) used in Yakult bottles and the importance of eco-friendly consumption and waste management.
Waste Management Practices	Underdeveloped; students rarely sorted or recycled waste properly.	Students began to show awareness and willingness to sort waste and support environmentally friendly behaviors, particularly the 3R principles.
Role as Change Agents	Passive; no clear intention to share knowledge or influence others.	Active; students committed to sharing their knowledge with family, friends, and communities, and to promoting healthy, eco-conscious lifestyles.
Understanding of CSR and SDGs	Limited understanding of corporate social responsibility and sustainable development goals.	Improved understanding of how industry-academia collaboration supports CSR and aligns with SDGs, particularly Goal 3 (Health) and Goal 12 (Responsible Consumption).

From a Corporate Social Responsibility (CSR) perspective, this activity showcased the effectiveness of partnerships between industry and academia. PT Yakult Indonesia Persada played an active role not only as a producer but also as an educational agent that opened access to valuable knowledge for the younger generation. This represents an ideal CSR model aligned with the Sustainable Development Goals (SDGs), particularly Goals 3 and 12.

A key takeaway from this initiative is that experience-based education has a transformative impact on shaping students' mindsets and attitudes. Students did not merely acquire information; they experienced, reflected upon, and formulated concrete action plans based on that experience. The activity reinforces the principles of "learning by doing" and experiential learning in higher education, positioning students as active agents of social change.

In the long term, similar initiatives could serve as a foundation for developing broader and more systematic educational programs. If replicated in other regions or conducted periodically with follow-up and community engagement strategies, there is strong potential for improving nutrition literacy and environmental awareness among younger generations in a sustainable way. Although limited to socialization and observation, this activity supports the Tri Dharma of Higher Education by raising awareness on health and environmental issues.

4. Conclusion

The outreach activity on fermented beverages at PT Yakult Indonesia Persada proved to be effective in increasing students' awareness of the importance of probiotic consumption for health. Through an educational approach based on real products and hands-on industrial tours, students gained a comprehensive understanding of the benefits of probiotics, the Yakult production process, and the health philosophy of "Shirota-ism." In addition to providing nutrition and health education, the activity also fostered awareness of environmental issues, particularly the management of plastic waste generated from daily consumption of Yakult products. By integrating values of nutrition, health, and sustainability into a single educational program, this initiative not only supports the implementation of the Tri Dharma of Higher Education and the Sustainable Development Goals (SDGs) but also empowers students to become agents of change toward a healthier and more environmentally conscious society.

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