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EMPOWERING STUDENTS THROUGH DEMONSTRATIVE TRAINING ON *ALOE VERA* BASED KOMBUCHA AS A FUNCTIONAL DRINK

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Abstract

Kombucha remains relatively unfamiliar to some groups, especially adolescents in formal education. To address this, a community service program, one of the pillars of Tri Dharma of Higher Education in Indonesia, was implemented as a transformative initiative linking academic knowledge with community needs. The program, held at MAN 3 Pontianak on May 8, 2025, involved 32 students and aimed to enhance knowledge and attitudes toward functional drinks, particularly aloe vera–based kombucha. This community service program employed a Participatory Action Research (PAR) approach, incorporating educational sessions, demonstrations, and hands-on training. Pre- and post-tests showed participants' knowledge and attitudes improved after the program. The results showed a significant increase: students with high knowledge rose from 68.7% in the pre-test to 100% in the post-test. Overall, structured education integrated with direct practice effectively improved understanding and promoted positive health.

Keywords: education, demonstration, kombucha, Aloe vera

Abstrak

Kombucha masih relatif kurang dikenal oleh sebagian kelompok masyarakat, terutama remaja di lingkungan pendidikan formal. Untuk mengatasi hal tersebut, program pengabdian kepada masyarakat sebagai salah satu pilar Tri Dharma Perguruan Tinggi dilaksanakan sebagai inisiatif transformatif yang menghubungkan pengetahuan akademik dengan kebutuhan masyarakat. Kegiatan ini dilaksanakan di MAN 3 Pontianak pada tanggal 8 Mei 2025 dengan melibatkan 32 siswa, dan bertujuan untuk meningkatkan pengetahuan serta sikap terhadap minuman fungsional, khususnya kombucha berbasis lidah buaya. PkM ini menggunakan pendekatan Participatory Action Research (PAR) melalui penyuluhan, demonstrasi, dan pelatihan langsung, disertai pre–post test untuk menilai peningkatan pengetahuan dan sikap peserta. Hasil menunjukkan peningkatan yang signifikan: proporsi siswa dengan tingkat pengetahuan tinggi meningkat dari 68,7% pada pre-test menjadi 100% pada post-test. Secara keseluruhan, pendidikan terstruktur yang dipadukan dengan praktik langsung terbukti efektif dalam meningkatkan pemahaman dan menumbuhkan kesadaran positif terhadap kesehatan.

Kata Kunci: *edukasi, demonstrasi, kombucha, lidah buaya*

INTRODUCTION

Tea consumption among the Indonesian population presents a significant opportunity for the development of kombucha, a fermented tea beverage that is increasingly recognized for its health benefits compared to conventional tea beverages (Khamidah et al., 2020). Over the past decade, kombucha consumption has grown substantially, driven by increasing public awareness of functional foods (Morales et al., 2023). Traditionally, kombucha is produced by fermenting sweetened black or green tea using a Symbiotic Culture of Bacteria and Yeasts (SCOBY), resulting in a mildly sweet and sour beverage that is well accepted in terms of taste and aroma (Jayabalan & Waisundara, 2019; Soares et al., 2021). Beneficial microorganisms typically include lactic acid bacteria (*Lactobacillus* and *Oenococcus* spp.), acetic acid bacteria (*Acetobacter*, *Gluconobacter*, *and Komagataeibacter* spp.), and yeasts (*Saccharomyces, Debaryomyces*, and *Kluyveromyces* spp.) (Coton et al., 2017; Gaggìa et al., 2019). These microbes work synergistically to produce various metabolites, including organic acids and polyphenols, which contribute to the potential therapeutic properties of the beverage, such as anti-aging, antioxidant, and disease-preventive effects (Kapp & Sumner, 2019).

Although tea leaves remain the conventional substrate for kombucha fermentation, recent research and innovations have explored the use of alternative ingredients, including fruits, herbs, and functional plants, to diversify the organoleptic and nutritional properties of beverages (Freitas et al., 2022). A promising alternative is *Aloe vera*, which is rich in bioactive compounds. *Aloe vera* gel contains approximately 99.5% water and 0.5% solid matter, which is composed of polysaccharides, vitamins, minerals, enzymes, and phenolic compounds. Scientific evidence has highlighted its antioxidant, antimicrobial, and health-promoting properties, making it a suitable substrate for producing functional beverages (Arsene et al., 2022; Bendjedid et al., 2021; Shakil et al., 2023).

Kombucha remains insufficiently known among adolescents in formal education, including students at MAN 3 Pontianak, who exhibit a limited understanding of the health benefits and production principles of fermented

functional beverages. This lack of exposure represents a key issue for the partner institution, particularly given the availability of local resources such as *Aloe vera*, which remain underutilized in school-based learning. To address this need, a community service initiativealigned with the Tri Dharma mandatewas implemented to bridge academic expertise with the partner's educational challenges. The program introduced the *Aloe vera*–based kombucha as a model for functional drink production, combining scientific explanations with direct practical engagement. Through this approach, students gained essential technical skills, heightened scientific awareness, and improved appreciation for health-oriented innovation relevant to their local context.

METHODS

This community engagement program adopted a Participatory Action Research (PAR) framework integrating educational outreach with experiential, skill-oriented training at MAN 3 Pontianak (Figure 1). The initiative progressed through the PAR cycle—planning, action, observation, and reflection—operationalized into three phases: preparation, implementation, and evaluation. The core intervention was carried out on May 8, 2025, with 32 students actively participating in both conceptual instruction and hands-on practice.

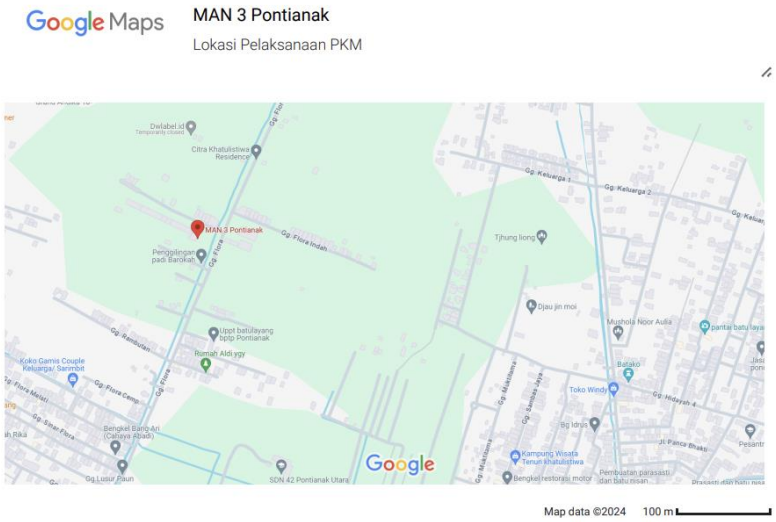

Figure 1. Site of Community Engagement Activities at MAN 3 Pontianak

Preparations for the activity involved the development of instructional materials, including a PowerPoint presentation and printed brochures, as well as the preparation of equipment and raw materials required for kombucha production using *Aloe vera*. The equipment used included weighing scales, stoves, stainless steel pans, glass jars, spoons, measuring glasses, and glass bottles. The raw materials consisted of *Aloe vera*, water, granulated sugar, SCOBY (Symbiotic Culture of Bacteria and Yeasts), and a starter solution.

Prior to the intervention, a pre-test was administered to assess participants' baseline knowledge of kombucha, its production process, and its associated health benefits. The main intervention commenced with participant registration and the distribution of refreshments, followed by an educational session using slide presentations and brochures that introduced the health benefits of *Aloe vera* and the fermentation process involved in kombucha production. After the theoretical session, practical training was conducted, in which students directly participated in preparing *Aloe vera*-based kombucha. This participatory approach aimed to foster both conceptual understanding and practical skill development. At the end of the session, the participants completed a feedback questionnaire and a group photo was taken for documentation purposes.

To assess the effectiveness of the intervention, a post-test was administered using a structured questionnaire adapted and modified from Helmidanora et al. (2023). The collected data were analyzed descriptively. Attitudinal responses were evaluated using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). An attitude was considered positive if the total score exceeded 50% and negative if it was below this threshold (Indriasari et al., 2022). This integrated approach allowed for a comprehensive understanding of the impact of educational and practical exposure on students' awareness, knowledge, and readiness to innovate functional food products derived from natural resources.

RESULTS AND DISCUSSION

The community engagement activity at MAN 3 Pontianak was successfully conducted as scheduled on May 8, 2025, involving 32 high school students (Figure

2). The program combined educational sessions with hands-on training on the production of *Aloe vera*-based kombucha, designed to enhance students' knowledge, attitudes, and practical skills regarding functional beverages derived from natural resources. The students' direct engagement in the kombucha preparation process enabled the practical internalization of concepts introduced during the instructional session, an approach consistent with active learning frameworks known to improve knowledge retention while simultaneously strengthening their technical and interpersonal competencies and fostering a more positive outlook toward future health innovation opportunities (Bayuriansyah et al., 2025; Mancin et al., 2025).

Figure 2 (A) Tools and Materials for Demonstration; (B) Delivery of Materials; (C) Practice of *Aloe vera* Kombucha Tea Preparation

Table 1 Sociodemographic Characteristics of Students at MAN 3 Pontianak

No	Characteristics	Frequency (n)	%
1	**Age**		
	15-16 years	12	37.5
	17-18 years	19	59.4
	≥19 years	1	3.1
	Total	**32**	**100.0**
2	**Gender**		
	Male	11	34.4
	Female	21	65.6

	Total	**32**	**100.0**
3	**Occupation**		
	Father		
	Civil Servant	3	9.4
	Private Sector	14	43.8
	Farmer	4	12.5
	Laborer	6	18.8
	Trader	3	9.4
	Other	2	6.3
	Total	**32**	**100.0**
	Mother		
	Civil Servant	2	6.3
	Private Sector	1	3.1
	Laborer	1	3.1
	Trader	2	6.3
	Housewife	26	81.3
	Total	**32**	**100.0**
4	**Parental Income**		
	<1 million	9	28.1
	1-2 million	13	40.6
	2-4 million	6	18.8
	>4 million	4	12.5
	Total	**32**	**100.0**
5	**Father's Education**		
	Primary School (SD)	3	9.4
	Junior High School (SMP)	11	34.4
	Senior High School (SMA)	12	37.5
	Bachelor's Degree (S1)	5	15.6
	Bachelor Degree (S2)	1	3.1
	Total	**32**	**100.0**
	Mother's Education		
	Primary School (SD)	6	18.8
	Junior High School (SMP)	11	34.4
	Senior High School (SMA)	10	31.3
	Bachelor's Degree (S1)	5	15.6
	Total	**32**	**100.0**

Based on Table 1, the sociodemographic profile of students at MAN 3 Pontianak suggests key considerations for designing community service initiatives. The majority (59.4%) were aged 17–18, indicating their readiness to adopt health-related interventions, as late adolescence is a formative period for shaping lifestyle habits (Sawyer et al., 2018). Females predominated (65.6%), aligning with evidence that young women generally demonstrate higher receptivity to nutrition and health

education (Svendsen et al., 2021). Parental characteristics suggest limited socioeconomic resources, as fathers were predominantly employed in the private sector (43.8%), mothers were largely housewives (81.3%), and the highest share of families reported an income of IDR 1–2 million (40.6%). Lower parental education, for example, senior high school for fathers (37.5%) and junior high school for mothers (34.4%), may also indicate constrained health literacy, which influences dietary practices and access to nutritious food (Angraini et al., 2023; Hastuti & Noor Yuliati, 2019).

Table 2 Distribution of Questions and Student Responses at MAN 3 Pontianak

No	Question	Percentage of Correct Answers	
		Pre-Test	Post-Test
1	What is Kombucha?	91	100
2	What is the main function of the SCOBY culture in kombucha production?	94	97
3	What is the main content of aloe vera?	69	91
4	How long is the fermentation process of kombucha?	63	97
5	What flavor is produced when kombucha is fermented properly?	75	100
6	What are the benefits of aloe vera kombucha?	75	94
7	What is the role of sugar in the kombucha-making process?	59	88
8	What does SCOBY stand for?	75	97
9	Why is it important to maintain cleanliness during kombucha production?	91	94
10	Why should kombucha not be consumed excessively?	75	94

Beyond demographic factors, program effectiveness was assessed using a pre- and post-test design that included a survey. As shown in Table 2 and Figure 3, the students' knowledge of kombucha production improved substantially after the intervention. Pre-test scores indicated limited understanding, particularly regarding *Aloe vera* content (69%), fermentation duration (63%), and sugar's role (59%). The post-test results showed a marked increase, with correct responses exceeding 90% for nearly all items.

This improvement was reflected in the overall knowledge category, where the proportion of students with high knowledge increased from 68.7% to 100%, while

those with low knowledge declined to zero. These findings confirm the value of interactive approaches, including demonstrations and hands-on practice, in enhancing the learning outcomes. Similar trends have been reported in community-based education, where practical demonstrations significantly strengthened students' comprehension of functional beverages (Hartati et al., 2025).

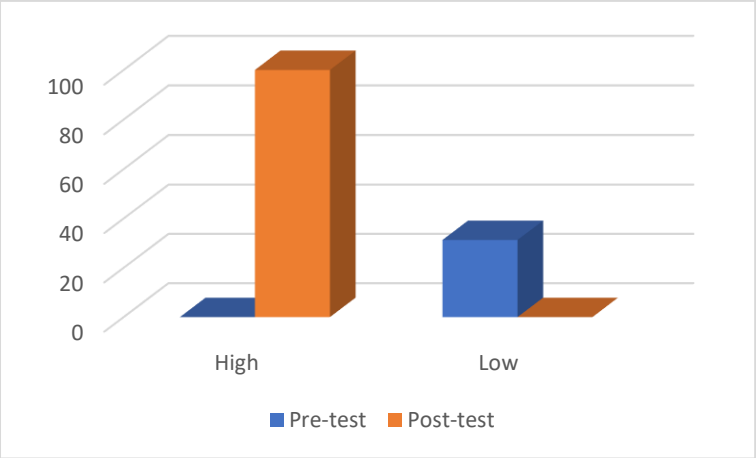

Figure 3 Distribution of Frequency by Knowledge Level

Table 3 Distribution of Frequency Students' Attitudes at MAN 3 Pontianak

Criteria	Positive		Negative	
	N	%	N	%
Attitude	32	100	0	0
Total	32	100	0	0

In addition to knowledge improvement, students' attitudes were uniformly positive (Table 3). All participants (100%) expressed favorable perceptions of the program, with no negative responses recorded. Such positive attitudes indicate not only acceptance of the material but also enthusiasm for functional food innovations, such as Aloe vera kombucha. Attitudinal outcomes are crucial in community education, as they determine the readiness to adopt and potentially disseminate the knowledge gained. These findings are consistent with earlier studies showing that participatory and interactive learning strategies enhance both cognitive and affective learning outcomes (Chiba et al., 2020; Dermawan et al., 2024; Dwisari et al., 2025; Lestari et al., 2024).

The integration of pre- and post-tests demonstrated significant knowledge improvement and uniformly positive attitudes, confirming the effective transfer of functional food education on butterfly pea kombucha. When coupled with entrepreneurship training, students recognized fermentation not only as a biological process but also as a health-oriented business opportunity, aligning with the increasing demand for functional beverages among youth. This dual approach strengthens scientific understanding, fosters innovation, and encourages sustainable practices within the community. Overall, the program extended beyond outreach and achieved measurable educational outcomes with long-term community relevance.

CONCLUSION

This community service program effectively enhanced students' knowledge, attitudes, and perspectives on the development of functional drinks, particularly aloe vera-based kombucha. The combination of interactive education and hands-on practice not only improved the understanding of natural fermentation but also encouraged students to translate scientific knowledge into innovative, health-oriented opportunities. The integration of pre–post evaluation confirmed measurable educational gains, and the emphasis on sustainable health practices ensured community relevance. Overall, the program highlights that functional drink education, when combined with active participation, can foster both cognitive and behavioral transformations with long-term societal impact.

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