 ISSN: 2540-8747

Assessing the Effectiveness of Oral Health Education: Large Versus Small Groups among Primary School Students in Watesjaya, West Java

Stephani Dwiyanti[1*], Mora Octavia[2], Isadora Gracia[3], Indriani Oktaria[4], Cornelia Tyara Tantra[5], Alvira Susanto[6], Audie Djiady[7], Bryan Santoso[8]
[1,2,3,4] Department of Dental Medicine, School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia, Jl. Pluit Raya No.2, 14440 - Indonesia
[5,6,7,8] School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia, Jl. Pluit Raya No.2, 14440 - Indonesia
*E-mail corresponding author: stephani.dwiyanti@atmajaya.ac.id

Received: 17 Februari 2025; Revised: 10 Oktober 2025; Accepted: 15 Oktober 2025; Available Online: 1 November 2025

Abstract. Insufficient oral health knowledge contributes to high prevalence of oral disease among primary school students. Large-group lectures are commonly used in community services but may not be the most effective learning method. Studies suggest that small-group settings foster better learning environments. This study examines knowledge changes before and after oral health education (OHE), comparing the effectiveness of large- and small-group settings. Fifty-three students aged 10 to 12 years were divided into two groups: Group A (21 students) received OHE in a large lecture-style setting, while Group B (32 students) received OHE in smaller groups of 4 to 8 students. A pre-test was administered before OHE session, followed by a post-test to assess knowledge improvement. Statistical analysis showed significant pre-test to post-test improvement in both groups ($p < 0.001$). The gain in test scores for group A (27.62 ± 18.69) was greater than that of group B (17.50 ± 10.47), which was also statistically significant ($p=0.028$). These findings suggest that OHE effectively improves knowledge, with larger groups showing greater score improvement, potentially due to factors such as group dynamics, the physical environment, or learning aids.

Keywords: Group size; knowledge improvement; learning effectiveness; oral health education; primary school students.

DOI: https://doi.org/10.30653/jppm.v10i3.1380

1. INTRODUCTION

Oral health plays a crucial role in determining overall health status and quality of life, as well as influencing the growth and development of children (Baiju, 2017; Phantumvanit et al., 2018). Oral health issues affect many children in Indonesia (Maharani et al., 2017). According to the results of the 2018 Indonesia Basic Health Research (Riset Kesehatan Dasar/Riskesdas), the prevalence of oral diseases, especially caries, root caries, and periodontitis among children aged 10-14 years in Indonesia, is 73.4%. Meanwhile, the average DMF-T index for permanent teeth in this age group is 1.8 (Badan Penelitian dan Pengembangan Kesehatan, 2019).

Dental carriers are a major public health issue globally and are the most common non-communicable disease (World Health Organization, 2017). According to the Global Burden of Disease Studies 2015, caries is a condition with high prevalence, where caries in permanent teeth ranks first (2.3 billion people) and caries in primary teeth ranks twelfth (560 million children) (Global Burden of Disease Collaborative Network, 2016). Untreated caries can cause pain and infection, leading to difficulties in eating, speaking, playing, and learning (Centers for Disease Control & Prevention, 2022; Shirahmadi et al., 2024). Childhood marks a crucial period in oral health management as it involves the transition from primary dentition to permanent dentition, known as the mixed dentition phase (Janus et al., 2019; Park et al., 2024). Compared to children with good oral health, those with poor oral health are more absent from school and achieve lower grades. Preventing, treating, and improving the oral health of children also impacts their academic achievement, as well as their cognitive and psychosocial development (Guarnizo-Herreño & Wehby, 2012; Kitsaras et al., 2021).

Many factors contribute to the increasing prevalence of oral diseases among children, one of which is the inadequate knowledge of parents and children in maintaining good oral health, such as proper tooth brushing techniques, brushing duration, foods that affect oral health, and so on. One of the foods most associated with oral health problems is sugars, especially free sugars (Mahboubi et al., 2021; Moynihan, 2016). Free sugars, defined by WHO as “all monosaccharides and disaccharides added to foods and drinks by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices, and fruit juice concentrates”, are the essential dietary factor in the development of dental caries (World Health Organizations, 2017). Sugars can be metabolized by bacteria in the mouth to produce acid that demineralizes the dental tissues, causing dental curries (Carvalho Silva et al., 2021; World Health Organizations, 2017). In many countries, sugar-sweetened beverages, including fruit-based and milk-based sweetened drinks and 100% fruit juices, are a primary source of free sugars, as well as confectionery, cakes, biscuits, sweetened cereals, sweet desserts, sucrose, honey, syrups, and preserves. During a survey in the village of Wates Jaya, it was observed that school-aged children have a fondness for snacks containing high sugar content and other snacks that are detrimental to oral health, such as crepes, ice cream, and cotton candy. These snacks are readily available around their schools during break time and after school. Recognizing this, it was important to improve knowledge and promote behaviors supporting children’s oral health. One of the objectives of this community service is to assess whether students' knowledge improves before and after the oral health education session, as measured by pre-test and post-test scores. It is expected that post-test scores will be higher than pre-test scores, with students in smaller group settings achieving better results compared to those in larger group settings.

A quasi-experimental research study conducted by Sarayuthpitak et al, shows that a group that has been given an oral health education program demonstrated improved oral hygiene within one year (Sarayuthpitak et al., 2022). Most community services are done via lectures (Nurkhalika et al., 2024; Sousa, 2016). Nevertheless, there are various learning methods that can be used to help improve the knowledge and cognitive abilities of participants (Sarayuthpitak et al., 2022). There are several problems faced when using pedagogical learning via lecture presentations. One of these issues is that the number of participants is often too high, the classroom size is not adjusted to accommodate the number of participants, and the availability of tools such as learning media is insufficient for the number of participants who need them (Ismail, 2018). Having too

many participants in a classroom can make it difficult for the educator to provide individual attention to each participant and manage their behaviour (Yussif, 2023). Participants may feel neglected, and their behavior may become disruptive. Additionally, the more participants there are, the less opportunity for each participant to make individual contributions. In this community service session, we decided to divide the participants into large and small group settings to compare the effectiveness of oral health education, as we have not found any existing literature on this matter. Therefore, another objective of this community service is to determine which learning method is more effective in enhancing this knowledge: education conducted in large or small class environments.

2. METHOD

This community service is in the form of community education/training. The education session on the importance of maintaining oral health was delivered by the community service team of the School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia *(Fakultas Kedokteran dan Ilmu Kesehatan Universitas Katolik Indonesia Atma Jaya/ FKI*K UAJ). The community service was held on January 2024 at SDN Cigombong RW 05 Wates Jaya, Bogor. The target is primary school students from grade 4, 5, and 6. Those students, typically around 10 to 12 years old, are at an age where they are more capable of understanding complex health concepts and taking responsibility for their health behaviors. Also, by grades 4, 5, and 6, most children have already experienced the eruption of their permanent teeth. It is crucial to educate them about proper oral hygiene practices to maintain the health of these permanent teeth, as they will have them for the rest of their lives.

The participants were divided into 2 groups: a large group of 21 students receiving lectures in a classroom (group A) (see figure 1) and 6 small groups of 4-8 students (group B, total of 32 students) receiving lectures in another classroom (see figure 2). Within group A, 3 undergraduate students delivered the lecture with the assistance of a projector and a whiteboard. For the small groups in group B, each group was led by one undergraduate student who gave the presentation via tablet. All presenters had undergone training by facilitators prior to oral health education.

The community service began with the administration of a pre-test through worksheets containing multiple-choice questions about oral health. Next, a 30-minute lecture session was held in a large classroom and small groups in another classroom. The event continued with the screening of a video about an eggshell experiment related to tooth decay for 5 minutes, still within their respective groups. Subsequently, both groups reassembled in one classroom. At the end of the event, mini games were conducted followed by a post-test with the same questions as the pre-test. The winning group was awarded a prize as appreciation, and participants were also given goodie bags. Visual aids in the form of illustrated posters containing information about oral health were placed around the school environment of SDN Cigombong, including on school bulletin boards and classroom walls from grades 1 to 6.

The pre-test and post-test scores of each participant were recorded and grouped according to the group they joined (Group A vs. Group B). Mean pre-test and post-test scores were obtained for each group, and the Paired t-test and Wilcoxon test were used to evaluate whether there was a significant difference between the pre-test and post-test scores of participants in each group. Also, mean gained score (the difference between the pre- and post-test) for each group was obtained. Mann-Whitney test was used to evaluate whether there was significant difference in gained score between both groups.

Figure 1. Group A receiving lecture in classroom settings

Figure 2. Group B receiving lecture in small groups of 4-8

3. RESULT AND DISCUSSION

There was a total of 53 participants in the oral health education program, consisting of 21 participants in Group A and 32 students in Group B. The participants were from grades 4 to 6, with grade 5 having the highest number of participants (Table 1).

Table 1. Demographic information of the participants in OHE at SDN Cigombong

	Group A		Group B		n
	Age (Mean+SD)	Frequency	Age (Mean+SD)	Frequency	
4th Grade	9.80±0.50	4	9.43±0.53	7	11
5th Grade	10.50±0.53	10	10.62±0.65	13	23
6th Grade	11.86±0.38	7	12.33±0.49	12	19
		21		32	53

The mean pre-test score for group A was 41.90±0.78 and increased to 69.52±17.17 during the post-test. For group B, the mean score also increased from 44.69±16.26 to 62.19±16.21 (Table 2). Statistically, the pre-test and post-test scores for each group were significantly different ($p<0.001$). The gain in test scores for group A (27.62±18.69) was greater than that of group B (17.50±10.47). The difference between the test scores gained of group A and B was also statistically significant (Table 3).

Table 2. Comparison of pre-test and post-test for group A and group B

	n	Pre-Test Score (Mean±SD)	Post-Test Score (Mean±SD)	p-value
Group A	21	41.90±0.78	69.52±17.17	$p < 0.001$*
Group B	32	44.69±16.26	62.19±16.21	$p < 0.001$*

Statistical analysis using Paired t-test for Group A and Wilcoxon test for Group B.

*Statistically significant if p<0.05.

Table 3. Comparison gained score for group A and group B

Gained Score Group A	Gained Score Group B	p-value
27.62 ± 18.69	17.50 ± 10.47	0.028

Statistical analysis using Mann-Whitney.
*Statistically significant if p<0.05.

The present study showed that oral health education (OHE) lectures effectively increase oral health knowledge among primary school students. This is shown by an immediate gain in test scores after an educational intervention (27.62 in group A and 17.50 in group B). This result was in accordance with a previous study conducted by Al Saffan et al., where the oral hygiene knowledge score was increased by 25.6% after a 30-minute Oral Health Education (OHE) lecture and video (Al Saffan et al., 2017). Another study by Subedi et al, also found that oral hygiene knowledge measured using a questionnaire was immensely increased by 77.51% in the group given the OHE lecture at baseline, third and sixth months versus 6.6% in the control group that only received OHE lecture after the study was over (Subedi et al., 2021). Kurniawan et al. (2023) used similar community service methods of counseling and practice of dental and oral health for kindergarten and primary school students, resulting in increased knowledge of maintaining oral hygiene by 52%. The consistent and significant improvements across multiple studies affirm that oral health education, especially when delivered through lectures and reinforced over time, is a powerful and reliable method for enhancing oral hygiene knowledge in children.

This current study also found that students in the larger group setting showed better test results compared to small groups. A previous study by Al Mulhim and Eldokhnyl supports this finding stating that large-size groups were more effective in terms of student achievement, due to better motivation of the students to accomplish one goal. However, this result contradicted most previous studies that favored small group learning activities to improve learning outcomes (Al Mulhim & Eldokhny, 2020). Ferreri and O'Connor found that students in smaller group settings reported better academic outcomes compared with students in large-lecture-based classes (Ferreri & O'Connor, 2013). Another study by Afify also showed that small-group learning activities have a better effect on critical thinking skills and performance in discussion forums than large-sized group learning (Afify, 2019).

These differences could be attributed to the fact that all small group learning activities were carried out in the same classroom in the study we conducted. The decision to consolidate all the small groups in the same classroom was due to the limited number of classrooms available for the lecture. The bustling classroom environment may have caused participants to become less focused. Another possible cause for the lower score gained in group B was the unequal distribution of participants in each small group. One group had only 4 participants, while another group had 8 participants. We suspected that the attentiveness and concentration of the group with 8 participants would be less to that with 4 participants. Additionally, smaller visual media tools such as tablets/laptops were utilized for small groups vs large projector screens for big groups. This potentially results in less clear images for the students. Whereas clear visual media tools are highly important for students to increase focus and grasp educational concepts better (Shabiralyani et al., 2015).

5. CONCLUSION

Oral health education has demonstrated its effectiveness in enhancing primary school students' knowledge, in which the students in the large group setting had higher post-test and gained test scores compared to those in small groups. When engaging in community service activities, effective classroom management emerges as a pivotal factor. This includes meticulous arrangements within the physical environment, encompassing teaching aids, learning ambiance,

lighting, temperature, and sound levels, all meticulously calibrated to optimize learning outcomes.

ACKNOWLEDGEMENTS

Thank you to the School of Medicine and Health Science Atma Jaya Catholic University of Indonesia Student Senate for doing this community service activity.

REFERENCES

Afify, M. K. (2019). The Influence of Group Size in the Asynchronous Online Discussions on the Development of Critical Thinking Skills, and on Improving Students' Performance in Online Discussion Forum. *International Journal of Emerging Technologies in Learning (iJET)*, *14*(05), 132-152. https://doi.org/10.3991/ijet.v14i05.9351

Al Mulhim, E. N., & Eldokhny, A. A. (2020). The Impact of Collaborative Group Size on Students' Achievement and Product Quality in Project-Based Learning Environments. *International Journal of Emerging Technologies in Learning (iJET)*, *15*(10), 157-174. https://doi.org/10.3991/ijet.v15i10.12913

Al Saffan, A., Baseer, M., Alshammary, A., Assery, M., Kamel, A., & Rahman, G. (2017). Impact of Oral Health Education on Oral Health Knowledge of Private School Children in Riyadh City, Saudi Arabia. *Journal of International Society of Preventive and Community Dentistry*, *7*(Suppl 3), S186-S193. https://doi.org/10.4103/jispcd.JISPCD_372_17

Badan Penelitian dan Pengembangan Kesehatan. (2019) *Laporan Nasional Riskesdas 2018*. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan.

Baiju, R. (2017). Oral Health and Quality of Life: Current Concepts. *Journal of Clinical and Diagnostic Research, 11*(6), ZE21-ZE26. https://doi.org/10.7860/JCDR/2017/25866.10110

Carvalho Silva, C., Gavinha, S., Vilela, S., Rodrigues, R., Manso, M. C., Severo, M., Lopes , C., Melo, P. (2021). Dietary Patterns and Oral Health Behaviours Associated with Caries Development from 4 to 7 Years of Age. *Life*, *11*(7), 609. https://doi.org/10.3390/life11070609

Centers for Disease Control and Prevention. (2022). Children's Oral Health. Retrieved February 15, 2025 from https://www.cdc.gov/oralhealth/basics/childrens-oral-health/index.html

Ferreri, S. P., & O'Connor, S. K. (2013). Redesign of a Large Lecture Course Into a Small-Group Learning Course. *American Journal of Pharmaceutical Education*, *77*(1), 13. https://pmc.ncbi.nlm.nih.gov/articles/PMC3578326/

Global Burden of Disease Collaborative Network. (2016). *Global Burden of Disease Study 2015 (GBD 2015) Life Expectancy, All-Cause and Cause-Specific Mortality 1980-2015*. Seattle, United States of America.

Guarnizo-Herreño, C. C., & Wehby, G. L. (2012). Children's Dental Health, School Performance, and Psychosocial Well-being. *J Pediatr.*, *161*(6), 1153–1159. https://doi.org/10.1016/j.jpeds.2012.05.025

Ismail, F. (2018). *Pengantar Evaluasi Pendidikan* (2nd ed.; M. Astuti, Ed.). Palembang: Karya Sukses Mandiri.

Janus, M., Reid-Westoby, C., Lee, C., Brownell, M., & Maguire, J. L. (2019). Association between Severe Unaddressed Dental Needs and Developmental Health at School Entry in Canada: A Cross-sectional study. *BMC Pediatrics*, *19*(481). https://doi.org/10.1186/s12887-019-1868-x

Kitsaras, G., Goodwin, M., Kelly, M. P., & Pretty, I. A. (2021). Bedtime Oral Hygiene Behaviours, Dietary Habits and Children's Dental Health. *Children*, *8*(5), 416. https://doi.org/10.3390/children8050416

Kurniawan, U. S., Akmalia, N. S., Novildan, N. H. S., Nugroho, D. A., & Puspita, S. (2023).

Peningkatan Pengetahuan Kesehatan Gigi dan Mulut Anak di Dusun Botokan, Sendangrejo, Minggir, Sleman. *Dental Agromedis: Jurnal Pengabdian kepada Masyarakat*, *1*(1), 1–7. https://journal.unej.ac.id/dentalagromedis/article/download/347/127

Maharani, D. A., Adiatman, M., Rahardjo, A., Burnside, G., & Pine, C. (2017). An Assessment of the Impacts of Child Oral Health in Indonesia and Associations with Self-esteem, School Performance and Perceived Employability. *BMC Oral Health*, *17*(1), 65. https://doi.org/10.1186/s12903-017-0358-5

Mahboubi, Z., Pakdaman, A., Yazdani, R., Azadbakht, L., & Montazeri, A. (2021). Dietary Free Sugar and Dental Caries in Children: A Systematic Review on Longitudinal Studies. *Health Promotion Perspectives*, *11*(3), 271–280. https://doi.org/10.34172/hpp.2021.35

Moynihan, P. (2016). Sugars and Dental Caries: Evidence for Setting a Recommended Threshold for Intake. *Advances in Nutrition*, *7*(1), 149–156. https://doi.org/10.3945/an.115.009365

Nurkhalika, R., Samor, V. A., Lestari, Y. E., & Saddam, H. (2024). Edukasi Peningkatan Kesadaran Penyakit Menular Seksual pada Warga Binaan Lembaga Pemasyarakatan Perempuan Kelas IIA Way Hui BandarLampung. *Jurnal Pengabdian Pada Masyarakat*, *9*(2), 388–396.

Park, S. A., Lim, J. N., & Lee, J. Y. (2024). Evaluation of the Effectiveness of Children's Dental Care Programs: A Retrospective Study. *Healthcare*, *12*(7), 721. https://doi.org/10.3390/healthcare12070721

Phantumvanit, P., Makino, Y., Ogawa, H., Rugg-Gunn, A., Moynihan, P., Petersen, P. E., … Ungchusak, C. (2018). WHO Global Consultation on Public Health Intervention against Early Childhood Caries. *Community Dentistry and Oral Epidemiology*, *46*(3), 280–287. https://doi.org/10.1111/cdoe.12362

Sarayuthpitak, J., Rodpipat, S., Ekgasit, S., & Ravizza, D. M. (2022). Effectiveness of an Oral Hygiene Promoting Program for Elementary School Students using a Smartphone Endomicroscope in Thailand. *Journal of Health Research*, *36*(6), 1176–1186. https://doi.org/10.1108/JHR-12-2020-0657

Shabiralyani, G., Hasan, K. S., Hamad, N., & Iqbal, N. (2015). Impact of Visual Aids in Enhancing the Learning Process Case Research: District Dera Ghazi Khan. *Jorunal of Education and Practice*, *6*(19), 226–233. http://files.eric.ed.gov/fulltext/EJ1079541.pdf

Shirahmadi, S., Bashirian, S., Soltanian, A. R., Karimi-shahanjarini, A., & Vahdatinia, F. (2024). Effectiveness of Theory-based Educational Interventions of Promoting Oral Health among Elementary School Students. *BMC Public Health*, *24*(1), 130. https://doi.org/10.1186/s12889-023-17528-0

Sofi Nurmay, S., Yusransyah, Y., Chairan, F., & Adini, S. (2024). Edukasi Penggunaan Obat Antidiabetes saat Berpuasa Ramadhan di Panti Asuhan Hasanudin Pandeglang. *Jurnal Pengabdian Pada Masyarakat*, *9*(4), 889–898. https://jurnal.unmabanten.ac.id/index.php/jppm/article/download/934/487/

Sousa, D. A. (2016). *How the Brain Learns* (5th ed.). Thousands Oak, CA: Corin Press.

Subedi, K., Shrestha, A., Bhagat, T., & Baral, D. (2021). Effectiveness of Oral Health Education Intervention among 12–15-year-old School Children in Dharan, Nepal: A Randomized Controlled Trial. *BMC Oral Health*, *21*(1), 525. https://doi.org/10.1186/s12903-021-01877-6

World Health Organization (2017). Sugars and Dental Caries. Retrieved Feburary 15, 2025 from https://www.who.int/news-room/fact-sheets/detail/sugars-and-dental-caries

Yussif. (2023). The 4 Major Classroom Management Problems. Retrieved February 16, 2025 from https://classroommanagementexpert.com/blog/the-4-major-classroom-management-problems/