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Relay Ball Game as an Effort to Improve Oral Health Knowledge Among Elementary School Children

Gregorius Gunawan Ge'e[1*], Tedi Purnama[2]

[1,2] Department of Dental Health, Polytechnic Health of Jakarta I, Indonesia

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ABSTRACT

Background: Oral and dental health is an essential component of overall health. Insufficient knowledge of oral and dental health among elementary school children may increase their risk of developing oral health problems, particularly dental caries. Health education using interactive and enjoyable learning approaches, such as relay ball games, may provide an effective strategy for improving children's oral health knowledge. Objective: This study aimed to analyze differences in oral and dental health knowledge before and after health education using a relay ball game among fourth-grade students at SDN Kampung Bulak 02, South Tangerang City, in 2026. Methods: This study employed a pre-experimental design with a one-group pretest-posttest approach. The study involved 89 fourth-grade students at SDN Kampung Bulak 02, South Tangerang City, selected using total sampling. Data were collected using a 15-item knowledge questionnaire administered before and after the intervention. The intervention consisted of health education delivered through a relay ball game. Data were analyzed using the Wilcoxon signed-rank test. Results: Before the intervention, 47 students (52.8%) demonstrated good knowledge, while 42 students (47.2%) had poor knowledge. Following the intervention, the number of students with good knowledge increased to 88 (98.9%), while only one student (1.1%) remained in the poor knowledge category. The mean knowledge score increased from 67.79 before the intervention to 92.59 after the intervention. The Wilcoxon signed-rank test yielded a p-value of 0.000 ($p < 0.05$), indicating a statistically significant difference in oral and dental health knowledge before and after the intervention. Conclusion: The relay ball game method was effective in improving oral and dental health knowledge among elementary school students

INTRODUCTION

Oral and dental health is an essential component of overall health and should therefore receive appropriate attention and care (Zahara et al., 2025). Neglect of oral health may result in the accumulation of dental plaque containing pathogenic bacteria, which can contribute to enamel demineralization and the development of dental caries lesions (Marsh et al., 2017). This condition may be exacerbated by changes in dietary patterns, particularly increased consumption of sugary beverages, which may contribute to the increasing prevalence of dental caries among children (Anil et al., 2017). Untreated caries in primary teeth may cause persistent pain, tooth loss, and a reduced quality of life among children (Peres et al., 2019).

According to the World Health Organization (WHO), approximately 60–90% of children worldwide are affected by dental caries (WHO, 2022). Several countries in Southeast Asia also experience a high burden of oral health problems among school-aged children. A study conducted in Thailand (Duangthip et al., 2017) reported that approximately 87.4% of school-aged children experienced dental caries. A similar problem was reported in Afghanistan, where (Aalemi et al., 2024) found a dental caries prevalence of 78.8% among school-aged children aged 7–13 years in Kabul City.

In addition (Alraqiq et al., 2021)) reported that the prevalence of dental caries among elementary school children in Tripoli, Libya, reached 78%. These findings indicate that oral and dental health problems among children are not limited to Indonesia but are also prevalent in various countries worldwide. Such conditions may affect oral function and have long-term consequences for quality of life (Shahzad et al., 2020).

*Corresponding author.
E-mail addresses: gunawansekesal@gmail.com

According to the 2023 Indonesian Health Survey, the prevalence of oral and dental health problems in Indonesia was 56.9%, while the prevalence in Banten Province was 56.3% (Kemenkes RI, 2023a). By age group, oral and dental health problems affected 62.6% of children aged 5–9 years and 48.8% of children aged 10–14 years (Kemenkes RI, 2023a).

Dental caries is one of the most common oral health problems among children. It may cause pain and difficulty eating, which can subsequently reduce nutritional intake and affect children's nutritional status (Batubara et al., 2025). Suboptimal nutrition during childhood may interfere with growth and development and negatively affect children's quality of life (Ana et al., 2025).

One of the factors associated with oral and dental health problems is health behavior (Febriana & Husain, 2023). Individuals who practice good oral hygiene behaviors, such as brushing their teeth regularly, generally have lower levels of dental caries. In contrast, individuals who do not regularly maintain oral hygiene tend to have a higher risk of dental caries (Adam et al., 2022). This finding is consistent with (Imamah et al., 2022) who reported that better toothbrushing behavior was associated with improved oral hygiene, whereas poor oral hygiene practices were associated with poorer oral health status.

Health behavior is also influenced by knowledge, (Fauziah et al., 2023) reported that most school-aged children had insufficient knowledge of oral and dental health, with 48 children (80.0%) classified as having poor knowledge and only 12 children (20.0%) classified as having good knowledge among a total of 60 respondents. Knowledge refers to an individual's ability to recognize, explain, and analyze a particular situation (Notoatmodjo, 2018). Individuals with higher levels of knowledge tend to demonstrate greater concern for maintaining oral health (Defyani et al., 2024) reported that individuals with higher levels of knowledge tended to have a lower risk of dental caries, whereas those with lower levels of knowledge were more vulnerable to dental caries.

One strategy for improving knowledge is through health education (Setyaningrum et al., 2024). (Mutmainah et al., 2025) demonstrated an increase in the proportion of participants with good knowledge from 49.2% to 92.3% following an educational intervention.

The effectiveness of oral health education among school-aged children is strongly influenced by the educational method used. Interactive and game-based approaches have been shown to be more effective than conventional approaches in improving children's understanding and retention of information (Kumar et al., 2022). The results of research conducted by (Patil et al., 2024) reported that game-based oral health education was effective among children because it increased their interest, created an enjoyable and interactive learning environment, strengthened memory retention, and supported positive behavioral changes.

Elementary school children tend to understand learning materials more effectively when they are related to everyday experiences, delivered interactively, and involve both emotional and cognitive processes. One approach that can accommodate these characteristics is game-based learning (Jenny Hendrianty et al., 2024). Similarly, (Ansyori et al., 2025) demonstrated that game-based dental health education significantly improved dental health maintenance knowledge among elementary school students.

Game-based learning can increase student engagement, create an enjoyable learning environment, strengthen learning motivation, and encourage active participation during the learning process (Raharjo et al., 2024). Educational games may also improve knowledge retention and learning outcomes more effectively than traditional lecture-based approaches because they provide children with a more active and engaging learning experience (Safitri et al., 2025). The results of research conducted by (Hidayatulloh et al., 2020) reported that students who participated in game-based learning demonstrated better learning outcomes than those who did not use games. Collaborative game models, such as the Team Games Tournament, have also been shown to significantly improve students' ability to retain learning materials compared with conventional lecture methods.

One potentially engaging educational activity is the relay ball game. A relay ball game is a group activity involving teamwork, task distribution, turn-taking, and the achievement of common goals among group members (Melati, 2018). In addition to encouraging active student participation, relay ball games can serve as an effective learning medium for elementary school children and may improve learning outcomes (Farida et al., 2024). In the present study, students worked in groups to answer questions and complete tasks related to oral and dental health in turns. Each student actively contributed to achieving the group's common goal, creating a collaborative and participatory learning environment. This approach was expected to increase students' engagement, learning interest, and understanding of the importance of maintaining oral and dental health. Therefore, this study aimed to analyze differences in oral and dental health knowledge before and after the implementation of a relay ball game among fourth-grade elementary school students.

METHOD

This study employed a pre-experimental design using a one-group pretest-posttest approach. The study aimed to analyze the effectiveness of a relay ball game in improving oral and dental health knowledge among elementary school students. The study was conducted at SDN Kampung Bulak 02, South Tangerang City, in April 2026. The sampling technique used was total sampling; therefore, the entire study population was included as research participants.

The research instrument was a knowledge questionnaire consisting of 15 multiple-choice questions designed to measure students' knowledge of oral and dental health. Knowledge was categorized as good when the score was equal to or greater than the mean and as poor when the score was below the mean (Azwar, 2022).

The intervention was delivered twice. The pretest and posttest were administered one week apart. This interval was selected based on the consideration that administering tests too close together may allow respondents to remember the questions from the pretest, whereas an excessively long interval may allow changes to occur in the measured variable (Jannah, 2016). The research procedures were conducted as follows:

1. The researchers introduced themselves and explained the purpose and sequence of research activities to the participants.
2. Informed consent forms were distributed to the participants before data collection.
3. A pretest was administered to assess the participants' baseline knowledge of oral and dental health.
4. During the first intervention, the researchers provided oral and dental health education through a 30-minute relay ball game conducted in groups. The equipment consisted of one large box used as the starting point for the balls, two small boxes placed at the back of each team as the final sorting area, and 21 balls containing oral and dental health-related materials, such as pictures of sugary foods, toothbrushes, and oral health behaviors. Each small box was divided into two categories: "Healthy Teeth" and "Cavities." The odd number of balls was intended to facilitate determination of the winning team.
5. Participants were divided into two teams, Team A and Team B, with each team consisting of 15 children. Each team was further divided into three smaller groups of five children. Team A was positioned on the left side and Team B on the right side of the playing area. Each team consisted of three sequentially arranged groups, with Group 1 positioned near the large box, Group 2 in the middle, and Group 3 near the small boxes used for final sorting.
6. The game began after the researcher gave a signal. The first child from each team took one ball from the large box and ran toward Group 1. The child verbally stated the content or material written or depicted on the ball before passing it to the next participant. The ball was passed successively until it reached the last child in the group. The last child in Group 1 then carried the ball to Group 2, where the same process was repeated. The procedure continued until the ball reached the last child in Group 3.
7. Each participant was required to take, pass, identify, and sort the ball into the appropriate "Healthy Teeth" or "Cavities" category. After the game, a question-and-answer session was conducted to evaluate the participants' understanding of the educational materials.
8. During the second intervention, the researchers again provided oral and dental health education using the relay ball game for 30 minutes to reinforce the participants' understanding of the educational materials.
9. After all interventions had been completed, a posttest was administered to assess changes in the participants' oral and dental health knowledge

Bivariate data analysis was performed using the Wilcoxon signed-rank test to determine differences in knowledge before and after the intervention. The results were presented in tables to facilitate interpretation

RESULT

Tabel 1. Characteristics of Respondents by Age and Sex

Characteristic	Frequency (n=89)	Percentage
Age		
9–10 years	55	61.8%
11–12 years	34	38.2%
Sex		
Male	46	51.7%
Female	43	48.3%

Table 1 shows that the study included 89 respondents. Most respondents were aged 9–10 years, comprising 55 students (61.8%), while 34 students (38.2%) were aged 11–12 years. Regarding sex, 46 students (51.7%) were male and 43 students (48.3%) were female

Tabel 2. Distribution of Oral Health Knowledge Scores Before and After the Relay Ball Game

Knowledge	**x̄**	**Statistics**		
		SD	**Min**	**Max**
Pretest	67.79	17.27	20	93.33
Posttest	92.59	6.95	67.67	100

Table 2 shows an increase in the mean oral and dental health knowledge score following the relay ball game intervention. The mean score increased from 67.79 at pretest to 92.59 at posttest

Table 3. Normality Test Results

Knowledge	**x̄ ± SD**	**p-value**
Pretest	67.79 ± 17.27	0.000
Posttest	92.59 ± 6.95	0.000

* *Kolmogorov-Smirnov*

Table 3 shows that the p-value for both pretest and posttest knowledge scores was 0.000. Since the p-values were below 0.05, the data were considered not normally distributed. Therefore, a non-parametric statistical test, namely the Wilcoxon signed-rank test, was used for further analysis

Tabel 4. Effectiveness of the Relay Ball Game in Improving Oral and Dental Health Knowledge

Knowledge	**x̄ ± SD**	**p-value**
Pretest	67.79 ± 17.27	0.000
Posttest	92.59 ± 6.95	

Table 4 shows that the mean oral and dental health knowledge score among fourth-grade students at SDN Kampung Bulak 02, South Tangerang City, increased from 67.79 at pretest to 92.59 at posttest. The Wilcoxon signed-rank test yielded a p-value of 0.000 ($p < 0.05$), indicating a statistically significant difference in knowledge before and after the relay ball game intervention. Therefore, the relay ball game was effective in improving oral and dental health knowledge among elementary school students

DISCUSSION

Knowledge is the result of a cognitive process acquired through sensory experiences involving the five senses: sight, hearing, smell, taste, and touch (Notoadmodjo, 2022). Knowledge may also be influenced by learning experiences, environmental factors, age, education, and the learning methods used (Darsini et al., 2019). In oral health education, interactive and enjoyable learning methods can increase students' attention, motivation, and retention of the information presented. One such approach is a group-based educational game, such as a relay ball game, which incorporates physical activity, teamwork, communication, and interaction among students.

The findings of this study showed that before the relay ball game intervention, the mean oral and dental health knowledge score among fourth-grade students at SDN Kampung Bulak 02, South Tangerang City, was 67.79. Based on the frequency distribution, 47 students (52.8%) had good knowledge, whereas 42 students (47.2%) had poor knowledge. These findings indicate that although most students had good knowledge before the intervention, a substantial proportion still had insufficient knowledge. The findings are consistent with (Tsakila & Purnama, 2025) who reported that among 41 students, 40 students (97.6%) had good knowledge and one student (2.4%) had moderate knowledge before receiving game-based education. These findings suggest that game-based learning is not only beneficial for students with low levels of knowledge but may also reinforce and maintain knowledge among students who already have good baseline knowledge (Wardani & Kiptiyah, 2024).

Although most students had good knowledge before the intervention, almost half of the respondents were classified as having poor knowledge. This condition may be associated with age, learning experiences, daily habits, and limited exposure to oral health education among elementary school children (J. d'Are Z. Adam & Ratuela, 2022). Insufficient exposure to oral health information, frequent consumption of cariogenic foods, and inadequate oral hygiene practices may contribute to insufficient knowledge and increase the risk of dental caries. Frequent consumption of high-sugar foods is known to increase the risk of dental caries among school-aged children (Aalemi & Yaqubi, 2024). In addition, inadequate oral hygiene practices may increase the risk of oral health problems (Peres et al., 2019).

Children in the fourth grade of elementary school are generally within the concrete operational stage of cognitive development. At this stage, children begin to think logically about concrete situations, understand simple cause-and-effect relationships, and retain information acquired through previous learning experiences (Juwantara, 2019). According to Piaget's theory of cognitive development, children aged 7–12 years are increasingly capable of processing information systematically, particularly when learning materials are related to concrete and everyday experiences (Marinda, 2020). Therefore, fourth-grade students are generally capable of understanding basic oral health concepts, including appropriate toothbrushing times, the importance of maintaining oral hygiene, and the effects of excessive consumption of sugary foods on dental health.

The variation in students' baseline knowledge may also be associated with differences in learning experiences, attention to health information, family environment, and daily oral health practices (Rasni et al., 2020). Some students may not have fully understood proper toothbrushing techniques, appropriate toothbrushing times, the importance of limiting sugary food consumption, or the need for regular dental visits. (Yoranita Septiani et al., 2025)similarly reported that some elementary school students frequently consumed sugary foods without being accompanied by consistent oral hygiene practices, potentially increasing their risk of dental caries.

To improve students' oral and dental health knowledge, the researchers delivered health education using the relay ball game in two intervention sessions conducted over three research visits. The relay ball game is a group-based learning method involving physical activity, teamwork, sequential ball passing, and evaluation of oral health-related educational materials. In this study, each ball contained brief information about oral and dental health. Students were required to identify the content of the ball aloud, pass it to another student, and subsequently classify the ball into the appropriate category. This method actively involved students in the learning process and created a more enjoyable and less monotonous learning environment.

During the intervention, students were divided into several groups and participated in the game sequentially. The students appeared enthusiastic, actively collaborated, and demonstrated motivation when answering questions related to the materials contained in the relay balls. The physical activity and group interaction involved in the game may have helped students remember the oral health information more easily. This finding is consistent with (Ramadhani & Puspita Ari Metalin Ika, 2025) who reported that active game-based learning can improve students' attention, engagement, and memory retention.

Following the intervention, the mean oral and dental health knowledge score increased to 92.59, representing an increase of 24.80 points from the pretest score. In addition, the frequency distribution showed that 88 students (98.9%) were classified as having good knowledge, while only one student (1.1%) remained in the poor knowledge category. These findings demonstrate a substantial improvement in students' oral and dental health knowledge following the relay ball game intervention

The findings are consistent with (Fitratunisa & Lestari, 2025), who reported that an educational dental health labyrinth game increased the mean knowledge score among elementary school students from 78.39% to 98.06%. Similarly, Salsabilah and Tauchid (2025) demonstrated that game-based educational media increased students' oral and dental health knowledge from 65% to 93%. The consistency of these findings supports the potential effectiveness of game-based learning approaches in improving oral and dental health knowledge among elementary school children.

The Wilcoxon signed-rank test yielded a p-value of 0.000 ($p < 0.05$), indicating a statistically significant difference in oral and dental health knowledge before and after the relay ball game intervention. These findings demonstrate that the relay ball game had a significant effect on improving oral and dental health knowledge among fourth-grade students at SDN Kampung Bulak 02, South Tangerang City.

The improvement in knowledge may be attributed to the active involvement of students in the learning process. Rather than merely listening to information, students participated in physical movement, discussion, verbal communication, and group collaboration. These activities made the learning process more engaging and easier for elementary school children to understand. In addition, educational games may enhance learning motivation, concentration, and information retention.

The novelty of this study lies in the integration of oral health education with a physical, cooperative, and group-based game. The method not only facilitates students' understanding of oral health information but also provides opportunities to develop social interaction, motor coordination, communication, and teamwork. Therefore, the relay ball game may serve as an alternative educational medium that is engaging, interactive, and appropriate for oral health education among elementary school children.

CONCLUSION

Based on the findings of this study, oral and dental health education using the relay ball game was effective in improving oral and dental health knowledge among elementary school students

REFERENCES

Aalemi, A. K., & Yaqubi, B. (2024). Prevalence of dental carries among school-going children aged 7–13 years in Kabul City. *BMC Oral Health*, *24*(1). https://doi.org/10.1186/s12903-024-04897-0

Adam, J. d'Arc Z. A., & Ratuela, J. E. (2022). Tingkat Pengetahuan Tentang Kebersihan Gigi Dan Mulut Siswa Sekolah Dasar. *Journal of Public Health and Community Medicine*, *3*, 1–6.

Adam, J. d'Are Z., & Ratuela, J. E. (2022). Tingkat Pengetahuan Tentang Kebersihan Gigi Dan Mulut Siswa Sekolah Dasar. *Journal of Public Health and Community Medicine*, *3*, 1–7.

Alraqiq, H., Eddali, A., & Boufis, R. (2021). Prevalence of dental caries and associated factors among school-aged children in Tripoli, Libya: a cross-sectional study. *BMC Oral Health*, *21*(1). https://doi.org/10.1186/s12903-021-01545-9

Ana, D., Batubara, N. S., & Mardelita, S. (2025). Hubungan Karies Gigi Dengan Status Gizi Anak Pada Siswa SDN 008 Huta Raja Kecamatan Siabu Kabupaten Mandailing Natal. *Jurnal Kesehatan Republik Indonesia*, *2*(9).

Anil, S., & Anand, P. S. (2017). Early childhood caries: Prevalence, risk factors, and prevention. In *Frontiers in Pediatrics* (Vol. 5). Frontiers Media S.A. https://doi.org/10.3389/fped.2017.00157

Ansyori, B. Al, Purnama, T., Rikawarastuti, R., Kristianto, J., & Emini, E. (2025). The Mystery Box Game in Improving Dental Health Knowledge in Elementary School. *Journal Center of Excellent : Health Assistive Technology*, *3*(2), 69–73. https://doi.org/10.36082/jchat.v3i2.2615

Azwar, S. (2022). *Penyusunan Skala Psikologi Edisi 2* (2nd ed.). Pustaka pelajar.

Batubara, D. A. N. S., & Mardelita, S. (2025). Hubungan Karies Gigi Dengan Status Gizi Anak Pada Siswa SDN 008 Huta Raja Kecamatan Siabu Kabupaten Mandailing Natal. *Jurnal Kesehatan Republik Indonesia*, *2*(9), 489–498.

Darsini, Fahrurrozi, & Cahyoho, E. A. (2019). Pengetahuan ; Artikel Review. In *Jurnal Keperawatan* (Vol. 12, Number 1).

Defyani, R. M. M., N.P I. G. A. Kusuma Astuti, & Hidayati, S. (2024). Pengetahuan Orang Tua tentang Kesehatan Gigi dan Mulut dengan Indeks def-t Siswa TK Banyu Urip Surabaya. *Journal of Oral Health Care*, *11*(2), 70–79. https://doi.org/10.29238/ohc.v11i2.1851

Duangthip, D., Gao, S. S., Lo, E. C. M., & Chu, C. H. (2017). Early childhood caries among 5- to 6-year-old children in Southeast Asia. *International Dental Journal*, *67*(2), 98–106. https://doi.org/10.1111/idj.12261

Farida, R. N., Pramasdyahsari, A. S., Hartati, H., & Saputra, H. J. (2024). Efektifitas Permainan Estafet Bola terhadap Hasil Belajar Kognitif Siswa Pada Mata Pelajaran PPKn. *Jurnal Ilmiah Profesi Pendidikan*, *9*(3), 2218–2223. https://doi.org/10.29303/jipp.v9i3.2513

Fauziah, A., Ramli, R., Jama, F., Keperawatan, I., & Kesehatan Masyarakat, F. (2023). Hubungan Pengetahuan dengan Perawatan Gigi dan Mulut pada Anak Usia Sekolah. In *Window of Nursing Journal* (Vol. 4, Number 1).

Febriana, L. A., & Husain, F. (2023). Hubungan Tingkat Pengetahuan Terhadap Perilaku Menjaga Kesehatan Gigi pada Siswa Kelas IV-VI SDN Mranggen. *Sehat Rakyat: Jurnal Kesehatan Masyarakat*, *2*(4), 502–510. https://doi.org/10.54259/sehatrakyat.v2i4.2017

Fitratunisa, M. A., & Lestari, S. Y. (2025). Dental Health Labyrinth Game Education to Improve Dental and Oral Health Knowledge in Elementary School Students. *Journal Center of Excellent : Health Assistive Technology*, *3*(1), 49–52. https://doi.org/10.36082/jchat.v3i1.2224

Hidayatulloh, S., Praherdhiono, H., & Wedi, A. (2020). Pengaruh Game Pembelajaran Terhadap Peningkatan Hasil Belajar Pemahaman Ilmu Pengetahuan Alam. *JKTP: Jurnal Kajian Teknologi Pendidikan*, *3*(2), 199–206. https://doi.org/10.17977/um038v3i22020p199

Imamah, N., Ningsih, N. S., & Abral. (2022). *Perbedaan Angka Karies Gigi Berdasarkan Waktu Menyikat Gigi*. http://journal.ahmareduc.or.id/index.php/AMHJ

Jannah, M. (2016). *Psikologi Ekperimen*. UNESA UNIVERSITY PRESS.

Jenny Hendrianty, B., Ibrahim, A., Iskandar, S., & Mulyasari, E. (2024). *Kalam Cendekia: Jurnal Ilmiah Kependidikan Membangun Pola Pikir Deep Learning Guru Sekolah Dasar*.

Juwantara, R. A. (2019). Analisis Teori Perkembangan Kognitif Piaget Pada Tahap Anak Usia Operasional Konkret 7-12 Tahun Dalam Pembelajaran Matematika. *Jurnal Ilmiah Pendidikan Guru Madrasah Ibtidaiyah*, *9*(1), 27–34.

Kemenkes RI. (2023). *Survei Kesehatan Indonesia*.

Marinda, L. (2020). Teori Perkembangan Kognitif Jean Piaget Dan Problematikanya Pada Anak Usia Sekolah Dasar. *Jurnal Kajian Perempuan & Keislaman*, *13*, 116–151.

Marsh, P. D., & Zaura, E. (2017). Dental biofilm: ecological interactions in health and disease. *Journal of Clinical Periodontology*, *44*, S12–S22. https://doi.org/10.1111/jcpe.12679

Melati, L. R. (2018). *Pengembangan Alat Permainan Estafet Sebagai Media Pembelajaran Dalam Perkembangan Anak Usia Dini*.

Mutmainah, B. A., & Hidayat, F. (2025). Efektivitas Intervensi Edukasi Kesehatan Terhadap Peningkatan Pengetahuan Dismenorea Pada Remaja Putri: Sebuah Studi Eksperimental. *Jurnal Berkala Ilmiah Kedokteran*, *08*, 72–81.

Notoadmodjo, S. (2022). *Promosi Kesehatan dan Perilaku Kesehatan*. Rineka Cipta.

Patil, S., Licari, F. W., Bhandi, S., Awan, K. H., Blasio, M. Di, Isola, G., Cicciù, M., & Minervini, G. (2024). Effect of game-based teaching on the oral health of children: a systematic review of randomised control trials. In *Journal of Clinical Pediatric Dentistry* (Vol. 48, Number 4, pp. 26–37). MRE Press. https://doi.org/10.22514/jocpd.2024.075

Peres, M. A., Macpherson, L. M. D., Weyant, R. J., Daly, B., Venturelli, R., Mathur, M. R., Listl, S., Celeste, R. K., Guarnizo-Herreño, C. C., Kearns, C., Benzian, H., Allison, P., & Watt, R. G. (2019). Oral diseases: a global public health challenge. In *The Lancet* (Vol. 394, Number 10194, pp. 249–260). Lancet Publishing Group. https://doi.org/10.1016/S0140-6736(19)31146-8

Raharjo, A., Amelia Putri, A., & Rekso Budi, H. (2024). *Hipkin Journal of Educational Research The use of game-based learning to increase student engagement* (Vol. 1, Number 3). http://ejournal-hipkin.or.id/index.php/hipkin-jer/HJER

Ramadhani, A. Y., & Puspita Ari Metalin Ika. (2025). Upaya Meningkatkan Daya Ingat dan Hasil Belajar Siswa Melalui Pengunaan Media Permainan Memory Game Dalam Pembelajaran Pendidikan Pancasila Materi Sejarah Perumusan Pancasila Kelas IV SD. *Jurnal Ilmiah Pendidikan Dasar*, *10 No 4*, 219–232.

Rasni, N. D. P., Khoman, J. A., & Pangemanan, D. H. C. (2020). Gambaran Kebiasaan Menyikat Gigi dan Status Kesehatan Gingiva pada Anak Sekolah Dasar. *E-GiGi*, *8*(2), 61–68. https://doi.org/10.35790/eg.8.2.2020.29905

Safitri, R. R., Rahmania, U. G., Putri, A. F., & Jumadi, J. (2025). The Impact of Game-Based Learning on Student Competencies in Science: A systematic Review. *Jurnal Pendidikan Dan Kebudayaan*, *10*(1), 116–136. https://doi.org/10.24832/jpnk.v10i1.5188

Salsabilah, M., & Tauchid, S. N. (2025). Knowledge of dental and oral health before and after counseling using quartet cards for elementary school students. *Journal Center of Excellent : Health Assistive Technology*, *3*(1), 42–44. https://doi.org/10.36082/jchat.v3i1.2222

Setyaningrum, N., Nur, D., & Sari, A. (2024). *Edukasi sebagai Upaya Peningkatan Pengetahuan First Aid Pada Luka Bakar Bagi Ibu*. https://jurnal.ruangide.org/JPKMT

Shahzad, H. Bin, Awais, F., Shirazi, U.-R., Majeed, H. A., & Rafique, A. (2020). The impact of dental caries on oral health related quality of life amongst adult population in Lahore, Pakistan. *Makara Journal of Health Research*, *24*(1). https://doi.org/10.7454/msk.v24i1.1074

Tsakila, S. Q., & Purnama, T. (2025). Uno Dental Card Game as an Effort to Improve Dental Health Knowledge in Elementary School Students. *Journal Center of Excellent : Health Assistive Technology*, *3*(1), 14–18. https://doi.org/10.36082/jchat.v3i1.2204

Wardani, M. E., & Kiptiyah, S. M. (2024). Game-Based Learning Model with Baamboozle Media Based on Artificial Intelligence Increases Student Engagement and Learning Outcomes. *Jurnal Ilmiah Sekolah Dasar*, *8*(2), 293–303. https://doi.org/10.23887/jisd.v8i2.67141

WHO. (2022). *Global Oral Health Status Report.* http://apps.who.int/bookorders.

Yoranita Septiani, N., Daeli, W., & Solehudin. (2025). Hubungan Mengkonsumsi Makanan Kariogenik Dan Kebiasaan Menggosok Gigi Terhadap Karies Gigi Pada Anak Usia Sekolah Dasar The Relationship Between Consuming Caryogenic Foods And Teeth Brushing Habits And Dental Caries In Elementary School Children. *Jurnal Intelek Insan Cendikia*, *2 No.8*, 14043–14057. https://jicnusantara.com/index.php/jiic

Zahara, E., Keumala, C. R., Andriani, A., & Liana, I. (2025). Peningkatan pengetahuan dan keterampilan kesehatan gigi melalui pendekatan preventif pada masyarakat Desa Lamlumpu Lhok, Peukan Bada Aceh Besar. *Jurnal PADE: Pengabdian & Edukasi*, *7*(2), 122. https://doi.org/10.30867/pade.v7i2.2780