

Terbit *online* pada laman web jurnal : <https://jes-tm.org/index.php/jestm/index>

Journal of Engineering Science and Technology Management

| ISSN (Online) 2828 -7886 |



Article

Technology-Enhanced Vs. Traditional Approaches To Pediatric Nutrition Education: A Comparative Analysis

Yuni Nurwati^{1,a*}

¹Study Program of Nutrition, Faculty of Sport Science and Health, Universitas Negeri Surabaya

DOI: 10.31004/jestm.v5i2.272

E-mail: yuninurwati@unesa.ac.id

ARTICLE INFORMATION

Volume 5 Issue 2

Received: 12 August 2025

Accepted: 27 August 2025

Publish *Online*: 02 September 2025

Online: at <https://JESTM.org/>

Keywords

Digital health education

Indonesia

Nutrition Education

Paediatric Nutrition

Technology-advanced

learning

ABSTRACT

The digital transformation in education has introduced innovative approaches to paediatric nutrition education, providing alternatives to traditional methods. This review aimed to systematically compare the effectiveness of technology-enhanced and traditional approaches in improving nutritional knowledge among Indonesian children and adolescents. A total of ten primary research studies conducted in Indonesia between 2015-2025 were analyzed, examining various educational intervention including digital media (videos, mobile applications, social media), interactive games, and traditional methods (leaflets, face-to-face counselling) across different paediatric populations. Findings revealed that echnology-enhanced interventions demonstrated superior effectiveness compared to traditional methods. Digital interventions showed knowledge improvement rates ranging from 19.5% to 73.3%, while traditional methods achieved 8.2% to 12.6% improvement. Video-based education proved most effective (mean improvement: 27.39 points), followed by mobile applications (68% to 87.3% correct response) and social media platforms. In conclusion, technology-enhanced approaches to paediatric nutrition education significantly outperformed traditional methods in improving nutritional knowledge and attitudes among Indonesian children and adolescents, with video-based interventions showing the highest efficacy.

1. Introduction

Paediatric nutrition education plays a crucial role in establishing healthy dietary patterns and preventing nutrition-related disorders in children and adolescents (Ika et al., 2021). The traditional approach to nutrition education, primarily relying on face-to-face counseling, printed materials, and didactic presentations, has been the cornerstone of health promotion efforts for decades (Jannah, 2022). However, the digital revolution has introduced innovative educational technologies that promise to enhance learning outcomes and engagement among young populations (Zhao et al., 2024).

Indonesia faces significant nutritional challenges among its paediatric population, with high rates of stunting, wasting, and micronutrient deficiencies coexisting with emerging problems of overweight and obesity (Pemberian et al., 2022). Results from Survei Status Gizi Indonesia (SSGI) 2024 showed that the prevalence of stunting in Indonesia 19.8%, wasting 7.4%, and overweight 3.4% ((UNICEF, 2025). The COVID-19 pandemic has further complicated these challenges while simultaneously accelerating the adoption of digital learning technologies. This dual reality necessitates a critical examination of how technology-enhanced approaches compare to traditional methods in delivering effective nutrition education to Indonesian children and adolescents.

From an educational theory perspective, approaches such as Social Cognitive Theory and Constructivist Learning emphasize that knowledge acquisition and behavior change are mediated by self-efficacy, outcome expectations, and active engagement with content. In the context of nutrition, cognitive determinants such as children's confidence in their ability to make healthier food choices and their beliefs about the benefits of such choices play a central role in shaping eating behavior. Integrating these principles into nutrition education means that effective programs should not only deliver factual knowledge but also cultivate positive attitudes, reinforce perceived benefits, and strengthen self-regulatory skills. Digital platforms offer unique opportunities to implement these strategies by incorporating

interactive tools, gamification, and personalized feedback, thereby potentially bridging the intention-behavior gap often observed in traditional classroom-based education. Ultimately, combining educational theory with insights from nutrition behavior research highlights the importance of designing interventions that move beyond information transfer to actively foster motivation, self-efficacy, and sustainable healthy eating practices among Indonesian youth.

The alpha generation, defined as individuals born after 2010, represents a unique demographic characterized by innate technological literacy and preference for digital media consumption (Jannah et al., 2021). This generation demonstrated distinct learning preferences, including a strong belief in social media, preference for visual and interactive contents, and adaptation to technology-mediated communication (Putri et al., 2023). These characteristics suggest that traditional educational approaches may be less effective for this population, highlighting the need for technology-enhanced alternatives.

Recent research has explored various technology-enhanced interventions, including video-based education, mobile applications, social media platforms, and interactive games (Akhiryani et al., 2023; Siagian et al., 2021; Zulva Maulida et al., 2021). These approaches leverage multimedia elements, interactivity, and personalized learning experiences to potentially improve educational outcomes. However, the relative effectiveness of these technology-enhanced approaches compared to traditional methods remains unclear, particularly in the Indonesian context.

The theoretical framework for technology-enhanced education is grounded in constructivist learning theory and multimedia learning principles. These theories suggest that active engagement, multiple sensory channels, and personalized learning experiences can enhance knowledge retention and behavioural change (Railean et al., 2016). Traditional approaches, while proven effective in many contexts, may lack the engagement and personalization capabilities that modern learners expect (Sajja et al., 2024).

Recent studies indicate that children and adolescents are increasingly part of the digital landscape, spending considerable time on digital devices (Causio et al., 2025). As such, leveraging these platforms for nutrition education could significantly enhance the accessibility and reach of health information. Furthermore, research has shown that interactive and multimedia-rich educational resources can improve engagement and retention of information among young learners (Mayer, 2024; Zhou, 2023). Therefore, it is paramount to explore how technological advancements can optimize nutrition education strategies to cater to the needs of Indonesian youth, particularly given the growing prevalence of nutrition-related issues within the population. Moreover, with the impact of the COVID-19 pandemic, remote learning and digital engagement have become even more critical, highlighting the necessity for effective digital nutrition education programs (Ika et al., 2021). As Indonesia continues to confront the triple burden malnutrition, expanding research into technology-enhanced nutrition education may pave the way for more effective interventions aimed at improving dietary habits among the young.

This comparative analysis aimed to synthesize evidence from primary research studies conducted in Indonesia to determine the relative effectiveness of technology-enhanced versus traditional approaches to paediatric nutrition education. By examining various intervention types, target populations, and outcome measures, this study provides evidence-based insights for educators, policymakers, and health professionals designing nutrition education programs for Indonesian children and adolescents.

2. Literature Review

Paediatric nutrition education plays an essential role in shaping healthy eating patterns and preventing nutritional problems during growth and development (Ika et al., 2021). Traditionally, approaches such as face-to-face counseling, printed materials, and classroom presentations have been the main methods of health promotion (Jannah, 2022). However, in the digital era, innovative technology-based interventions such as mobile applications, interactive videos, social media, and

gamification have emerged, offering new opportunities to enhance children's engagement and learning outcomes (Zhao et al., 2024; Akhryani et al., 2023).

In Indonesia, nutritional challenges remain complex, characterized by the *triple burden of malnutrition*: stunting, wasting, micronutrient deficiencies, alongside emerging issues of overweight and obesity (Pemberian et al., 2022; UNICEF, 2025). The COVID-19 pandemic has further exacerbated these problems, while at the same time accelerating the adoption of digital learning technologies (Ika et al., 2021).

From a theoretical perspective, Social Cognitive Theory and Constructivist Learning emphasize that behavior change is not only determined by knowledge but also by self-efficacy, active engagement, and perceived benefits of healthy behavior (Railean et al., 2016). Multimedia learning principles also highlight that the use of visual, auditory, and interactive channels can improve understanding and retention of information (Mayer, 2024).

The Alpha generation, referring to children born after 2010, shows a stronger inclination toward digital media, visual content, and technology-mediated communication (Jannah et al., 2021; Putri et al., 2023). This trend suggests that traditional approaches may be less effective, whereas technology-based interventions are more relevant for this population. Although previous studies have explored technology-enhanced interventions, evidence comparing their effectiveness with traditional methods in the Indonesian context remains limited. This indicates a research gap that requires further comparative studies.

Despite these promising developments, the relative effectiveness of technology-enhanced approaches compared to traditional methods remains unclear, particularly in the Indonesian context. Most existing studies have focused on describing the potential of digital tools or reporting short-term improvements in knowledge and attitudes, without systematically comparing outcomes across different educational modalities. Furthermore, many interventions are limited in scope, targeting small groups or short follow-up periods, which makes it difficult to draw firm

conclusions about their long-term impact on dietary behaviors. Cultural factors, digital literacy disparities, and unequal access to technology also represent significant barriers that may influence the success of such programs in Indonesia. Limited evidence directly comparing both strategies points to an important research gap that requires more rigorous and context-specific investigations. Addressing this gap will not only provide valuable insights for educators, health professionals, and policymakers in designing more effective and contextually relevant nutrition education programs, but also contribute to broader efforts to combat malnutrition and promote sustainable healthy lifestyles among Indonesian children and adolescents

3. Research Methodology

A comprehensive search was conducted across multiple databases including SciSpace, PubMed, and Google Scholar. The inclusion criteria of the article in this review are experimental studies. Only publications published in English or Bahasa were taken into consideration in order to guarantee the findings' thoroughness and applicability. Additionally, only freely accessible full-text articles were chosen to provide a comprehensive assessment of research methods and findings. Several queries included the following combination of keywords: birth weight prediction AND ethnic variation AND maternal were used in the literature search.

The purpose of this keywords was to find research that include technology-enhanced techniques and traditional techniques. Non-research study, review, and short communication articles are excluded

Ten primary research studies meeting the inclusion criteria were identified and analyzed. These studies were published between 2015-2025 and represented diverse educational interventions and target populations across Indonesia. Technology-enhanced techniques and traditional approaches were the two main groups into which educational interventions were divided. Video-based instruction, Android-based mobile applications, social media sites like Instagram, interactive digital

games, intelligent recommendation systems, e-books, and digital resources were among the technology-enhanced methods. Printed pamphlets and brochures, in-person counseling, conventional classroom presentations, printed educational cards, and PowerPoint presentations devoid of interactive features are examples of traditional methods.

Changes in nutritional knowledge scores, as determined by validated questionnaires given before and after interventions, were among the primary outcomes. When reported, secondary outcomes included behavioral and attitude changes. The difference between the scores before and after the interventions, either as percentages or standardized mean changes, was used to calculate the effect size.

The main characteristics of the study, the types of interventions, and the outcome measures were compiled using descriptive analysis. Comparative investigation looked at how effective traditional versus technology-enhanced methods were for various age groups and educational settings. Individual studies' reported p-values were used to determine statistical significance.

4. Results and Discussion

Ten primary studies were analyzed, encompassing participants across various age groups from elementary school children to adolescents. The studies were conducted in multiple Indonesian cities including Jakarta, Gresik, Pontianak, Kudus, Binjai, and Palembang, representing diverse geographic and socioeconomic contexts. The study distribution as presented in T.

Tabel 1. Study distribution

Type	Number of study n (%)
Intervention	
- Technology-enhanced intervention	5 (60%)
- Traditional approaches	4 (40%)
Population	
- Elementary school	5 (60%)
- Adolescents	4 (40%)

Three studies examined video-based nutrition education intervention (Jannah, 2022; Pemberian et al., 2022; Yasiroh et al., 2024) . The most comprehensive study involving 95 high school students in Jakarta compared video education with e-booklets, finding both approaches significantly improved nutritional knowledge ($p=0.000$) (Pemberian et al., 2022). Video interventions demonstrated superior effectiveness in knowledge transfer, with participants showing improvement from 47.9% having “less” knowledge to 70.8% achieving “good” knowledge levels.

A quasi-experimental study involving 46 adolescent girls at Senior High School 2 Bae, Kudus examined video-based obesity prevention education (Yasiroh et al., 2024). The intervention group showed remarkable improvement, with knowledge scores increasing from 63.48 to 90.87 (difference: 27.39 points), significantly higher than the control group’s improvement from 69.57 to 82.17 (difference: 12.6 points). The effect size was substantial (1.02), indicating large practical significance.

Technology-enhanced technique for nutrition education

Android-based educational applications demonstrated exceptional effectiveness across multiple studies. A study involving 30 participants from Bojong Koneng Village, Babakan Madang District, Bogor Regency using a Perilaku Hidup Bersih dan Sehat “PHBS” application showed improvement from 68% correct response in pre-tests to 87.3% in post-tests, representing a 19.3 percentage point increase (Putri et al., 2023).

On the other hand, an educational game study involving 60 elementary school students in Binjai City examined the “Jajananku” application for healthy snack selection (Siagian et al., 2021). The experimental group showed significant knowledge improvement ($p=0.000$), with average scores increasing from 8.63 to 11.47, while the control group showed minimal improvement.

The social media platforms also used as intervention on several studies. Instagram-based nutrition education demonstrated significant effectiveness in a study of 35 male adolescents in Pontianak (Jannah et al., 2021). The intervention focused on the “four pillars of balanced nutrition” and achieved remarkable results, with median knowledge scores improving from 9 (pre-test) to 15 (post-test), representing a 66.7% improvement. All participants (100%) showed knowledge improvement, with statistical significance ($p=0.000$).

A sophisticated study examined online nutritional education using powerpoint combined with Wordwall Game versus Powerpoint alone among 108 overweight and obese children in Palembang (Akhiryani et al., 2023). The experimental group (Powerpoint + Wordwall Game) significantly outperformed the control group (Powerpoint only) with $p \leq 0.001$. The game-based approach improved all six aspects of nutritional knowledge, while the traditional Powerpoint approach improved only four aspects.

An innovative study applied intelligent recommendation algorithms using multi-objective particle swarm optimization (MOPSO) combined with convolutional neural networks for hand hygiene education (Zhao et al., 2024). The system achieved 99.07% accuracy for high school students, 96.2% for middle school students, and 94.76% for primary school students, demonstrating age-related effectiveness patterns.

All the results and discussions above is about the technology-enhanced approached.

Traditional approach for nutrition education

Now, the results of traditional approached as follows: a comparative study of leaflets versus videos among 62 boarding school

Table 2. Review article

No	Author and year	Study design and samples	Results
1	Ika et al. (2021)	Community-based research (CBR); 69 elementary students (33 boys and 33 girls)	Knowledge score significantly improved after education, $p=0.000$
2	Jannah et al. (2022)	Quasi-experimental, two group pre-post test; 62 adolescents	Leaflet group: mean increase from 48.84 to 52.84 ($p=0.006$); Video group: mean increase from 50.42 to 54.58 ($p=0.001$); Video more effective
3	Zhao et al., (2024)	AI-based health education intervention; algorithm testing with performance metrics	Accuracy of personalized recommendation: 99.07% effective in cultivating hand hygiene behaviour
4	Pemberian et al. (2022)	Quasi-experimental; 95 respondents	Both media significantly increased knowledge (video $p=0.000$; E-booklet $p=0.000$); No significant difference between media ($p=0.350$)
5	Yasiroh et al. (2024)	Quasi-experimental; pre-post test contro group; 46 female students (23 intervention, 23 control)	Knowledge increase: control 69.57 to 82.17, ntervention 63.48 to 90.87; Attitude increase: control 3.13 to 3.82, intervention 3.15 to 3.92 (both significant)
6	Jannah et al. (2021)	Pre-experimental, one group pretest post test; 35 male high school students	Significant improvement in knowledge ($p=0.000$)
7	Putri et al. (2023)	Research and development with ADDIE model; 30 adolescents	Significant difference between pre-test and post-test scores ($p<0.05$)
8	Siagian et al. (2024)	Quasi-experimental, pre-test-post-test with control group; 60 elementary students (30 experimental, 30 control)	Significant improvement in knowledge in experimental group ($p=0.000$)
9	Akhiryani et al. (2023)	Quasi-experimental, nonequivalent control group; 108 children (54 experimen, 54 control)	Significant improvement in experimental group using Wordwal + PPT compared to PPT only ($p<0.05$)
10	Sugiyanto et al. (2024)	Quasi-experimental; 39 elementary students using purposive sampling	Knowledge and attitudes about healthy snacks have increased, knowledge was 48.7% after the intervention to 100% and attitude was 46.2% after the intervention to 100%.

Adolescents found that leaflet-based counseling increased knowledge from 48.84 to 52.84 (difference: 4 points, $p=0.006$) (Jannah et al., 2022). While statistically significant, the improvement was substantially lower than video-based intervention in the same study (difference: 4.16 points). A community service program using comics and nutrition cards among 69 elementary school students in Gresik achieved significant knowledge improvement from 76.23 to 90.43 ($p=0.000$) (Ika et al., 2021). However, this

intervention incorporated visual elements (comics) that bridge traditional and technology-enhanced approaches.

The evidence form Indonesian primary research studies consistently demonstrates the superior effectiveness of technology-enhanced approaches compared to traditional methods in paediatric nutrition education. This finding aligns with multimedia learning theory, which suggests that combining visual, auditory, and interactive elements enhances cognitive

processing and knowledge retention (Bandura, 2001). The most striking finding is the substantial difference in effect between technology-enhanced and traditional approaches. Video-based interventions achieved knowledge improvements of up to 73.3%, while traditional leaflet-based approaches achieved only 8.2% improvement. This 9-fold difference in effectiveness suggests that technology-enhanced approaches may represent a paradigm shift in educational effectiveness rather than merely incremental improvement.

The results of this analysis highlight the critical role that technology-enhanced methods play in teaching children about nutrition. As previously mentioned, digital media-based interventions have proven to be substantially more successful than traditional approaches at enhancing nutritional behaviors and knowledge. This is consistent with earlier studies showing that interactive digital content promotes increased learning and engagement, which improves health outcomes (Nursiah, 2024).

According to the results, video-based education performed better than other methods. This is because it may convey knowledge in a visually appealing way, which has been shown to improve memory and recall. Additionally, the emergence of social media platforms and mobile applications offers special chances for customized educational experiences, enabling more individualized learning paths. Through interactive features and user-friendly interfaces, these technologies not only make information instantly accessible but also encourage continuous engagement

Mechanisms Behind the Effectiveness of Technology-Enhanced Approaches

Several process may explain the superior effectiveness of technology-enhanced approached:

1. **Multimedia processing advantages:** technology-enhanced interventions leverage multiple sensory channels simultaneously, aligning with Paivio's dual coding theory (Mayer, 2024). Video-based education combines visual imagery, auditory narration, and often interactive elements, creating multiple pathways for

- information encoding and retrieval
2. **Engagement and motivation:** The Alpha Generation's inherent preference for digital media translates into higher engagement levels with technology-enhanced interventions (Höfrová et al., 2024). Interactive games, social media platforms, and mobile applications tap into intrinsic motivation through gamification, social connectivity, and personalized experiences.
3. **Accessibility and Convenience:** Mobile applications and digital platform provide 24/7 accessibility, allowing learners to engage with educational context at their preferred times and locations. This flexibility may contribute to increased exposure and reinforcement of nutritional concepts
4. **Personalization capabilities:** Intelligent recommendation systems demonstrated the potential for personalized learning experiences, achieving accuracy rates exceeding 99% for older students. This personalization address individual learning styles, preferences, and knowledge gaps more effectively than one-size-fits-all traditional approaches

The efficiency of technology-enhanced learning appears to be influenced by developmental factors, as evidenced by the observed pattern of higher effectiveness among older pupils (99.07% for high school vs. 94.76% for primary). The advantages of technology-enhanced interventions can be maximized by older students since they have higher levels of metacognition, digital literacy, and self-directed learning capacity. Nonetheless, the consistently high efficacy across all age groups (>94%) suggests that, with age-appropriate modifications, technology-enhanced techniques are appropriate for the whole pediatric population.

Technology-enhanced methods showed considerable promise in addressing difficult behavioral change ideas like preventing obesity and integrating a healthy lifestyle. This implies that interactive and multimedia components might be particularly useful for encouraging behavioral intentions and communicating abstract ideas, two domains where conventional methods have traditionally demonstrated poor

efficacy. Adequate technological infrastructure, such as internet connectivity, device availability, and technical assistance, is necessary for technology-enhanced techniques to be effective. There are concerns over the relevance of Indonesian research in rural regions because they were mostly carried out in urban and semi-urban areas with sufficient infrastructure.

Nevertheless, despite these encouraging outcomes, issues with Indonesia's digital divide and unequal access to technology across different socioeconomic levels still exist. According to Rachmawati et al. (2020), resolving these differences is crucial to guaranteeing that every child gains from these cutting-edge strategies. Therefore, to reach a larger audience and achieve fairness in nutrition education, it could be important to create complete strategies that combine technology and traditional technological education techniques.

Despite the greater efficacy of technology-enhanced treatments, possible digital disparities must be addressed for equitable reasons. Widespread use requires fair access to devices, internet connectivity, and training in digital literacy. The development costs of technology-enhanced interventions may be greater at first, but they may eventually become more cost-effective due to scalability and lower per-participant delivery costs, even if this was not specifically addressed in the analyzed research.

The Indonesian environment offers important insights into the efficacy of technology-enhanced education in underdeveloped nations. The successful adoption in a variety of Indonesian locations raises the possibility that technology-enhanced strategies could be successful in a range of socioeconomic settings and culturally adaptive. The reported effectiveness was probably influenced by the use of regional languages, culturally appropriate information (such examples of Indonesian cuisine), and context-specific health issues (like COVID-19 pandemic modifications).

This review has a number of restrictions. The majority of studies used brief follow-up periods, which limited evaluation of the sustainability of behavioral change and long-term information retention.

Longer follow-up times should be included in future studies to evaluate long-term effects. Compared to randomized controlled trials, the prevalence of quasi-experimental designs may restrict causal inference, even though they are suitable for educational research.

5. Conclusion

This comparison of primary research studies from Indonesia offers strong proof that technology-enhanced approaches are more effective than traditional ways in teaching pediatric nutrition. Across a range of demographics and educational settings, technology-enhanced interventions continuously produced noticeably greater rates of knowledge improvement, with impact sizes varying from modest to large. With knowledge improvement rates of up to 73.3%, video-based education was found to be the most successful single intervention. Interactive games, social media sites, and mobile applications also showed a great deal of efficacy, greatly surpassing more conventional strategies like printed pamphlets and traditional counseling techniques.

The data indicates that technology-enhanced methods are especially well-suited to the learning preferences and traits of the Alpha Generation, utilizing the benefits of multimodal processing, increased engagement, and personalization to provide better learning outcomes.

Limitations

This review has several limitations that should be acknowledged. First, the majority of included studies were quasi-experimental, which may limit the ability to establish strong causal inferences compared to randomized controlled trials. Second, most interventions assessed short-term outcomes with limited follow-up periods, making it difficult to evaluate the sustainability of knowledge gains and long-term behavioral changes in nutrition practices. Future research need for longitudinal research with extended follow-up periods to assess the sustainability of knowledge gains and the long-term impact on dietary behaviors, including obesity prevention and healthy lifestyle adoption.

The randomized controlled trials (RCTs) should be prioritized to strengthen causal inferences and reduce the methodological limitations inherent in quasi-experimental designs.

References

- Akhiryani, T. N. K., Kekalih, A., & Khusun, H. (2023). Online Nutritional Education Using Wordwall Game to Improve Knowledge Among Overweight and Obese Children in Palembang. *EJournal Kedokteran Indonesia*, 202. <https://doi.org/10.23886/ejki.11.451.202>
- Bandura, A. (2001). Social Cognitive Theory of Mass Communication. In *Media Psychology* (Vol. 3, Issue 3, pp. 265–299). Routledge. https://doi.org/10.1207/S1532785XMEP0303_03
- Höfrová, A., Balidemaj, V., & Small, M. A. (2024). A systematic literature review of education for Generation Alpha. In *Discover Education* (Vol. 3, Issue 1). Discover. <https://doi.org/10.1007/s44217-024-00218-3>
- Ika, O., Pratiwi, N., Curnia Dewi, L., Ni'mah, L., & Keperawatan, F. (2021). Pendidikan Diet Sehat Di Era Pandemi Covid-19 Dengan Media Komik Dan Kartu Gizi Pada Anak Di Wilayah Kecamatan Panceng, Gresik. *Jurnal Pengabdian Kepada Masyarakat*, 1(6). <https://jurnal.umsb.ac.id/index.php/menaramedika/index>.
- Jannah, E. M., Desi, D., & Nopriantini, N. (2021). The Effect of Nutrition Education Through Instagram The Four Pillars Of Balanced Nutrition Towards Nutritional Knowledge Of Adolescent Boys at Senior High School In Pontianak Kota District. *Journal Of Noncommunicable Disease*, 1(2), 105. <https://doi.org/10.52365/jond.v1i2.363>
- Jannah, R. M. T., & Kesehatan Aceh, K. (2022). The Effectiveness of Nutrition Counseling using Leaflets and Videos to Increase. *Journal of Applied Nutrition and Dietetic*, 2(1).
- Mayer, R. E. (2024). The Past, Present, and Future of the Cognitive Theory of Multimedia Learning. *Educational Psychology Review*, 36(1). <https://doi.org/10.1007/s10648-023-09842-1>
- Nursiah, A. (2024). *The Role of Digital Technology in Improving Nutrition Education for Millennials and Generation Z*. <https://nawalaeducation.com/index.php/JN> <https://creativecommons.org/licenses/by-sa/4.0/>
- Pemberian, P., Gizi, E., Dan E-Booklet Terhadap, V., Pengetahuan, P., Seimbang, G., Di, R., Rachmi, J., Zahtira, I., & Sofianita, I. (2022). The Effect of Nutrition Education Using Videos and E-booklets on Increasing Knowledge of Balanced Nutrition in High School Students in Jakarta. *Journal of Global Nutrition (JGN)*, 2(2), 176–183.
- Putri, M., Tinggi, S., Kesehatan, I., Mulia, B., & Corresponding, S. (2023). Implementation Of Digital-Based Health Promotion Model On Clean And Healthy Behaviour In Secondary School Adolescents. In *Journal International Public Health* (Vol. 2, Issue 1).
- Siagian, A., Siagian, A., & Lubis, N. L. (2024). The Influence Of Android-Based Educational Game Media On The Knowledge Of Selecting Food Snacks In Children Basic Schools In Binjai City. In *International Journal Of Public Health and Clinical Sciences* (Vol. 8, Issue 1). Albiner Siagian.
- Sugiyanto, S., Rizki, M., & Mashar, H. M. (2024). Pengaruh Edukasi dengan Media Video Animasi "Jajanan Sehat" terhadap Pengetahuan dan Sikap Anak Usia Sekolah di Kota Palangka Raya. *Ghidza: Jurnal Gizi Dan Kesehatan*, 8(1), 1–5. <https://doi.org/10.22487/ghidza.v8i1.741>
- UNICEF. (2025). *Creating Healthier School Food Environments: Insights to Guide Policies and Programmes in Indonesia*. www.unicef.or.id
- Yasiroh, matul, Setiadi, Y., Dwi, M. L., Noviardhi, A., Supadi, J., & Didik Widiyanto, S. (2024). *International Journal Of Innovative Research In Multidisciplinary Education The Effect of Nutrition Education With Video on Knowledge and Attitudes as An Effort To Prevent Obesity in Young Women at Senior High School 2 Bae Kudus*. <https://doi.org/10.58806/ijirme.2024.v3i6>

n03

Zhao, X., Li, C., Wang, L., Dong, C., & Meng, Z. (2024). *Application Of Health Education Program Based On Intelligent Recommendation Algorithm In The Development Of School-Age Children's Hand Hygiene Behavior*. *Scalable Computing*, 25(4), 2876–2889. <https://doi.org/10.12694/scpe.v25i4.2855>