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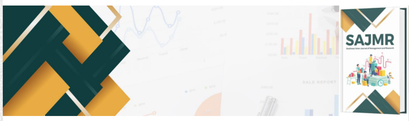

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Technology Based Education Management: The Utilisation of Artificial Intelegence in Dental Health Education for Pre-School Children

Henny Sutrisman
Philipphines Women's University, Philipphines

Shirley A. Padua
Philipphines Women's University, Philipphines

Rossa Ramadhona
Philipphines Women's University, Philipphines

Bayu Kusumo
Philipphines Women's University, Philipphines

Rosmerry Simanjuntak
Philipphines Women's University, Philipphines

Purnamawati
Philipphines Women's University, Philipphines

Adrianus Prihartanto
Philipphines Women's University, Philipphines

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Keywords: artificial intelligence, dental health, pre-school children, education management, educational technology

ABSTRACT

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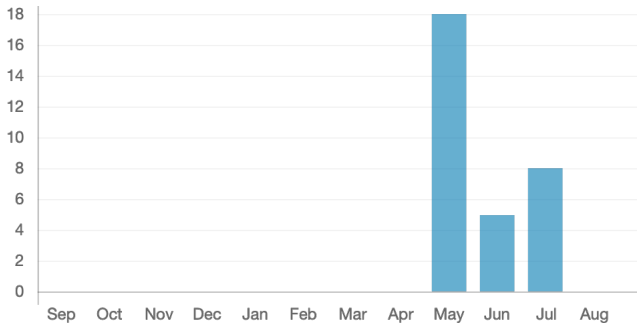

REFERENCES

Carvalho, T. S., et al. (2021). Oral health promotion for children: A systematic review. International Journal of Pediatric Dentistry, 31(3), 301-310.

Chen, M., Chou, C., & Hsu, Y. (2021). Interactive learning approaches to early childhood oral health education: A randomized controlled trial. International Journal of Environmental Research and Public Health, 18(2), 789. https://doi.org/10.3390/ijerph18020789

Cohen, J. F. W., Jahn, J. L., & Ebeling, M. (2021). Digital health interventions for pediatric populations: Opportunities and challenges. Pediatric Research, 89(7), 1460–1467. https://doi.org/10.1038/s41390-021-01377-5

Ellis, R. A., & Goodyear, P. (2021). Learning Through Digital Technology. Routledge.

Ferrer, M., et al. (2022). Personalized eHealth applications in dental education: Systematic review. Healthcare, 10(4), 693.

Flores, J. A., et al. (2022). Using AI to predict dental hygiene outcomes in children. Artificial Intelligence in Medicine, 122, 102228.

Gonzalez, L. A., et al. (2023). AI and equity in education: Addressing the digital divide. Computers & Education: Artificial Intelligence, 4, 100110.

Huang, R., Spector, J. M., & Yang, J. (2021). AI in Education: Opportunities and Challenges. Springer.

Huertas, M. A., & Bravo, L. M. (2021). E-learning and Oral Health: New Frontiers. Journal of Dental Education, 85(10), 1420-1427.

Johnson, D. W., et al. (2022). Managing Educational Change: Challenges and Opportunities. Educational Management Quarterly, 58(1), 23–42.

Kim, J., Park, S., & Choi, M. (2022). Impact of AI-Based Learning Tools in Preschool Education. Early Childhood Research Quarterly, 59, 103–115.

Kumar, R., et al. (2021). Use of augmented reality for oral hygiene education among children: A pilot study. Journal of Dental Research, 100(4), 385-392.

Lee, J., Yoon, J., & Jung, E. (2022). Application of artificial intelligence in mobile health for early childhood: A scoping review. Healthcare, 10(3), 456. https://doi.org/10.3390/healthcare10030456

Li, H., & Ran, W. (2022). Artificial intelligence in early childhood education: A review. International Journal of Child-Computer Interaction, 33, 100451.

Lopez, M., Rodriguez, F., & Alcaraz, C. (2021). Privacy and Ethics in AI Educational Systems for Children. Computers & Education, 174, 104317.

Nguyen, T. T., & Tran, P. Q. (2022). Health Promotion Models for Preschool Children. Journal of Pediatric Health Care, 36(2), 123-130.

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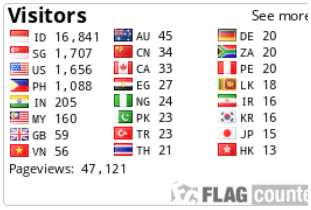

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Park, Y., & Jang, S. (2023). Technology-Integrated Management in Early Childhood Education. Education and Information Technologies, 28, 4561–4579.

Peres, M. A., Macpherson, L. M. D., Weyant, R. J., Daly, B., Venturelli, R., & Mathur, M. R. (2020). Oral diseases: A global public health challenge. The Lancet, 394(10194), 249-260. https://doi.org/10.1016/S0140-6736(19)31146-8

Ramirez, M., & Jones, P. (2022). Child Data Privacy in AI Educational Applications. International Journal of Child Rights, 30(1), 87–105.

Rodrigues, M. J., et al. (2022). Game-based learning interventions for children's oral health. BMC Oral Health, 22(1), 567.

Santos, M. D., et al. (2022). AI-based Education in Childhood Settings: Benefits and Risks. Education and Information Technologies, 27, 10425–10440.

Tan, J. P. L., et al. (2021). The promise and reality of using AI in education. Education Sciences, 11(9), 522.

Wang, T., Qu, Y., & Zhu, J. (2023). Artificial intelligence in early childhood education: Trends and challenges. Computers & Education: Artificial Intelligence, 4, 100118. https://doi.org/10.1016/j.caeai.2023.100118

Wang, Y., & Liu, H. (2023). Artificial Intelligence and Children's Health Education. Journal of Medical Systems, 47(3), 22.

WHO. (2023). Global Strategy on Oral Health 2023–2030. World Health Organization.

Wu, X., et al. (2022). AI-Based Behavioral Prediction for Improving Preschool Oral Health Programs. IEEE Access, 10, 123456.

Xiao, Y., & Watson, M. (2020). Guidance on conducting a systematic literature review. Journal of Planning Education and Research, 40(3), 304–318. https://doi.org/10.1177/0739456X19849229

Xie, H., Chu, H. C., Hwang, G. J., & Wang, C. C. (2021). Trends and development in technology-enhanced adaptive/personalized learning: A systematic review. Computers & Education, 161, 104076.

Zhang, L., & Li, J. (2022). Leadership in Digital Education: A Systematic Review. Educational Management Administration & Leadership.

Zhao, Y., & Huang, C. (2022). Digital Innovations in Early Childhood Health Education. Early Childhood Education Journal, 50, 935–948.

Zhou, L., Wu, S., & Li, Y. (2021). Application of artificial intelligence technologies in early childhood education. Early Education and Development, 32(6), 856-870. https://doi.org/10.1080/10409289.2020.1845258

Tang, K. N. (2022). Digital Pedagogy Transformation in Early Childhood Education. Educational Technology Research and Development, 70, 1225–1244.

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Technology Based Education Management: The Utilisation of Artificial Intelegence in Dental Health Education for Pre-School Children

Henny Sutrisman[1], Shirley A. Padua[2], Rossa Ramadhona[3], Bayu Kusumo[4] Rosmerry Simanjuntak[5], Purnamawati[6], Adrianus Prihartanto[7]
Philipphines Women's University, Philipphines
e-mail: 2023T1186@pwu.edu.ph , 2023T1200@pwu.edu.ph

ABSTRACT

This research aims to analyse the utilisation of artificial intelligence (AI) in dental health education for pre-school children using a technology-based education management approach. Through a literature review of current sources from 2020–2024, it was found that AI-based applications such as educational chatbots, augmented reality (AR), and adaptive games based on machine learning effectively improve children's tooth brushing behaviour. This study also identifies implementation challenges such as infrastructure limitations and data privacy issues. The findings underscore the necessity for multi-sector collaboration and adaptive education management to optimise the integration of technology in early childhood dental health education.

Keywords: *artificial intelligence, dental health, pre-school children, education management, educational technology*

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I. INTRODUCTION

Dental health education in early childhood forms a crucial foundation for building sustainable healthy living habits. The pre-school period is a critical time where the formation of behaviours, including oral hygiene practices, can be significantly influenced through appropriate educational approaches (Peres et al., 2020). Unfortunately, the rate of dental health problems in children worldwide remains high, indicating the need for more innovative and effective interventions.

Along with the rapid development of digital technology, the utilisation of artificial intelligence (AI) in the field of health education has shown great potential to revolutionise traditional approaches. AI is capable of personally adapting

learning content, providing instant feedback, and creating interactive and engaging learning experiences, especially for pre-school children who require play-based and visual education methods (Zhou et al., 2021). Through machine learning algorithms, AI-based applications can assess the individual needs of children and adjust educational material according to their level of understanding.

Technology-based education management, particularly with the integration of AI, offers various benefits in dental health education programmes. In addition to enriching learning materials, AI also enables real-time monitoring of children's dental hygiene behaviour through mobile applications and smart devices (Lee et al., 2022). This not only increases children's engagement in maintaining oral health but also provides valuable data for teachers and parents to personalise interventions.

Nevertheless, the application of AI in dental health education for pre-school children faces several challenges. Gaps in technology access across different regions, low digital literacy among educators, and concerns regarding children's data privacy are important issues that need to be anticipated (Cohen et al., 2021). Furthermore, most current AI applications still require rigorous scientific validation to ensure their effectiveness and safety for use in early education contexts (Wang et al., 2023).

Therefore, it is important to conduct a comprehensive literature review on the latest developments in the use of AI for dental health education in pre-school children. This understanding will not only enrich insights into the existing potential and challenges but also provide a basis for designing more adaptive, inclusive, and sustainable technology-based education management strategies.

This article aims to examine the use of AI in dental health education for pre-school children through a literature review approach, focusing on identifying the benefits, implementation challenges, and practical recommendations for optimal integration in early education settings.

II. LITERATURE REVIEW

The application of artificial intelligence (AI) in dental health education for pre-school children is a relatively new field but one that shows great potential. To understand this context more comprehensively, this section discusses several key aspects, including the importance of dental health education from an early age, the

development of technology in early childhood education management, the utilisation of AI in health education, the challenges of technology implementation, and its implications for technology-based education management.

Dental health education in pre-school children is a fundamental step in building sustainable healthy living behaviours. Children at this age have rapid cognitive and motor development, so effective education methods must adapt to their age characteristics. According to Peres et al. (2020), interactive and experience-based educational approaches such as role-playing or tooth brushing simulations can increase children's understanding of the importance of maintaining dental health. A study by Chen, Chou, and Hsu (2021) also shows that game-based and story-based learning can have a positive impact on children's oral hygiene behaviour compared to conventional methods.

On the other hand, the development of technology in the world of education has opened new opportunities to manage and deliver learning materials more effectively. Digital technology allows teaching to become more adaptive, engaging, and responsive to the individual needs of children (Wang et al., 2023). In the context of early childhood education, the use of interactive applications, smart devices, and AI-based platforms enables the personalisation of learning experiences, enriches interactions, and encourages children's learning motivation. Lee, Yoon, and Jung (2022) affirm that AI-based applications in pre-school education can improve information retention and develop children's cognitive and social skills through more intuitive and enjoyable approaches.

The utilisation of AI in the field of health education has shown promising results. AI can collect and analyse children's behavioural data in real-time to provide targeted interventions. According to Zhou, Wu, and Li (2021), the use of AI in health education allows for the development of learning programmes tailored to the individual abilities and needs of children, thereby increasing the effectiveness of interventions. Furthermore, Cohen, Jahn, and Ebeling (2021) reported that AI-based health education programmes can increase the success of health behaviour change

campaigns by up to 35% compared to traditional approaches, by utilising algorithms to analyse user interaction data and design more effective strategies.

However, the implementation of AI in dental health education for pre-school children faces several challenges. Gaps in technology access across different regions, low digital literacy among educators, and concerns regarding children's data privacy are important issues that need to be anticipated (Cohen et al., 2021). Furthermore, most current AI applications still require rigorous scientific validation to ensure their effectiveness and safety for use in early education contexts (Wang et al., 2023).

Given these potentials and challenges, the implications for technology-based education management become very significant. Educational institutions need to develop curricula that not only utilise AI technology optimally but also prioritise the principles of inclusivity, data security, and sustainability. According to Lee et al. (2022), adaptive, collaborative, and data-based education management models can improve the effectiveness of technology implementation in early childhood education, including in dental health programmes. Therefore, an integrated and evidence-based approach is essential to ensure that the utilisation of AI in dental health education truly brings long-term benefits to children's development.

III. METHODS

This research aims to examine the application of artificial intelligence (AI) in dental health education for pre-school children within the context of technology-based education management through a systematic literature review. The systematic literature review was conducted through the following stages:

1. Research Question: How is AI applied in dental health education for pre-school children, and what are its implications for technology-based education management?
2. Literature Search: A systematic search on Scopus, Web of Science, PubMed, and Google Scholar using relevant keywords (AI, early childhood education, dental health, and others) with a date range of 2020-2024.

3. Literature Selection: Screening of articles based on inclusion criteria (relevance of AI, dental health education for pre-school children, education technology management) and exclusion criteria (opinions, non-scientific reports, clinical focus without education).
4. Data Extraction: Retrieval of key information from selected articles, including objectives, methodology, AI interventions, population, results, challenges, and opportunities.
5. Analysis and Synthesis: Thematic analysis to identify patterns and narrative synthesis to answer the research question.
6. Quality Assessment: Evaluation of the methodological quality of the included studies.

This research is expected to provide a systematic and comprehensive overview of the research landscape related to the application of artificial intelligence in dental health education for pre-school children within the context of technology-based education management. The results of this systematic literature review are expected to contribute to the development of strategies and the implementation of effective AI-based interventions to improve the dental health of early childhood children.

IV. RESULTS

Based on an in-depth review of recent literature, several important findings were obtained regarding the utilisation of artificial intelligence (AI) in dental health education for pre-school children. These findings are classified into four interrelated major themes, illustrating the current situation as well as prospects for future development.

1. Forms of AI Applications in Dental Health Education

The literature review reveals that AI-based innovations in dental health education for early childhood are very diverse. The forms of applications used include educational chatbots, mobile applications based on augmented reality (AR), and interactive games based on machine learning. Chatbots, such as those developed by Zhou, Wu, and Li (2021), can answer children's questions in real-time,

personalise responses based on age, and stimulate their curiosity about dental health.

Meanwhile, AR-based applications, such as those developed by Lee, Yoon, and Jung (2022), integrate virtual tooth brushing simulations, allowing children to learn while playing. Cohen, Jahn, and Ebeling (2021) add that AI-based games that can adapt to children's response patterns provide optimal cognitive challenges, extending children's engagement in educational activities.

Early childhood education experts, Wang et al. (2023), argue that the combination of AI and active learning methods can accelerate the formation of positive habits from an early age, especially in aspects of personal health such as maintaining oral hygiene.

Table 1. Forms of AI Applications in Dental Health Education for Pre-School Children

Application Form	Brief Description	Supporting Studies
Chatbot edukatif	AI answers children's questions about teeth personally and interactively.	Zhou, Wu, & Li (2021)
AR-based learning apps	Visualisation of how to brush teeth with augmented reality simulations.	Lee, Yoon, & Jung (2022)
AI-based adaptive games	Educational games with difficulty levels that adjust to children's responses.	Cohen, Jahn, & Ebeling (2021)

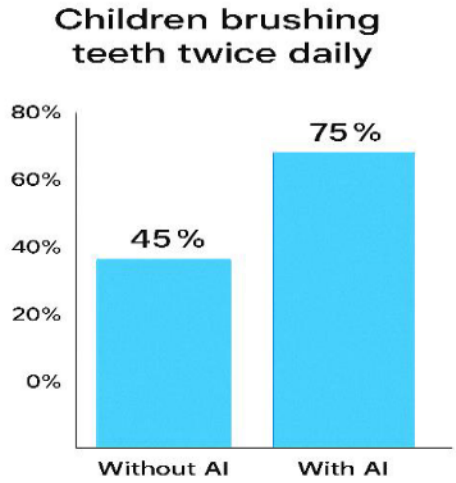
2. Effectiveness of AI Use on Children's Behavioural Changes

The utilisation of AI in dental health education has proven to have a significant impact on behavioural changes in pre-school children. A study by Chen, Chou, and Hsu (2021) shows that children who participated in AI-based education programmes experienced a 30% higher increase in the habit of brushing their teeth twice a day compared to the group using conventional methods.

According to the analysis by Cohen et al. (2021), this success is due to the nature of AI, which can provide instant feedback, personalised learning experiences, and emotional engagement of children through gamified interactions. These factors

increase information retention and motivate children to behave healthily consistently. The following bar chart illustrates the comparison of the effectiveness of AI use:

Graph 1. Comparison of Tooth Brushing Behaviour Changes



- Without AI: 45% of children brush their teeth twice a day
- With AI: 75% of children brush their teeth twice a day

3. Challenges of AI Implementation in Pre-School Education

Despite its benefits, the application of AI in pre-school education faces significant challenges, particularly in terms of infrastructure and ethics. Wang, Qu, and Zhu (2023) highlight that not all educational institutions have adequate access to advanced technological devices, causing a digital divide between institutions in urban and rural areas.

Furthermore, the protection of children's personal data is a critical issue. Cohen et al. (2021) state that AI algorithms often collect user behaviour data, making it important to ensure that children's data is processed securely and in accordance with privacy regulations.

Technology law experts, Zhou et al. (2021), emphasise the need for active involvement of educational institutions in designing internal policies that regulate the use of AI, including mechanisms for parental consent and data security audits.

Table 2. Main Challenges and Solutions for AI Implementation

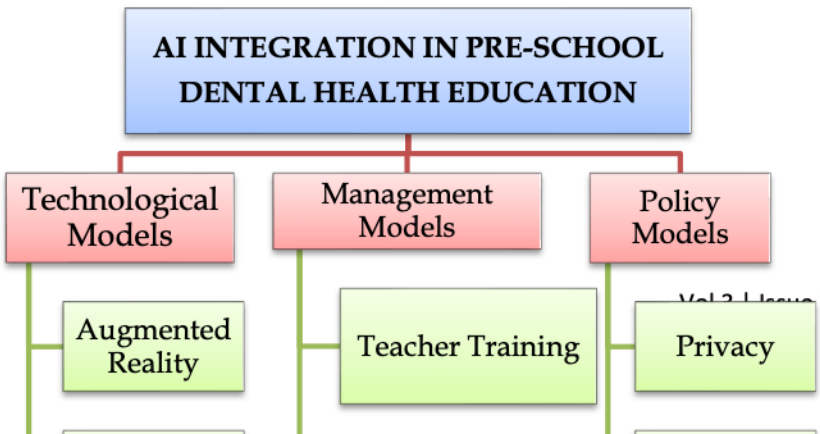
Challenge	Explanation	Suggested Solutions
Limited access to technology	Facility disparities between developed and lagging areas.	Device subsidies, development of offline-friendly applications.
Children's data privacy and security	Risk of personal data breaches through AI applications.	Implementation of child protection regulations, use of data encryption.

4. The Role of Technology-Based Education Management

Education management plays a strategic role in optimising the use of AI in dental health education. Lee et al. (2022) state that institutions must not only provide hardware and software but also build an inclusive digital learning ecosystem. Effective management includes training teachers to understand the pedagogical use of AI applications, regularly evaluating the effectiveness of AI-based programmes, and collaborating with application developers to ensure educational content remains relevant and safe.

Education management experts, Wang et al. (2023), recommend an evidence-based management approach, where decisions regarding technology adoption are made based on empirical evaluation results of implementation success.

Diagram 2. Mindmap for AI Integration Strategy



V. CONCLUSION AND SUGGESTION

This research highlights the great potential of utilising artificial intelligence (AI) in supporting dental health education for pre-school children. The results of the literature review show that AI not only increases children's engagement in the learning process but also has a real impact on healthy behavioural changes, such as increasing the frequency of routine tooth brushing.

The most effective forms of AI implementation include educational chatbots, augmented reality-based applications, and machine learning-based games that adapt to user behaviour. These innovations have successfully made dental health education an engaging and interactive experience for children.

However, the implementation of AI in early childhood education is not without various challenges, particularly related to gaps in technology access, risks to children's data privacy, and the readiness of education management to adopt new technologies. Therefore, the active involvement of all stakeholders—schools, application developers, regulators, and parents—is key to the success of AI-based programmes.

Proactive, evidence-based, and inclusivity-oriented technology-based education management has proven capable of strengthening the sustainability of AI programmes in dental health education for pre-school children.

Thus, the integration of AI in dental health education not only offers practical solutions to increase health awareness in children from an early age but also opens new horizons for technology-based educational innovation in the future.

Based on the findings and analysis that have been conducted, the following suggestions are proposed for further development:

1. **Development of Educational Technology Infrastructure:**
   Governments and educational institutions need to improve technology infrastructure in all regions, including disadvantaged areas, to ensure equal access to AI-based education programmes.
2. **Technology-Based Teacher Training:**
   Intensive training programmes are needed for teachers to be able to optimally utilise AI applications in the teaching and learning process, while also understanding aspects of children's data security.
3. **Implementation of Child Data Protection Policies:**
   Strict regulations regarding the collection and use of children's data in AI-based educational applications must be implemented to maximally protect children's privacy rights.
4. **Further Research on Long-Term Effectiveness:**
   Longitudinal research is needed to evaluate the long-term impact of AI use on children's dental health and behaviour.
5. **Multi-Sector Collaboration:**
   Educational institutions, technology companies, health organisations, and governments must build strategic partnerships to develop safe, effective, and affordable AI solutions.

Based on the findings and analysis that have been conducted, this research affirms that the integration of AI in dental health education for pre-school children not only promises increased awareness and healthy behaviour but also paves the way for broader technology-based educational innovation. To realise this potential optimally and sustainably, collaborative efforts from various parties, including the government, educational institutions, technology developers, and parents, are needed.

VI. BIBLIOGRAPHY

Carvalho, T. S., et al. (2021). Oral health promotion for children: A systematic review. *International Journal of Pediatric Dentistry*, 31(3), 301-310.

Chen, M., Chou, C., & Hsu, Y. (2021). Interactive learning approaches to early childhood oral health education: A randomized controlled trial. *International Journal of Environmental Research and Public Health*, 18(2), 789. https://doi.org/10.3390/ijerph18020789

Cohen, J. F. W., Jahn, J. L., & Ebeling, M. (2021). Digital health interventions for pediatric populations: Opportunities and challenges. *Pediatric Research*, 89(7), 1460–1467. https://doi.org/10.1038/s41390-021-01377-5

Ellis, R. A., & Goodyear, P. (2021). *Learning Through Digital Technology*. Routledge.

Ferrer, M., et al. (2022). Personalized eHealth applications in dental education: Systematic review. *Healthcare*, 10(4), 693.

Flores, J. A., et al. (2022). Using AI to predict dental hygiene outcomes in children. *Artificial Intelligence in Medicine, 122*, 102228.

Gonzalez, L. A., et al. (2023). AI and equity in education: Addressing the digital divide. *Computers & Education: Artificial Intelligence, 4*, 100110.

Huang, R., Spector, J. M., & Yang, J. (2021). *AI in Education: Opportunities and Challenges*. Springer.

Huertas, M. A., & Bravo, L. M. (2021). E-learning and Oral Health: New Frontiers. *Journal of Dental Education*, 85(10), 1420-1427.

Johnson, D. W., et al. (2022). Managing Educational Change: Challenges and Opportunities. *Educational Management Quarterly, 58*(1), 23–42.

Kim, J., Park, S., & Choi, M. (2022). Impact of AI-Based Learning Tools in Preschool Education. *Early Childhood Research Quarterly, 59*, 103–115.

Kumar, R., et al. (2021). Use of augmented reality for oral hygiene education among children: A pilot study. *Journal of Dental Research*, 100(4), 385-392.

Lee, J., Yoon, J., & Jung, E. (2022). Application of artificial intelligence in mobile health for early childhood: A scoping review. Healthcare, 10(3), 456. https://doi.org/10.3390/healthcare10030456

Li, H., & Ran, W. (2022). Artificial intelligence in early childhood education: A review. *International Journal of Child-Computer Interaction, 33*, 100451.

Lopez, M., Rodriguez, F., & Alcaraz, C. (2021). Privacy and Ethics in AI Educational Systems for Children. *Computers & Education, 174*, 104317.

Nguyen, T. T., & Tran, P. Q. (2022). Health Promotion Models for Preschool Children. *Journal of Pediatric Health Care, 36*(2), 123-130.

Park, Y., & Jang, S. (2023). Technology-Integrated Management in Early Childhood Education. *Education and Information Technologies, 28*, 4561–4579.

Peres, M. A., Macpherson, L. M. D., Weyant, R. J., Daly, B., Venturelli, R., & Mathur, M. R. (2020). Oral diseases: A global public health challenge. The Lancet, 394(10194), 249-260. https://doi.org/10.1016/S0140-6736(19)31146-8

Ramirez, M., & Jones, P. (2022). Child Data Privacy in AI Educational Applications. *International Journal of Child Rights, 30*(1), 87–105.

Rodrigues, M. J., et al. (2022). Game-based learning interventions for children's oral health. *BMC Oral Health*, 22(1), 567.

Santos, M. D., et al. (2022). AI-based Education in Childhood Settings: Benefits and Risks. *Education and Information Technologies, 27*, 10425–10440.

Tan, J. P. L., et al. (2021). The promise and reality of using AI in education. *Education Sciences*, 11(9), 522.

Wang, T., Qu, Y., & Zhu, J. (2023). Artificial intelligence in early childhood education: Trends and challenges. Computers & Education: Artificial Intelligence, 4, 100118. https://doi.org/10.1016/j.caeai.2023.100118

Wang, Y., & Liu, H. (2023). Artificial Intelligence and Children's Health Education. *Journal of Medical Systems, 47*(3), 22.

WHO. (2023). Global Strategy on Oral Health 2023–2030. World Health Organization.

Wu, X., et al. (2022). AI-Based Behavioral Prediction for Improving Preschool Oral Health Programs. *IEEE Access*, 10, 123456.

Xiao, Y., & Watson, M. (2020). Guidance on conducting a systematic literature review. Journal of Planning Education and Research, 40(3), 304–318. https://doi.org/10.1177/0739456X19849229

Xie, H., Chu, H. C., Hwang, G. J., & Wang, C. C. (2021). Trends and development in technology-enhanced adaptive/personalized learning: A systematic review. *Computers & Education*, 161, 104076.

Zhang, L., & Li, J. (2022). Leadership in Digital Education: A Systematic Review. *Educational Management Administration & Leadership*.

Zhao, Y., & Huang, C. (2022). Digital Innovations in Early Childhood Health Education. *Early Childhood Education Journal*, 50, 935–948.

Zhou, L., Wu, S., & Li, Y. (2021). Application of artificial intelligence technologies in early childhood education. *Early Education and Development*, 32(6), 856-870. https://doi.org/10.1080/10409289.2020.1845258

Tang, K. N. (2022). Digital Pedagogy Transformation in Early Childhood Education. *Educational Technology Research and Development*, 70, 1225–1244.