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RESEARCH ARTICLE

Study on the Attitudes toward Artificial Intelligence and Digital Literacy of Dental Hygiene Students

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Background: The Fourth Industrial Revolution highlights the importance of artificial intelligence (AI) and digital literacy in dental hygiene education. However, research on students' attitudes toward AI and their digital literacy levels is limited. Therefore, this study investigated the attitudes of dental hygiene students toward AI and digital literacy levels.

Methods: In total, 167 dental hygiene students in Baekseok University participated in the study and provided informed consent. The survey tool included general characteristics, smartphone usage patterns, attitudes toward AI, and digital literacy levels. Attitudes toward AI and digital literacy based on general characteristics and smart device usage were analyzed using t-tests and one-way ANOVA. Correlations among attitudes toward AI, digital literacy awareness, and digital literacy behaviors were analyzed using Pearson's correlation analysis. The impact of AI attitudes and digital literacy awareness on digital literacy behavior was examined using linear regression analysis.

Results: Students with higher interest in their major had more positive attitudes toward AI, and those with higher smart device usage showed increased AI attitudes and digital literacy ($p<0.05$). Simple frequency or duration of smartphone use did not affect digital literacy, but students who perceived their smart device usage positively and believed that they used smart devices effectively in their studies exhibited higher levels of digital literacy ($p<0.05$). A positive attitude toward AI is associated with higher levels of digital literacy ($p<0.05$). Digital literacy awareness and attitudes toward AI influenced digital literacy behavior ($p<0.05$).

Conclusion: These results suggest that the qualified utilization and application of digital devices in dental hygiene education are important. Improving the educational curriculum is necessary; as a result, digital technology can be effectively utilized, and various educational programs should be introduced to enhance digital literacy.

Key Words: Artificial intelligence, Computer literacy, Dental hygienists, Mobile applications

Introduction

1. Background

With the advent of the Fourth Industrial Revolution, the development of artificial intelligence (AI) and digital technologies has brought about significant changes in the field of dental hygiene. These advancements have influenced various areas, including dental diagnosis, treatment planning, management, and telemedicine[1]. Consequently, the integration of AI and digital technology into dental hygiene education has become increasingly important.

As future dental professionals, dental hygiene students must be equipped with the ability to understand and use AI. However, studies examining the attitudes of healthcare students toward AI have shown that, while students generally view AI positively, they lack confidence in their ability to effectively use it in practice[1]. This underscores the urgent need for programs that incorporate AI and digital technology into healthcare education. In dental hygiene education, AI-based learning tools can enhance students' learning experiences by providing real-time feedback, thereby improving learning efficiency. Jeong et al.[2] reported that dental hygiene students had a high interest in AI but low confidence in it, but they did not analyze the correlation

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using digital device usage patterns.

Digital literacy, originally defined as the ability to understand and use information through computers[3], has evolved to encompass skills such as information retrieval, data analysis, and digital tool use. This is now considered an essential competency in modern society[4]. Research on the relationship between digital literacy and academic achievement among university students has shown that those with high digital literacy demonstrate better self-regulation, higher satisfaction with their quality of life, and greater academic success. This highlights the significant impact of digital skills on academic achievement and the quality of life[5]. Park and Shim[6] reported that the digital literacy of dental hygiene students was influenced by self-expression motivation but did not analyze it using smart device usage patterns. Therefore, further research is needed to analyze digital literacy according to smart device usage patterns.

Attitudes toward AI are influenced by an individual's experience, knowledge, and confidence in their technical skills. Positive attitudes play a crucial role in accepting and actively using AI technologies[7]. Individuals with a positive attitude toward AI are more open to learning new technologies and applying them to their work or studies[8]. Digital literacy refers to the ability to identify, evaluate, and use information in a digital environment. High digital literacy can be a key factor in enhancing the understanding and utilization of AI[9,10].

2. Objectives

Despite the importance of fostering a positive attitude toward AI and developing digital literacy skills among dental hygiene students, research on these topics remains limited. Therefore, this study aimed to investigate the attitudes toward AI and the level of digital literacy among dental hygiene students. These findings provide essential data for the development of an effective curriculum to prepare students for the Fourth Industrial Revolution.

Materials and Methods

1. Participants

This study targeted dental hygiene students in their second, third, and fourth years at a 4-year university in Cheonan. After receiving approval from the Institutional Review Board of Baekseok University, data were collected through an online survey conducted from April 24, 2024 to April 30, 2024, using a convenience sampling method. The survey was conducted with participants who were informed of the research objectives and who willingly consented to participate. Respondents completed the online survey by accessing a provided URL link and submitting their self-reported answers.

2. Study design

The sample size was determined using G-power version 3.1.9.7 program, applying a regression analysis with a medium effect size of 0.15, a significance level of 0.05, and a statistical power of 0.95. The minimum sample size required was 138. Considering the dropout rate, 167 participants were included in the study, and 167 responses were used in the final data analysis.

3. Instruments

The instruments used in this study consisted of five items on demographic characteristics (sex, grade, interest in major, major satisfaction, and academic achievement), seven items on smart device usage, 18 items on attitudes toward AI, 15 items on digital literacy awareness, and 21 items on digital literacy behaviors. All survey items were measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

1) Attitudes toward artificial intelligence

To measure attitudes toward AI, the tool developed by Kim and Lee[10] was used. The subfactors of this tool include five items on communication with AI, four on the social impact of AI, four on interaction with AI, three on AI characteristics, and two on AI self-efficacy. The tool was designed to measure positive attitudes toward AI, with higher scores indicating a more positive attitude and lower scores indicating a more negative attitude. Cronbach's alpha for the attitude toward AI scale was 0.805.

2) Awareness and behaviors related to digital literacy

A tool validated for university students was used to assess awareness and behaviors related to digital literacy,

and a tool validated for university students was used[9]. Digital literacy was evaluated in two domains: "awareness" and "behavior." The "awareness" domain consisted of four sub-factors: the value of reading and writing (two items), the value of the internet (three items), self-efficacy (five items), and emotions (five items). The "behavior" domain included five sub-factors: self-regulation (two items), participation (four items), ethics (six items), security (five items), and critical reading (four items). Cronbach's alpha was 0.881 for the digital literacy awareness scale and 0.901 for the digital literacy behavior scale.

4. Data analysis

Data analysis was conducted using IBM SPSS (ver. 27.0; IBM Corp., Armonk, NY, USA). Descriptive statistics were used to examine major satisfaction, academic achievement, self-directed learning, and smart device usage levels. Attitudes toward AI, digital literacy awareness, and digital literacy behaviors based on general characteristics and smart device usage were analyzed using t-tests and one-way ANOVA (Scheffe's test). Correlations among attitudes toward AI, digital literacy awareness, and digital literacy behaviors were analyzed using Pearson's correlation analysis. The impact of AI attitudes and digital literacy awareness on digital literacy behavior was examined using linear regression analysis.

Results

1. Attitudes toward artificial intelligence based on general characteristics

The general characteristics of the participants are provided in Table 1. In the study, there were six male students (3.6%) and 161 female students (96.4%). They comprised second (31.7%)-, third (30.5%)-, and fourth (37.7%)-year students. The higher the interest in a major, the better the attitude toward AI. No correlation was observed among major satisfaction, academic achievement, and attitudes toward AI.

2. Digital literacy based on general characteristics

Digital literacy based on general characteristics is provided in Table 2. Students with a higher interest in majors had higher digital literacy awareness and behaviors ($p < 0.05$). Students who responded that they had a moderate interest in their majors had the lowest digital literacy ($p < 0.05$).

3. Attitudes toward artificial intelligence based on smart device usage

The smart device usage patterns of the students are shown in Table 3. Of the students, 46.1% responded that they used their smart devices for more than 6 hours, and 21.0% responded that they used their smart devices for

Table 1. Artificial Intelligence Attitudes by General Characteristics

General characteristic		Artificial intelligence attitude		p-value
Sex	Male	6 (3.6)	3.05±0.48	0.693
	Female	161 (96.4)	2.97±0.46	
Grade	2nd[a]	53 (31.7)	2.96±0.47	0.930
	3rd[b]	51 (30.5)	2.97±0.39	
	4th[c]	63 (37.7)	2.99±0.51	
Interest in major	Low[a]	15 (9.0)	2.84±0.42	0.015
	Medium[b]	57 (34.1)	2.86±0.42	
	High[c]	95 (56.9)	3.07±0.48	
Major satisfaction	Low[a]	44 (26.3)	2.90±0.41	0.224
	High	123 (73.7)	3.00±0.48	
Academic achievement	Low[a]	44 (26.4)	2.89±0.47	0.326
	Medium[b]	79 (47.2)	3.02±0.46	
	High[c]	44 (26.4)	2.98±0.46	

Values are presented as n (%) or mean±standard deviation. p-value was calculated using the independent t-test and one-way ANOVA (Scheffe's test).

Table 2. Digital Literacy by General Characteristics

General characteristic		Digital literacy awareness		Digital literacy behavior	
		Value	p-value	Value	p-value
Sex	Male	3.78±0.64	0.955	3.91±0.57	0.528
	Female	3.77±0.56		4.05±0.54	
Grade	2nd[a]	3.73±0.44	0.410	4.00±0.45	0.617
	3rd[b]	3.72±0.53		4.02±0.58	
	4th[c]	3.85±0.66		4.10±0.59	
Interest in major	Low[a]	3.83±0.59	0.036	4.18±0.50	<0.001 (b<a,c)
	Medium[b]	3.62±0.54		3.82±0.57	
	High[c]	3.86±0.55		4.16±0.49	
Major satisfaction	Low	3.77±0.58	0.997	3.98±0.57	0.331
	High	3.77±0.55		4.07±0.52	
Academic achievement	Low[a]	3.82±0.60	0.284	4.05±0.42	0.655
	Medium[b]	3.70±0.55		4.11±0.55	
	High[c]	3.85±0.51		4.05±0.54	

Values are presented as mean±standard deviation. p-value was calculated using the independent t-test and one-way ANOVA (Scheffe's test).

Table 3. Attitudes toward Artificial Intelligence by Smart Device Usage

Use of smart device		Artificial intelligence attitude		p-value
Use of smartphone	Low	154 (92.2)	2.98±0.46	0.458
	High	13 (7.8)	2.88±0.54	
Smart device usage time	≤4[a]	35 (21.0)	3.16±0.54	0.033 (c<a)
	4~6[b]	55 (32.9)	2.93±0.45	
	≥6[c]	77 (46.1)	2.92±0.42	
Changes in quality of life after using smart device	Low[a]	12 (7.2)	2.71±0.40	0.014 (a<c)
	Mediun[b]	33 (19.8)	2.85±0.34	
	High[c]	122 (73.1)	3.04±0.48	
Smart device utilization level	Bad	30 (18.0)	2.90±0.39	0.293
	Well	137 (82.0)	2.99±0.48	
Digital equipment proficiency	Low	31 (18.6)	3.79±0.41	0.011
	High	136 (81.4)	3.02±0.46	
Use of smart devices for major	Low	26 (84.4)	2.79±0.37	0.026
	High	141 (15.6)	3.01±0.47	

Values are presented as n (%) or mean±standard deviation. p-value was calculated using the independent t-test and one-way ANOVA (Scheffe's test).

less than 4 hours. Of the students, 73.1% responded that their quality of life improved after using smart devices, and their attitude toward AI was the most statistically positive. No difference was observed in attitudes toward AI based on the level of smart device use. Of the students, 81.4% responded that they used smart devices well, and their attitude toward AI was negative ($p<0.05$). Students who responded that they made good use of smart devices to study for their majors had a more positive attitude toward AI ($p<0.05$).

4. Digital literacy based on smart device usage

Digital literacy based on smart device usage is provided in Table 4. No difference was observed in digital literacy according to the duration of smart device use. Digital literacy was high among respondents who reported that their quality of life improved after using smart devices ($p<0.05$). Digital literacy increased as the level of smart device use increased, and the respondents responded that they were good at using digital equipment ($p<0.05$). Digital literacy was higher when students used smart devices more frequently when studying for their majors ($p<0.05$).

Table 4. Digital Literacy through Smart Device Usage

Use of smart device		Digital literacy awareness		Digital literacy behavior	
		Value	p-value	Value	p-value
Use of smartphone	Low	3.79±0.55	0.202	4.07±0.51	0.198
	High	3.58±0.65		3.77±0.78	
Smart device usage time	≤4[a]	3.73±0.62	0.153	3.97±0.57	0.455
	4~6[b]	3.68±0.46		4.11±0.39	
	≥6[c]	3.86±0.59		4.04±0.62	
Changes in quality of life after using smart devices	Low[a]	3.72±0.45	0.001	3.97±0.56	0.018
	Mediun[b]	3.46±0.51	(b<c)	3.82±0.53	
	High[c]	3.86±0.55		4.12±0.53	
Smart device utilization level	Bad	3.49±0.54	0.002	3.74±0.58	0.001
	Well	3.83±0.54		4.11±0.51	
Digital equipment proficiency	Low	3.41±0.54	<0.001	3.72±0.64	0.003
	High	3.85±0.53		4.12±0.49	
Use of smart devices for major	Low	3.50±0.55	0.008	3.72±0.58	0.001
	High	3.82±0.55		4.11±0.51	

Values are presented as mean±standard deviation. p-value was calculated using the independent t-test and one-way ANOVA (Scheffe's test).

Table 5. Correlation between Attitudes toward Artificial Intelligence and Digital Literacy

	Artificial intelligence attitude	Digital literacy awareness	Digital literacy behavior
Artificial intelligence attitude	1		
Digital literacy awareness	0.300 (<0.001)	1	
Digital literacy behavior	0.061 (0.436)	0.603 (<0.001)	1

Correlation coefficient was calculated using Pearson's correlation analysis.

Table 6. Impact of Artificial Intelligence Attitudes and Digital Literacy Awareness on Digital Literacy Behavior

	Standard error	β	t	p-value	Adjust R^2	F (p-value)
Artificial intelligence attitudes	0.088	0.643	9.972	<0.001	0.372	20.211 (<0.001)
Digital literacy awareness	0.088	0.132	2.046	0.042		

p-value was calculated using the liner regression.

5. Correlation between attitudes toward artificial intelligence and digital literacy

The correlations between attitudes toward AI and digital literacy are shown in Table 5. AI is positively correlated with digital literacy awareness ($p<0.001$). Digital literacy awareness was positively correlated with digital literacy behavior ($p<0.001$).

6. Impact of attitudes toward artificial intelligence and digital literacy awareness on digital literacy behaviors

The impacts of attitudes toward AI and digital literacy awareness on digital literacy behavior are provided in Table 6. Attitudes toward AI and digital literacy awareness have a significant effect on digital literacy behavior ($p<0.05$).

Discussion

1. Interpretation

This study analyzed the attitudes of dental hygiene students toward AI and their levels of digital literacy. The results revealed a clear pattern. Students who expressed higher confidence in their ability to effectively use smart devices exhibited more positive attitudes toward AI and

had higher levels of digital literacy. This suggests that digital literacy and positive attitudes toward AI are interconnected and that proficiency in using digital tools enhances students' openness to AI technologies.

Table 1, 2 show attitudes toward AI and digital literacy according to general characteristics. Attitudes toward AI did not show significant differences according to sex, grade, major satisfaction, or academic achievement. This could be attributed to the shift toward digital-based education since the outbreak of COVID-19, when students became more accustomed to digital learning, potentially reducing the influence of digital literacy on academic achievement[11]. Since COVID-19, university education has transitioned to digital-based education, and many students are familiar with digital-based learning; therefore, it is believed that digital literacy has not affected academic achievement. However, positive attitudes toward digital literacy and AI increased with interest in their majors. The transition to the active use of digital devices in studying majors was related to students' interest in their majors and showed these results. What is unusual is that students who responded that they had low interest in their major had high digital literacy. These results are different from those of previous studies, and a detailed analysis is needed to determine whether students with high digital literacy use digital devices more in fields related to their major studies[12,13]. However, Bennett et al.[14] argued that digital literacy is not related to major interests and that digital technology may be mainly used for personal leisure or social networking rather than for academic purposes. A difference could exist between the perception of smart device usage time and actual usage time, and smart device usage may be limited to the use of specific apps. Therefore, future research should analyze the correlation between digital literacy items and accurate records of smartphone use time. Therefore, it is necessary to analyze the various factors affecting digital literacy among students with low interest in their majors but high digital literacy. Qualitative research is necessary, if necessary.

Table 3 shows attitudes toward AI according to smart device usage patterns. A positive attitude was observed toward AI among students who responded that they used smart devices for 4 hours or fewer. As smart device usage time increases, attitudes toward AI would be positive due to exposure to various digital platforms, but in this study, students who used their smart devices for less than 4 hours had more positive attitudes toward AI[15,16]. This suggests that excessive smart device usage hinders critical thinking and information evaluation skills[17,18]. This result was similar to that of other studies claiming that excessive smartphone usage lowered information literacy because users uncritically evaluated the source of information[15]. Other studies have reported that smart device usability, rather than smart device usage time, has a positive effect on quality of life, which is in line with the results of this study[14,19]. The difference is that while Han et al.[19] analyzed smart device use time as a continuous variable, this study analyzed it as a dichotomous variable based on 4 hours. Based on the results of a study on the relationship between digital device use time and mental health among American adolescents, students who used digital devices for more than 4 hours had poor mental health[20]. In this study, 4 hours of digital device use was considered as a meaningful reference time.

A positive attitude toward AI among students who felt their quality of life had improved after using smart devices had higher proficiency with digital devices and higher the use of smart devices in studying their major. Students who believed that smart devices improved their quality of life and those who frequently used these devices for majoring demonstrated a more favorable outlook toward AI[21]. These results highlight the importance of both digital literacy and positive engagement with digital tools in shaping student attitudes toward AI[17]. However, students who responded that they were highly competent at using smart devices showed a negative attitude toward AI. The study observed that people who frequently use digital devices may feel more anxious about interacting with AI or robots[22]. This could be because the better the understanding of the technology, the more we know about its limitations and potential risks.

Table 4 shows digital literacy according to smart device usage patterns. Digital literacy was not related to the time spent using smart devices but to proficiency in using digital tools. Digital literacy increased as people felt that their quality of life improved after using smart devices;

their level of smart device use was high, their digital device proficiency was high, and they were more likely to use smart devices to study majors.

Table 5 shows the correlation between the attitude toward AI and digital literacy. Attitudes toward AI are related to digital literacy awareness, and digital literacy awareness is related to digital literacy behaviors. No correlation was observed between the attitude toward AI and digital literacy behavior. These results might indicate that students who used digital literacy did not actively show a positive attitude toward AI because of its risks and limitations[22]. However, additional analyses are required to understand the paths through which these factors influence each other. Analyzing the correlation between the sub-items of digital literacy and the sub-categories of attitudes toward AI and analyzing them by adding parameters such as digital device usage patterns is important.

Table 6 shows the impact of digital literacy awareness and sense of AI on digital literacy behavior. AI attitudes and digital literacy attitudes have a positive effect on digital literacy behavior. Understanding digital technology and beliefs about AI have a significant impact on the manner and extent of actually using digital technology. These results are in the same context as previous research showing that as digital literacy awareness increases, digital literacy behavior increases[23]. A positive attitude was observed toward AI promoting its AI technology[24]. Therefore, we believe that dental hygiene education should focus on increasing awareness of digital literacy and forming a positive attitude toward AI, beyond simple training on how to use it.

2. Comparison to previous studies

In contrast to previous research, this study reported no significant differences in attitudes toward AI based on sex, academic year, major satisfaction, or academic achievement. Earlier studies suggested that higher academic achievement is linked to more positive attitudes toward AI and greater digital literacy[17]. This divergence in findings could be attributed to the post-COVID-19 shift toward digital-based education, which likely leveled the playing field, making students across various academic achievements equally accustomed to digital learning. This widespread exposure may reduce the impact of digital literacy on academic outcomes. Additionally, the observation that students with a strong interest in their major exhibited more positive attitudes toward AI aligns with previous research that emphasizes that intrinsic interest in a field can enhance the adoption of digital tools and AI. Comparisons with studies conducted in other contexts, such as dental students in India, support the idea that effective use of smart devices correlates with improved digital literacy[18]. This consistency across different studies and contexts suggests that confidence in smart device usage is a crucial factor influencing positive attitudes toward AI[19,21].

3. Suggestion

The findings of this study have several practical implications in dental hygiene education and beyond. Given the strong link between digital literacy and positive attitudes toward AI, dental hygiene programs should incorporate comprehensive digital literacy training and AI-related content into their curricula[25]. This could involve integrating AI tools into the learning process, offering workshops on effective digital device usage, and providing opportunities for students to engage with AI in a hands-on manner[26]. In addition, it is essential to foster an environment in which students can build confidence when using smart devices[27]. This can be achieved through targeted educational programs that emphasize the practical application of digital tools in major-related activities[28]. Universities should consider developing guidelines for the effective academic use of smart devices, ensuring that students use these tools more frequently and effectively, thereby enhancing their learning outcomes and overall well-being[19,25]. The effectiveness of simulation dental hygiene education using digital equipment has been emphasized[23], augmented reality technology was introduced and taught at dental surgery sites, and the development of dental hygiene education was suggested[24]. The transition toward digital transformation in healthcare further supports the need for AI and digital literacy to be integral components of dental hygiene education, preparing students for the future demands of the profession.

4. Limitations

Although this study offers valuable insights, it is essen-

tial to acknowledge its limitations. The study was conducted using a sample from a single dental hygiene department, which limits the extent to which the findings can be generalized to all dental hygiene students or other fields. Future research should include a broader and more diverse sample, incorporating students from different universities and academic backgrounds, to ensure that the findings are universally applicable. Additionally, the study did not account for various external factors that could influence attitudes toward AI and digital literacy, such as cultural differences, socioeconomic status, prior exposure to AI, or the quality of digital infrastructure available to students[17]. These factors could potentially affect the results and should be considered in future studies. Despite these limitations, this study is significant, as it is one of the first in Korea to explore the relationship between attitudes toward AI and digital literacy among dental hygiene students. This lays the groundwork for future research exploring these relationships in different educational contexts and among more diverse student populations. By expanding the scope of this research, future studies can provide a more comprehensive understanding of enhancing AI-related education and digital literacy, ultimately contributing to better-prepared healthcare professionals in the digital age.

5. Conclusion

This study analyzed the attitudes of dental hygiene students toward AI and their levels of digital literacy, with the following results:

1) Students with higher interest in their major had more positive attitudes toward AI, and those with higher smart device usage showed increased AI attitudes and digital literacy.
2) Simple frequency or duration of smartphone use did not impact digital literacy, but students who perceived their smart device usage positively and believed that they used smart devices effectively in their studies exhibited higher levels of digital literacy.
3) A positive attitude toward AI was associated with higher digital literacy.
4) Digital literacy awareness and attitudes toward AI influenced digital literacy behavior.

These findings suggest that good use of smart devices influences digital literacy and positive attitudes toward AI. Therefore, good use of digital devices is essential for dental hygiene education. A need to improve educational curricula to use digital technologies effectively and introduce various educational programs to enhance digital literacy is important.

Notes

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

This study was approved by the Institutional Review Board of Baekseok University (BUIRB-202404-HR-015).

Author contributions

Conceptualization: Seon-Ju Sim. Data acquisition: Ji-Hye Kim, Min-Hee Hong, Myung-Jin Lee, and Seon-Ju Sim. Formal analysis: Ji-Hye Kim, Min-Hee Hong, and Su-Min Hong. Supervision: Seon-Ju Sim. Writing-original draft: Ji-Hye Kim and Min-Hee Hong. Writing-review & editing: Seon-Ju Sim, Su-Min Hong, and Myung-Jin Lee.

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Data availability

Data supporting the results of this study are available from the corresponding author or the Korean Society of Dental Hygiene Science upon reasonable request.

References

1. Thurzo A, Strunga M, Urban R, Surovková J, Afrashtehfar KI: Impact of artificial intelligence on dental education: a review and guide for curriculum update. Education Sciences 13: 150, 2023. https://doi.org/10.3390/educsci13020150
2. Jeong H, Han SS, Kim KE, Park IS, Choi Y, Jeon KJ: Korean dental hygiene students' perceptions and attitudes toward artificial intelligence: an online survey. J Dent Educ 87: 804-812, 2023. https://doi.org/10.1002/jdd.13189
3. Gilster P: Digital literacy. Wiley Computer Pub., New York, pp.40-45, 1997.
4. Seo S, Ok H: Development of self assessment tool for digital literacy competence. Soc Digit Policy Manag 18: 1-8, 2020. https://doi.org/10.14400/JDC.2020.18.7.001
5. Yi Y: New paradigm and literacy in the digital era: focusing on digital literacy and ai literacy. J Gen Educ 20: 35-60, 2022. https://doi.org/10.24173/jge.2022.07.20.2
6. Park SY, Shim YS: Based on dental hygiene students' use of social media digital literacy convergence competence. J Next-Gen Converg Technol Assoc 6: 2376-2385, 2022. https://doi.org/10.33097/JNCTA.2022.06.12.2376
7. Wang B, Rau PLP, Yuan T: Measuring user competence in using artificial intelligence: validity and reliability of artificial intelligence literacy scale. Behav Inf Technol 42: 1324-1337, 2023. https://doi.org/10.1080/0144929X.2022.2072768
8. Nguyen TT, Larrivée N, Lee A, Bilaniuk O, Durand R: Use of artificial intelligence in dentistry: current clinical trends and research advances. J Can Dent Assoc 87: l7, 2021.
9. Abou Hashish EA, Alnajjar H: Digital proficiency: assessing knowledge, attitudes, and skills in digital transformation, health literacy, and artificial intelligence among university nursing students. BMC Med Educ 24: 508, 2024. https://doi.org/10.1186/s12909-024-05482-3
10. Kim SW, Lee Y: Attitudes toward artificial intelligence of high school students' in Korea. J Korea Converg Soc 11: 1-13, 2020. https://doi.org/10.15207/JKCS.2020.11.12.001
11. Holm P: Impact of digital literacy on academic achievement: evidence from an online anatomy and physiology course. E-Learn Digit Media 2024. [Epub ahead of print] https://doi.org/10.1177/20427530241232489
12. Kim EJ: A study on the relationship between digital literacy and major satisfaction of nursing students: intermediary role of lms learning effects. J Converg Cult Technol 8: 27-35, 2022. https://doi.org/10.17703/JCCT.2022.8.4.27
13. Wild D, Kydd A, Szczepura A: Implementing digital skills training in care homes: a literature review. Nurs Older People 28: 26-29, 2016. https://doi.org/10.7748/nop.28.4.26.s22
14. Bennett S, Maton K, Kervin L: The 'digital natives' debate: a critical review of the evidence. Br J Educ Technol 39: 775-786, 2008. https://doi.org/10.1111/j.1467-8535.2007.00793.x
15. Leung L, Lee PSN: The influences of information literacy, internet addiction and parenting styles on internet risks. New Media Soc 14: 117-136, 2012. https://doi.org/10.1177/1461444811410406
16. Kim HC, Lim JY, Park I, Kim M: A study on the development and validation of digital literacy measurement for middle school students. J Korea Soc Comput Inf 28: 177-188, 2023. https://doi.org/10.9708/jksci.2023.28.09.177
17. Ryu EJ, Jang KS, Kim EA: Influence of learning presence of non-face-to-face class experience in nursing students on academic achievement: mediating effect of learning flow and moderated mediation of digital literacy. J Korean Acad Nurs 52: 278-290, 2022. https://doi.org/10.4040/jkan.21241
18. Saxena P, Gupta SK, Mehrotra D, et al.: Assessment of digital literacy and use of smart phones among Central Indian dental students. J Oral Biol Craniofac Res 8: 40-43, 2018. https://doi.org/10.1016/j.jobcr.2017.10.001
19. Han S, Ma E, Choi S, Hong D: Analysis on the impact of using smart-phone to subjective quality of life. Korean Assoc Inf Soc 20: 49-89, 2011.
20. Twenge JM, Campbell WK: Associations between screen time and lower psychological well-being among children and adolescents: evidence from a population-based study. Prev Med Rep 12: 271-283, 2018. https://doi.org/10.1016/j.pmedr.2018.10.003
21. Celik I: Exploring the determinants of artificial intelligence (AI) literacy: digital divide, computational thinking, cogni-

tive absorption. Telemat Inform 83: 102026, 2023. https://doi.org/10.1016/j.tele.2023.102026

22. Nomura T, Kanda T, Suzuki T, Kato K: Prediction of human behavior in human--robot interaction using psychological scales for anxiety and negative attitudes toward robots. IEEE Trans Rob 24: 442-451, 2008. https://doi.org/10.1109/TRO.2007.914004
23. Buchanan JA: Use of simulation technology in dental education. J Dent Educ 65: 1225-1231, 2001. https://doi.org/10.1002/j.0022-0337.2001.65.11.tb03481.x
24. Al-Saud LM, Mushtaq F, Allsop MJ, et al.: Feedback and motor skill acquisition using a haptic dental simulator. Eur J Dent Educ 21: 240-247, 2017. https://doi.org/10.1111/eje.12214
25. Fabbrizio A, Fucarino A, Cantoia M, et al.: Smart devices for health and wellness applied to tele-exercise: an overview of new trends and technologies such as IoT and AI. Healthcare (Basel) 11: 1805, 2023. https://doi.org/10.3390/healthcare11121805
26. Tay JRH, Ng E, Chow DY, Sim CPC: The use of artificial intelligence to aid in oral hygiene education: a scoping review. J Dent 135: 104564, 2023. https://doi.org/10.1016/j.jdent.2023.104564
27. Kong SC, Cheung WMY, Tsang O: Evaluating an artificial intelligence literacy programme for empowering and developing concepts, literacy and ethical awareness in senior secondary students. Educ Inf Technol 28: 4703-4724, 2023. https://doi.org/10.1007/s10639-022-11408-7
28. Araujo T, Helberger N, Kruikemeier S, de Vreese CH: In AI we trust? Perceptions about automated decision-making by artificial intelligence. AI Soc 35: 611-623, 2020. https://doi.org/10.1007/s00146-019-00931-w