LETTERS IN BIOMATHEMATICS
An International Journal

RESEARCH ARTICLE

OPEN ACCESS

EdTech Integration in Korean Dental Hygiene Education: Impacts on Student Engagement, Personal Satisfaction, and Academic Success

Narae Jung*

Department of Dental Hygiene, Hanseo University, 46 Hanseo 1-ro, Haemi-myeon, Seosan-si, Chungcheongnam-do 31962, Republic of Korea, https://orcid.org/0000-0002-2494-4634, jnrgood@naver.com

ABSTRACT

Background & Purpose: Dental hygienists are essential healthcare professionals who plan and execute oral health education across various settings. Selecting, producing, and utilizing educational media tailored to target audiences is a required core competency. With the digital transformation in higher education, educational technology (EdTech) is expanding rapidly. This study aimed to investigate the status of EdTech tool utilization in an oral health education media production course among undergraduate dental hygiene students in Korea and empirically analyze differences in student engagement, personal satisfaction, and academic success according to EdTech usage experience.

Methods: From December 2025 to June 2026, 162 dental hygiene students who had finished an oral health education media production course in Korea within the previous year were given a structured online survey. We measured academic success (35 items), personal satisfaction (21 items), student engagement (10 items) using a 5-point Likert scale. Thematic content analysis for open-ended qualitative replies, one-way ANOVA with Games-Howell post-hoc testing, and independent t-tests were employed to process the quantitative and qualitative data.

Results: Of those surveyed, 85.8% (n=139) said they used EdTech tools. The most popular tools were Padlet (29.5%), Canva (44.6%), and Generative AI (79.9%). When compared to non-users, EdTech users showed considerably greater levels of academic success (4.46 vs. 3.95), personal satisfaction (4.38 vs. 3.73), and student engagement (4.24 vs. 3.58) ($p < .001$). Compared to instructor-led or student-led modes alone, a combined "instructor-guided and student-led" strategy demonstrated superior student engagement (4.54) and personal satisfaction (4.58). To mitigate digital overload and fatigue, moderate EdTech utilization (30% to <50% of course weeks) yielded much better results than heavy usage (≥50%). All outcomes were significantly worse for students with lower academic Success (GPA < 3.0). Paywalls, unstable internet, and team project dynamics were the biggest obstacles, while real-time teacher feedback (56.1%) and AI-driven content development (31.7%) were the main facilitators, according to qualitative analysis.

Conclusion: Student engagement, personal satisfaction, and academic success are greatly increased when EdTech is methodically incorporated into practice-oriented oral health education media courses. To avoid cognitive overload and maximize learning outcomes, a scaffolded, instructor-guided strategy paired with selective tool deployment (5–7 weeks) is advised.

ARTICLE HISTORY
Received September 17, 2026
Accepted October 28, 2026

KEYWORDS
EdTech, Student Engagement, Personal Satisfaction, Academic Success, Department of Dental Hygiene

1. Introduction

Dental hygienists plan and deliver oral health education across clinics, schools, public health centers, and community institutions. Selecting, designing, and applying context-appropriate educational media represents a core professional capability. Recent occupational analyses confirm that planning and creating health communication materials remain central duties across clinical and non-clinical roles [1]. Consequently, domestic dental hygiene curricula incorporate hands-on media production courses designed to foster practical development capabilities in prospective practitioners.

Technological advancements have accelerated the adoption of educational technology (EdTech)—encompassing digital platforms, artificial intelligence (AI), and virtual/augmented reality (VR/AR)—throughout higher education. Korean university students generally view EdTech as a practical tool for improving digital literacy and learning efficiency [2]. Similar positive trends appear in health professions

CONTACT Narae Jung: jnrgood@naver.com

education, where systematic reviews document EdTech applications enhancing cognitive, psychomotor, and affective learning outcomes [3].

In dental hygiene instruction, empirical evaluations of digital media continue to expand. A recent scoping review of Korean dental hygiene literature (2018–2025) identified 12 studies on digital learning media (VR, AR, 3D simulation), with VR comprising half of all implementations (50.0%) and affective responses (satisfaction, engagement, interest) serving as primary outcome measures [4]. Specific course interventions—including flipped clinical instruction [5], smart-learning modules [6], and capstone design projects [7]—have shown improvements in academic achievement, course satisfaction, and student participation over traditional lecture formats.

Learning flow (engagement) serves as a key framework connecting these cognitive and affective responses. Derived from Csikszentmihalyi's flow theory, validated flow scales in Korea consistently link higher engagement to academic performance and major satisfaction, including among dental hygiene students in distance-learning environments [8,9].

While general benefits of EdTech are documented, empirical data regarding specific tool adoption patterns and their measured impacts in hands-on oral health media production courses remain limited in Korean dental hygiene education. Because media creation courses emphasize active production over passive knowledge intake, evaluating how EdTech exposure influences student performance in practical settings can inform instructional design.

This study evaluated EdTech utilization among Korean undergraduate dental hygiene students in an oral health education media course, testing for differences in engagement, satisfaction, and academic success based on usage characteristics. These findings offer empirical baseline data for structuring EdTech integration in health education curricula.

2. Methods

Participants

This study was approved by the Institutional Review Board (IRB) of Hanseo University, Korea (IRB Approval No: 2025-0917-01). The study targeted undergraduate dental hygiene students who had completed a course involving the direct production of oral health education media within the past year. A self-administered online survey using Google Forms was conducted from December 10, 2025, to June 10, 2026. Individuals who did not voluntarily consent to participate or submitted incomplete/insincere responses were excluded.

The required sample size was calculated using G*Power 3.1.9.7 [10]. Based on a one-way analysis of variance (ANOVA) across four comparison groups (e.g., EdTech usage duration categories), a medium effect size $f^2 = 0.30$, significance level $\alpha = 0.05$, and statistical power $1 - \beta = 0.80$ yielded a minimum required sample size of 126. Accounting for an anticipated 10% dropout rate, the target recruitment was set at 140 or more. After excluding 3 respondents who did not meet inclusion criteria, a final sample of 162 participants was included in the analysis, which fully satisfied the required statistical power for all group comparisons.

Variables

Student engagement represents the degree to which a learner attentively participates and immerses themselves in class activities. This variable was measured using a modified version of the Student Course Engagement Questionnaire (SCEQ) validated by Lee and Ji (2025) [11] and originally developed by Handelsman et al. (2005) [12]. The tool assesses cognitive (4 items), affective (3 items), and behavioral engagement (3 items), totaling 10 items scored on a 5-point Likert scale (1 = 'Strongly Disagree' to 5 = 'Strongly Agree'). Higher scores indicate higher learning engagement. Cronbach's α in this study was .929.

Personal satisfaction was assessed using an adapted tool based on Joo et al. (2008) [13]. Modified to suit the course context, 21 items were grouped into content/design (9 items), overall satisfaction (5 items), instructor (4 items), and assessment (3 items), measured on a 5-point Likert scale. Higher scores reflect higher satisfaction. Cronbach's α was .979.

Academic success was evaluated using an instrument adapted from the Korean Educational Development Institute (Lee, 2003) [14]. The instrument comprised 35 items across communication capability (10 items), problem-solving capability (15 items), and self-directed learning capability (10 items) on a 5-point Likert scale. Cronbach's α was .989.

Qualitative learning participation experiences among EdTech users were investigated using six open-ended questions adapted from Park and Nam (2023) [15], covering: most helpful features, instances of heightened motivation/interest, areas for improvement, accessibility/convenience, impact on understanding/satisfaction, and differences (advantages/disadvantages) compared to traditional instruction.

Statistical Methods

Data analysis was performed using IBM SPSS Statistics version 19.0 (SPSS Inc., Chicago, IL, USA) with a statistical significance threshold of $\alpha = 0.05$. Frequency analysis was conducted for demographic characteristics and EdTech usage patterns. Mean scores were

calculated for student engagement, personal satisfaction, and academic success. Differences in outcome variables according to general characteristics and EdTech usage experiences were analyzed using independent t-tests and one-way Analysis of Variance (ANOVA). Levene's test for equality of variances was conducted; when equal variances were not assumed, Welch's ANOVA and Games-Howell post-hoc tests were applied.

Qualitative narrative responses were analyzed using thematic and content analysis frameworks proposed by Braun and Clarke (2006) [16]. Two independent researchers categorized the data into main themes and sub-themes based on semantic similarity. Response frequencies (n) and percentages (%) were calculated for each category. To establish inter-coder reliability, any coding discrepancies were resolved through iterative consensus discussions until 100% agreement was achieved [15].

3. Results

1. Demographic Characteristics of Participants

The general demographic characteristics of the 162 study participants are summarized in Table 1. Females accounted for 92.6% (n=150) and males 7.4% (n=12). Regarding degree program, 48.1% (n=78) were enrolled in 3-year programs and 51.9% (n=84) in 4-year programs. By grade level, 3rd-year students formed the largest group (51.2%, n=83), followed by 2nd-year (43.2%, n=70) and 4th-year (5.6%, n=9); no 1st-year students were included. Regarding GPA, 63.6% (n=103) had GPAs between 3.0 and <4.0, 20.4% (n=33) had GPAs <3.0, and 16.0% (n=26) had GPAs ≥4.0.

Table 1. General and Sociodemographic Characteristics of Participants

Demographic Variable	Category	n (%)
Gender	Female	150 (92.6)
	Male	12 (7.4)
Degree Program Type	3-Year College	78 (48.1)
	4-Year University	84 (51.9)
Grade Level	2nd Year	70 (43.2)
	3rd Year	83 (51.2)
	4th Year	9 (5.6)
GPA (Grade Point Average)	< 3.0	33 (20.4)
	3.0 – < 4.0	103 (63.6)
	≥ 4.0	26 (16.0)

Note. N = 162.

2. Status of Ed Tech Tool Usage in Oral Health Education Media Production Course

The status of EdTech tool utilization is presented in Tables 2 and 3. Of all 162 respondents, 85.8% (n=139) reported experience using EdTech tools in the course, whereas 14.2% (n=23) reported no experience.

Among EdTech users (n=139), the most common official usage mode was 'both instructor-guided and student-led' (53.2%, n=74), followed by 'instructor-guided' (32.4%, n=45) and 'student-led' (14.4%, n=20). Over half used 2 EdTech tools (55.4%, n=77), 23.0% (n=32) used 1 tool, and 21.6% (n=30) used ≥3 tools. Regarding course duration, 48.2% (n=67) used tools for 30% – < 50% (5-7 weeks), 28.8% (n=40) for ≥ 50% (≥ 8 weeks), 19.4% (n=27) for 10% – < 30% (2-4 weeks), and 3.6% (n=5) for <10% (<2 weeks).

As shown in Table 3, Generative AI (ChatGPT, AI image generation) was the most frequently utilized tool (79.9% of cases, 42.9% of total responses), followed by Canva (44.6% of cases), Padlet (29.5%), other tools (24.5%), and Google Classroom (7.9%).

Table 2. Experience of Using EdTech Learning Tools in the Oral Health Education Media Production Course

EdTech Usage Experience	Category	n (%)
Usage Status (n=162)	Yes	139 (85.8)
	No	23 (14.2)
Official Usage Mode	Instructor-Guided	45 (32.4)
	Student-Led	20 (14.4)
	Both (Hybrid)	74 (53.2)
Number of Tools Used	1 Tool	32 (23.0)
	2 Tools	77 (55.4)
	≥ 3 Tools	30 (21.6)
Proportion of Usage (Weeks)	< 10% (< 2 weeks)	5 (3.6)
	10% – < 30% (2-4 weeks)	27 (19.4)
	30% – < 50% (5-7 weeks)	67 (48.2)
	≥ 50% (≥ 8 weeks)	40 (28.8)

Note. N = 139 for sub-categories.

Table 3. Types of EdTech Learning Tools Used in the Oral Health Education Media Production Course

Tool Category / Name	Responses (n)	% of Responses	% of Cases
Generative AI (ChatGPT, AI image generation)	111	42.9	79.9
Canva	62	23.9	44.6
Padlet	41	15.8	29.5
Others	34	13.2	24.5
Google Classroom	11	4.2	7.9

Note. N = 139. Multiple responses were allowed (up to 3 items per respondent). Total percentage of cases exceeds 100% due to multiple selections.

3. Differences in Outcomes According to Demographic Characteristics

Differences in student engagement, satisfaction, and academic success according to demographic variables are shown in Table 4.

Independent t-test revealed that male students reported significantly higher student engagement (4.6 ± 0.67) than female students (4.1 ± 0.73; t = -2.22, p = .028). However, no significant gender differences were observed for personal satisfaction (female 4.3 ± 0.69 vs. male 4.6 ± 0.54; p = .080) or academic success (female 4.4 ± 0.62 vs. male 4.6 ± 0.62; p = .307). Degree program (3-year vs. 4-year) and grade level showed no statistically significant differences across all three outcome variables.

In contrast, GPA level demonstrated highly significant differences in engagement (F = 12.777, p < .001), satisfaction (F = 7.028, p = .002), and academic success (F = 11.061, p < .001). Games-Howell post-hoc tests indicated that students with GPA < 3.0 scored

significantly lower in engagement (3.56 ± 0.79), satisfaction (3.82 ± 0.84), and academic success (3.88 ± 0.75) compared to both the 3.0–<4.0 and ≥4.0 groups. No significant differences were found between the 3.0–<4.0 and ≥4.0 groups.

Table 4. Differences in Student Engagement, Personal Satisfaction, and Academic Success According to Sociodemographic Characteristics

Demographic Variable	Category	Student Engagement	Personal Satisfaction	Academic Success
		M ± *SD*	*M* ± *SD*	*M* ± *SD*
Gender	Female	4.1 ± .73	4.3 ± .69	4.4 ± .62
	Male	4.6 ± .67	4.6 ± .54	4.6 ± .62
	t (p)	-2.22 (.028)	-1.762 (.080)	-1.024 (.307)
Degree Program Type	3-Year College	4.13 ± .78	4.22 ± .70	4.32 ± .63
	4-Year University	4.16 ± .68	4.35 ± .68	4.45 ± .60
	t (p)	-.312 (.755)	-1.227 (.222)	-1.391 (.166)
Grade Level	2nd Year	4.10 ± .77	4.15 ± .68	4.27 ± .64
	3rd Year	4.15 ± .71	4.37 ± .69	4.48 ± .57
	4th Year	4.46 ± .66	4.48 ± .65	4.43 ± .70
	F (p)	.937 (.394)	2.355 (.098)	2.391 (.095)
GPA (Grade Point Average)	< 3.0	3.56 ± .79[a]	3.82 ± .84[a]	3.88 ± .75[a]
	3.0 – < 4.0	4.27 ± .66[b]	4.40 ± .60[b]	4.49 ± .52[b]
	≥ 4.0	4.38 ± .55[b]	4.28 ± .69[b]	4.39 ± .62[b]
	F (p)	12.777 (< .001)	7.028 (.002)	11.061 (< .001)

Note. *N* = *162*. *M* = mean; *SD* = standard deviation. Means with different superscript letters (a, b) within a column differ significantly at $p < .05$ based on Games-Howell post-hoc test.

4. Differences in Outcomes According to EdTech Usage Experiences

Table 5 presents outcomes across EdTech usage categories. EdTech users achieved higher student engagement (4.24 ± 0.69 vs. 3.58 ± 0.73; t = 4.187, $p < .001$), personal satisfaction (4.38 ± 0.64 vs. 3.73 ± 0.70; t = 4.429, $p < .001$), and academic success (4.46 ± 0.58 vs. 3.95 ± 0.65; t = 3.773, $p < .001$) than non-users.

Operational delivery mode significantly affected engagement (F = 17.898, $p < .001$), satisfaction (F = 8.332, $p = .001$), and academic success (F = 7.919, $p = .001$). The hybrid group (engagement 4.54, satisfaction 4.58) scored higher than instructor-guided (3.82 / 4.14) and student-led groups (4.09 / 4.16). The hybrid model also yielded higher academic success (4.64) than instructor-guided delivery (4.22). Tool count (1 vs. 2 vs. ≥3) showed no significant effect on outcomes. However, usage duration (weeks) produced significant differences across engagement (F = 27.922), satisfaction (F = 15.048), and academic success (F = 10.391; all $p < .001$). Using EdTech for 30% to < 50% of course weeks (5–7 weeks) yielded the highest ratings (engagement 4.64, satisfaction 4.70, academic success 4.71), outperforming all other duration categories.

Table 5. Differences in Student Engagement, Personal Satisfaction, and Academic Success According to EdTech Tool Usage Experience

EdTech Usage Experience	Category	Student Engagement	Personal Satisfaction	Academic Success
		M ± *SD*	*M* ± *SD*	*M* ± *SD*
Usage Status (n=162)	Yes	4.24 ± .69	4.38 ± .64	4.46 ± .58
	No	3.58 ± .73	3.73 ± .70	3.95 ± .65
	t (p)	4.187 (< .001)	4.429 (< .001)	3.773 (< .001)
Official Usage Mode	Instructor-Guided	3.82 ± .75[a]	4.14 ± .71[a]	4.22 ± .72[a]
	Student-Led	4.09 ± .56[a]	4.16 ± .68[a]	4.33 ± .51[ab]
	Both (Hybrid)	4.54 ± .52[b]	4.58 ± .52[b]	4.64 ± .44[b]
	F (p)	17.898 (< .001)	8.332 (.001)	7.919 (.001)
Number of Tools Used	1 Tool	4.11 ± .70	4.19 ± .76	4.33 ± .67
	2 Tools	4.27 ± .67	4.41 ± .59	4.47 ± .55
	≥ 3 Tools	4.31 ± .74	4.50 ± .62	4.56 ± .57
	F (p)	.806 (.449)	2.040 (.134)	1.178 (.311)
Proportion of Usage (Weeks)	< 10% (< 2 weeks)	3.50 ± .37[a]	3.53 ± .75[ab]	3.98 ± .59[ab]
	10% – < 30% (2-4 weeks)	3.80 ± .51[a]	4.05 ± .56[a]	4.23 ± .51[a]
	30% – < 50% (5-7 weeks)	4.64 ± .49[b]	4.70 ± .42[b]	4.71 ± .38[b]
	≥ 50% (≥ 8 weeks)	3.96 ± .74[a]	4.17 ± .72[a]	4.24 ± .73[a]
	F (p)	27.922 (< .001)	15.048 (< .001)	10.391 (< .001)

Note. $N = 139$. *M* = mean; *SD* = standard deviation. Means with different superscript letters (a, b) within a column differ significantly at $p < .05$ based on Games-Howell post-hoc test.

5. Qualitative Analysis of EdTech Learning Participation Experiences

Table 6 summarizes thematic analysis of qualitative responses (n=139):

Most Helpful Feature: Real-time instructor feedback and immediate correction was noted most frequently (56.1%, n=78), followed by 'Real-time peer collaboration and co-editing' (26.6%, n=37).

Motivation & Interest: Direct AI visual creation (31.7%, n=44) and observing peer visual work (25.2%, n=35) were primary motivators.

Difficulties & Improvements: While 41.0% (n=57) reported no difficulties, paywall restrictions and connectivity issues (15.1%, n=21) alongside group work friction (11.5%, n=16) were identified.

Accessibility & Convenience: Positive ratings reached 71.9% (n=100) with 27.3% (n=38) noting QR code access and app-free

login as main advantages.

Comprehension & Satisfaction: Enhanced understanding via hands-on practice (54.0%, n=75) and AI concept summarization (5.0%, n=7) were key benefits.

Comparison from Traditional Courses: Students cited the cognitive demand of continuous idea generation (27.3%, n=38) alongside greater engagement compared to textbook lectures (14.4%, n=20).

Table 6. Content and Thematic Analysis Results by Domain on Class Participation Experience Utilizing EdTech

Domain / Question Area	Main Theme / Sub-theme Category	n	%	Key Extract Keywords & Characteristics
1. Most Helpful Feature	Instructor Real-Time Feedback & Immediate Editing	78	56.1	Real-time correction, instructor feedback, immediate revision
	Real-Time Work Sharing & Peer Collaboration	37	26.6	Canva/Padlet co-editing, simultaneous updates, idea synthesis
2. Motivation, Interest & Collaboration	Direct Creation of AI & Visual Content (Canva/AI)	44	31.7	AI character creation, video production, visual media use
	Visual Sharing of Peers' Ideas & Mutual Stimulation	35	25.2	Observing other teams' work, peer motivation, idea expansion
3. Inconveniences & Improvements Needed	No Inconveniences Reported (Satisfied)	57	41.0	None, no specific issues, smooth and satisfied usage
	Paid Feature Restrictions, Internet & Security Limits	21	15.1	Paid subscription prompts, idea exposure/security, disconnection
	Team Project Collaboration & Free-Riding Stress	16	11.5	Non-participating team members, free-riding, communication friction
4. Perceived Accessibility & Convenience	Overall Positive Accessibility & Convenience	100	71.9	Convenient, high accessibility, accessible from anywhere
	QR Code Access & No-Installation / Easy Login	38	27.3	QR scan access, no app installation needed, time-saving
5. Impact on Understanding & Satisfaction	Increased Comprehension via Experiential Learning	75	54.0	Experience-based learning, deeper understanding, positive impact
	ChatGPT/AI Use for Concept Summary & Instant Q&A	7	5.0	ChatGPT summaries, exam study efficiency, instant query resolution
6. Differences from Traditional Classes	Perceived Difficulty in Active Participation & Thinking	38	27.3	Continuous mental engagement, course fatigue, time investment
	Freshness & Engagement Compared to Textbooks	20	14.4	Moving beyond rigid text, improved focus, creative activities

Note. N = 139; n = number of respondents mentioning the specific sub-theme. Percentages (%) represent the percent of cases calculated based on the total sample (N = 139) and may sum to over 100% due to multiple coding across response categories. Data were derived from thematic and content analysis of 6 open-ended survey questions regarding EdTech-integrated course participation

experiences.

4. Discussion

This study investigated the status of EdTech tool utilization in an oral health education media production course among Korean dental hygiene students and empirically analyzed differences in student engagement, personal satisfaction, and academic success according to EdTech usage characteristics. The primary findings and their academic/educational implications are discussed below.

1. EdTech Utilization Status and Tool Diversity

The high adoption rate (85.8%) confirms broad integration of EdTech in health professions curricula. Generative AI (79.9%), Canva (44.6%), and Padlet (29.5%) dominated student choices, aligning with broader digital visualization trends in medical education [3,4]. In media production tasks, generative AI image tools and template platforms reduce graphic design barriers, allowing students to focus on clinical accuracy and messaging.

2. Instructional Delivery and Self-Determination

EdTech users consistently outperformed non-users across all quantitative outcomes ($p < .001$), reinforcing evidence on active and flipped learning models in dental hygiene [5,6,17]. Notably, the hybrid delivery model combining instructor guidance with student autonomy achieved peak scores (engagement 4.54, satisfaction 4.58, academic success 4.64). Grounded in Self-Determination Theory [18,19], student-led media creation fulfills autonomy needs, while real-time instructor feedback supports competence acquisition [5,6,9]. Qualitative responses confirm this interplay, with 56.1% highlighting instructor feedback as pivotal.

3. Optimal Duration and Cognitive Load

Peak outcomes occurred when EdTech was integrated for 30% to < 50% of course duration (5–7 weeks), rather than continuously throughout the semester (≥50%). This non-linear pattern aligns with Cognitive Load Theory [20] and Multimedia Learning Theory [21]. Uninterrupted tool usage across every session introduces technical troubleshooting overhead and tool fatigue. Concentrating EdTech deployment during intensive creation weeks optimizes flow while keeping cognitive load manageable.

4. Academic Achievement Gaps and Scaffolding for Low GPAs

Students with GPAs < 3.0 reported lower outcome scores across all dimensions ($p < .001$). Lower academic self-efficacy and digital literacy create initial adoption friction [11]. Providing introductory software walkthroughs and structuring mixed-ability peer teams can cushion low-performing students against digital entry barriers.

5. Practical and Technical Constraints

Qualitative findings indicated that software paywalls, network connectivity issues (15.1%), and team project freeriding (11.5%) pose notable operational challenges. Institutional investments in campus Wi-Fi infrastructure and software site licenses, combined with objective peer-evaluation metrics for group projects, are essential to mitigate these obstacles.

Several limitations should be noted. First, while overall usage weeks and tool counts were measured, continuous exposure metrics—such as daily log duration or session frequencies—were not recorded. Learning Management System (LMS) telemetry should be incorporated in future studies to examine time-series usage intensity. Second, sampling was limited to specific Korean institutions via convenience sampling. Third, reliance on self-reported instruments suggests that future studies should integrate objective scoring rubrics or expert media evaluations.

5. Conclusion

This study evaluated the impact of EdTech tool utilization on student engagement, personal satisfaction, and academic success among 162 Korean dental hygiene students in an oral health education media production course.

EdTech Efficacy: EdTech integration into practical oral health education media courses significantly improves student engagement, satisfaction, and academic success relative to non-integration.

Instructional Design: A hybrid teaching structure that combines instructor feedback with student-led media production delivers the strongest outcomes. Concentrating EdTech usage within 30% to < 50% of course weeks (5–7 weeks) prevents cognitive fatigue.

Institutional Support: Generative AI and digital layout platforms should be supported through site licensing, robust network infrastructure, and introductory training for lower-performing students.

Systematic EdTech deployment in practice-oriented dental hygiene curricula strengthens professional capabilities in educational media design and health communication.

Author Contributions

N.J. conceived and designed the study, performed the data collection and statistical analysis, interpreted the data, and drafted and finalized the manuscript.

Conflicts of Interest

The author declares no conflict of interest.

Funding

This work was supported by the Hanseo University Research Grant of 2026 (Grant No. 20262236).

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Hanseo University (IRB Approval No: 2025-0917-01).

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the author(s) utilized Gemini (Google, Alphabet Inc.) in order to improve language clarity, correct grammatical errors, and refine English phrasing. Following the use of this technology, the author(s) thoroughly reviewed, verified, and edited the content as necessary and take(s) full responsibility for the integrity and accuracy of the content presented in this publication.

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