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Dental Students' Perceptions of Playful Learning and Classroom Engagement

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Dental education

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A B S T R A C T

Purpose: Playful learning is increasingly recognized in the literature as an approach that supports engagement, creativity, and collaboration in adult and professional education, yet its use in dental education remains limited. This study examined dental students' perceptions of playful learning activities implemented through interactive review exercises alongside traditional lectures, and how these approaches influence engagement, motivation, retention, and overall classroom experience.
Methods: A cross-sectional survey was administered to predoctoral students at two U.S. dental schools. Students compared their perceptions in traditional lecture-based classrooms with those that incorporated playful learning across items that include engagement, motivation, content retention, application of knowledge, confidence, teamwork, and learning preferences. Descriptive and inferential statistics were used to analyze responses.
Results: Of 266 invited students, 167 completed the survey (63% response rate). Students reported significantly higher engagement, motivation, participation, and satisfaction in classrooms that included playful learning activities ($p<0.01$). Most students also indicated improved retention, application of content, teamwork, and confidence. No significant differences were observed between institutions.

Conclusion: Students viewed playful learning as a valuable complement to traditional lectures, reporting benefits across multiple aspects of their learning experience. These findings align with current evidence on the value of active and student-centered learning and suggest that incorporating playful strategies may help improve learning outcomes and support students as they progress toward preclinical and clinical practice.

Introduction

Play has long been recognized as a fundamental component of early childhood education, with roots tracing back to the early 20th century. Pioneers like Friedrich Fröbel, founder of the kindergarten movement, emphasized the critical role of play in children's cognitive and emotional development, and in doing so, shaped modern pedagogical approaches (Wong & Logan, 2016; Saracho & Spodek, 1995). While the benefits of play such as enhanced cognitive, social, and emotional skills are well-documented in early education, its integration into higher education has been a more recent endeavor (Ginsburg, 2007; Pellegrini, 2010).

Since the mid-2010s, the concept of playful learning has increasingly gained recognition in higher education, driven by initiatives from organizations like the LEGO Foundation and academic institutions such as the Harvard Graduate School of Education (Mardell et al., 2023). In the context of higher education, playful learning encompasses educational strategies that foster curiosity, creativity, and intrinsic motivation through interactive and student-centered experiences (Zosh et al., 2018; Boysen et al., 2022). It focuses on developing a playful mindset where students feel safe to take intellectual risks, explore new ideas, and engage deeply with content (James & Nerantzi, 2019; Nørgård et al., 2017; Whitton, 2018). This approach contrasts with traditional lecture-based learning, which predominantly involves passive knowledge transfer from instructor to student, often emphasizing rote memorization over critical thinking and engagement (Fredricks et al, 2004; Kreber, 2013). While lectures can efficiently deliver substantial content, they may limit opportunities for active participation, student engagement, and collaborative problem-solving.

Despite its potential benefits, play remains underutilized in professional higher education. Traditional educational practices, especially in professional disciplines like dentistry, have favored lecture-based, competency-driven models, often overlooking the role of play in enhancing deeper learning and engagement (Licari & Patil, 2022). There are several reasons for this lack of play in higher education. First, according to Sharmin and Chow, play is often perceived as inappropriate or lacking seriousness within higher education, particularly in fields requiring rigorous technical training, such as medicine and dentistry (Sharmin & Chow, 2024). Additionally, the focus on standardized testing, assessments, and outcome-driven results has led institutions to prioritize efficiency and measurable outcomes over more open-ended, explorative learning methods like play (El Tantawi et al., 2018; Lai, 2023). Moreover, limited resources and time constraints make it difficult for educators to incorporate more dynamic, student-centered learning activities like play into already packed curricula (Pereira & Walmsley, 2019). As a result, opportunities for creativity, critical thinking, and collaboration, which are key benefits of playful learning remain largely unexplored in healthcare education (Zheng & Ferreira, 2020).

More recently, educational approaches in higher education have introduced elements of gamification such as interactive quizzes and digital simulations into dental curricula to enhance student engagement and learning outcomes (Abdel-Wahed et al., 2024; Syed et al., 2024). For example, studies have demonstrated that gamified learning platforms, such as Kahoot!, can improve knowledge retention, student satisfaction, and engagement in dental education (Nguyen et al., 2023).

Despite these advantages, the integration of playful learning strategies in dental education remains limited, and there is a lack of research exploring dental students' perceptions of such approaches. While prior studies

have examined the effects of game-based learning in dental education, (Alkhattab, 2025; Fernández-Gómez et al., 2025; Krause et al., 2024; Lin & Yang, 2023; Nguyen et al., 2023; Tran & Lipp, 2023; Tuil et al., 2023; Wu et al., 2025) few have explored dental students' perspectives across more than one institution, highlighting differences in perception, implementation, and institutional support for playful learning. Understanding students' viewpoints is essential for identifying gaps and opportunities to integrate playful learning across higher education, using dentistry as a practical example. This study explores dental students' perceptions of playful learning strategies implemented alongside traditional lectures, highlighting how Kahoot! quizzes and Jeopardy-style review sessions complement instruction to enhance engagement, motivation, and overall classroom experience. Kahoot! allows real-time quiz responses with friendly competition and immediate feedback, while Jeopardy promotes team-based learning and collaboration. These activities exemplify playful learning rather than gamification. While both approaches may involve game-like elements, playful learning prioritizes intrinsic enjoyment, social interaction, and flexible exploration (Zosh et al., 2018; Zosh et al., 2017). In our context, tools such as Kahoot! and Jeopardy engage students through active participation, collaboration, and light-hearted competition, fostering a playful mindset rather than imposing external rewards or point-based structures typically associated with gamification. The research was conducted at two U.S. dental schools, UTHealth Houston School of Dentistry (UTSD) and East Carolina University School of Dental Medicine (ECU SoDM). By examining students' perceptions, this study aims to offer insights into the potential of incorporating playful learning strategies to enhance dental curricula, supporting both educational enrichment and student satisfaction.

Methods

This study was reviewed by the Committee for Protection of Human Subjects (CPHS) at UTHealth Houston (Protocol HSC-DB-24-1122) and determined to be exempt from full Institutional Review Board (IRB) oversight, as it involved minimal risk to participants and only anonymous survey responses. The study population consisted of first- and second-year dental students (classes of 2028 and 2027 respectively) from UTSD and first year dental students (class of 2028) from the ECU SoDM. A total of 266 students were invited (via class listserv) to participate in the optional QuestionPro online survey and received a letter of information detailing the purpose of the study. The survey was available for 30 days during the period of November-December, 2024. All responses remained anonymous and no risks were associated with this project. Convenience sampling was used in this study based on availability and willingness of the participants to take part in the survey.

The two schools were selected based on the teaching appointments of the first author. At ECU SoDM, the first author served as the primary instructor for a two-week anatomy block, allowing full implementation of playful learning activities. At UTSD, the first author contributed as a co-instructor during a full-semester in-person course, which limited the ability to implement activities consistently. Teaching methods were otherwise consistent across both sites, consisting primarily of lecture-based instruction supplemented with playful learning activities. Specifically, two interactive review activities were implemented: *Kahoot!* quizzes and *Jeopardy*-style review sessions. *Kahoot!* is an online quiz platform that allows students to answer questions in real time, often incorporating friendly competition and immediate feedback. In this study, *Kahoot!* quizzes were administered immediately following lectures as a review tool. *Jeopardy*-style review sessions, modeled after the popular quiz show, were held a few days before each exam.

The main distinction between the two sites was the instructional context (remote versus in-person), which allowed exploration of student perceptions of playful learning across different teaching environments. The inclusion of two institutions was intended to capture a broader range of student perceptions across distinct educational contexts, thereby enhancing the generalizability of the findings. The survey was administered four weeks after the completion of these teaching assignments to allow students to reflect on their perceptions independently. To further support transparency and allow readers to evaluate the survey design, a sample of survey items is provided (see Supplementary Appendix A). To minimize bias, participation was voluntary, survey responses were anonymous, and data were analyzed independently. The design of the survey questionnaire was developed by the authors and validated by educational research experts who were responsible for evaluating and checking the construction of the survey questions. The survey consisted of 32 questions and was divided into six sections. Students were asked to classify instructional approaches as "traditional lecture-base" or "playful learning" based on standardized definitions provided in the survey. These classifications reflect student perceptions and were not independently validated by teaching staff. The first section asked about student demographics regarding their enrolled institution, cohort year in school, sex (male or female), and generational category (4 questions). The generational categories included: Generation X- born between 1965 to 1980; Generation Y- born between 1981 to 1996; and Generation Z- born between 1997 to 2012). The second section asked about students' perceptions in traditional lecture-based classroom. In the survey, traditional classroom learning was defined as a teacher delivering instruction to a group of students in a physical classroom, with set schedules, lectures, standardized assessments, and typically no activities involved. Students were provided with this definition before completing the survey to ensure a consistent understanding of the term. Students were asked how often traditional lectures were implemented in their dental education as well as their perceptions of engagement, motivation, participation, effectiveness, enjoyment, and satisfaction in traditional classroom learning (7 questions). The third section asked about students' perceptions in a classroom that incorporates playful learning. In the survey, playful learning is defined as an approach/ activity that combines joy and creativity that can either be unstructured or structured while supporting exploration and problem solving. Again, students were provided with this definition before completing the survey to ensure their understanding of the term. Similarly, to the second section, students were asked how often playful learning was implemented in their dental education as well as their perceptions of engagement, motivation, participation, effectiveness, enjoyment, and satisfaction (7 questions). The fourth section compared students' perceptions on the impact of learning in a classroom utilizing playful versus traditional teaching methods. These questions focused on aspects such as stress reduction, critical thinking, focus, retention, application, confidence, and teamwork (7 questions). The fifth section consists of overall reflection items about playful learning such as whether it adds value to their learning experience, contributes positively to their learning, makes them more eager to attend classes, whether play should be more integrated into their dental education, and their preferred learning format (5 questions). Finally, a free narrative response section was included in which students could provide comments/ feedback on their perceptions of learning in a traditional lecture- based classroom versus one that incorporates play (2 questions). The collected data was extracted from QuestionPro (Austin, TX) and converted to Excel sheets (Microsoft, USA). Descriptive analyses were conducted for the demographic variable. Participants responded to non-demographic questions on a five-point Likert scale (1= strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5= strongly agree). Kruskal–

Wallis chi-squared tests were used to evaluate associations across sex, institutional cohorts (first-year students at UTSD and ECU SoDM), and training levels (first- vs. second-year UTSD students), with a significance level of $p<0.05$. This non-parametric approach was selected because it does not assume equal group sizes or normal distributions. All statistical analyses were performed using R statistical software (R Core Team).

Results

Demographics

A total of 167 students participated in the survey (63% response rate). Respondents included first- and second-year dental students from UTSD and first-year dental students from ECU SoDM. The majority of participants were female (67%), followed by male students (31%), with 2% choosing not to identify. Most respondents (98%) belonged to Generation Z, with a small proportion (2%) from Generation Y. Detailed demographic characteristics are presented in Table 1.

Table 1.
Demographic characteristics showing the distribution of respondents based on sex, graduation year, and generation. Values are reported as counts with percentages in parentheses.

Category	All n (%)	UTSD n (%)	ECU SoDM n (%)
Sex			
Male	52 (31.1)	45 (32.4)	7 (25.0)
Female	112 (67.1)	92 (66.2)	20 (71.4)
Prefer not to answer	3 (1.8)	2 (1.4)	1 (3.6)
Graduation Year			
Class of 2027	33 (19.7)	33 (31.1)	n/a
Class of 2028	134 (80.2)	106 (100)	28 (51.9)
Generation			
Y (Born1981–1996)	4 (2.4)	1 (0.7)	3 (10.7)
Z (Born 1997–2012)	163 (97.6)	138 (99.3)	25 (89.3)

Student Perceptions on Traditional Lecture-Based vs Playful Learning Classrooms

Students' responses reflected their perceptions of their overall dental curriculum, not just the module taught by the author. To ensure consistency in the interpretation, the survey provided definitions of traditional lecture-based instruction and playful learning prior to completion. Traditional lectures were reported to be used most of the time by approximately 52.1% and always by 45.5% of respondents. In contrast, about 81% and 16% indicated that playful learning was incorporated once in a while or about half the time, respectively. To evaluate perceptions of both environments, students rated their engagement, motivation, participation, perceived effectiveness, enjoyment, and overall satisfaction. Across all measures, significantly more students agreed or strongly agreed that playful learning enhanced their educational experience compared to traditional lectures ($p<0.01$). Specifically, in classrooms using playful learning, approximately 95%, 92%, and 72% of

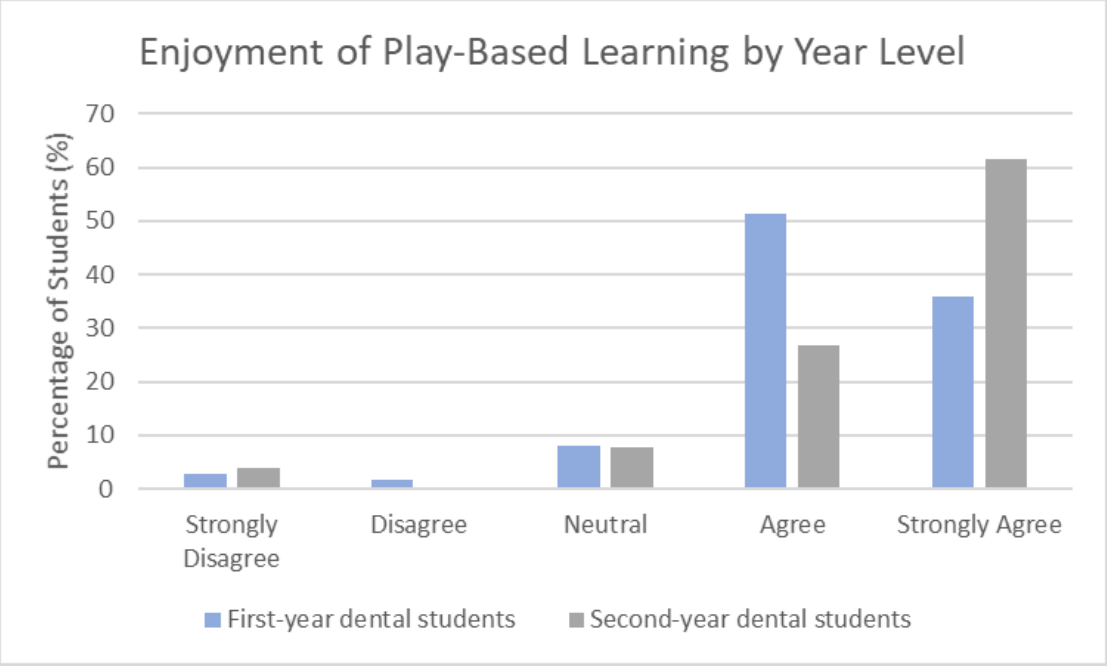
students felt engaged, motivated, and actively participated, respectively, compared to 34%, 35%, and 23% in traditional lecture settings. Regarding learning outcomes, approximately 85%, 92%, and 88% of respondents agreed or strongly agreed that playful classrooms helped them effectively grasp complex dental concepts, enjoy learning, and feel overall satisfaction, respectively. In comparison, only about 35%, 34%, and 40% reported the same for traditional lecture-based environments. Table 2 presents a comparative layout to improve readability.

Table 2.
Student Perceptions of Traditional Lecture-Based vs. Playful Learning Classrooms.
Percentages represent respondents selecting "Agree" or "Strongly Agree" for each listed item. Playful learning was rated significantly higher across all measures compared to traditional lectures ($p<0.01$). Differences between UTSD and ECU SoDM responses for active participation in traditional lectures are indicated with (*) ($p<0.05$). Differences between first- and second-year students at UTSD are marked with (**) ($p<0.05$). See Supplemental Figure 1 and 2 for detailed differences between schools and year-level response patterns.

Measured items	Playful Learning (% Agree/Strongly Agree)	Traditional Lectures (% Agree/Strongly Agree)
Engagement	95%	34%
Motivation	92%	35%
Active Participation*	72%	23%
Effectiveness	85%	35%
Enjoyment**	92%	34%
Overall Satisfaction	88%	40%

Within UTSD, comparisons between first- and second-year dental students showed no significant differences ($p>0.05$) for most survey items. For the item assessing enjoyment of play-based learning as indicated in Table 2, the distribution of responses differed significantly ($p<0.05$), with first-year students more often selecting 'Agree' and second-year students more frequently selecting 'Strongly Agree,' although overall enjoyment was similarly high for both groups. The distribution of responses by year is provided in Supplemental Figure 1. No significant differences were observed between male and female respondents across all measures ($p>0.05$).

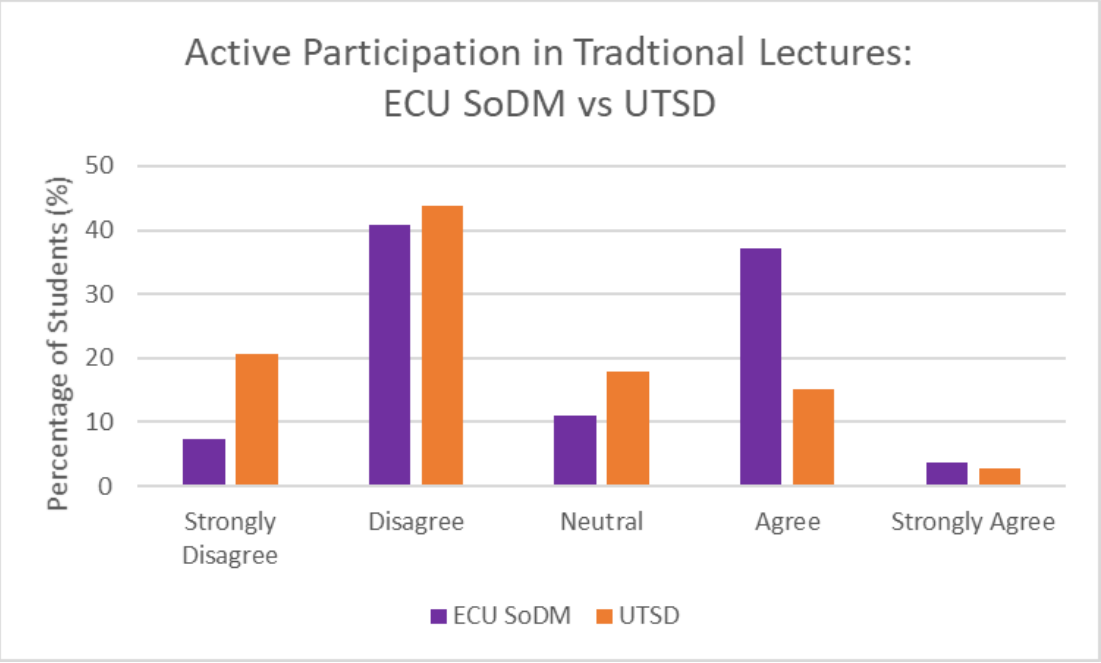
Supplemental Figure 1.
Distribution of responses by year for the statement "I enjoy learning in a classroom that incorporates play-based activities." Responses from first- and second- year dental students at UTSD are shown separately. Percentages reflect the proportion of respondents in each Likert category. A Kruskal-Wallis test indicated a significant difference in the distribution of responses between year levels ($\chi^2 = 3.98$, df = 1, p = .046), with first-year students more often selecting "Agree" and second-year students more frequently selecting "Strongly Agree."



When comparing first-year students from UTSD and ECU SoDM, there were no statistically significant differences in responses ($p>0.05$), except for the statement "actively participate in a traditional lecture-based classroom" as indicated in Table 2 ($p<0.05$). ECU SoDM students more frequently selected Agree or Strongly Agree compared to UTSD students, while UTSD respondents showed higher proportions in the Disagree and Neutral categories (Supplemental Figure 2).

Supplemental Figure 2.

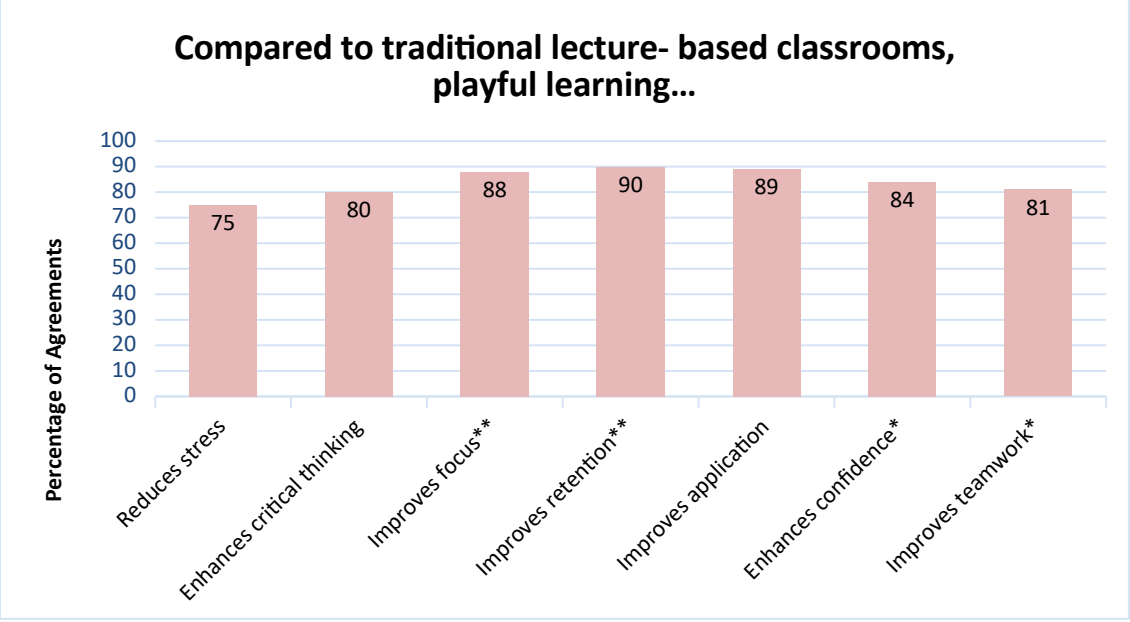
Distribution of responses by schools for the statement "I actively participate in a traditional lecture-based classes." Percentages reflect the proportion of respondents in each Likert category. A Kruskal-Wallis test indicated a statistically significant differences between ECU SoDM and UTSD ($\chi^2 = 4.90$, df = 1, p = .027), with ECU SoDM students more frequently selected Agree than UTSD students.



Impact of Playful Learning Compared to Traditional Lecture-Based Methods

To assess the perceived impact of playful learning, respondents evaluated its benefits over traditional lecture-based only classrooms across seven domains: 1) reduced stress, 2) enhanced critical thinking, 3) improved focus 4) improved retention, 5) better content application, 6) increased confidence in understanding material, and 7) improves teamwork skills. Overall, all respondents (at least 75%) collectively agreed or strongly agreed that playful learning had a greater positive impact on all these aspects compared to traditional lecture-based methods ($p<0.01$) (Figure 1).

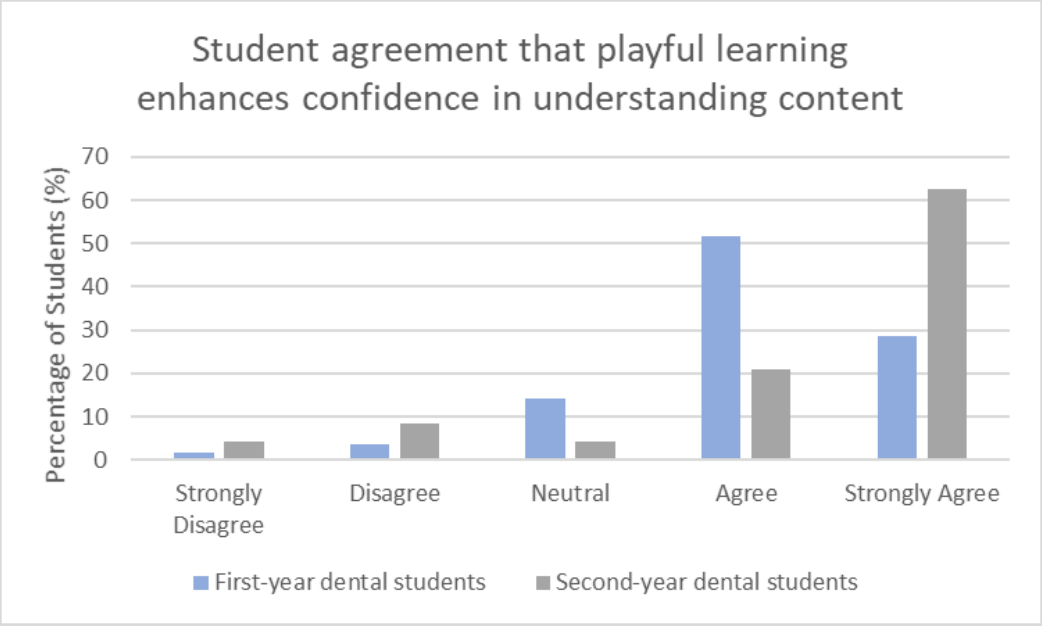
Figure 1.
Students' Perception on the Impact of Traditional Lecture-Based vs. Playful Learning by percentage of agreements. Statistically significant differences were identified for select statements when comparing first- and second-year students (*) and male and female respondents (**), reflecting shifts in the distribution of Likert responses rather than differences in overall levels of agreement. Detailed year-level and male/female response distributions for these items are provided in Supplemental Figures 3–6



When comparing first- year students from UTSD vs. ECU SoDM, no statistically significant differences were observed across all measured statements ($p>0.05$). However, a statistically significant difference was observed between first- and second-year students at UTSD for the item 'Playful learning enhances confidence in understanding the content' ($p<0.05$). Second-year students selected 'Strongly Agree' more frequently than first-year students, whereas first-year students more often selected 'Agree,' indicating a subtle difference in response distribution, though overall agreement was high for both groups (see Supplemental Figure 3).

Supplemental Figure 3.

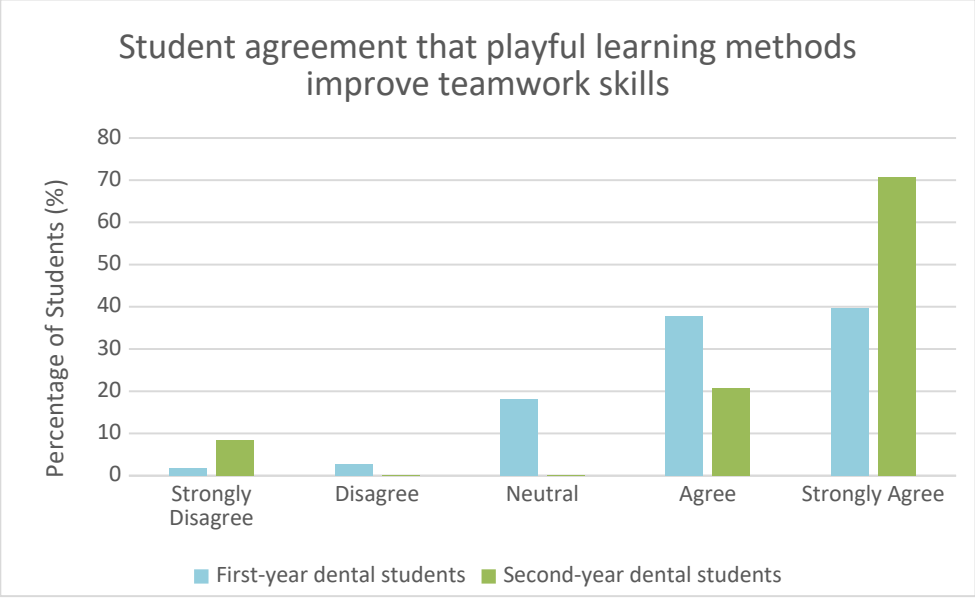
Distribution of first- and second-year students' responses to the statement "Playful learning enhances confidence in understanding the content compared to traditional lecture-based classrooms." Responses from first-year dental students at UTSD are shown separately. Percentages reflect the proportion of respondents in each Likert category. A Kruskal-Wallis test indicated a statistically significant difference in the distribution of responses between year levels ($\chi^2 = 5.32$, df = 1, p = 0.021), with first-year students more often selecting "Agree" and second-year students more frequently selecting "Strongly Agree." Overall agreement was high for both groups, indicating a subtle shift in response intensity rather than a difference in overall confidence.



For 'Playful learning improves teamwork skills,' second-year students selected 'Strongly Agree' more often, while first-year students were more evenly distributed between 'Agree' and 'Strongly Agree' ($p<0.05$) (See Supplemental Figure 4).

Supplemental Figure 4.

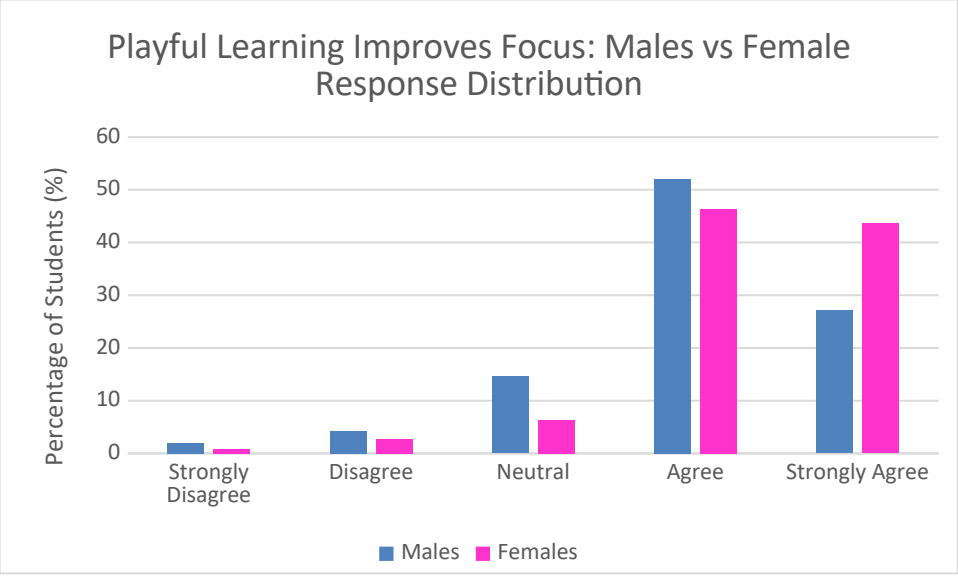
Distribution of first- and second-year students' responses to the statement "Playful learning methods improve teamwork skills compared to traditional lecture-based classrooms." Responses from first-year and second-year dental students at UTSD are shown separately. Percentages reflect the proportion of respondents in each Likert category. A Kruskal-Wallis test indicated a statistically significant difference in the distribution of responses between year levels ($\chi^2 = 6.55$, df = 1, p = 0.010), with second-year students more frequently selecting "Strongly Agree" and first-year students more evenly distributed between "Agree" and "Strongly Agree." Overall agreement was high for both groups, indicating a subtle difference in response intensity rather than a difference in overall perception of teamwork improvement.



These findings indicate small distributional differences between year levels, rather than differences in overall agreement. In terms of differences between male and female respondents, for the item 'Playful learning improves focus in grasping the content,' a statistically significant difference in response distribution was observed between male and female respondents ($p<0.05$), with female students more frequently selecting 'Strongly Agree' and male students more often selecting 'Agree' (Supplemental Figure 5).

Supplemental Figure 5.

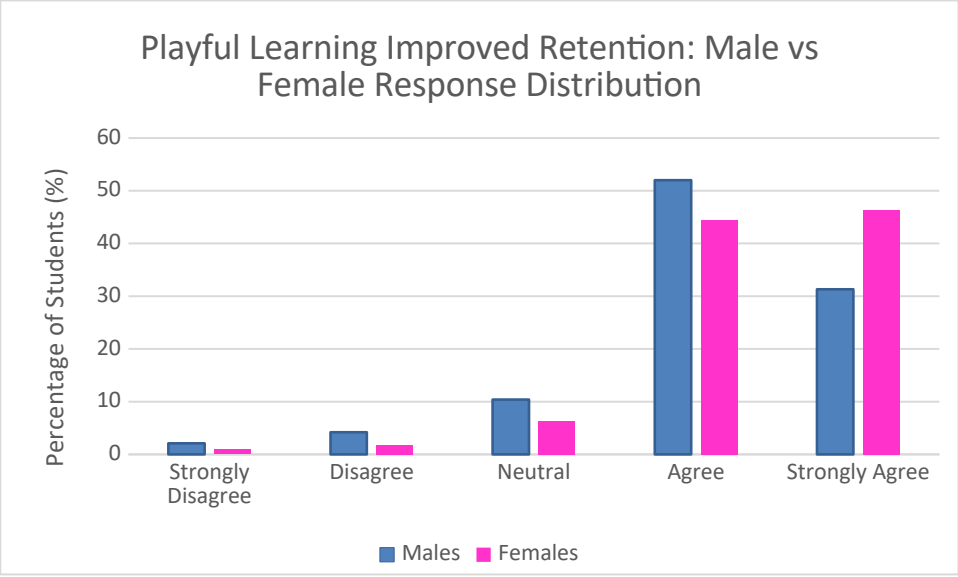
Distribution of male and female responses to the item "Playful learning improves focus in grasping the content compared to a traditional lecture-based classroom." Female respondents selected "Strongly Agree" more frequently than male respondents, whereas male respondents more often selected "Agree." A statistically significant difference in response distribution was observed ($\chi^2 = 5.24$, df = 1, p = .022).



For the item 'Playful learning improves retention of content,' a subtle but statistically significant difference was also found ($p<0.05$), with female respondents more often selecting 'Strongly Agree' and male respondents more often selecting 'Agree' (Supplemental Figure 6). Overall, these findings indicate high agreement across both sexes for all playful learning items, and the observed differences reflect shifts in response distribution rather than large differences in overall agreement.

Supplemental Figure 6.

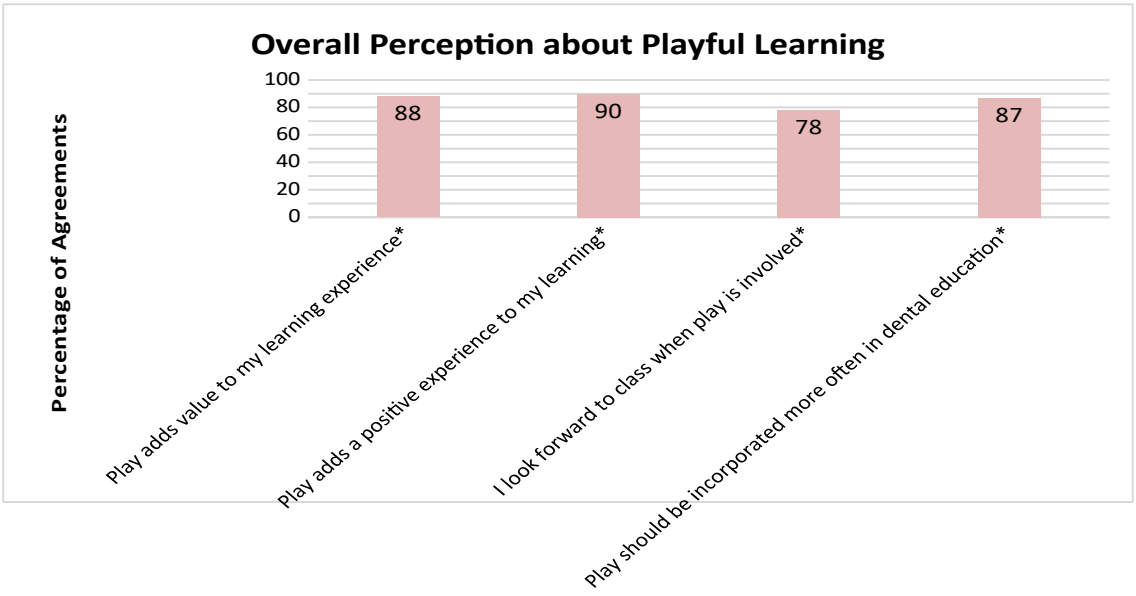
Distribution of male and female responses to the item "Playful learning improves retention of content compared to traditional lecture-based classrooms." Female respondents selected "Strongly Agree" more often than male respondents, while male respondents more frequently selected "Agree." A statistically significant difference in response distribution was observed ($\chi^2 = 3.88$, df = 1, p = .049)



Overall Student Perceptions and Preferences Towards Playful Learning

To evaluate students' overall perception of playful learning, students were asked the following four items: 1) playful learning adds value to their education, 2) contributes positively to their learning experience, 3) makes them look forward to class, and 4) should be incorporated more frequently into dental education (Figure 2). Approximately 88% and 90% of students agreed or strongly agreed that playful learning adds value and a positive experience to their learning, respectively. Additionally, 78% reported looking forward to class when playful elements were included, and 87% believed it should be incorporated more often in dental education. No statistically significant differences were found between first-year students at UTSD and ECU SoDM ($p>0.05$) or between first- and second- year students at UTSD ($p>0.05$). Statistically significant differences were identified between males and females across these four items ($p<0.05$). These differences primarily reflected shifts in response distribution in which females more frequently selected Strongly Agree, whereas males more often selected Agree. Thus, both groups demonstrated similarly high overall endorsement of the value of playful learning, with the significant findings indicating differences in intensity rather than direction of agreement. Because the primary figure (Figure 2), presents overall agreement patterns without showing subgroup variations, a Supplemental Table 1 has been provided to detail the response distribution for males and females. When asked about their preferred learning format, the majority of students (53.2%) favored a combination of traditional lectures and playful learning. Playful learning alone was preferred by 43% of respondents, while only 3.8% favored traditional lecture-based instruction exclusively (Figure 3).

Figure 2.
Students' overall perception of playful learning, by percentage of agreements. Statistically significant differences (*) were found between male and female respondents for all statements ($p < .05$). Because the figure displays only overall agreement patterns, Supplemental Table 1 provides detailed response distributions.

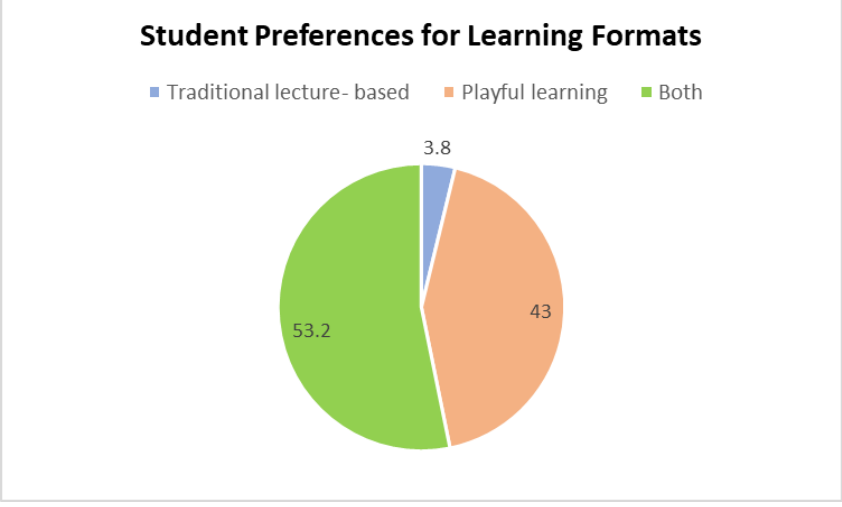


Supplemental Table 1.

Response distribution for Male and Female Students Across Overall Perceptions of Playful Learning. Percentages represent the proportion of male and female students selecting each Likert-scale option (SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree) for four items evaluating perceptions of playful learning. Chi-square (χ^2) tests assessed sex differences in response patterns. Statistically significant p-values indicate differences in the distribution of response categories rather than differences in overall endorsement.

Statements	Group	SA	A	N	D	SD	χ^2	p value
Play adds value to my learning experience	Male	27.7	57.4	8.5	2.1	4.3	5.39	0.02
	Female	47.7	43	6.5	2.8	0		
Play adds a positive experience to my education	Male	36.2	46.8	12.8	0	4.2	3.84	0.05
	Female	49.5	43.9	5.6	1	0		
I look forward to attending class when play is involved	Male	31.3	47.9	14.6	2	4.2	6.55	0.01
	Female	50.4	40.2	8.4	1	0		
Play should be incorporated more often in dental education	Male	31.3	47.9	14.6	2	4.2	6.57	0.01
	Female	50.4	40.2	8.4	1	0		

Figure 3.
Student Preferences for Learning Formats. The pie chart illustrates the percent distribution of students' preferred learning formats. The categories include traditional lecture-based learning (blue), playful learning (orange), and a combination of both approaches (green).



Students' Open-Ended Comments

In the free narrative response section (Table 3), students shared their perceptions of traditional lecture-based classrooms and classrooms that incorporated playful learning. To analyze these responses, all comments were carefully reviewed to identify patterns and themes. Across more than 200 responses, common themes included engagement, classroom atmosphere, peer interaction, perceived learning experiences, student preferences, and perceived limitations of each approach. While no formal thematic analysis or coding scheme was applied, themes were generated based on repeated ideas across multiple responses, and representative quotes are provided to illustrate each theme and highlight students' perceptions.

Table 3.
Comparison of student perceptions of traditional lecture-based learning and playful learning in dental education, with representative anonymous quotes illustrating common themes. Note: Quotes were drawn from open-ended survey responses. A formal qualitative coding process was not conducted; themes were identified to contextualized and complement the quantitative findings.

Theme	Traditional Lecture-Based Learning	Playful Learning
Engagement	*"Lectures are monotonous... it's hard to concentrate after a while."*	*"It made learning fun and interactive, not just sitting and listening."*
Retention and Recall	*"We cram so much, I memorize for the test and forget after."*	*"I remember the concepts more because I associate them with the activity."*
Classroom Atmosphere	*"Lectures make me feel anxious, especially when there's a lot of material and little time."*	*"It was less stressful and I felt more comfortable participating."*
Perceived Learning Effectiveness	*"Some lectures are clear, but a lot of it just feels rushed."*	*"I understood the material better because we had time to apply it in a fun way."*
Interaction and Peer Learning	*"Most of the time we just listen; there's not much room to talk or ask questions."*	*"We talked more with classmates and helped each other figure things out."*
Preference	*"Lectures are good for learning a lot of content quickly."*	*"I prefer this method — it's a more memorable way to learn."*
Limitations Noted	*"It's easy to zone out during long lectures."*	*"Sometimes the games take up too much time and I'm not sure if I learned more."*

Students frequently described lecture-based instruction as efficient for delivering content but often disengaging or stressful. For example, one student remarked, "Lectures are monotonous…it's hard to concentrate after a while," while another noted, "We cram so much, I memorize for the test and forget after." These comments suggest that students perceive lectures as limiting interaction and engagement, and that they may experience challenges in maintaining attention during passive learning.

Playful learning was commonly described as enjoyable, interactive, and supportive of active participation. One student commented, "It made learning fun and interactive, not just sitting and listening," while another shared, "I understand the material better because we had time to apply it in a fun way." These remarks reflect students' perceptions that playful strategies enhance engagement, encourage participation, and make classroom experiences more positive. Students also highlighted social benefits, noting increased collaboration and peer support: "We talked more with classmates and helped each other figure things out."

Students recognized potential limitations of both approaches. Traditional lectures were sometimes perceived as monotonous and lacking interaction, whereas playful activities were occasionally seen as time-consuming or unclear in their learning focus. For example, one student commented, "Sometimes the games take up too much time and I'm not sure if I learned more." These perceptions indicate that while playful learning is generally appreciated, careful design is needed to ensure clarity and purposeful engagement.

Overall, the qualitative feedback complements the quantitative results by illustrating how students perceive the classroom environment, instructional strategies, and peer interactions. The comments provide insight into what students value in their learning experience, emphasizing engagement, collaboration, and clarity in instructional design.

Discussion

This study provides valuable insights into dental students' perceptions of playful learning in comparison to traditional lecture-based instruction at two U.S. dental schools. Across both institutions, students reported significantly higher levels of engagement, motivation, participation, and satisfaction when playful learning was incorporated into their educational experiences (Table 2). These findings support growing evidence in the literature suggesting that playful learning fosters active involvement, deepens understanding, and enhances the learning environment, especially when integrated into higher education contexts like professional training programs (Forbes, 2021; James & Nerantzi, 2019; Nguyen et al., 2023; Nørgård et al., 2017). In dental education, these benefits may extend beyond classroom knowledge to clinical application, where critical thinking, teamwork, and communication are essential to patient care. By engaging students in low-stakes, interactive activities early in the curriculum, playful learning may help develop the confidence and collaborative mindset that translate to more effective performance in preclinical and clinical settings.

Despite being a relatively underused approach in dental education (Pereira & Walmsley, 2019) and as reported in our study in which 81% of respondents from both schools reported that playful learning is incorporated in their education "once in a while," playful learning was widely viewed by students as a valuable complement to traditional instruction. The vast majority of respondents agreed that playful learning enhances their ability to grasp complex concepts (critical thinking), improves focus and retention, and fosters positive emotions toward

learning (Figures 1 and 2). These outcomes are especially important in professional programs like dentistry, where curricular intensity and performance pressures can negatively impact student well-being and engagement (Alzahem et al., 2014; Jiménez-Ortiz et al., 2019; Katwala et al., 2018). In the clinical environment, where students often experience high levels of anxiety and self-doubt, the emotional and motivational benefits of playful learning may help sustain focus, resilience, and adaptability during patient interactions and procedural practice. The finding that students reported reduced stress and increased confidence through playful learning (Figure 1) aligns with previous studies suggesting that play can serve both cognitive and emotional functions in academic settings (Forbes, 2021; Heljakka, 2023).

Interestingly, while nearly all students expressed favorable views of playful learning, most (53.2%) preferred a hybrid approach that combined traditional lectures and playful strategies. Only a small fraction (3.8%) favored lecture-based instruction alone (Figure 3). This preferences for blended methods suggest that students recognize the complementary strengths of both pedagogies: the efficiency and structure of lectures alongside the engagement and enjoyment of playful learning. In dental education, for example, playful strategies could complement didactic instruction through gamified case-based discussions, role-play simulations for patient communication, or collaborative review games that reinforce clinical reasoning. Such approaches may bridge the gap between theoretical understanding and hands-on clinical application.

Demographic analyses revealed subtle differences in perceptions by males and females. Female respondents were more likely than male respondents to select 'Strongly Agree' for items assessing focus and retention through playful learning (Supplemental Figures 5 and 6). This aligns with previous research suggesting that female students may be more receptive to collaborative or interactive learning approaches, potentially reflecting differences in learning preferences, engagement, and openness to active classroom participation (Curşeu et al., 2018; Feng et al., 2023). These differences reflect shifts in response distribution rather than large differences in overall agreement and should be interpreted cautiously.

First-year dental students at ECU SoDM reported higher levels of agreement regarding active participation in traditional lecture-based classrooms than their counterparts at UTSD (Supplemental Figure 2). This difference may be attributed to the smaller class size at ECU SoDM (54 students) compared to the larger cohort at UTSD (106 students), which could facilitate more opportunities for student interaction and participation even in a traditional lecture-based setting.

Although statistically significant differences were observed between first- and second-year UTSD students for several playful learning items, these differences primarily reflected shifts in the distribution of Likert responses rather than differences in overall agreement, which remained high across both groups. The playful learning items included: enjoyment of play-based learning, confidence in understanding the content, and improvement in teamwork skills. For enjoyment of play-based learning (Supplemental Figure 1), second-year students selected 'Strongly Agree' more frequently than first-year students, a pattern that may relate to differences in curricular experiences. Compared to first-year dental students who are primarily engaged in didactic coursework, second-year students spend more time in pre-clinical and hands-on settings. As a result, play-based or interactive activities may feel more relevant and engaging to them. Similarly, for confidence in understanding the content (Supplemental Figure 3) and improvement in teamwork skills (Supplemental Figure 4), second-year students more frequently selected 'Strongly Agree,' whereas first-year students more often

selected 'Agree' or were more evenly distributed between 'Agree' and 'Strongly Agree.' These subtle shifts may reflect the greater exposure of second-year students to hands-on and interactive learning opportunities, which could make playful learning activities feel more immediately applicable. However, given the small magnitude of these differences, these interpretations should be viewed cautiously.

Importantly, across both institutions, students overwhelmingly supported the increased inclusion of playful learning in dental education. At least 78% or more of students agreed in the following four statements that playful learning: 1) enhances the value of their education, 2) creates a more positive learning experience, 3) increases their anticipation for attending class, and 4) feel that play should be incorporated more often in dental education (Figure 2). Although males and females showed similarly high levels of overall endorsement, statistically significant differences emerged in the distribution of their Likert-scale responses ($p<0.05$). Specifically, females more frequently selected "Strongly Agree" across all four statements, whereas males tended to select "Agree" more often, indicating a shift in response intensity rather than a substantive difference in overall support. These patterns align with prior work suggesting that female learners may be particularly more responsive to interactive, collaborative, and affectively engaging instructional approaches which are characteristics commonly associated with playful learning strategies (Feng et al., 2023). Detailed response distributions for each statement are provided in Supplemental Table 1.

These overall findings challenge outdated assumptions that play lacks academic seriousness, particularly in professional program like dentistry (Whitton, 2018; Nørgård et al., 2017; James & Nerantzi, 2019; Licari & Patil, 2022). Instead, this study joins a growing body of work advocating for a redefinition of play in adult learning as a purposeful, pedagogically sound method for enhancing both classroom and clinical competencies (Forbes, 2021). This shift is especially relevant for Generation Z students, who comprise the majority of current dental class cohorts. Generation Z learners, raised in a digital environment, prefer active, hands-on learning over passive lectures. They value engagement, collaboration, and real-world application (Isaacs et al., 2020; Nguyen & Patel, 2023; Piglionico & Presti, 2025; Shatto & Erwin, 2017; Walinski et al., 2023) and incorporating playful learning strategies aligns with the learning preferences of these cohorts while supporting practical skills needed for patient care.

The qualitative feedback (Table 3) provides insight into how students perceived traditional lecture-based and playful learning approaches in dental education. Consistent with the quantitative results, students described lectures as efficient for delivering content but often disengaging. Comments such as, "Lectures are monotonous…it's hard to concentrate after a while," and, "We cram so much, I memorize for the test and forget after," suggest that students perceived lectures as limiting engagement and interaction. These perceptions align with previous work indicating that students often find lecture-heavy formats less stimulating, even if they cover content thoroughly (Walinski et al., 2023; Prince, 2004).

In contrast, playful learning was consistently described as enjoyable and interactive. Students reported feeling more engaged and confident in participating during class, with one noting, "It made learning fun and interactive, not just sitting and listening," and another, "I understand the material better because we had time to apply it in a fun way." These comments reflect students' perceptions that playful approaches promote active participation, conceptual clarity, and a positive classroom atmosphere. Social benefits were also highlighted, with students noting increased collaboration and peer support: "We talked more with classmates and helped

each other figure things out." These perceptions suggest that playful learning can foster a supportive, community-oriented classroom environment, which students value in their learning experience (Freeman et al., 2014).

Students also noted potential limitations of playful learning, such as time efficiency or uncertainty about the learning focus: "Sometimes the games take up too much time and I'm not sure if I learned more." These perceptions indicate that while students find playful learning approaches engaging, careful planning is needed to ensure activities are perceived as purposeful and aligned with traditional goals (Narla et al., 2025; Xing et al., 2025; Romero & Kalmpourtzis, 2020).

Overall, the qualitative findings complement the quantitative results by illustrating how students perceived the effects of different instruction strategies on their engagement, participation, and classroom experience. These insights can guide educators in designing learning activities that are perceived as both enjoyable and educationally meaningful, emphasizing engagement, collaboration, and confidence in the learning environment.

This study demonstrates a strong student preference for learning environments that incorporate playful elements alongside traditional instruction. Importantly, playful learning activities were implemented to complement, rather than replace, lecture-based teaching, serving primarily as a review and reinforcement tools. The findings suggest that playful learning is compatible with the demands of professional education and can enhance overall educational experience without diminishing the value of lectures. Within dental education, the integration of playful methods may have unique value in preparing students for clinical practice such as fostering a safe, engaging space for trial and error, team work, and reflective thinking. Activities such as gamified case review or diagnostic challenges can simulate real-world decision-making while maintaining a supportive and enjoyable atmosphere.

Despite the strong student endorsement, the limited presence of playful learning in current curricula highlights ongoing challenges in implementation. Faculty hesitancy, curricular rigidity, and assessment structures may act as barriers to broader adoption (Annamma et al., 2024). As noted by Nørgård et al., transforming learning environments to incorporate play requires institutional support, faculty training, and a shift in pedagogical culture (Nørgård et al., 2017).

There are several limitations that should be considered in this study. First, data was conducted from only two U.S. dental schools, which may restrict the applicability of findings to other institutions with different cultural, curricular, or demographic contexts. Future studies could benefit from including a broader sample of dental schools across the U.S and student levels (first- through fourth- year dental students) to determine whether perceptions of playful learning versus traditional lecture-based instruction are consistent across the field. Second, the implementation of playful learning differed between the two schools due to the first author's instructional role. At ECU SoDM, as the primary instructor, playful learning activities were implemented consistently, whereas at UTSD, the first author was a contributing instructor, which limited the frequency and timing of these activities. These differences should be considered when interpreting students' perceptions across the two instructional contexts. Third, the study focuses exclusively on student perceptions and does not include objective learning outcomes, such as exam scores or course grades. This was due in part to differences

in instructors and semesters between the two schools, making direct comparisons of performance data impractical. In addition, while standardized definitions of instructional approaches (traditional lecture-based instruction and playful learning) were provided, these classifications reflect student-reported perceptions and were not independently validated by teaching staff. Comparing faculty and student understanding of these pedagogical terms could provide additional insight and represents an important avenue for future research. There were also relatively low response rates among first- year students at ECU SoDM (52%) and second-year students at UTSD (31%), which may introduce non-response bias and limit the representativeness of those cohorts. Despite these limitations, the study provides exploratory, descriptive insights into how dental students perceive playful learning, which can inform future research incorporating both perceptions and measurable learning outcomes across multiple institution.

Conclusion

This study highlights dental student's positive perceptions of playful learning as a valuable supplement to traditional lecture-based instruction. Students from two dental schools reported increased engagement, motivation, enjoyment, and satisfaction when playful strategies were used, with most expressing a clear preference for a hybrid instructional model. These findings suggest that encouraging students to have a playful mindset through playful learning may help address common challenges in dental education such as high stress, low engagement, and reliance on rote memorization by promoting a more interactive and supportive learning environment. By fostering confidence, teamwork, and critical thinking, playful learning may also support students' preparedness for preclinical and clinical practice. Although still underutilized, the strong student endorsement highlights its potential to enhance the educational experience in a demanding academic setting. As dental schools adapt to the learning needs of Generation Z, playful strategies may contribute to improve motivation, better knowledge retention, and stronger educational outcomes. While this study examined students' perceptions rather than implementation practices, the findings may help inform future work developing and testing practical strategies for integrating playful learning in dental curricula. Future research should explore the impact of playful learning on measurable clinical competencies, identify effective implementation strategies, and examine faculty perspectives to support wider adoption across professional higher education.

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Supplementary Appendix A: Student Perception Survey Instrument

SECTION I: DEMOGRAPHICS

Which school do you attend?

1. East Carolina University School of Dental Medicine
2. UTHealth Houston School of Dentistry

What year of the program are you currently in?

1. 1st Year
2. 2nd Year
3. 3rd Year
4. 4th Year

To which sex do you identify?

1. Female
2. Male
3. Prefer not to say

Select your generation.

1. Boomers (1946-1964)
2. Generation X (1965-1980)
3. Generation Y (1981-1996)
4. Generation Z (1997-2012)
5. Prefer not to say

SECTION II: STUDENTS' PERCEPTIONS IN TRADITIONAL LECTURE- BASED CLASSROOM

Perspectives on Traditional Classroom Learning (Characterized by a teacher delivering instruction to a group of students in a physical classroom, with set schedules, lectures, standardized assessments, and typically no activities involved.)

How often is traditional lecture incorporated in your dental education experience?

1. Never
2. Once in a while
3. About half the time
4. Most of the time
5. Always

Please indicate your level of agreement with the statements below.

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree
I feel engaged learning in a traditional lecture-based classroom	❑	❑	❑	❑	❑
I feel motivated to learn in a traditional lecture-based classroom	❑	❑	❑	❑	❑
I actively participate (e.g. asking/ answering questions) in a traditional lecture- based classroom.	❑	❑	❑	❑	❑
I feel traditional classroom teaching is effective in grasping complex dental concepts.	❑	❑	❑	❑	❑
I enjoy learning in a traditional lecture-based classroom	❑	❑	❑	❑	❑
I am satisfied with my learning experience in a traditional lecture- based classroom.	❑	❑	❑	❑	❑

SECTION III: STUDENTS' PERCEPTIONS OF PLAYFUL LEARNING

Playful learning is defined as an approach/ activity that combines joy and creativity that can either be unstructured or structured while supporting exploration and problem solving.

How often is playful learning incorporated in your dental education experience?

1. Never
2. Once in a while
3. About half the time
4. Most of the time
5. Always

Please indicate your level of agreement with the statements below.

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree
I feel engaged learning in a classroom that incorporates play-based activities.	❑	❑	❑	❑	❑
I feel motivated to learn in a classroom that incorporates play-based activities.	❑	❑	❑	❑	❑

I actively participate (e.g. asking/ answering questions) in a classroom that incorporates play-based activities.	❑	❑	❑	❑	❑
I feel playful learning is effective in grasping complex dental concepts.	❑	❑	❑	❑	❑
I enjoy learning in a classroom that incorporates play-based activities.	❑	❑	❑	❑	❑
I am satisfied with my learning experience in a classroom that incorporates play-based activities.	❑	❑	❑	❑	❑

SECTION IV: IMPACT OF PLAYFUL LEARNING VS TRADITIONAL-LECTURE BASED INSTRUCTION

Please indicate your level of agreement with the statements below. Playful learning...

	Strongly disagree	Disagree	Neither Agree not Disagree	Agree	Strongly agree
... reduces stress compared to traditional lecture-based classrooms.	❑	❑	❑	❑	❑
... methods enhance critical thinking skills compared to traditional lecture-based classrooms.	❑	❑	❑	❑	❑
... improves focus in grasping the content compared to a traditional lecture-based classroom.	❑	❑	❑	❑	❑
... improves retention of content compared to traditional lecture-based classrooms.	❑	❑	❑	❑	❑
... improves application of content compared to traditional lecture-based classrooms.	❑	❑	❑	❑	❑
... enhances confidence in understanding the content compared to traditional lecture-based classrooms.	❑	❑	❑	❑	❑
... methods improve teamwork skills compared to traditional lecture-based classrooms.	❑	❑	❑	❑	❑

SECTION V: OVERALL REFLECTION OF PLAYFUL LEARNING

Please indicate your level of agreement with the statements below.

	Strongly	Disagree	Neutral	Agree	Strongly

	disagree				agree
Playful learning should be incorporated more often in dental education	❑	❑	❑	❑	❑
Incorporating play in the classroom adds value to my learning experience	❑	❑	❑	❑	❑
Classrooms that incorporate play adds a positive experience to my education	❑	❑	❑	❑	❑
I look forward to attending class when play is involved	❑	❑	❑	❑	❑

Which learning format do you prefer?

1. Traditional lecture-based
2. Playful learning
3. Both

SECTION VI: FREE NARRATIVE RESPONSE

Please share your experience in learning in a traditional lecture-based classroom

Please share your experience in learning in a classroom that incorporates play

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