Jordan Journal of Dentistry, Volume **2**, No. **2**, **2025**
DOI: https://doi.org/10.14525/JJD.v2i2.04

Jordan Journal of Dentistry

www.jjd.just.edu.jo

Exploring Self-directed Learning in Dental Education: Analyzing Student Perceptions, Practices, and Resource Utilization

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ARTICLE INFO

Article History:
Received: 25/11/2024
Accepted: 8/12/2024

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ABSTRACT

Objectives: The main objective of this research was to examine students' perceptions and practices related to self-directed learning in dental education, as well as to assess the extent to which their confidence in this learning approach is supported by evidence.

Materials and Methods: A cross-sectional survey was conducted among 531 participants in 3rd- to 5th-year students (63.7% females, 36.3% males).

Results: Fifth-year students were the main respondents (62.7%). Students had an average screen time of 6.45 hours on their mobiles last week, with males' screen times averaging higher (6.73h, p=0.045). For the Modified eHealth Questionnaire, there was no difference between perceptions of both genders (p=0.22), but the 5th-year student scores were higher (p=0.03). Curricular and extra-curricular subjects where students felt a need for online searches were reported. The overall perceptions for educational online resources were positive. While many students feel comfortable incorporating internet-based information into their learning and clinical decision-making (positive perceptions 62%), a significant number lack the skills to assess whether the information is credible and evidence-based (negative or neutral 63.3%).

Conclusions: This discrepancy poses a risk, as students may unknowingly rely on inaccurate or sub-standard materials, potentially affecting their education and patient care. To address this issue, there is a clear need for improved training in digital literacy and critical evaluation of online resources.

Keywords: Self-directed learning, Dental education, Perceptions of self-directed learning, Confidence in self-directed learning, eHealth literacy, Educational technology in healthcare, Evidence-based learning practices.

1. Introduction

In the last couple of decades (1), then further solidified after the COVID-19 pandemic, online learning has transformed into a critical component of education across many fields, including healthcare and dentistry. This shift has driven the development and the refinement of advanced online learning resources, which are defined as any tool or platform used to acquire

knowledge. These resources encompass a wide range of shapes, from instructional materials to interactive media, and can be categorized into four major groups: instructor-guided, self-guided, student-interactive, and instructor-guided, presented as online resources (2).

In the field of dentistry, online learning resources, such as videos, media, and applications, have been a considerable attraction due to their ability to offer enhanced visualization of the small oral cavity, which often is difficult to access during traditional learning. The use of video-based instructions has been preferred for providing a standardized delivery of information reducing inconsistencies that might arise from different instructors who still recognize their potential to improve academic outcomes and the development of clinical skills (3).

One of the most notable advantages perceived by students was the increased accessibility afforded by online learning platforms, eliminating geographical barriers, reducing travel costs, being at times convenient to the students, and balancing between their responsibilities and commitments (4). Another benefit frequently cited by students was the development of computer literacy (5). Online learning also provided opportunities for engaging with global resources and offered a stimulating alternative to traditional classroom learning. Many students appreciated the interactivity provided by well-designed online courses, which featured comprehensive discussions, group activities, and immediate feedback; whether from instructors, course designers, or computer-based systems.

Despite these advantages, students identified several challenges associated with these online courses, particularly those related to technological frustrations; such as slow download speeds, time consumption, higher internet costs, and limited access to computer resources, which were common complaints (6). Furthermore, the lack of face-to-face interaction with tutors and peers often led to the feeling of isolation and social disconnection (7).

Given these complexities, it is essential to examine how frequently students engage with self-guided online learning resources, how beneficial they perceive them to be for their learning and how this learning, environment influences their confidence and preparedness for future clinical practice. Confidence is a key factor, and successful learning outcomes particularly in professional settings where clinical management skills are evidence-based, are critical (8). Thus, it is essential for dental students to feel well-prepared and confident in their ability to perform clinical tasks, and for education designers to develop innovative learning strategies that complement traditional teaching methods while prioritizing self-directed learning (9). By adopting a learning environment that encourages autonomy and self-motivation, we can empower students to take greater ownership of their educational journey and master this life-long skill to build their confidence, master clinical skills, and thrive in their future careers (10).

The aim of this research was to explore students' perceptions and practices regarding self-directed learning in dental education, as well as evaluating how well their confidence in this learning approach is backed by evidence.

2. Materials and Methods

This study employed a mixed-method approach, integrating both quantitative and qualitative methodologies to examine the relationships between dental health resource usage, screen time, gender, and year of study, while also exploring students' perceptions of online learning experiences.

2.1 Ethical Approval

This study first received ethical approval from the Deanship of Research at Jordan University of Science and Technology. Then, it was carried out as a part of the research project course for final year dental students.

2.2 Study Design and Participants

A cross-sectional study design was employed and ended by the end of the semester in January 2024. It targeted 3rd-5th-year dental students in the Faculty of Dentistry, who were willing to participate in the research just before their final examinations.

2.3 Questionnaire Development and Review

The questionnaire went through a review process, involving the academic researcher and 26 students from the eligible student body as a convenience sample. They engaged in several calibration sessions to ensure that the questions were clear, easy to understand, and comprehensive. Then, it was translated, and adjusted as needed to improve its relevance for the student population. Special care was taken to preserve the scientific integrity and relevance of the questions in

order to guarantee high-quality data collection. Instructions were provided on how to conduct the interviews in a way that would be as approachable as possible for students.

The questionnaire used consisted of a total of 13 multiple-choice and open-ended questions, organized into five main domains:

(1) Personal data,

(2) Average screen time (last week),

(3) A modified version of a validated eHealth assessment. Questions were formatted as 5-point Likert-scale items, designed to reflect the context or conditions in which most students felt that they needed to address these questions. These conditions were established by the research team during the calibration session discussions (Table1).

(4) Checklist-format questions were included about the topics and specialized subjects where students felt that additional resources were necessary due to deficiencies in their curriculum. The checklist format was developed from the calibration sessions, allowing participants to easily select relevant options from a pre-defined list. The last item in this section was labeled "Other," enabling respondents to provide additional information not captured by the checklist.

(5) Additionally, questions were included regarding the use of search engines, mobile applications, social media accounts, and websites for accessing dental educational resources, employing open-ended questions to invite participants to express their thoughts and insights in their own words.

Table 1: The modified eHealth questionnaire questions

1. Considering that you have access to dental education websites that distinguish between basic and advanced dental sciences, and you have received guidance from your curriculum or dental educator regarding website selection, how confident are you in the following statement? **"I know what dental educational websites are available on the internet."**
2. Given that you can specify your educational needs and use only those websites that directly benefit you, how confident are you in the following statement? **"I know where to find helpful dental educational resources on the internet."**
3. Under the conditions that you can recognize educational materials on certified platforms, use keywords and a dental glossary to aid your searches, and maintain focus without being misled by unrelated links, how confident are you in the following statement? **"I know how to search for reliable dental educational resources on the internet."**
4. Considering that you typically search the internet for solutions when challenges arise and frequently return to it while studying (for exams, assignments, case presentations, or clinical cases), how confident are you in the following statement? **"I know how to use the internet to answer my questions or solve clinical cases."**
5. Given that you understand how to utilize information obtained from the internet to meet your educational needs and you have developed habits of taking notes, communicating findings, and saving relevant information, how confident are you in the following statement? **"I know how to use the educational information that I find on the internet to aid my education."**
6. Considering your ability to assess whether a piece of information meets your educational needs at a given moment, how confident are you in the following statement? **"I have the skills that I need to evaluate the educational resources that I find on the internet."**
7. Given that you know where to find evidence-based journals (such as PubMed and Scopus), access the websites of official dental bodies (like AAPD and ADA), and can read scientific reviews to extract relevant information, how confident are you in the following statement? **"I can distinguish high quality, evidence-based resources from other educational resources on the internet."**
8. Considering that your reliance on educational websites assures you of the accuracy of the information, boosts your confidence in sharing and presenting this information, and contributes to improving your patient treatment approach, to what extent do you agree with the following statement? **"I am confident that utilizing information from the internet can enhance my clinical decision making and fulfill my informational needs."**

2.4 Data Collection

Data was gathered by the 26 interviewing calibrated-students, who collected the data from 531 participants. The consent from participants was secured by their agreement to respond to the questionnaire. The questionnaire was available in both English and Arabic to accommodate diverse language preferences, addressing any inquiries or preferences from students,

and in the same sequence, to ensure consistency in responses. The translation was carefully reviewed and discussed in the calibration process to ensure accuracy and reliability in both languages. Participants were assured that their participation in the surveys was anonymous.

2.5 Statistical Analysis

Data analysis was performed using the Statistical Package for Social Sciences (SPSS), version 27. We used descriptive statistics to summarize key features of the data. To guarantee the appropriate degree of precision, a minimum sample size was previously calculated and found to be between 108 and 243 participants (11). To guarantee the reliability of the questionnaire, a test-retest methodology was employed. The 26 interviewers completed the same questionnaire on two separate occasions, with a two-week washout period. The reliability of the scoring system was assessed through the Intra-class Correlation Coefficient (ICC), comparing total scores across two time points. The ICC value for average measures was 83.2%, with a significance level of $p<0.0001$, indicating high repeatability. This can be attributed to the refinement of some questions following several calibration meetings, which focused on enhancing students' interviewing skills, particularly in crafting open-ended inquiries and defining the conditions or contexts in which the questions were relevant.

Group differences in total score and average of daily hours using mobile were examined using independent t-tests between males and females and ANOVA between different years of study, with Bonferroni *post hoc* tests for multiple comparisons when ANOVA test was significant. Pearson-correlation analysis was applied to explore relationships between total score and average of daily hours using mobile. The differences in answering the different questions were tested using Jonckheere-Terpstra test. P-value was set to be significant at 0.05.

3. Results

A total of 531 participants consented by responding to the questionnaire, which was conducted through structured interviews, yielding a 100% response rate. The majority of respondents were females, accounting for 63.7%, while males made up 36.3% of the sample. Completed responses were obtained from 333 fifth-year students, with 70% being females and 30% males. Fifth-year students constituted the largest group of respondents, representing 62.7%, followed by fourth-year students at 24.7% and third-year students at 12.6% of the subjects.

At the beginning of the survey, participants reported a mean mobile screen time of 6.45 hours over the previous week. There was a significant difference in screen time between males and females, with females reporting an average of 6.30 hours and males averaging 6.73 hours (p=0.05).

The eight questions from The Modified eHealth Questionnaire are present in Table 2. There was no difference between female and male scores (p=0.22). There was a difference between fourth-and fifth-year student scores (p=0.03), where fifth-year student scores were higher (p=0.03).

Table 2: The modified eHealth questionnaire 8 questions' results (5-scale Likert scale)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Strongly Disagree	4.5%	3.2%	3.4%	2.6%	2.3%	3.4%	4.0%	1.9%
Disagree	14.7%	15.3%	13.4%	8.5%	7.7%	13.4%	19.6%	6.6%
Neutral	38.0%	31.6%	33.9%	29.4%	28.1%	34.1%	39.7%	32.2%
Sum of –ve or neutral	**57.2%**	**50.1%**	**50.7%**	**40.5%**	**38.1%**	**50.9%**	**63.3%**	**40.7%**
Agree	37.7%	44.1%	42.0%	46.7%	51.8%	40.5%	33.%0	49.3%
Strongly Agree	5.1%	5.8%	7.3%	12.8%	10.2%	8.7%	3.8%	10.0%
Sum of +ve	**42.8%**	**49.9%**	**49.3%**	**59.5%**	**62%**	**49.2%**	**36.8%**	**59.3%**

Regarding specific dental topics (Table 3), students perceived that online dental resources were particularly helpful for understanding operative dentistry (59.4%), followed by prosthodontics (51.5%), anatomy (48.3%), and dental materials (35.2%).

In terms of dentistry-related subjects not covered in their syllabus (Table 3), the most frequently encountered topic was laser dental therapies (50.6%), followed by

aesthetic dentistry (46.4%), management of broken endodontic instruments (45.1%), and management of C-shaped canal cleaning and shaping (41.2%). A breakdown of additional topics is presented in the related graphic.

The most commonly used social media platforms among students (Table 3) were Instagram (84.2%), Facebook (49.1%), and YouTube (47.6%), with Snapchat also being a notable choice at 27.8%. Details of other platforms used by students are included in the next graph.

Table 3: Applications, topics, subjects, and websites utilized by students for online resource searching and identifying inadequacies

The most important **applications** you use		Dental **subjects** found online are not covered in your syllabus		**Topics** that online resources helped you understand better		**Websites** used a source for educational information	
Digital Application	%	Subject	%	Topic	%	Source	%
Instagram	84.2	Laser Dental Therapies	50.6	Operative Dentistry	59.4	You Tube	84.4
Facebook	49.1	Aesthetic Dentistry	46.4	Prosthodontics	51.5	Google	81.8
YouTube	47.6	Management of Broken Endodontics Instrument	45.1	Anatomy	48.3	Wikipedia	28.4
Snap Chat	27.8	Management of Shaping and Cleaning of C-shaped Canals	41.2	Dental Material	35.2	ChatGPT	19.2
TikTok	21.4	Magnifications Used for Dental Treatments	34.4	Orthodontics	31.6	Osmosis	15.0
X (Twitter).	20.3	Ergonomics Related to Dentistry	24.4	Histology	23.9	Slideshare	11.3
WhatsApp	4.1	Maxillfacial Surgery	0.4	Pediatric Dentistry	16.7	Researchgate	9.4
Telegram	1.5	Non	0.4	Surgery	0.9	NCBI	8.1
Messenger	0.9	Medications	0.2	Oral Pathology	0.8	ScienceDirect	7.5
Google Maps	0.2	Tips and Tricks from YouTube for Conservative Dentistry	0.2	Oral Physiology	0.4	Qoura	5.8
Books	0.2	Orthognathic Surgeries	0.2	Oral Radiology	0.4	coursera	3.9
Botim	0.2	Dental Materials	0.2	Don't Use	0.2	Scribd	3.9
Google	0.2			Microbiology	0.2	SciELO	3.6
Netflix	0.2			Pharmacology	0.2	Cox bond dental	2.8
Photos	0.2			Systemic	0.2	Mental dental	0.2
Udemy™	0.2					Www.scoresacademy.com	0.2
Line	0.2					Telegram	0.2
other	1.0					Don't Use	0.2

Regarding online sources for educational information (Table 3), YouTube was the most relied-upon platform, with 84.4% of students utilizing it, followed by Google (81.8%). Wikipedia was used by 28.4% of students, and ChatGPT by 19.2%.

A significant proportion of students (59.4%) agreed that the operative dentistry syllabus was insufficient, with 51.5% indicating similar dissatisfaction with the prosthodontics syllabus. Furthermore, 46.4% agreed that aesthetic dentistry was not adequately covered in their syllabus, prompting them to seek supplementary information from online resources. Confidence levels were highest in surgery and lowest in operative dentistry, prosthodontics, and endodontics. Notably,

84.4% of students reported that YouTube was their primary source of educational content, regardless of the formal syllabus.

4. Discussion

In the context of rapidly evolving higher education landscapes, universities face the critical challenge of adapting their strategies to align with the characteristics of Generation-Z (Gen Z) students (8). This generation is distinguished by its digital fluency and unique learning preferences make it essential for educational institution advancements in technology, for enhancing educational experiences. It also introduces challenges that require a thoughtful approach to student engagement and learning practices.

A key component of effective education, in this context, is understanding how students engage in self-directed learning (SDL). By examining student behaviors, educators can gain insights into how students interact with online resources, their perceptions of these tools, and their confidence in utilizing them (12). Compared to traditional lecture formats, SDL has been found to improve course satisfaction and provide students with the flexibility to learn at their own pace (13). This shift in educational strategy is essential for developing lifelong learning skills rather than promoting rote memorization of information.

Premkumar (10) summarized the four principles to promote SDL that are applicable to dental education:

1. Matching the level of SDL required in learning activities to student readiness.
2. Progressing from teacher-directed to student-directed learning over time.
3. Supporting the acquisition of subject matter knowledge alongside SDL skills.
4. Facilitating adult practice of SDL in the context of learning tasks.

4.1 Demographic Trends and Response Rates

In the current study, notable findings emerged regarding the demographic composition of participants, particularly the strong participation of female students and fifth-year cohorts. This may reflect demographic trends or varying interest levels among specific groups. The high response rate lends credibility to the data collected, enhancing its reliability and relevance.

Participants reported an average mobile screen time of 6.45 ± 2.37 hours, over the past week. There was a significant difference in screen time between genders, with females averaging 6.30 hours and males 6.73 hours. The small number of students who did not report their screen time did so primarily due to time constraints during data collection rather than due to concerns about privacy.

4.2 Perceptions of Online Educational Resources

The results of this study reveal important insights into the awareness, confidence, and ability of dental students in utilizing online educational resources. Despite the widespread availability of digital platforms for learning, the findings demonstrate varying levels of proficiency in identifying, evaluating, and applying internet-based dental resources.

In terms of awareness of available dental education websites, 42.8% of respondents reported being aware of such platforms, while 57.2% either disagreed or remained neutral. This indicates that a significant portion of participants is either unfamiliar with or uncertain about the availability of these online educational tools, suggesting a need for increased visibility and integration of these resources into formal dental curricula.

When asked where to find these resources, 49.9% of respondents expressed confidence, while 50.1% indicated disagreement or neutrality. This nearly even split highlights that while many participants feel equipped to locate online resources, a considerable portion still struggles, pointing to the need for improved guidance on effective search strategies.

Confidence in searching for reliable dental resources is slightly less than a half, with 49.3% of respondents feeling confident in their search capabilities. A nearly equal proportion of those lacking confidence (50.7%) suggests that while many students or professionals can navigate the internet effectively, there remains significant room for improvement in search skills.

The ability to use the internet to answer clinical questions received a more positive response, with 59.5% of respondents being confident in using online resources to solve clinical cases. However, 40.5% of participants expressed doubt or remained neutral, indicating that while the majority have confidence in this area, a significant portion still faces challenges in applying these resources to practical clinical scenarios.

Regarding the ability to use educational information found online, 62% of respondents felt confident in

effectively utilizing such information in their education, leaving 38.1% unsure or lacking confidence. This strong positive result suggests that most participants can integrate online educational resources into their learning, although the remaining gap indicates that some students may benefit from further training on how to leverage these tools effectively.

In contrast, confidence in the ability to evaluate the quality of online educational resources is more evenly divided, with 49.2% of participants feeling confident in their evaluation skills, and 50.9% indicating uncertainty or a lack of confidence. This points to a significant challenge for many individuals in discerning the credibility and reliability of the information that they find online, underscoring the need for targeted instruction in resource evaluation.

The ability to differentiate high-quality, evidence-based resources from other online materials presents one of the greatest challenges, with only 36.8% of respondents confident in their ability to do so, while 63.3% expressing doubt or neutrality. This substantial level of uncertainty highlights a critical area where dental professionals require greater support, as the ability to distinguish credible, evidence-based information is vital in clinical decision-making and professional development.

Finally, in terms of confidence in using internet-based information to enhance clinical decision-making, 59.3% of respondents felt confident, while 40.7% indicated uncertainty or a lack of confidence. This finding suggests that while the majority believe that online resources can aid in their clinical practice, a considerable proportion remains hesitant, possibly due to concerns over the quality or reliability of the information available online.

When comparing the responses to Question 5 (confidence in using educational information found online) with the responses to Questions 6, 7, and 8 (which focus on evaluating the quality of information), an important and potentially concerning pattern emerges regarding the use of online resources *versus* the ability to assess their credibility.

In Question 5, the majority of respondents expressed confidence in using the educational information that they find online to support their learning. This suggests that many participants feel comfortable incorporating internet-based resources into their studies. However, when asked about their ability to evaluate this information (as seen in Questions 6 and 7), the level of confidence significantly drops.

For Question 6, which focuses on evaluating the educational resources found on the internet, nearly a half of the respondents did not feel fully capable of determining the credibility or quality of the information that they use. This indicates a gap between their confidence in using online resources and their ability to critically assess whether the information is accurate or evidence-based. The risk here is clear: students may be relying on online materials without thoroughly evaluating their validity, potentially leading to the use of unreliable information.

This concern is even more pronounced in Question 7, which asks whether respondents feel that they can differentiate between high-quality, evidence-based resources and other resources containing less reliable information. A significant portion of participants indicated that they were unsure or lacked the skills to make this distinction. This suggests that many students may not have the necessary tools to recognize whether the information that they are using is scientifically sound, increasing the likelihood of integrating misinformation into their education.

In Question 8, which assesses confidence in using internet-based information to support clinical decision-making, a majority of respondents felt that online resources could help them in this area. However, a substantial number still expressed doubt, indicating mixed levels of trust in the information that they find online when it comes to real-world clinical applications.

The discrepancy between confidence in using online information (as seen in Question 5) and confidence in evaluating its quality (as reflected in Questions 6 and 7) suggests a considerable risk. Dental students and professionals may be applying information from the internet without being fully confident in its reliability or level of evidence. This can lead to the adoption of sub-optimal or incorrect practices, ultimately affecting patient care.

Given the critical importance of evidence-based decision-making in healthcare, addressing this gap is essential. Without the ability to evaluate and differentiate high-quality, evidence-based resources from less credible ones, the reliance on internet resources could compromise both education and clinical outcomes. Therefore, enhancing digital literacy and critical appraisal skills

should be prioritized to ensure that dental professionals are equipped to make informed decisions based on reliable, scientifically sound information.

The findings from this study carry significant implications for dental education. Premkumar (10) explained the model that emphasizes the importance of three psychological constructs relevant to SDL: self-monitoring (cognitive responsibility), self-management, and motivation. Self-monitoring involves observing both cognitive and metacognitive processes, which is essential for students to develop an awareness of their learning and research strategies. Effective self-management, which includes establishing goals and seeking external assistance, is essential for navigating the complicated world of online educational resources. Motivation, especially centering on task motivation, has a significant impact on students' engagement with online resources and entire learning experience. To overcome the survey's deficiencies, educational institutions should prioritize improving self-monitoring techniques, offering systematic self-management tools, and encouraging students' intrinsic drive. This may be accomplished through focused training sessions, workshops, and the development of online and library resources that are meant to instill confidence and competence in using efficiently search tools and strategies for online dental educational materials in academic databases. Furthermore, scientific information literacy abilities should be developed to recognize sources and navigate databases (14).

These should take the form of articulated clinical queries. This will assist in gaining experience with database navigation, interpreting statistics related to health research, and improving critical appraisal skills required to evaluate the quality of research (15). Once attained, students should have communication skills, which will allow them to practice sharing results and teaching peers, perform reflection and self-assessment, engage in self-evaluation, and create learning objectives (16) in a world of ongoing education and research upgrades. By equipping students with these essential skills, educational institutions can significantly improve their ability to make informed decisions, ultimately enhancing clinical practice and patient outcomes (17).

To achieve these outcomes, strategies to enhance faculty support are needed. These can be conducted in the following forms:

1. Enhanced Training in Information Literacy (18,19)

Regularly implementing workshops and seminars on information literacy helps staff develop skills in identifying credible online resources, managing time, understanding copyright, and participating in peer review, ultimately boosting their confidence. Integrating this training within the curriculum ensures that students acquire these essential skills as part of their clinical education.

2. Access to Reliable Resources (20,21)

Providing students with curated lists of reliable online resources, such as evidence-based journals and reputable dental organizations, tailored to their level of study, ensures that they have access to trustworthy information from the start of their dental program. Additionally, teaching students to use resource evaluation tools like the CRAAP criteria (Currency, Relevance, Authority, Accuracy, Purpose) helps them critically assess the quality and reliability of online information sources.

3. Case-based Learning (22, 23)

Incorporating real-world scenarios and case studies encourages students to apply online resources in clinical decision-making, allowing them to practice evaluating and using information in a supportive, problem-based learning environment. Collaborative group discussions further enhance this process by fostering peer learning and critical analysis of the credibility and practical application of various resources.

4. Mentorship Programs (24)

Pairing students with upperclassmen or faculty members provides personalized guidance in navigating online resources effectively, while professional mentorship connects them with experienced practitioners who share insights on utilizing online information in real-world practice.

5. Feedback Mechanisms (25)

Regular surveys and assessments help gauge students' confidence and skills in using online resources, identifying areas for improvement. Providing constructive feedback on assignments that involve online research further reinforces their strengths and highlights opportunities for growth.

6. Integration of Technology (26-28)

Utilizing interactive learning platforms, such as online modules and simulations, enhances students' engagement with evidence-based practices, while mobile applications provide convenient access to reliable resources and clinical decision support. Incorporating social media platforms further enriches the learning experience by connecting students with educators, organizations, and thought leaders, offering valuable insights, tutorials, and updates. This approach fosters a dynamic learning community, where students can collaborate, share resources, and stay informed about the latest trends in dental education and practice.

4.3 Content Relevance and Student Satisfaction

The survey indicated that students find online dental resources particularly beneficial for topics, such as operative dentistry (59.4%), prosthodontics (51.5%), and anatomy (48.3%). However, they also expressed a need for additional coverage in their syllabi, particularly regarding laser dental therapies (50.6%). and aesthetic dentistry (46.4%). A significant number of students reported dissatisfaction with the current operative dentistry (59.4%). and prosthodontic (51.5%) syllabi, indicating a need for dental programs to focus on enriching their curricula with advanced topics that are currently underrepresented, such as endodontic instrument management and C-shaped canal shaping (41.2%).

Furthermore, leveraging social media platforms, like YouTube and Instagram, could provide effective channels for disseminating educational content. Enhancing access to credible online resources and mobile applications for learning, particularly for operative and prosthodontic practices, will better prepare students for their clinical experience and improve their confidence in these areas. Integrating these resources into the syllabus could promote a more comprehensive educational experience, addressing both the gaps identified by students and the evolving demands of the dental field (29, 30).

4.4 Limitations of the Study

This study has several limitations. Previous research indicates that most dental students primarily use the internet for personal purposes, which may influence their engagement with educational resources. Additionally, the limited sample size may have reduced the statistical power of the analysis, potentially hindering the detection of significant effects. Furthermore, the study was conducted at a single dental school, limiting the generalizability of the findings. The reliance on subjective responses based on students' self-assessments, rather than evaluations conducted under academic supervision in a clinical environment, means that the results may not fully capture students' actual knowledge and daily professional practice. Lastly, the emphasis on a teacher-dependent learning environment, particularly in the initial years of training, can limit students' autonomy and critical thinking skills, thereby affecting their ability to engage with and utilizing online resources effectively in a clinical context.

5. Conclusions

In summary, SDL emerged as a beneficial online activity for students as they proactively sought supplementary learning materials both within and outside their curriculum. However, despite the high amount of screen time dedicated to these resources, students' confidence in the credibility of these materials as evidence-based was not consistently demonstrated. Thus, institutes as well as instructors are faced with a challenge to fill the gap and enhance the effectiveness of dental education by designing and building skills of digital literacy, resource evaluation, and clinical application of online information. Implementing targeted educational strategies and fostering a supportive learning environment in dental programs can equip students with the necessary self-directed learning competencies to continuously and confidently thrive in their professional careers.

Acknowledgements

The authors would like to acknowledge Mr. Abedelmalek Tabnjh, from Jordan University of Science and Technology (JUST) for his invaluable statistical advice and guidance during this research.

The authors would like to extend heartfelt thanks to all those who generously agreed to participate in this study.

Conflict of Interests

The authors have no potential or known conflict of interests to declare regarding the preparation and publication of this research.

Funding Information

This research did not receive any funding from any source.

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