Advances in Medical Education and Practice

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Self-Directed Learning Activities Implemented by Undergraduate Dental Students in King Saud University, Saudi Arabia: A Cross-Sectional Study

Balqees Almufleh[1], Ala'a Abu Obaid[1], Nada Alghamdi[2], Noura Alothaim[3]

[1]Department of Prosthetic Dental Sciences, College of Dentistry, King Saud University, Riyadh, Saudi Arabia; [2]King Saud Medical City, Riyadh, Saudi Arabia; [3]College of Dentistry, King Saud University, Riyadh, Saudi Arabia

Correspondence: Balqees Almufleh, Department of Prosthetic Dental Sciences, College of Dentistry, King Saud University, P.O.Box 60169, Riyadh, 11545, Saudi Arabia, Email balmufleh@ksu.edu.sa

Advances in Medical Education and Practice downloaded from https://www.dovepress.com/
For personal use only.

Aim: This study aims to explore the self-directed learning activities implemented by dental students to support their education, and to assess the effect of gender and different academic level on student engagement with different self-directed learning activities.

Methods: A cross-sectional study was conducted on undergraduate dental students at King Saud University, Riyadh. All fourth- and fifth-year dental students, interns, and recent graduates were invited to participate in a 16-item self-administered questionnaire distributed through an online survey platform. Descriptive statistics were presented. Differences among different academic levels and between gender were tested using nonparametric tests. $P < 0.05$ was considered significant.

Results: The response rate was 71.5%. More than half of the participants (59.3%) reported actively engaging in self-directed learning activities, with the most common activities being learning from presentation slides (94%), utilizing YouTube and social media accounts (75.6%), and searching for information online (68.5%). Conversely, textbooks were the least frequently used resource for self-directed learning (14.9%). Significant differences in self-directed learning activities utilization were found between male, and female ($P < 0.05$), and between different academic levels ($P < 0.05$).

Conclusion: The study highlights willingness of undergraduate dental students to support their learning and the diverse self-directed learning activities employed. Learning from presentation slides, YouTube videos and looking for information on search engines were the most commonly implemented activities among students to support their learning, suggesting a shift towards digital learning modalities. These activities can be further encouraged in dental curriculum to enhance students learning experience.

Keywords: self-directed learning, dental students, dental education, YouTube

Introduction

Nowadays, health fields, are rapidly evolving at a very fast pace, and health practitioners, including dentists are expected to seek knowledge constantly after graduation to stay updated.[1–5] This requires practitioners to take responsibility for their own learning and be able to develop critical thinking to adapt to the new challenges developing throughout their practice. Educational institutions, should equip their graduate with not merely the knowledge of today, but also with self-directed learning skill sets to be able to grow and succeed in this ever-changing world after graduation.[1–5]

Self-directed learning was defined by Knowles as a process by which individuals take the initiative in diagnosing their learning needs, formulating goals, identifying resources, and evaluating their progress.[6] This approach empowers students to engage actively in their education, enhancing their knowledge retention and self-confidence.[1,4–7] Literature indicated that self-directed learning skills are positively associated with high academic achievement, success in clinical skills and mental health.[3,8]

While it may seem obvious that self-learning should be encouraged and fostered in health fields curriculum including dental schools education, current status shows the opposite.[2,8,9] It has been shown that health fields students preparedness to self-directed learning, decrease after first to second year of school, and remain at that level until graduation.[2,8,9] This

Received: 8 December 2024
Accepted: 27 March 2025
Published: 26 April 2025

© 2025 Almufleh et al. This work is published and licensed by Dove Medical Press Limited. The full terms of this license are available at https://www.dovepress.com/terms.php and incorporate the Creative Commons Attribution – Non Commercial (unported, v4.0) License (http://creativecommons.org/licenses/by-nc/4.0/). By accessing the work you hereby accept the Terms. Non-commercial uses of the work are permitted without any further permission from Dove Medical Press Limited, provided the work is properly attributed. For permission for commercial use of this work, please see paragraphs 4.2 and 5 of our Terms (https://www.dovepress.com/terms.php).

indicates that current curriculums are highly instructor-led, and overly structured, with little room left for self-learning or student-led learning tasks. To foster self-learning, more flexible less-structured learning environment should be implemented.[1,4] Newer teaching strategies like flipped/blended classrooms were associated with active learning practices among students.[10]

In our school, there is no formal training on self-directed learning skills. However, in many courses, students are required to perform some forms of self-directed learning projects which are mainly in the form of topic presentation prepared solely by the students with minimum or no guidance from instructors. Additionally, for most of the courses, extra resources for self-directed learning are listed in the course outline, however there is no intentional support or encouragement to students to pursue self-directed learning. Program learning outcomes of the undergraduate curriculum does not include self-directed learning as a required skill outcome of the program, and this probably the same as other dental programs in Saudi Arabia.

With the advent of technology, more flexible and versatile learning materials are now available at no or low cost to everyone, including students.[11–13] Available learning resources vary, and could include textual and audiovisual resources.[14] Additionally, more sophisticated interactive learning resources are becoming increasingly available which include artificial intelligence guides, virtual reality and digital immersive tools to help engage students in self-directed learning.[15–17] Studies showed that dental students worldwide are using open access learning resources to gain knowledge, and support their learning.[11,12,18] More than ninety percent of dental student surveyed in the US considered YouTube videos on clinical procedures to be a helpful learning tool, and the majority reported that they refer to a YouTube video to prepare for a procedure that they have never done.[18]

In Saudi Arabia, few studies assessed the utilization of social media by dental students for learning purposes.[13,19,20] All dental students surveyed in three major universities in the western region in Saudi Arabia reported using social media, and the majority indicated willingness to use it for learning.[13] In another study of dental students in three major cities in Saudi Arabia, results showed that finding dental information and watching clinical procedures for learning were the major reasons for using social media.[20] Considerable number of the students were using Facebook for educational purposes (66%), and they perceived Facebook as a source of inspiration and motivation (40%).[19] However, to the best of the authors knowledge, there is no data currently on the students perception and utilization of the different available self-directed learning resources and activities, other than the social media. Learning about self-directed activities used by the students could help dental educators to plan effective self-directed learning activities that can enhance students learning experience. Thus, the aim of this study was to investigate the utilization of self-directed learning activities and resources by undergraduate students to support their learning, and to determine the effect of gender and academic level on students' engagement with certain self-directed learning resources.

Methodology

Study Design

A cross-sectional study was implemented on dental students at King Saud University, Riyadh, Saudi Arabia in October 2021. The study was granted approval by the Institutional Review Board of the College of Medicine, King Saud University (IRB Project No. E-21-6220).

All fourth-year dental students (N = 130), fifth-year (N = 137), interns (N = 128) and recent graduate students within 6 months of their graduation (N = 129) were invited to participate voluntarily in a 16-item questionnaire, uploaded on an online survey platform (SurveyMonkey). The questionnaire was made in English language, as it is the language of instructions in this school, and the students are very proficient in English. The link was sent to participants individually via social media platform (WhatsApp messages) and reminders were sent weekly to encourage participation. The online survey was open for participants for a period of one month.

Questionnaire Format

Published literature on self-directed learning activities and resources used by dental students was reviewed by the research group to help in developing of the first draft of the questionnaire items, in addition to a list of self-directed

learning activities crafted by the research group. This draft was further reviewed and tailored to our sample using data collected from a focus group discussion. This discussion was held virtually, and included 5 male and female students of our sample representing all included levels of education, who were randomly selected and invited for the focus group discussion. The meeting was guided by one investigator asking five open-ended questions formulated to capture the students experience on self-directed learning. Questions were discussed in a thoughtful permissive atmosphere. Based on these results, two items were added to the questionnaire. Questionnaire was further checked for clarity and specificity by two faculty members and some items were edited.

The questionnaire had an introduction that explained the aim of the study, the study procedures and approximate time required to fill the questionnaire, confidentiality of the participants information, and contact information of the research supervisor in case participants would like to inquire about the study. It also indicated that participation in this study is strictly voluntary. The questionnaire was anonymous and no personal identifying information were sought from participants. By clicking next, participants consented that they were voluntarily willing to participate in the study.

The questionnaire was divided into three sections: the first section had questions on demographic data, including age, gender and level of education. The second section was designed to gather information regarding self-directed learning activities and resources implemented by the students using 5-points frequency scale from always to never. The third section includes two questions; the first one is a question about students perception of self-directed learning on a 5 points agreement scale. The second question is an open-ended question about any additional self-directed learning resources or activities, that participants engaged in. This question was included to allow participants to elaborate on their learning experiences to enrich the results and cover the topic more comprehensively. The final questionnaire is available in the Supplementary Material.

Statistical Analysis

The responses were captured in a database entered to IBM SPSS statistic software (version 28.0.1.0 IBM Corp., Armonk, NY, USA), and 5-points likert frequency scale responses were coded from 1–5, where "1" indicates "always", and "5" indicates "never". Proportion tables, graphs, and descriptive data of means and standard deviations were obtained. Differences in utilization of different self-directed learning activities and resources among different academic levels and between gender were tested using nonparametric Kruskal Wallis and Mann Whitney test, respectively. Alpha was set at 0.05, and p-value less than 0.05 was considered statistically significant. Answers to the open-ended question were coded manually to look for any additional themes that were not included in the self-directed learning resources and activities of the quantitative part of the survey.

Results

A total of 392 responses were received out of 542 surveys sent. However, 17 of these responses were initiated but did not answer any research questions, resulting in a total of 375 usable surveys. This yielded a response rate of 71.5%.

Demographic Data

The distribution of participants included 111 (29.6%) fourth-year students, 92 (24.5%) fifth-year students, 114 (30.4%) interns, and 58 (15.5%) recent graduates, illustrated in Figure 1. The gender distribution consisted of 173 (46.2%) female and 202 (53.8%) male participants. The majority of responses (49.7%) were from participants aged 24–26 years.

Self-Directed Learning Activities

Most of the students (94%) reported learning from presentation slides made by the lecturer, followed by learning from YouTube videos and other social media accounts for educational purposes (75.6%), searching several search engines (68.5%) and learning from clinical manuals (65.2%), as illustrated in Figure 2, and Table 1.

Other self-directed learning activities were implemented relatively less frequently by the students, for instance; joining small group discussions with peers (56.4%), learning from authorized organizations websites (40.1%), creating clinical procedures summaries (33.9%), attending educational events (32.9%) and learning from published scientific

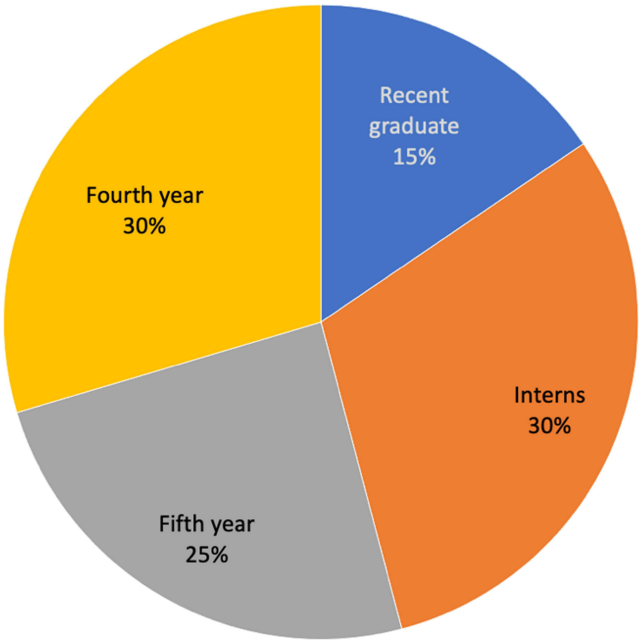

Figure 1 Percentages of academic levels of participants (n=392).

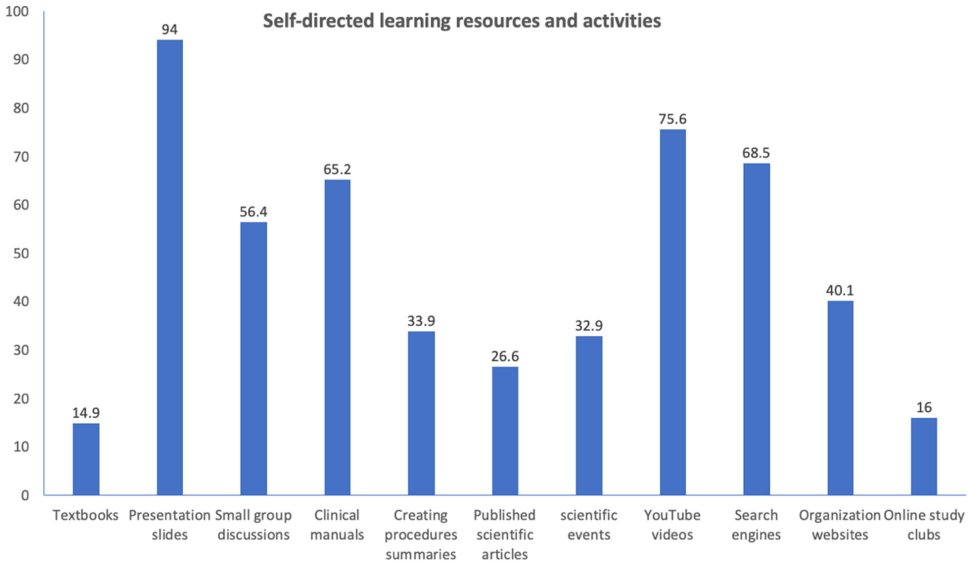

Figure 2 Percentages of Utilized Self-directed Learning Activities and Resources.

articles (26.6%). The least commonly used resources were joining online study clubs (16%) and learning from textbooks (14.9%), as illustrated in Figure 2, and Table 1.

There were significant differences between different academic levels in their frequency of using self-directed learning activities, illustrated in Table 2. Recent graduates learned significantly more frequently from published scientific articles (2.6 ± 1.1), and attended scientific events (2.6 ± 1.1), compared to other academic levels $p < 0.001$, $p < 0.001$, respectively. Interns significantly less frequently learned from YouTube and educational social media (2.2 ± 0.9) compared to other academic levels, $p < 0.010$. Fifth year significantly more frequently used clinical manuals and created clinical procedures summaries compared to other academic levels ($p = 0.02$, $p = 0.01$, respectively).

Gender differences also were noticed and illustrated in Table 3. Female significantly more frequently (2.7 ± 1.2) created clinical procedures summaries, used (2.9 ± 1.1) scientific published literature to learn, and used search engine

Table 1 Frequency of Participants Utilization of Self-Directed Learning Resources and Activities

Survey Statements	Likert Scale*		
	Always-Often	Sometimes	Rarely-Never
1. I used text books not required by my curriculum	14.9%	30.7%	54.4%
2. I used presentation slides made by the lecturer	94.0%	4.0%	2.0%
3. I had small group discussions with my peers (on clinical cases and scenarios)	56.4%	26.1%	17.5%
4. I used clinical manuals	65.2%	24.0%	10.8%
5. I created clinical procedures summaries	33.9%	31.9%	34.2%
6. I used published scientific articles as a learning resource	29.1%	33.6%	37.2%
7. I attended events such as seminars\ meetings\ workshops	32.9%	28.8%	38.3%
8. I used YouTube videos and social media accounts for educational purposes	75.6%	20.7%	3.7%
9. I used several search engines to look for information	68.5%	22.5%	9.0%
10. I used website organizations, such as the Ministry of Health, Dental Association, and WHO as source of information	40.1%	34.6%	25.3%
11. I joined online study clubs	16.5%	16.5%	67.1%
12. Educational challenges encouraged me to actively pursue self-directed learning	58.4%	29.7%	11.8%

Notes: *The 5-points scale of frequency responses was rearranged to represent 3 points scale for ease of interpretation, with always and frequently combined in one category, and rarely and never combined in another category.

Table 2 Mean and Standard Deviation of Student Utilization of Self-Directed Learning Resources Among Different Academic Levels

Self-Directed Learning Activities and Resources	Current Academic Level				p-value
	Fourth Year	Fifth Year	Interns	Recent Graduate	
1. Textbooks	3.5 (1.1)	3.7 (1.1)	3.6 (1.1)	3.6 (1.1)	0.56
2. Presentation slides	1.3 (0.6)	1.3 (0.5)	1.5 (0.9)	1.3 (0.6)	0.27
3. Small group discussions	2.4 (1.1)	2.3 (1.2)	2.5 (1.1)	2.4 (1.2)	0.39
4. Clinical manuals	2.3 (1.1)	1.9 (0.9)	2.1 (0.8)	2.4 (1.2)	0.02*
5. Clinical procedures summaries	3.2 (1.1)	2.6 (1.2)	2.9 (1.1)	3.1 (1.3)	0.01*
6. Published scientific articles	3.5 (1.1)	3.1 (1.1)	3.1 (1.1)	2.6 (1.1)	<0.001*
7. Scientific events	3.4 (1.2)	3.2 (1.1)	3.2 (1.1)	2.4 (1.1)	<0.001*
8. YouTube videos and social media	1.7 (0.7)	1.8 (0.9)	2.2 (0.9)	1.8 (0.8)	<0.001*
9. Search engines	1.9 (1.2)	2.1 (1.0)	2.2 (1.1)	1.8 (0.8)	0.09
10. Professional organizations website	3.0 (1.1)	2.7 (1.2)	2.5 (1.1)	2.6 (1.1)	0.03*
11. Online study clubs	3.8 (1.3)	3.9 (1.2)	3.9 (1.2)	3.8 (1.2)	0.68

Notes: The 5 points likert scale responses were coded so "1" indicates "always", and "5" indicates "never". *statistically significant at p<0.05.

Table 3 Mean and Standard Deviation of Student Utilization of Self-Directed Learning Resources Among Male and Female

Self-Directed Learning Activities and Resources	Gender		p-value
	Female	Male	
1. Textbooks	3.7 (1.0)	3.4 (1.1)	0.005
2. Presentation slides	1.3 (0.6)	1.5 (0.7)	0.009
3. Small group discussions	2.3 (1.2)	2.5 (1.0)	0.13
4. Clinical manuals	2.1 (1.0)	2.2 (1.0)	0.39
5. Clinical procedures summaries	2.7 (1.2)	3.2 (1.1)	<0.001*
6. Published scientific articles	2.9 (1.1)	3.3 (1.0)	0.001*
7. Scientific events	3.1 (1.2)	3.2 (1.2)	0.43
8. YouTube videos and social media	1.8 (0.9)	1.8 (0.8)	0.64
9. Search engines	1.9 (1.1)	2.1 (1.1)	0.02*
10. Professional organizations website	2.7 (1.2)	2.7 (1.1)	0.88
11. Online study clubs	3.7 (1.3)	4.0 (1.2)	0.02*

Notes: The 5 points likert scale responses were coded so "1" indicates "always", and "5" indicates "never".
*statistically significant at p<0.05.

(1.9 ± 1.1) compared to male, $p < 0.001$, $p = 0.001$, $p = 0.02$, respectively. On the other hand, male significantly more frequently (3.4 ± 1.1) studied from textbooks not required by the curriculum, compared to female (3.7 ± 1.0), ($p = 0.005$).

Students' Perception of Self-Directed Learning

More than half of the participants (59.3%) reported that they engaged actively in self-directed learning activities and resources, and educational challenges encouraged them to actively pursue self-directed learning, with no significant differences observed among academic levels or gender ($p>0.05$).

Open-Ended Question: Students' Voices

The open-ended questions were asked to allow students to elaborate on their self-learning activities and resources not mentioned in the survey. However, all comments they have mentioned were already stated in the statements of the questionnaire.

Discussion

Self-directed learning is essential for fostering lifelong learning, and should be encouraged in dental schools to help future dentists remain current in an ever-evolving field. In medical education, interventions such as coaching, learning plans, and supportive tools have demonstrated positive effects on promoting self-directed learning.[4] Dental schools should consider implementing similar strategies to cultivate these vital skills among future practitioners.

Available learning materials for self-directed learning are various including textual, and audiovisual resources.[14] Textual resources including textbooks, and slides printouts, could be portable, easy to use without the need for technology or equipment, and can present topics in depth. However, these resources may have limited ability to explain hands-on procedures, and processes, and therefore result in limited student engagement.[14] On the other side, audiovisual learning materials can explain hands-on processes more effectively and help students better visualize the material, but needs equipment, and may cause some distractions.[13,14,18] The authenticity of the available resources must be checked before utilizing that for self-directed learning.[13,14,18]

Among the various self-directed learning activities, learning from presentation slides prepared by lecturers was the most commonly reported method, confirming the results of a previous study.[21] These slides typically provide a clear and focused overview of the assigned material, making it easier for students to review and comprehend the content.[21]

The second most utilized resources were educational social media accounts, particularly YouTube videos, which came in agreement with previous studies.[11,18] These highly accessible visually appealing resources are likely to enhance students understanding, particularly for complex clinical procedures.[11,18] However, the open-access nature of social media content raises concerns about the reliability of information, as it often lacks peer review. Only a small percentage of the most viewed YouTube videos on dental procedures are produced by accredited dental schools,[22] highlighting the need for educational institutions to create valid and reliable online resources.

Other self-directed learning activities, such as participating in small group discussions, creating clinical procedure summaries, and utilizing resources from authorized organizations and published scientific literature, were less frequently employed. Around (56.4%) of participants reported engaging with small group discussions, where collaborative learning experiences can occur.[23] Previous research has shown that small group discussions can positively impact educational outcomes.[23] Encouraging faculty to promote small group learning can enhance students' educational experiences and foster self-directed learning. In this study, factors such as busy schedules and a lack of faculty encouragement may have limited students' participation in group discussions.

Creating clinical procedures summaries would require students to employ effective cognitive learning strategies including rehearsal, elaboration and reorganization of information, which are components of self-directed learning.[1] These summaries could then help with knowledge retention that would help students to easily apply this knowledge in clinical settings.[3] In this sample, only (33.9%) proactively created summaries to help themselves, apart from course requirements.

It should be noted that most of the commonly utilized resources are digital resources, which are easily accessible, highly interactive and engaging, which made them popular among students.[11,13,18,23] Future dental educational plans should consider investment in various electronic study materials, artificial intelligence guides, virtual reality and digital immersive tools to help engage students in self-directed learning.[15–17] In a study, dental students were provided with electronic interactive guide in lab sessions, and that made a positive impact on the student self-paced learning experience and engagement in simulated environment.[24]

While published scientific literature is a valid and peer-reviewed source of knowledge that can empower students learning, limited students' exposure to literature during undergraduate program resulted in limited use among students in this sample. Previous findings have indicated low utilization rates of academic databases among students (26.6%).[22] Interestingly, interns reported higher engagement with scientific literature compared to undergraduate students, likely due to their increased familiarity with research, which is a requirement during their internship.

Gender differences in utilization of self-directed learning resources were observed, as female students were significantly more likely to create clinical procedure summaries and utilize published literature for learning compared to males, while male students were significantly more likely to learn from textbooks. This may indicate differing approaches to self-directed learning based on gender. Further studies are recommended to explore how such differences could inform tailored educational strategies.[2]

There were significant differences between different academic levels in utilization of different self-directed learning resources. Recent graduates significantly utilized scientific published literature, and attended scientific events more than other academic levels, which could be attributed to their advanced level and experience, which would make these resources very beneficial for them to stay updated, compared to students, and interns. On the other side, fifth year students significantly more frequently used clinical manuals and created clinical procedures summaries compared to other academic levels, which is in agreement with previous study that showed an upward trend in students' utilization of self-directed learning resources from lower to upper academic levels.[13] This could be related to the fact that fifth year students are required to manage advanced more comprehensive clinical cases, for which they need more resources.[13]

While the open-ended responses allowed for personal reflections, the lack of new insights suggests that the structured questionnaire effectively captured the primary experiences and resources utilized by students.

This study showed that more than half of the participants (59.3%) reported engaging proactively in self-directed learning activities. This enthusiasm by students could be related to the various educational challenges posed by the COVID pandemic in the previous year, which hinders students learning in many ways.[25–29] This finding is consistent with previous studies indicating that students often take charge of their education and become motivated to pursue self-directed learning when faced with obstacles.[25,27,30]

This study has several strengths, including a good response rate, diverse representation across academic levels and genders and a comprehensive survey for data collection. However, there are limitations to consider. The findings may not be generalizable as the study was conducted in a single public institution. Additionally, recall bias may affect survey responses, and the online nature of the survey may have influenced participants' answers based on peer perceptions.

As dental education continues to evolve, curriculum should be carefully reviewed to foster self-directed learning through innovative and reliable resources, which are essential in preparing competent lifelong learners dental professionals. Future research should explore the identified trends across various institutions and settings to gain a comprehensive understanding of self-directed learning in dental education. Factors enhancing self-directed learning practice among students could be further assessed in future studies.

Conclusions

The study highlights the willingness of the majority of students to support their learning and the diverse self-directed learning activities employed. Learning from presentation slides, YouTube videos and looking for information on search engines were the most commonly implemented activities among students to support their learning, suggesting a shift towards digital learning modalities. These activities can be further encouraged in dental curriculum to enhance students learning experience. Gender and academic level differences in self-directed learning activities utilized were observed and can be used to customize recommended resources on planning educational activities.

Data Sharing Statement

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to ethical and institutional restrictions.

Ethical Approval

This study was implemented on dental students at King Saud University, Riyadh, Saudi Arabia. The study was granted approval by the Institutional Review Board of the College of Medicine, King Saud University (IRB Project No. E-21-6220).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Acknowledgment

The authors would like to thank Mr. Nassr Almaflehi, Statistician at King Saud University, College of Dentistry for his contribution in the statistical analysis.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This research received no external funding.

Disclosure

All the authors declared that they have no conflicts of interest to disclose for this work.

References

1. Bowman M. The transition to self-regulated learning for first-year dental students: threshold concepts. *Eur J Dent Educ*. 2017;21(3):142–150. doi:10.1111/eje.12193
2. Tekkol İA, Demirel M. An investigation of self-directed learning skills of undergraduate students. *Front Psychol*. 2018;9:2324. doi:10.3389/fpsyg.2018.02324
3. Turan S, Konan A. Self-regulated learning strategies used in surgical clerkship and the relationship with clinical achievement. *J Surg Educ*. 2012;69(2):218–225. doi:10.1016/j.jsurg.2011.09.003
4. van Houten-Schat MA, Berkhout JJ, van Dijk N, Endedijk MD, Jaarsma ADC, Diemers AD. Self-regulated learning in the clinical context: a systematic review. *Med Educ*. 2018;52(10):1008–1015. doi:10.1111/medu.13615
5. Woods NN, Mylopoulos M, Brydges R. Informal self-regulated learning on a surgical rotation: uncovering student experiences in context. *Adv Health Sci Educ Theory Pract*. 2011;16(5):643–653. doi:10.1007/s10459-011-9285-4
6. Knowles MS. *Self-Directed Learning: A Guide for Learners and Teachers*. Englewood Cliffs, NJ: Prentice Hall/Cambridge; 1975.
7. Lalla RV, Li EY, Huedo-Medina TB, MacNeil RLM. Evaluation of an experiential and self-learning approach to teaching evidence-based decision making to dental students. *J Dent Educ*. 2019;83(10):1125–1133. doi:10.21815/JDE.019.125
8. Cho KK, Marjadi B, Langendyk V, Hu W. The self-regulated learning of medical students in the clinical environment - a scoping review. *BMC Med Educ*. 2017;17(1):112. doi:10.1186/s12909-017-0956-6
9. Premkumar K, Pahwa P, Banerjee A, Baptiste K, Bhatt H, Lim HJ. Changes in self-directed learning readiness in dental students: a mixed-methods study. *J Dent Educ*. 2014;78(6):934–943. doi:10.1002/j.0022-0337.2014.78.6.tb05748.x
10. Gadbury-Amyot CC, Redford GJ, Bohaty BS. Dental students' study habits in flipped/blended classrooms and their association with active learning practices. *J Dent Educ*. 2017;81:1430–1435. doi:10.21815/JDE.017.103
11. Aldallal SN, Yates JM, Ajrash M. Use of YouTube™ as a self-directed learning resource in oral surgery among undergraduate dental students: a cross-sectional descriptive study. *Br J Oral Maxillofac Surg*. 2019;57(10):1049–1052. doi:10.1016/j.bjoms.2019.09.010
12. van Schaijik B, Alshawa A, Hamadah O, Alshehri M, Kujan O. The role of Twitter in dental education: a systematic review. *J Dent Educ*. 2021;85(9):1471–1481. doi:10.1002/jdd.12621
13. Rajeh MT, Sembawa SN, Nassar AA, Al Hebshi SA, Aboalshamat KT, Badri MK. Social media as a learning tool: dental students' perspectives. *J Dent Educ*. 2021;85(4):513–520. doi:10.1002/jdd.12478
14. Vishnupriya S, Bharathi R. The impact of audio-visual aids in teaching. *Int J Health Sci*. 2022;6(S3):7847–7859. doi:10.53730/ijhs.v6nS3.7877
15. Goodacre CJ. Digital learning resources for prosthodontic education: the perspectives of a long-term dental educator regarding 4 key factors. *J Prosthodont*. 2018;27(9):791–797. doi:10.1111/jopr.12987
16. Luo F, Luo L, Zhang Y, et al. Enhancing dental education: integrating online learning in complete denture rehabilitation. *BMC Med Educ*. 2024;24(1):1079. doi:10.1186/s12909-024-06070-1
17. Saghiri MA, Vakhnovetsky J, Nadershahi N. Scoping review of artificial intelligence and immersive digital tools in dental education. *J Dent Educ*. 2022;86(6):736–750. doi:10.1002/jdd.12856
18. Burns LE, Abbassi E, Qian X, Mecham A, Simeteys P, Mays KA. YouTube use among dental students for learning clinical procedures: a multi-institutional study. *J Dent Educ*. 2020;84(10):1151–1158. doi:10.1002/jdd.12240
19. Naguib GH, Alyamani I, Alnowaiser AM, Hamed MT. Social media usage and self-perception among dental students at King Abdulaziz University, Saudi Arabia. *J Med Educ*. 2018;17(2):109–119.
20. Aboalshamat K, Alkiyadi S, Alsaleh S, et al. Attitudes toward social media among practicing dentists and dental students in clinical years in Saudi Arabia. *Open Dent J*. 2019;13:143–149. doi:10.2174/1874210601913010143
21. Alhassan M, Aldawsari AM, Alenazi A, Al-Harbi M, Alhajri RA, Ofisan SB. Use of self-study resources among medical students-towards avoiding death by PowerPoint. *Med Sci Educ*. 2023;33(4):825–828. doi:10.1007/s40670-023-01810-2
22. Dias da Silva MA, Pereira AC, Walmsley AD. Who is providing dental education content via YouTube? *Br Dent J*. 2019;226(6):437–440. doi:10.1038/s41415-019-0046-8
23. AlJasser R, Alolyet L, Alsuhaibani D, Albalawi S, Manzar MD, Albougami A. Perception of E-resources on the learning process among students in the College of Health Sciences in King Saud University, Saudi Arabia, during the (COVID-19) outbreak. *Healthcare*. 2021;10(1). doi:10.3390/healthcare10010040
24. Terry A, Liu D, Divnic-Resnik T. The impact of an electronic guide on students' self-directed learning in simulation clinic. *Eur J Dent Educ*. 2021;25(1):86–99. doi:10.1111/eje.12579
25. Amir LR, Tanti I, Maharani DA, et al. Student perspective of classroom and distance learning during COVID-19 pandemic in the undergraduate dental study program Universitas Indonesia. *BMC Med Educ*. 2020;20(1):392. doi:10.1186/s12909-020-02312-0
26. Farrokhi F, Mohebbi SZ, Farrokhi F, Khami MR. Impact of COVID-19 on dental education- a scoping review. *BMC Med Educ*. 2021;21(1):587. doi:10.1186/s12909-021-03017-8
27. Goriuc A, Sandu D, Tatarciuc M, Luchian I. The impact of the COVID-19 pandemic on dentistry and dental education: a narrative review. *Int J Environ Res Public Health*. 2022;19(5):2537. doi:10.3390/ijerph19052537
28. Passos KK, Bezerra HK, Leonel AS, et al. Self-regulated learning perception of undergraduate dental students during the COVID-19 pandemic: a nationwide survey in Brazil. *J Clin Exp Dent*. 2021;13(10):e987–e993. doi:10.4317/jced.58452
29. Trivandrum Anandapadmanabhan L, Ramani P, Ramadoss R, Panneerselvam S, Sundar S. Effect of COVID-19 on dental education: a review. *Cureus*. 2022;14(4):e24455. doi:10.7759/cureus.24455
30. Schlenz MA, Schmidt A, Wöstmann B, Krämer N, Schulz-Weidner N. Students' and lecturers' perspective on the implementation of online learning in dental education due to SARS-CoV-2 (COVID-19): a cross-sectional study. *BMC Med Educ*. 2020;20(1):354.

Advances in Medical Education and Practice

Dovepress
Taylor & Francis Group

Publish your work in this journal

Advances in Medical Education and Practice is an international, peer-reviewed, open access journal that aims to present and publish research on Medical Education covering medical, dental, nursing and allied health care professional education. The journal covers undergraduate education, postgraduate training and continuing medical education including emerging trends and innovative models linking education, research, and health care services. The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit http://www.dovepress.com/testimonials.php to read real quotes from published authors.

Submit your manuscript here: http://www.dovepress.com/advances-in-medical-education-and-practice-journal