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Original Article

MICROLEARNING ENVIRONMENT OF DENTISTRY STUDENTS: A SCOPING REVIEW

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ABSTRACT

Objectives: *This study aimed to accomplish a systematic search of the existing literature on microlearning in dentistry to define important terms and concepts, describe microlearning as a teaching approach, and assess the pedagogical results that students in dentistry encounter. This scoping review identifies noticeable trends, patterns, and evidence of how microlearning has been used and implemented in academic settings.*

Materials and Methods: *The bibliographic databases PubMed (MEDLINE), WILEY online library, Springer Link, ERIC, and Google Chrome were used to conduct a scoping review. Keywords and subject titles about just-in-time learning, electronic learning, or microlearning in conjunction with dentistry were integrated. Both antegrade and retrograde research was carried out. The search has no date restrictions, however, only English-language publications were included.*

Results: *Using the above-mentioned keywords, the total articles found were 363(ERIC),279(Pub med),52,864(Wiley online library),10,289(springer link), (2,910,000) Google Scholar using microlearning environment as keywords 4,670,000(Google scholar) using learning environment measure as keywords. By applying screens like full text, last 05 years, English language, journal articles, etc,25(ERIC),85(Pub med), 64(Wiley online library), 40(springer link),20(Google Scholar), following articles were shortlisted. By removing duplicates from PubMed, 27 articles were retained.12 articles were finally shortlisted after removing all irrelevant articles.*

Conclusion: *Microlearning bridges the gap between planned, delivered, and learned curricula. A positive learning environment is fostered as students' feedback is valued and learning occurs in small chunks, which is easy to understand. Various themes emerging out of literature have scrutinized microlearning in-depth for a better understanding of the subject and imply it in our daily practices.*

Key words: *Microlearning environment, teaching quality, teaching practices, competence in teaching*

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INTRODUCTION

Linder in 2004 defined microlearning as "microlearning is a new learning system based on microcontent and micro media in the new media ecosystem"[1]. It is also called bite-sized or chunk-sized learning. Microlearning consists of reducing the large contents into small sizes, adjustability of

time and space, accessibility of many learning media, and choice to selective learning (Zhou,2018). Large-sized data plays a pivotal role in the improvement of microlearning. In the era of microdata, the attention span of humans is decreasing considerably. As per Hebert (1971), "what information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it"[2].

Haden et al. in his paper mentioned that the ideal dental learning environment would be having a tolerant approach towards learning, it focuses on learning and not on performance and everyone's learning style should be valued[3,4].

Microlearning is technology and non-technology-based. Microlearning aids in decreased learning time and improves educational performance and aptitude. Smartphones and podcasts are convincing aids for students[5]. They are easily available and easy to use[6,7]. Nontechnology microlearning consists of audio, videos, short paragraphs, quizzes, animations, and models.

Microlearning is a new trend amongst medical and dental students. It will take time to fully understand it and efficiently implement it. But with the advancements in technology, the attention span of a pupil is reduced. So, microlearning can assist in dividing the content into more manageable chunks that can be processed more quickly, since the quantity of information that learners must process has increased[2,8,9]. The next area of emphasis in learning is connecting the little units, which form the basis of clinical reasoning and critical thinking[8,9]. Because medicine and dentistry are an ever-evolving field, micro-learning is especially crucial for today's students.

Buchem and Hamelmann's review of microlearning puts forth the following 10 concepts, to comprehend the features of microlearning i.e. learning context, amount of time invested, kind of content, creation, aggregation, retrieval, learning cycle structure, target group, the role of the learner, and learner participation[10].

Microlearning is better for students than macro-learning because it allows them to access the most recent information when they need it, whereas macrolearning is typically structured inflexibly and hierarchically. This is in contrast to reading textbook chapters and memorization content, which are the practices of older educational designs[11].

MATERIALS AND METHODS

The scoping review was carried out after seeking ethical approval via Appl. # Riphah /IRC/ 21/28 from Institutional Review Committee (IRC)of Islamic International Medical College. It includes: Identification of research questions, Identification of relevant studies/search strategy, Study selection, Data charting, Summary and results.

The search strategy was established to comprehensively ascertain published and unpublished literature following the 3-stepapproach developed by JBI[12]. First, a preliminary search was conducted in PubMed (MEDLINE) and Wiley online library. The titles, abstracts, and index terms that were used to characterize the articles found during the first search were examined by the authors. This guided the second search phase, which involved finalizing the strategy and customizing it for each information source. The following databases were searched: PubMed (MEDLINE), WILEY online library, ERIC, Springer link, and Google Chrome. Keywords and subject headings about microlearning, electronic learning (e-learning), or just-in-time learning in conjunction with dentistry were combined with the search (table 1). Both antegrade and retrograde research was conducted with the inclusion and exclusion criteria followed as mentioned in Table 2. The search was conducted from January to May 2023. After full-text screening of the search results, the third phase of the search process involved reviewing reference lists for articles.

MENDELEY was used to manage every identified citation, and duplicates were eliminated. Titles and abstract screening were done by two independent reviewers. Studies were included if they met the following requirements:

After being retrieved, the complete texts of the chosen studies were carefully evaluated in comparison to the inclusion criteria. Studies in full text that didn't fit the inclusion requirements were eliminated, and the reasons were mentioned. Conflicts amongst the reviewers were settled by discussion or by consulting a third reviewer.

Snowballing was done to find relevant articles. 12 articles were selected after excluding all the irrelevant articles. Full-text Articles of the last 5 years were considered. Articles that were not original were excluded along with those which were irrelevant. The quality of the review was appraised by Prisma

categorization and the QualSyst appraisal tool.

RESULT

Using the above-mentioned keywords, the total articles found were 363(ERIC),279(Pub med),52,864(Wiley online library),10,289(springer link), (2,910,000) Google Scholar using microlearning environment as keywords 4,670,000(google scholar) using learning environment measure as keywords. A snowballing approach was employed for the identification of relevant articles.

By applying screens. like full text, last 05 years, English language, journal articles, etc,25(ERIC),85(-Pub med), 64(Wiley online library),40(),20(Google Scholar), following articles were shortlisted. By removing duplicates from PubMed,27 articles were retained.12 articles were finally shortlisted after removing all irrelevant articles (Figure 1)

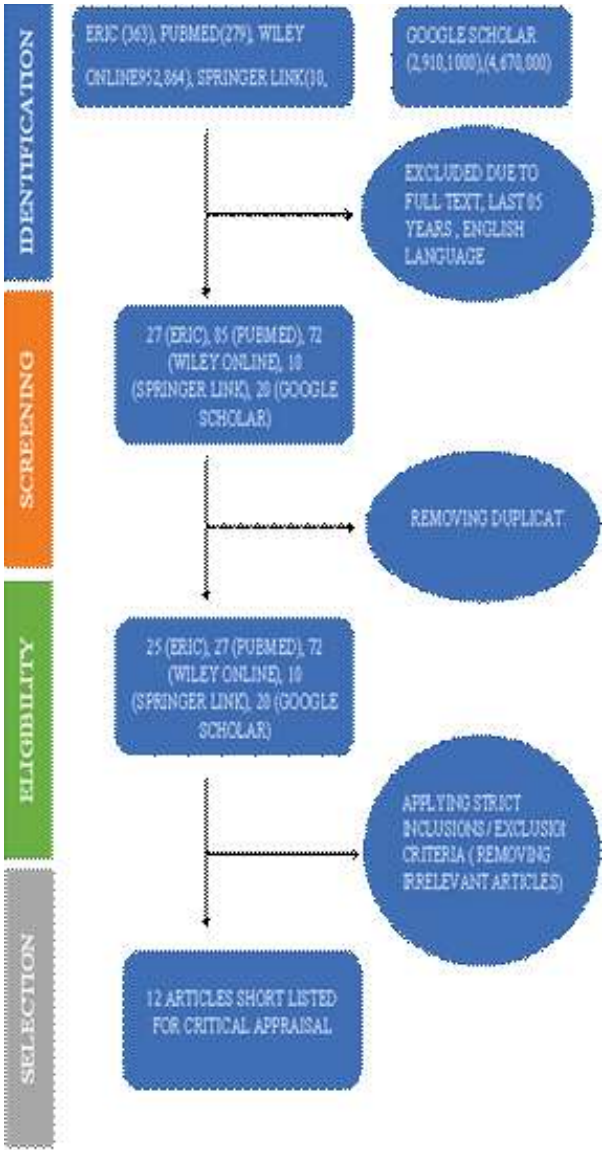

Fig 1: Flow chart of PRISMA

DISCUSSION

After a broad literature search using the keywords microlearning environment, following themes appeared; The definition of microlearning is "a learning program designed using a series of short learning content and short activities that make a mini course." It is also termed as a chunk-sized or bite-sized learning[13]. This so-called "microlearning" is characterized by a dynamic, flexible structure that allows learners to explore topics at an individual pace[5], and has been associated with greater effects in knowledge-based outcomes than formal long interactions[6]. It is specially designed to prevent cognitive overload. Several reasons havecontributed to the development and the positive welcome of the micro-learning paradigm. First, the human capacity to stay fixated on a single item, avoiding commotion and inattention, has reduced. It is known in the literature that even internet users can hardly pay eightseconds of continuous attention while surfing. Secondly recent advancements in technology, have resulted in workers needing to update their training. Finally, conventional training is not shown to be a holistic approach to efficient training[14].

Hug recommendedseven components of microlearning ie content, curriculum, time,form, process, media, and learning type,to be importantduring designing. pedagogy and technological aspects also play a role in planning appropriate micro-learning design. Technology,pedagogy, and content are considered to be the three basic elements. The content creation process starts with finding areas in the curriculumthat can be covered well with microlearning. Content creation requires us to understand that what

Table 1: Key terms and synonyms for literature search

Keywords	Synonyms
Microlearning	Learning in small chunks
Microlearning environment	Learning environment
Teaching practices	Teaching quality

Table 2: Inclusion and Exclusion criteria for articles

Inclusion Criteria	Exclusion Criteria
Since 2016, English articles, Original articles published in peer-reviewed journals, Full-text articles. Articles relevant to micro-learning environment in medical education	Articles that were not original, Conference papers, opinion papers, letters to editors editorials, or articles that were irrelevant.

are the requirements of students, and which topics can be distributed into small chunks. Once contents are created, it is imperative to finalize the pedagogical modelbased on knowledge of differentiation between essential and unnecessary information. A single specific learning outcome shall be achieved by chunking large topics into smaller units[15]. Finally,the appropriate choice of technology to design short activities or courses based on microlearning plays a critical role. By considering the above-mentioned three elements, micro-learning surely produces a positive effect on increased student engagement, satisfaction, and learning experience (breaking the walls of the classroom)[16].

In terms of guidelines, concise and varied subjects, stand-alone microcontent segments, and readily understood and useful data should be condensed and straightforward methods. It is also important to design concise, easily understood units that can be swiftly and easily implemented in a variety of settings. Previous literature also suggests that the micro-learning environment be constituted of micro-learning sessions (micro-content) of no more than 15 minutes each. The micro-learning activities should be designed to be directly managed by the learners themselves. Moreover, these activities are projected to encourage active participation by promoting the exploration, the use, and the creation of content (e.g. explanation of mind maps, designing of visual content and interactive activities, etc.)In addition to having supplementary materials that let students actively engage in the creation, assembly, and modification of the microlearning materials, the microlearning materials should be able to highlight very particular and obvious aspects. Achieving a balance between complementary information and a brief format is crucial. Lastly, it is particularly intriguing to support micro-learning for communities, where resources from the training exercises are made available to the student body in a way that allows them to be used as a springboard for discussion, as a source of support for brand-new projects, or just as a handy resource(integrating microlearning content). Content is designed considering that units are brief and easily perceived at a glance, Objectives and topics must be clear, to the point, and brief, each part of micro-content must be sufficient so that learners do not have to search for additional information,microcontent should be easily accessible from any other location.To summarize, the primary characteristics of microlearning are succinctness, directness, swift generation, consolidation, and distribution[17].

Microlearning can be technology or non-technology-based. Due to the latest wave in digitalization and the introduction of new techniques like learning through gamification, traditional teaching has lost its worth[18].These reduce learning time, expand academic achievements, enhance knowledge or skills, and increase contentment with the learning strategy. Besides, traditional classroom education has a limitation of time and space. Learning through mobile and video podcasting are incipient tools for medical education[19]. Microlearning can be diligently delivered through mobile. Mobile devices are perfect for accessing micro-content, as learners can interact with small pieces of content. Many of the teaching and learning content can now be disseminated via mobile-friendly applications. In addition, the number of students who own mobile devices continues to increase. (Breaking the walls) The use of micro-blogs such as Twitter can also improve students' participation and performance. Nontechnological tools of microlearning include short texts, Images, Videos,short audio, quizzes, and tests.

Students' active participation both inside and outside of the classroom is ensured by the microlearning model, which also raises student engagement. It does assist people in learning precise microcontents.When creating microlearning, instructors also keep the learning process in mind. Any course can benefit from the application of microlearning to enhance the teaching-learning process.(breaking the walls)In addition to helping work-based learners accomplish a specific, actionable task, microlearning allows them to acquire new knowledge or skills precisely when they are needed in this rapidly changing world. Microlearning is especially beneficial in a workplace setting because of these advantages. Additionally, microlearning can be effectively used by a large number of work-based learners who are always busy and have little time to pick up new skills or brush up on their knowledge in today's fiercely competitive business environment. shortly, work-based learning will focus even more on microlearning.(a review of the trend) Microlearning provides better Learning capacity, improved Learner contentment, quick and persisting Learning, elevated Engagement, decreased Development Time and Costs, Learning Culture Support, and enhanced Learner Efficiency[20].

Certain topics cannot be taught or learned through microlearning; instead, they require an instructive style of teaching. People who use a traditional approach might find it challenging to learn new technologies. When people need to pick up or learn complicated abilities, procedures, or behaviors, microlearning isn't helpful because Individuals re-

quire performance feedback and pertinent practice. (microlearning: a modernized education system) Also, arduous session planning may be required. The student may just listen to the lecture for the sake of an exam and be unsuccessful in making use of other independent forms of study.While podcasting,to elude reiteration,it is obligatory for universities to clearly define specifications about the execution of microlearning modes, network connectivity issues, and internet etiquette. Regard for faculty and student privacy while using social media for learning motives are some of the restrictions of microlearning[21].

Stakeholders in any learning environment include families, teachers, administrators, communities, and students. All stakeholders work together harmoniously to create an efficient learning space. Teachers are one of the most integral collaborators ina microlearning environment. In microlearning environments, teachers play a crucial role in facilitating and enhancing the learning experience. Teachers curate and select relevant, concise, and engaging microlearning content that aligns with the learning objectives. They provide guidance and support to learners as they navigate through microlearning modules. This may include answering questions, clarifying concepts, and offering feedback. With the progress in teaching and learning theories, teaching methodologies have been improved. Different educational designs and advanced approaches are in practice for teaching now.Teaching also incorporates how timetables are followed, chapters are organized, which medium of information transfer is used, interactive discussions are done, and learning goals are set and attained[22].

A positive learning environment refers to a setting in which learners feel comfortable, supported, and engaged in the learning process. In such an environment, students are more likely to be motivated, participate actively, and enjoy the learning experience. Key characteristics of a positive learning environment include:

1. Clear Expectations: Students understand what is expected of them, and there are clear guidelines for behavior and academic performance.

2. Inclusive Atmosphere: The environment respects and values diversity, creating an inclusive atmosphere where all students feel accepted and appreciated.

3. Effective Communication: Open and transparent communication between teachers, students, and parents fosters trust and understanding.

4. Engaging Instruction: Varied and interactive teaching methods keep students interested and actively involved in the learning process.

5. Appropriate Challenges: Assignments and activities are appropriately challenging, encouraging students to stretch their abilities without becoming overwhelmed.

6. Safe and Comfortable Physical Environment: The physical space is conducive to learning, safe, and well-maintained[23].

On the other hand, a negative learning environment is one in which learners may feel uncomfortable, demotivated, or disengaged. A negative learning environmentaffects the students adversely and it has an absolute influence on students' performance in general. Physical and psychological components both are important for any learning environment.

Students are the primary stakeholders in the microlearning environment, but regrettably, neither their opinions nor their thorough participation in decision-making processes are valued.In microlearning, the student's job is to create the learning material through concept exploration and social interaction, not to mimic an expert by consuming content[19]. As they take on the role of prosumer and change from being consumers to producers, learners become more driven and take on a greater sense of accountability for completing their learning objectives[19]. Finally, Buchem and Hamelmann proposed that microlearning relies on user interactions to drive idea creation and transfer, while macrolearning depends on the learner's interaction with predetermined content[24]. Student's responses and thoughts, providing them genuine advice at the right time, upgrade their understanding, expertise, and stance are all the components to be thought about while designing their courses.

Competence in teaching refers to the ability and effectiveness of a teacher in facilitating student learning and development. It encompasses a range of skills, knowledge, and attributes that enable a teacher to create a positive and productive learning environment. Competent teaching goes beyond just conveying information; it involves understanding the needs of diverse learners, adapting instructional strategies, and fostering a supportive classroom culture.Some particular adeptness and preconditions are required in medical teachers to be proficient enough to generate a positive microlearning environment[3,11]. Technology-based or non-technology-based environments, both require the teacher to be capable of microlearning module scheming, material selection,

program conveyance, evaluation methods, subject matter ability, and student participation. It is a multifaceted concept that involves a combination of knowledge, skills, and attitudes aimed at facilitating effective and meaningful learning experiences for students[25].

A progressive faculty member embraces and incorporates progressive educational principles and practices into their teaching approach. Student-centered approach, active learning, critical thinking, adaptability, real-world applicationof knowledge,and reflective practice are some of the attributes of a progressive faculty[22]. Faculty development programs are vital for getting advanced expertise and enhancing already existing ones. Management, directorship, educative, and professional development are the main aims of faculty development programs.

CONCLUSION

Our scoping review provides a deep understanding of different aspects of microlearning in the light of available literature. Further cross-disciplinary research studies can pave the way forward toward a more comprehensive theoretical framework for effectively applying microlearning to improve workplace learning and higher education in practice. Besides, it is the need of the hour that policymakers also work on designing, promoting,and use of microlearning to prepare people for digital transformation in the rapidly progressing world.

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CONFLICT OF INTEREST
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Conception or Design:	ZA, SSB, SI, SMJ, MD, SS
Acquisition, Analysis or Interpretation of Data:	ZA, SSB, SI, SMJ, MD, SS
Manuscript Writing & Approval:	ZA, SSB, SI, SMJ, MD, SS

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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