

## Unpacking the Effectiveness of Micro-Learning: A Systematic Review of Instructional Design Dimensions

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### ABSTRACT

Micro-learning is an instructional approach that delivers content in small, focused units to promote efficient and flexible learning. Although numerous studies have reported positive effects of micro-learning, existing evidence remains fragmented and often focuses on isolated variables without an integrative design-oriented perspective. This study aims to examine the effectiveness of micro-learning by synthesizing key aspects and design considerations that support its successful implementation. A Systematic Literature Review (SLR) was conducted following the PRISMA 2020 framework. Eight peer-reviewed articles from reputable academic journals were selected through strict inclusion and exclusion criteria to ensure methodological rigor, relevance, and alignment with the research objectives. While the limited number of reviewed studies may constrain the generalizability of the findings, this focused selection enables an in-depth and critical synthesis of evidence related to micro-learning design and effectiveness. The findings indicate that the effectiveness of micro-learning is influenced by three interrelated aspects: learners, content, and technology. Learner-related factors include engagement, satisfaction, performance, efficiency, and social interaction. Content-related factors emphasize cognitive load reduction, knowledge retention, and practical application, while technological factors highlight accessibility, contextualization, feedback, and interactivity. Overall, the study suggests that micro-learning can serve as an effective instructional approach when designed by integrating learner needs, content structure, and appropriate technological support to enhance learning outcomes and learner experiences across diverse educational contexts.

**Keyword:** Micro-learning; Learning effectiveness; Instructional design; Digital learning

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### INTRODUCTION

In the rapidly evolving digital and information era, sustaining learners' attention and engagement over extended learning periods has become increasingly challenging. Contemporary learners are continuously exposed to digital distractions, particularly through mobile devices, and often engage in multitasking behaviors that divide their cognitive focus across multiple activities. These conditions have prompted a shift in instructional approaches toward more flexible, time-efficient, and learner-centered models that align with fast-paced information consumption and digitally mediated learning environments. Consequently, educational innovations increasingly emphasize adaptive instructional strategies that respond to learners' limited attention spans while maintaining learning effectiveness.

One instructional approach that has gained growing scholarly attention in response to these challenges is micro-learning. Micro-learning is designed to deliver content in small, concise, and focused units that allow learners to acquire knowledge efficiently within limited time frames (Jomah et al., 2016). Previous studies suggest that micro-learning can support both individual and collaborative learning processes (Schumacher & Ifenthaler, 2018), particularly due to its short duration, focused content, interactivity, and accessibility through digital platforms (Liu & Feng, 2017). Additionally, micro-learning has been proposed as a practical response to contemporary educational and training demands shaped by rapid technological development (Alshehri, 2021). However, findings across studies vary in terms of the conditions under which micro-learning is most effective, indicating the need for a more nuanced understanding of its design and implementation.

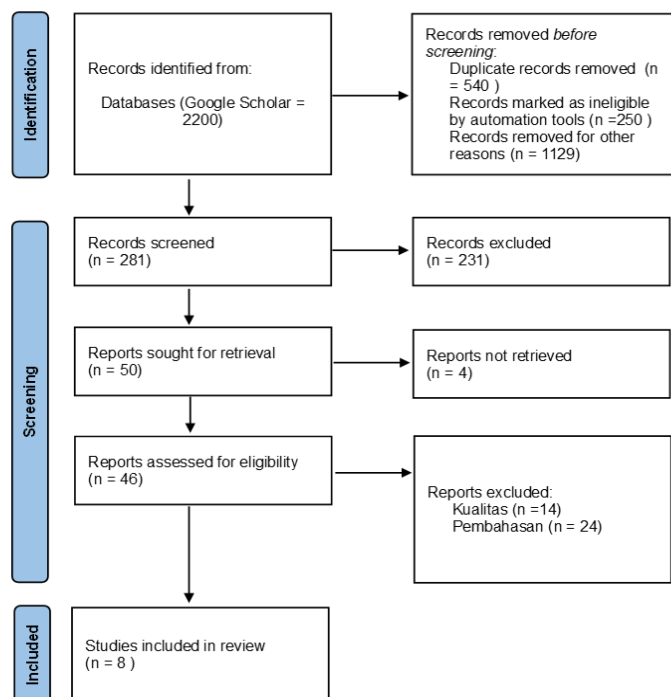
Empirical research further indicates that micro-learning structures content into small, meaningful segments that may reduce cognitive load and support flexible, self-paced learning (Mohammed et al., 2018). The widespread use of mobile technologies enables learners to access micro-learning content anytime and anywhere, facilitating contextualized learning aligned with immediate needs. Prior studies also suggest that the ability to revisit short learning units can enhance retention and understanding when content is appropriately designed (Mohammed et al., 2018). Nevertheless, these benefits are not uniformly reported across contexts, underscoring the importance of examining how specific design features influence learning effectiveness rather than relying solely on illustrative or anecdotal examples of everyday micro-learning practices.

Despite its potential advantages, micro-learning also presents notable limitations that warrant critical examination. Sozmen (2022) emphasizes that its effectiveness is shaped by learners' individual characteristics, instructors' digital competencies, and the availability of technological resources. Polasek (2019) further argues that micro-learning may be less suitable for developing complex or higher-order skills, as fragmented content can hinder holistic understanding. Additional constraints include limited opportunities for fostering certain competencies due to time and content restrictions (Rosa et al., 2023), as well as navigation difficulties arising from poorly organized or inconsistently structured learning units (Chen et al., 2022). These limitations highlight that micro-learning effectiveness is not inherent but highly dependent on how learner, content, and technological factors are integrated.

Given the diversity of findings and the contextual nature of micro-learning outcomes, a systematic and design-oriented synthesis of existing research is needed. While prior studies have examined specific variables or implementation contexts, there remains a lack of integrative analysis that consolidates key design dimensions influencing micro-learning effectiveness across studies. Therefore, this article aims to investigate the effectiveness of micro-learning through a Systematic Literature Review (SLR), with a specific focus on identifying and categorizing core design-oriented aspects related to learners, content, and technology. By synthesizing empirical and conceptual evidence, this study seeks to contribute a structured framework that clarifies how micro-learning can be effectively designed and implemented to enhance learning outcomes and learner experiences in contemporary educational contexts.

## METHODS

This study employed a Systematic Literature Review (SLR) methodology guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 protocol. The use of the PRISMA framework aimed to ensure transparency, methodological rigor, and replicability throughout all stages of the review process, from literature identification to final inclusion. SLR was selected as the most appropriate approach to synthesize empirical and conceptual evidence on micro-learning effectiveness, particularly in addressing fragmented findings and identifying key design-oriented aspects across studies. The literature selection procedure consisted of three main stages: Identification, Screening, and Inclusion, which were systematically applied to minimize selection bias and enhance the reliability of the review outcomes. Each stage is described as follows.



**Figure 1. PRISMA 2020 Flow Diagram**

During the identification stage, a total of 2,200 articles were retrieved using the initial keywords “micro learning,” “micro-learning,” and “microlearning.” The search was then refined by incorporating effectiveness-related terms, namely “effectiveness micro learning,” “effectiveness micro-learning,” and “effectiveness microlearning,” which reduced the number of retrieved articles to 1,660. Subsequently, the publication period was limited to 2017–2023 to ensure the inclusion of recent and relevant studies, resulting in 1,410 articles. At this stage, the availability of full-text articles in PDF format was also examined, yielding 281 potentially eligible articles.

The screening stage involved a multi-step evaluation of these 281 articles. First, 50 articles with the highest citation counts were selected to prioritize studies with significant academic impact. Four duplicate articles were identified and removed, leaving 46 articles for further assessment. Title and abstract screening, followed by full-text review, was conducted independently by two reviewers to assess methodological quality and relevance to the research objectives. Articles were excluded if they demonstrated insufficient methodological rigor or lacked a clear focus on micro-learning effectiveness and design considerations. As a result, 14 articles were excluded due to questionable methodological quality, and 24 articles were excluded because their content did not align with the scope of the study. Any disagreements between reviewers were resolved through discussion to reach consensus.

Following the screening process, eight articles met all inclusion criteria and were included in the final stage (Included). These selected articles constitute the corpus analyzed in this Systematic Literature Review.

## RESULTS AND DISCUSSION

To synthesize empirical evidence on micro-learning effectiveness, this study summarizes key findings from the selected articles included in the final review. Table 1 presents an overview of previous research, highlighting the research focus, context, and main outcomes reported in each study. This synthesis enables the identification of recurring patterns, convergent findings, and contextual variations related to the effectiveness of micro-learning across educational and professional settings.

**Table 1. Results of Previous Research Observations**

Title	Author	Year	Results
Trialling micro-learning design to	Chris Kossen, Chia-Yi Ooi	2021	<ul style="list-style-type: none"> <li>A significant increase in student engagement, satisfaction, and</li> </ul>

increase engagement in online courses			<ul style="list-style-type: none"> <li>performance was observed.</li> <li>Micro-learning design approaches demonstrated strong potential in addressing learner engagement barriers.</li> </ul>
The effectiveness of micro-learning in retail banking	M. Madden, Krishna K. Govender	2020	<ul style="list-style-type: none"> <li>Learners demonstrated positive responses toward micro-learning.</li> <li>Micro-learning was found to enhance job performance and business performance metrics.</li> </ul>
Beyond Chunking: Micro-learning Secrets for Effective Online Design	Amanda E. Major, Tina Calandrino	2018	<ul style="list-style-type: none"> <li>Micro-learning actively engages students and supports deeper learning.</li> <li>Micro-learning should be accessible and contextually designed to meet learners' needs.</li> </ul>
The effectiveness of microlearning to improve students' learning ability	Gona Sirwan Mohammed, Karzan Wakil, Sarkhell Sirwan Nawroly	2018	<ul style="list-style-type: none"> <li>Micro-learning was reported to improve students' learning ability by approximately 18%.</li> <li>Students were found to be motivated and able to retain information effectively.</li> </ul>
Microlearning for macro-outcomes: Students' perceptions of telegram as a microlearning tool	Tahani Aldosemani	2019	<ul style="list-style-type: none"> <li>The effectiveness of micro-learning from learners' perspectives.</li> <li>Students' perceptions of Telegram as a micro-learning platform.</li> </ul>
Social Microlearning Motivates Learners to Pursue Higher-Level Cognitive Objectives	Bernhard Göschlberger	2017	<ul style="list-style-type: none"> <li>Social micro-learning engages learners in higher-order cognitive activities.</li> <li>Learners gain deeper insights through the development of competencies.</li> </ul>
Language learning on-the-go: opportune moments and design of mobile microlearning sessions	Tilman Dingler, Dominik Weber, Martin Pielot, Jennifer Cooper, Chung-Cheng	2017	<ul style="list-style-type: none"> <li>Micro-learning integrated with ubiquitous technologies shows strong potential for language learning.</li> </ul>

	Chang, Niels Henze		<ul style="list-style-type: none"> <li>• Short learning sessions on mobile devices are more engaging, particularly during commuting or on-the-go contexts.</li> </ul>
Mobile microlearning design and effects on learning efficacy and learner experience	Yen-Mei Lee, Isa Jahnke, Linda Austin	2021	<ul style="list-style-type: none"> <li>• Mobile micro-courses enhance learners' knowledge acquisition and self-confidence.</li> <li>• Automated feedback and interactive content can be further improved.</li> </ul>

A cross-study synthesis of the reviewed articles reveals several converging patterns regarding the effectiveness of micro-learning. Across diverse educational and professional contexts, learner engagement emerges as the most consistently reported outcome, followed by improvements in learning performance, knowledge retention, and learner satisfaction. Studies focusing on instructional design (Kossen & Ooi, 2021; Major & Calandrino, 2018) emphasize that bite-sized, well-structured content plays a crucial role in reducing cognitive overload and maintaining learner attention. Meanwhile, studies conducted in workplace and professional training contexts (Govender & Madden, 2020; Lee et al., 2021) demonstrate that micro-learning can positively influence job-related performance, confidence, and practical skill application.

However, despite these consistent positive findings, several studies also report recurring challenges, including limited social interaction, insufficient automated feedback, and variability in content quality. These limitations suggest that micro-learning effectiveness is not solely determined by content size but is strongly influenced by instructional design quality, contextual relevance, and technological affordances.

The findings across the reviewed literature can be meaningfully interpreted through several established learning theories. First, Cognitive Load Theory provides a strong theoretical foundation for micro-learning effectiveness, as segmenting information into smaller units helps reduce extraneous cognitive load and allows learners to focus on essential learning elements. This theoretical alignment is evident in studies reporting improved comprehension and retention (Mohammed et al., 2018).

Second, principles of Self-Regulated Learning (SRL) are reflected in the flexibility and learner autonomy inherent in micro-learning environments. The ability to control learning pace, revisit content, and engage with materials on demand supports learners' metacognitive regulation and motivation. This is particularly evident in mobile and workplace learning contexts, where learners must balance learning with other concurrent tasks.

Third, Bloom's Taxonomy helps explain the role of social and interactive micro-learning designs in promoting higher-order cognitive processes. Studies on social micro-learning Göschlberger (2016) suggest that when micro-learning incorporates collaborative and reflective elements, it can move beyond surface-level knowledge acquisition toward analysis, evaluation, and competency development.

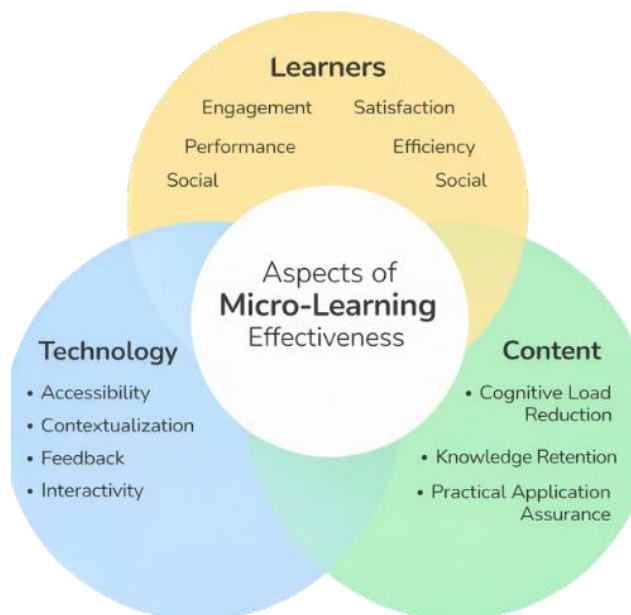
Despite the growing body of literature demonstrating the effectiveness of micro-learning, several research gaps remain. First, most studies emphasize short-term outcomes, such as immediate engagement or performance gains, while longitudinal evidence on sustained learning impact and knowledge transfer remains limited. Future research should examine the long-term effectiveness of micro-learning interventions across different learning stages.

Second, there is a lack of standardized design frameworks for micro-learning. While many studies highlight effective design principles, few provide systematic or replicable models that integrate cognitive, motivational, and technological dimensions. Developing validated micro-learning design frameworks would significantly strengthen both research and practice.

Third, although technology plays a central role in micro-learning, the impact of emerging technologies such as adaptive learning systems, learning analytics, and artificial intelligence driven personalization remains

underexplored. Future studies should investigate how these technologies can enhance feedback mechanisms, interactivity, and learner personalization within micro-learning environments.

Finally, existing research predominantly focuses on higher education and workplace training contexts. There is a need for further exploration of micro-learning effectiveness in K–12 education, inclusive learning settings, and low-resource environments, where access, contextualization, and equity issues may influence learning outcomes.



**Figure 2. Aspects of Micro Learning Effectiveness**

The importance of considering micro-learning design lies in several key aspects, as presented in Table 2. Specific design principles and instructional flows are implemented to enhance learning effectiveness (Lee et al., 2021). Micro-learning design should prioritize the application of principles that enable learners to achieve deep understanding. Consequently, appropriate design selection becomes a critical factor in ensuring that micro-learning experiences are not only efficient but also effective for all learners.

**Table 2. Aspects of Micro Learning Effectiveness**

Aspects	Microlearning Design Considerations
<b>Learners</b>	<ul style="list-style-type: none"> <li>• Considering learners’ preferred learning styles.</li> <li>• Applying instructional methods that align with learners’ needs.</li> <li>• Incorporating elements of social knowledge sharing.</li> <li>• Providing tools to support self-control and self-regulated learning.</li> <li>• Considering learners’ preferences regarding learning sessions.</li> <li>• Adjusting learning duration to create a sense of task completion.</li> </ul>
<b>Content</b>	<ul style="list-style-type: none"> <li>• Segmenting knowledge into small units to facilitate ease of understanding.</li> <li>• Ensuring content relevance to the learning objectives.</li> <li>• Aligning micro-learning activities with broader learning goals.</li> </ul>

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- Technology**
- Utilizing technology to deliver interactive notifications.
  - Employing flexible technologies to enable easy access to learning content.
  - Ensuring that the design is accessible across multiple devices.
  - Applying effective instructional design principles and learning flows.
  - Leveraging mobile micro-learning platforms with tailored instructional guidance.
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Furthermore, micro-learning design should be easily accessible across multiple devices, in line with the findings of Major & Calandrino (2018). Such accessibility not only enhances the reach of learning opportunities but also makes the learning experience more relevant and up to date. Considering current learning trends, micro-learning design must align with the dynamic and continuously evolving nature of contemporary learning environments.

The content aspect of micro-learning design also plays a crucial role. The use of small or even very small content units that focus on specific topics and are integrated with Personal Learning Environments ensures focused and effective learning. Interactivity is another key element, as it allows learners to practice skills and immediately apply newly acquired knowledge, thereby enriching their learning experience. Dingler et al., (2017) highlight that micro-learning sessions delivered through notifications or mobile applications, designed to be completed within short timeframes, add dimensions of accessibility and flexibility to learning. Additionally, considering contextual factors such as user engagement and learning context supports sustained learning over longer periods. Overall, micro-learning design not only serves as an effective solution for improving learning efficiency but also facilitates long-term knowledge retention.

## CONCLUSIONS

Micro-learning is a learning approach designed to deliver information in small, easily digestible units, enabling learners to acquire knowledge quickly and efficiently. This article has presented various categories of aspects and design considerations relevant to the development of effective micro-learning environments. The findings indicate that three key aspects must be considered to ensure the effectiveness of micro-learning. The first aspect is the learner dimension, which encompasses engagement, satisfaction, performance, efficiency, and social interaction. The second aspect is content, which includes cognitive load reduction, knowledge retention, and the assurance of practical application. The third aspect is technology, which involves accessibility, contextualization, feedback, and interactivity. By systematically integrating these three aspects, micro-learning can function as a powerful and effective instructional approach that supports meaningful learning experiences across diverse educational contexts.

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