STUDENT QUEST LITERATURE REVIEW

K20 CENTER

Abstract

This literature review examines how micro-learning supports student and adult learning through short, focused, and technology-mediated instructional experiences. Research suggests that effective micro-learning depends not only on brevity but also on intentional design, including clear learning objectives, accessible delivery formats, multimodal content, opportunities for interaction, timely feedback, and meaningful assessment. The review highlights how micro-learning can improve engagement, support knowledge retention, reduce cognitive overload, and promote flexible learning across educational and workforce contexts. It also examines the role of badges, micro-credentials, gamification, and mobile platforms in helping learners demonstrate skills and track progress. However, barriers such as badge credibility, unequal technology access, student motivation, digital distractions, and inconsistent design quality must be addressed to ensure that micro-learning experiences are meaningful, equitable, and aligned with college and career readiness goals.

Keywords: micro-learning, student engagement, digital badges, mobile learning, college and career readiness

Introduction

Instant gratification has become a defining expectation among modern students when engaging with new content (Leong et al., 2021). At the same time, attention spans are decreasing, creating challenges for traditional, long-form instructional approaches (Rathnasekara et al., 2025). In response to these shifts, educational strategies must adapt to provide more efficient, engaging, and accessible learning experiences that align with how students process information today (Davinnov & Wiryawan, 2025; Leong et al., 2021; Mercan et al., 2023).

As student expectations shift toward faster and more accessible information, micro-learning has emerged as a response to these changing demands (Boumalek et al., 2025). Micro-learning has been defined as an e-learning approach that uses student-centered, design-based methods to deliver content in small, focused segments centered on a specific skill or concept (Boumalek et al., 2025; Monib et al., 2025). Learning itself can be understood as a process of developing knowledge and skills in individuals or groups through the use of strategies, methods, and instructional approaches aimed at achieving specific goals (Alias et al., 2025). These learning experiences typically last no longer than fifteen minutes and can be as short as one minute, allowing students to engage with content in manageable, targeted increments (Leong et al., 2021; Mercan et al., 2023; Monib et al., 2025). This structure emphasizes efficiency, flexibility, and student control, positioning micro-learning as an effective instructional approach in modern educational environments.

Beyond its structure, research highlights several key benefits that make micro-learning an effective instructional approach. Micro-learning improves retention, increases engagement, enhances motivation, and promotes collaborative learning (Leong et al., 2021; C. R. Pitt et al., 2019). Additionally, its focused, chunked design supports learning across all levels of Bloom's taxonomy by allowing students to build knowledge incrementally (Krathwohl, 2002; Liyanage, 2026). These benefits are especially important in fast-paced learning environments, where students must balance multiple responsibilities and maintain focus amid constant distractions. Modern students struggle to sustain focus during long training sessions because they are "simultaneously doing multiple other actions instead of purely learning" (Shail, 2019, p. 1).

Micro-learning can also be referred to as just-in-time learning, providing immediate skills or knowledge in small chunks (Monib et al., 2025). Over the last 14 years, interest in micro-learning has increased (Boumalek et al., 2025; Leong et al., 2021). Research on the influence of micro-learning continues to evolve. Components such as engagement, design, and organization affect student learning outcomes (Boumalek et al., 2025; Siagian et al., 2020). As a result, short, targeted learning experiences not only align with cognitive processes but are also particularly well suited for delivery through digital technologies that enable flexible and accessible engagement.

These benefits are further enhanced by integrating digital technologies that support flexible and accessible learning environments. Research demonstrates that mobile device use plays a critical role in student-centered learning ecosystems by enabling students to access content anytime and at their own pace (Eom, 2023). This flexibility aligns closely with the principles of micro-learning, which emphasize accessibility, efficiency, and student control. Digital platforms such as learning management systems and mobile applications provide opportunities for delivering content in short, interactive formats that encourage engagement and continuous learning.

Among these technologies, short-form video platforms have gained increasing attention as powerful tools for delivering micro-learning experiences. Platforms such as TikTok enable users to engage with brief, creative, and interactive content aligned with micro-learning principles. Their accessibility and personalized delivery further reinforce the broader shift toward mobile-supported, just-in-time learning in higher education (Yang et al., 2025). TikTok has been described as facilitating "online micro-learning environments" through its short-video format and personalized content delivery (Yang et al., 2025, p. 1). As a result, short-form video is becoming an increasingly relevant medium for educational content delivery in formal and informal learning contexts. Micro-learning's effectiveness is also tied to how students process information in fast-paced, distraction-heavy environments. Short, focused micro-lessons delivered through mobile devices help mitigate this challenge by allowing students to engage in brief, manageable segments that fit naturally into their daily routines (Shail, 2019).

The value of micro-learning extends beyond educational settings and is increasingly evident in professional and workplace learning environments. Traditional professional development models no longer align with modern work demands, emphasizing that "96% of people search for information online in the moment they need it" (Zhang & West, 2020, p. 310). Micro-learning supports this just-in-time approach by providing concise, skill-based instruction that can be immediately applied. Micro-learning's growth can be linked to broader shifts in how professionals access and apply knowledge in the workplace. Because micro-learning delivers short, focused, skill-based instruction with minimal disruption, it supports just-in-time learning and ongoing development in ways that traditional training cannot. This relevance strengthens the role of micro-learning as a flexible and adaptive approach for lifelong learning and skill development (Boumalek et al., 2025).

Given these advantages, it is important to consider how micro-learning, particularly through video-based formats, can be designed to support specific student needs. While digital tools and platforms provide access to content, effective learning depends on how these tools are used to guide engagement, support understanding, and connect content to real-world applications.

The purpose of this literature review is to examine research on student learning through micro-learning videos, text slides, images, quizzes, and other media types to inform the development of micro-learning video resources for students and families focused on college and career preparation, with a particular emphasis on how micro-learning can be designed to improve engagement and student learning (Monib et al., 2025).

Background

Micro-learning is designed for an environment of technology-driven experiences and to impact all students (Boumalek et al., 2025). These learning experiences can be personalized, allowing students to work at their own pace as they build specific knowledge or skills in small, focused segments (Boumalek

et al., 2025; Davinnov & Wiryawan, 2025). More broadly, micro-learning emphasizes interactivity, accessibility, and targeted knowledge development (Boumalek et al., 2025). Because of these characteristics, micro-learning has become an increasingly relevant approach in contemporary learning environments.

The neurological basis for micro-learning strengthens its relevance in contemporary learning environments (Shail, 2019). Small, focused learning units support the brain's natural processes for encoding and storing information, particularly through rehearsal and reactivation. Evidence indicates that "reintroducing the lessons in smaller increments" helps students retain knowledge for longer periods and counteracts the forgetting curve (Shail, 2019, p. 3). This alignment between micro-learning structure and memory consolidation reinforces its effectiveness across diverse contexts (Shail, 2019).

Micro-learning can also be positioned within the landscape of competency-based education (CBE) and digital micro-credentials, emphasizing that all three approaches share a focus on measurable skills, student choice, and personalized pathways (West et al., 2020; Zhang & West, 2020). Micro-credentials are described as "a metadata cloud of proofs" documenting evidence of learning, issuer information, and criteria for mastery (Zhang & West, 2020, p. 312). Through micro-credentialing courses, proof of learning is provided to the student in a form they can share as evidence of their learning (Olcott, 2022). This framing reinforces micro-learning's role in enabling targeted, stackable skill development that can be validated and shared across contexts (Zhang & West, 2020).

In practice, some micro-learning courses provide students with a badge or credential as proof that they have gained knowledge or developed a new skill at an advanced level. These badges are web-based, shareable assets encoded with metadata that can display information such as the knowledge learned, who issued the badge, and when it was earned, even occasionally the evidence submitted (Boesdorfer & Daugherty, 2020; Clements et al., 2020; C. R. Pitt et al., 2019). Badges indicate that the student has mastered the knowledge or skills and met the criteria to earn the badge (Boesdorfer & Daugherty, 2020). They provide engagement and motivation for students to complete a course or learning module (Besser & Newby, 2020; Horstman et al., 2020).

Because micro-learning courses often focus on finite topics, students can recognize their strengths and weaknesses and can choose micro-learning courses to address gaps in learning and establish paths for further education or careers (C. R. Pitt et al., 2019; Hattie et al., 2023). For adult learners, these pathways can lead to a stack of badges that result in certifications or demonstrate specialized skills and abilities (Clausen, 2022). Moreover, a documented system of digital badges or other forms of micro-credentialing could give employers a more accurate picture of a candidate's ability to apply knowledge in practice rather than simply recall it (Claxton, 2015; Gauthier, 2020).

Micro-learning can therefore affect a broad range of students because it can be used in many settings to demonstrate that learning has been achieved (C. R. Pitt et al., 2019). Unlike some traditional learning environments, micro-learning has the ability to spotlight soft skills and technical skills for students (C. Pitt et al., 2019).

The flexibility of micro-learning is also reflected in the wide range of platforms and media through which it can be delivered. Micro-learning can be delivered on many platforms and media, such as podcasts, flashcards, videos, or mobile devices (Monib et al., 2025). Learning management systems are one method through which micro-learning courses can be presented to students (Boumalek et al., 2025; Horstman et al., 2020; Monib et al., 2025). Mobile devices are also commonly used for micro-learning (Boumalek et al., 2025; Monib et al., 2025). Mobile learning helps meet the goal of presenting material in a brief format that is accessible to students at all times and in any location (Boumalek et al., 2025; Monib et al., 2025).

Micro-learning is also increasingly supported by a wide range of digital platforms beyond traditional learning management systems. Mobile applications such as Duolingo and Quizlet, e-learning platforms like Coursera, Udemy, and LinkedIn Learning, and even social media tools including YouTube, Instagram, and TikTok now deliver short, targeted learning experiences that align with micro-learning principles (Mostrady et al., 2024). These platforms provide flexible, on-demand access to content and create

opportunities for students to engage with material in brief, meaningful intervals throughout their day (Mostrady et al., 2024).

Short-form video platforms are particularly relevant to the present review because they illustrate how micro-learning can be delivered through brief, highly engaging media. The disciplinary reach of short-form video platforms extends beyond informal learning, with TikTok now used across fields such as physical education, medical education, language learning, and business. Its "interactive interface, diverse content, and personalized recommendation" system has been shown to capture student attention more effectively than traditional formats (Yang et al., 2025, p. 2). These characteristics position TikTok as another digital environment capable of delivering micro-learning experiences that are brief, engaging, and tailored to student needs (Yang et al., 2025).

Research supports the role of mobile devices in enabling flexible, lifewide, and lifelong learning experiences for students (Mercan et al., 2023). Eom (2023) found that students frequently use mobile devices to access course materials, communicate with instructors and peers, and monitor their academic progress. This flexibility can be especially important for students balancing coursework with employment and other responsibilities, reinforcing the value of micro-learning environments that support self-paced and mobile access. Micro-learning encompasses competency-based education (CBE) by allowing students to demonstrate learning no matter when or where they are and at their own pace (Clements et al., 2020). Micro-learning is now part of traditional education institutions and nontraditional institutions, such as corporations (Clements et al., 2020). It is not intended to replace traditional learning but instead to supplement it and provide additional learning opportunities (Hattie et al., 2023).

This relevance extends beyond classroom learning into postsecondary access and workforce preparation. Colleges and universities accept digital badging as part of their application process. College admission officers can improve efficiency by reviewing student badges because badges offer a quick view of students' technical and soft skills that may not be visible in assessments and transcripts (C. R. Pitt et al., 2019). Students who add badges to their applications and resumes are able to communicate their postsecondary learning path (C. R. Pitt et al., 2019). Professionals who earn badges to improve or acquire skills can also add badges to their resumes for potential employers to review (Harmon & Copeland, 2016).

Finally, micro-learning should also be situated within the broader evolution of digital learning. The term e-learning emerged as the dominant term after 2002, replacing earlier labels such as network learning, computer-aided learning, and Web-based instruction (Siagian et al., 2020). It is generally defined as the delivery of learning through information technologies, including the internet, intranet, and multimedia systems (Siagian et al., 2020). The rapid growth of digital technologies and media has significantly transformed both education and the world of work (Siagian et al., 2020). Taken together, this literature suggests that micro-learning is effective not only because it aligns with how students process and retain information, but also because it can be delivered through flexible digital formats that support motivation, personalization, and skill documentation. These characteristics make mobile micro-learning a particularly promising resource for supporting students and families in college and career preparation. The next sections examine research on how micro-learning design can strengthen student engagement and learning outcomes, while also considering how students learn through technology.

Design Element

Effective micro-learning depends on more than shortening instructional content (Boumalek et al., 2025). Its design must account for how learners access information, engage with material, demonstrate understanding, and apply new skills (Boumalek et al., 2025). The following section examines the frameworks and design principles that shape micro-learning courses, including course planning, delivery methods, assessment structures, feedback, badges, and gamification.

Micro-Learning Frameworks and Foundational Design Principles

The design of these courses is important for creating positive learning outcomes and learning experiences

(Boumalek et al., 2025). Research on micro-learning design points to the importance of clear frameworks and intentional planning. Boumalek et al. (2025) studied 56 different micro-learning frameworks and developed four phases for micro-learning design. The first phase, the micro-course planning phase, focuses on the learning objectives and the needs of the student (Boumalek et al., 2025). Micro-learning courses typically center on one clearly defined learning objective so that students can quickly understand the content (Besser & Newby, 2020; Monib et al., 2025). Once objectives are established, designers identify the key concepts and knowledge to be taught and develop an outline that avoids cognitive overload while supporting smooth transitions between concepts (Boumalek et al., 2025). This phase ends with an outline of the course that focuses on avoiding cognitive overload and transitioning between concepts (Boumalek et al., 2025). Long, continuous learning sessions can cause neurotransmitter depletion and impair cognitive performance, while shorter, spaced lessons help maintain neurochemical stability (Gkintoni et al., 2025).

By breaking complex tasks into smaller, actionable steps, micro-learning enables students to apply theoretical concepts more effectively in authentic situations (Mostrady et al., 2024).

This emphasis on focused content aligns with cognitive load theory because breaking content into smaller chunks can help students retain information more effectively (Liyanage, 2026). Excessive objectives, dense content, or overly long activities lead to cognitive overload (McNeill & Fitch, 2023). Micro-learning's emphasis on brevity also supports cognitive efficiency by reducing the likelihood of mental fatigue (Shail, 2019). Micro-learning "avoids the phenomenon of mental fatigue" by allowing students to process information in brief, focused bursts rather than extended sessions that overwhelm cognitive resources (Shail, 2019, p. 9).

After planning, Boumalek et al. (2025) describe a design and engagement strategies selection phase in which designers choose activities that are engaging, relevant, and aligned with learning outcomes. Siagian et al. (2020) highlight that effective e-learning, and by extension micro-learning, depends on more than flexible delivery; it requires intentional instructional design that prioritizes student engagement, interaction, and structure. E-learning environments that are accessible anytime and anywhere support independent, self-directed learning, but their effectiveness is strengthened when they are designed around student-centered principles that give students control over pacing and participation (Siagian et al., 2020). The study emphasizes that meaningful interaction between students and instructors and among peers is essential for maintaining engagement and that LMS platforms enhance participation by integrating discussion, feedback, and collaborative elements (Siagian et al., 2020). Additionally, effective learning models incorporate key components such as clear sequencing of content, use of examples, opportunities for practice, and deliberate motivation strategies, all of which can be embedded within short micro-learning units (Siagian et al., 2020). Frequent formative assessment further supports learning by providing immediate feedback and enabling continuous improvement (Siagian et al., 2020). Finally, the use of multimedia, particularly the combination of narration and animation, enhances both retention and transfer of knowledge, demonstrating that carefully designed, interactive, and multimodal experiences are critical for improving student understanding and engagement (Siagian et al., 2020). In fact, incorporating sound, images, and animation into multimedia design enhances student learning by improving cognitive functions such as perception, attention, memory, and motor skills (Siagian et al., 2020). This phase also includes formative assessments and reflections that enable students to provide evidence of their learning (Boumalek et al., 2025).

The third phase is the micro-media production phase, during which designers create interactive elements with a focus on professionalism and quality (Boumalek et al., 2025). The final phase is the presentation and micro-course delivery phase, in which the course should be clear, organized, and user-friendly (Boumalek et al., 2025). Simple navigation tools and short, clear titles and descriptions help students understand quickly what they are learning and reduce cognitive load (Boumalek et al., 2025). Although frameworks vary, these are four common phases that are found in most micro-learning courses that are effective and high quality. Developers must also emphasize content quality, accessibility, simplicity, load

time, and readability to support learning effectively (Xu et al., 2025).
Khan's e-learning framework provides a complementary perspective. Corbeil et al. (2021) explain how Badrul Khan's e-learning framework outlines eight dimensions that shape effective digital learning: pedagogical, technological, interface design, evaluation, management, resource support, ethical, and institutional. Khan (2020) defines micro-learning as "a single objective-focused, outcome-based, stand-alone, meaningful, and interactive learning unit delivered in bite-sized snippets" either digitally or nondigitally (Corbeil et al., 2021, p. 6). Beyond content development, designers must also consider the development of the micro-learning system itself, including the platform workflow, the scope of participants, the resources available, and the structure of the badging system (Clements et al., 2020). Part of the workflow is the designing of the platform and the badges, with many decisions being made for the design and metadata (Clements et al., 2020). Developers need to determine whether a badge is issued by a facilitator or awarded automatically (Clements et al., 2020). The scope of the system is affected by the participants selected and the resources available (Clements et al., 2020). The platform, badging design, and content should be reviewed regularly based on student feedback, standards, and changes in technology (Clements et al., 2020).
Together, these frameworks suggest that effective micro-learning begins with purposeful structure and careful alignment between objectives, content, assessment, and the learning environment. Once that foundation has been established, the next consideration is how micro-learning is delivered and for what instructional purpose.

Delivery, Instructional Purpose, and Multimodal Interaction

Micro-learning supports the increasing integration of technology in current education by delivering information through brief, focused segments of digital content and media, including videos, graphics, and interactive tools such as quizzes and polls (Astiwardhani & Sobandi, 2024). Technology does not improve learning by itself (Ellis & Bliuc, 2019). Effective learning occurs when tasks are carefully designed to guide students in using technology in meaningful, purposeful ways (Ellis & Bliuc, 2019). For this reason, the instructional design of a micro-learning course must emphasize student-centered learning so that students have a meaningful learning experience (Boumalek et al., 2025). Educators must be able to apply learning methods that are aligned with the characteristics and needs of their students (Alias et al., 2025). Designers and course creators should incorporate traditional learning methods to create a blended approach between mobile learning and classroom learning (Hattie et al., 2023). Strong design principles such as time, animation, art, and content are essential for effectively engaging and educating students (McNeill & Fitch, 2023). Additionally, micro-learning offers a more personal and adaptive learning experience for students, allowing educators to focus on addressing individual learning styles and needs (Astiwardhani & Sobandi, 2024). To support this purpose, content should remain focused on a single topic or idea, include all necessary information for independent completion, and account for accessibility for all students, including students with disabilities (Mercan et al., 2023; Hattie et al., 2023).
One strategy to boost effectiveness and motivation is designing interactive and multimodal learning modules. Designers can strengthen motivation, effectiveness, and learning by integrating quizzes, short videos, simulations, audio clips, animations, and infographics into micro-learning modules (Astiwardhani & Sobandi, 2024; Boumalek et al., 2025; Monib et al., 2025). Through quizzes, students can get immediate feedback, see areas of improvement, and increase their retention of the concept (Boumalek et al., 2025). Feedback informs students about gaps between their current performance and mastery of the content (Besser & Newby, 2020). Similarly, using a variety of engagement styles can make micro-learning more effective across multiple content areas (Horstman et al., 2020). While narration alone and narration paired with animation both improve retention, combining narration with animation produces stronger results for transfer tasks (Siagian et al., 2020). This suggests that combining verbal and visual information supports deeper understanding, even when it does not dramatically increase basic recall (Siagian et al., 2020). More broadly, integrating sound, images, and animation enhances cognitive processes such as perception,

attention, memory, and motor skills, leading to more effective learning overall (Siagian et al., 2020). These features can improve students' attitudes toward learning and support a wider range of learning styles and preferences (Boumalek et al., 2025; Hattie et al., 2023). Providing varied presenters can increase engagement, especially when a student can relate to the person on the screen (Boumalek et al., 2025). The instructional purpose of micro-learning is also reinforced when lessons are timely and relevant. Zhang and West (2020) emphasize the importance of situating micro-learning in authentic workplace contexts and argue that lessons should provide "just-enough information" for students to apply a skill immediately (Zhang & West, 2020, p. 315). When students can apply skills directly to real tasks, the relevance and impact of micro-learning increase substantially (Zhang & West, 2020). The just-in-time orientation strengthens motivation and ensures that micro-learning functions as both performance support and professional development (Zhang & West, 2020). Siagian et al. (2020) likewise emphasize that each micro-unit should include a clear concept, an example, a quick practice task, and a motivational hook. They also stress that students should be actively involved through decision-making, problem-solving, and interaction rather than only passively watching videos (Siagian et al., 2020).

Mobile technology further supports these design goals by promoting interaction and self-regulated learning. Through self-regulated learning, students set their own goals and monitor their own progress, motivation, and behaviors (Gish-Lieberman et al., 2021). Self-regulated learning plays a critical role in student success within micro-learning environments and is a central mechanism through which mobile device use influences learning outcomes. Features such as goal setting, progress monitoring, and access to timely feedback allow students to take an active role in managing their learning (Gish-Lieberman et al., 2021). This alignment between self-regulation and micro-learning supports students' ability to engage meaningfully with content and retain knowledge over time (Eom, 2023). Empirical research also highlights the importance of mobile technology in supporting interaction and self-regulated learning within digital learning environments (Eom, 2023). These findings suggest that micro-learning courses should be intentionally designed to promote interaction, timely feedback, and opportunities for students to monitor and regulate their own progress (Eom, 2023). Taken together, these studies indicate that delivery design should emphasize interaction, accessibility, multimodal presentation, and student control. One important way these design principles become visible in practice is through badges and related systems of assessment and feedback.

Badges, Assessment, and Feedback

When creating a micro-learning course, the content needs to be defined, the criteria for when the content has been mastered should be clear, and potentially a decision should be made for when a badge is awarded (Boesdorfer & Daugherty, 2020). Before students earn a badge, they should be required to show their learning through an artifact or a demonstration of the specific skill learned (Clausen, 2022). Without the proof of learning, the badge or micro-learning course loses its credibility and, in some cases, the motivation of the students (Clausen, 2022). These assessments or artifacts should be evaluated by individuals with the knowledge, skills, and understanding needed to judge the targeted competencies and the extent to which the artifact represents them (Hickey & Chartrand, 2020).

Feedback is central to this process. During the evaluation process, students should receive specific feedback and opportunities to revise and resubmit their artifact (Clausen, 2022). Effective feedback helps clarify the requirements for mastery, identifies the gap between current performance and desired learning, and supports students in correcting misconceptions (Besser & Newby, 2020). Besser and Newby (2020) note that feedback may be corrective, reinforcement-based, benchmarking, or guiding in nature, and that the absence of feedback can negatively affect learning outcomes. Students value feedback that recognizes the time and effort they invested in learning. (Besser & Newby, 2020).

Badges themselves serve both motivational and communicative purposes. The purpose of badges is to provide both an incentive for participation and proof that a student has completed a course or mastered a specific skill. However, the criteria for earning a badge must be clearly aligned with its intended purpose

to ensure credibility and meaningful recognition (Horstman et al., 2020). One option developers have with micro-learning is awarding a badge to the student for completing a course. Research suggests that badges gain additional value when they are connected to external organizations because this connection increases the badge's merit and relevance beyond the course itself (Horstman et al., 2020). The type of badge awarded can influence the course's impact beyond the learning environment (Horstman et al., 2020). Students and other stakeholders increase their motivation to participate in a course with a real-life application of a badge and the learning connected to it, which increases the impact of micro-learning (Horstman et al., 2020; Zhang & West, 2020). Participants can display badges on social media, websites, resumes, and other digital platforms to gain recognition for their skills and knowledge they have acquired (Besser & Newby, 2020). This alignment can create challenges for developers, as they must make deliberate decisions about which badges to issue and how course content supports those outcomes (Horstman et al., 2020). The function, content, and structure of the course ultimately determine which badge design is most appropriate.

Sequencing and the frequency of badge issuance can also influence both the design of the learning platform and the overall learning experience for students (Horstman et al., 2020). Badge types vary by when and how a badge is issued in the course and can include peer-awarded, expert-awarded, teacher-awarded, automatically awarded, hidden, unlocking, repeatable, and timed badges (Horstman et al., 2020). Badges may also be open or free to anyone or stackable, showing the building of skills or knowledge over time (Besser & Newby, 2020). Horstman et al. (2020) suggest that badges representing a learning pathway should be thoughtfully nested so that progression and skill development are clear. Content should be intentionally sequenced, practice opportunities should be included, and students should be encouraged to reflect on their own growth, fostering intrinsic motivation through meaningful activities and tasks (Horstman et al., 2020). In this way, badges can represent not only completion but also student effort, development, and transferable competencies (Harmon & Copeland, 2016; Horstman et al., 2020).

When designing a micro-learning course and its associated badge, developers and content creators should be guided by several key design principles that support clarity, engagement, and student growth. This structural clarity helps students understand how individual achievements connect within and across courses. Engagement strategies and opportunities for students to practice their skills are equally important, as they help create a functional learning framework that reinforces understanding and application (Horstman et al., 2020). Research shows that micro-learning with badges is more successful when the assessment or artifact focuses on individual skills or knowledge (Hickey & Chartrand, 2020). Ultimately, effective micro-learning design blends content knowledge with skill development, ensuring that students not only acquire information but also build competencies that are transferable beyond the course itself (Horstman et al., 2020). Although not all courses can incorporate every aspect of these principles a combination of them can be just as effective (Horstman et al., 2020). Although badges can function as stand-alone indicators of achievement, they are often even more effective when paired with motivational features that make learning progress visible, interactive, and personally meaningful. This brings the discussion to gamification.

Gamification

Gamification is the addition of interactive gaming elements and rewards that make the task more engaging to the participant (Laubersheimer et al., 2016). In micro-learning environments, game design elements or gamification can further enhance motivation and engagement, particularly when aligned with learning objectives and integrated with badging systems (Boumalek et al., 2025; Horstman et al., 2020). Game design principles can help students better understand the goals of the course and become more active participants in their own learning (Horstman et al., 2020). When micro-learning courses have achievements and awards, student motivation and engagement in the interactive elements increase, creating a better learning environment (Boumalek et al., 2025; Laubersheimer et al., 2016). Research

shows that badging combined with gamification can increase participation, self-regulated learning, and competitiveness among students (Facey-Shaw et al., 2020; Harmon & Copeland, 2016).
At the same time, effective gamification depends on more than points and rewards. Goal setting, outcome expectations, and social status can affect students' responses to gamification (Facey-Shaw et al., 2020). Learner choice is also important. Allowing students to choose their own learning path can improve learning and engagement because it aligns the experience with their learning styles, strengths, and interests (Boumalek et al., 2025; Harmon & Copeland, 2016; Hattie et al., 2023; West et al., 2020). This increased choice can strengthen self-efficacy and shift the focus from external rewards to meaningful learning (Laubersheimer et al., 2016). Progress tracking and feedback can also impact students' study skills as they adjust their learning to meet their own needs and track their progress in the micro-learning platform (Hattie et al., 2023).
Recent app-based research reinforces these design principles. (J. Kim et al., 2021), in a meta-analysis of educational apps, found that app-based learning produced a modest but meaningful positive effect on student achievement, but that effectiveness depended more on the quality of the learning experience than on the amount of use. High-impact apps were those grounded in active engagement, meaningful practice, clear learning goals, and opportunities for feedback (J. Kim et al., 2021). Surveys are an effective way for developers and instructional designers to gather information about a student's learning experience, preferences, growth of knowledge, and satisfaction with the course itself (Boumalek et al., 2025). The authors also found that apps can be especially effective when they support social interaction and co-engagement with caregivers, and that gamification is most effective when it is integrated with structured learning goals rather than used only as entertainment (J. Kim et al., 2021).
While these design elements establish the structure of micro-learning environments, their importance ultimately lies in how they influence student learning. The effectiveness of micro-learning depends not only on content brevity but on the quality of its design. Frameworks, delivery choices, assessment systems, badges, and gamification shape how students engage with content and demonstrate progress. The next section examines how these elements affect student learning, engagement, and outcomes, and how students learn through technology.

Student Learning

Building on the influence of design elements, it is essential to examine how these instructional decisions shape student learning, engagement, and long-term knowledge development. Whether students are learning in the classroom or online, it is important that their learning is meaningful and effective. Students who view their online learning with positive perspectives are shown to have a deeper understanding of the content (Ellis & Bliuc, 2019). Students need to understand the importance and the implications of their learning for it to be retained and for them to view the information as important (Ellis & Bliuc, 2019).

Student Learning and Engagement in Digital Environments

Micro-learning environments promote engagement by presenting content in shorter, more accessible formats. These condensed learning experiences allow students to interact with content more frequently and at a manageable pace, which increases both engagement and efficiency (Mercan et al., 2023). Research shows that students enjoy the interactive elements of micro-learning, such as quizzes and real-life scenarios. When students are provided with a variety of digital options, they are more engaged, improve their digital literacy, and have a higher overall satisfaction rate for the course (Liyanage, 2026). Students appreciate the convenience of integrating micro-learning into their daily routines and learning tips and suggestions for content application throughout lessons or courses (Lee et al., 2021).
The use of mobile devices further enhances this experience by enabling flexible access to content, improving time management and focus while supporting structured, chunked learning (Liyanage, 2026; Hattie et al., 2023). Research has shown that students who use mobile learning applications may earn higher grades and assessment scores compared to students who just use traditional study skills (Hattie et

al., 2023).
Evidence from multiple disciplines demonstrates that short-form micro-learning can improve academic performance. Studies summarized in a recent systematic review reported gains in knowledge retention, oral proficiency, and practical skill development, with one study showing that TikTok-assisted students outperformed traditional students by 12.9% on final exam scores (Yang et al., 2025, p. 5). These findings reinforce the broader argument that micro-learning's focused, bite-sized structure supports both immediate performance and long-term retention (Yang et al., 2025).

Cognitive Processes: Retention, Chunking, and Cognitive Load

Beyond general engagement, research highlights the importance of how micro-learning influences cognitive processing and knowledge retention. Micro-learning helps students avoid mental fatigue due to the pace at which they can interact with the learning (Mercan et al., 2023). Knowledge retention is improved when students chunk information and revisit content over time, allowing for repeated exposure and reinforcement (Liyanage, 2026). Chunked learning also enables students to access content more easily and at convenient times throughout their day (Leong et al., 2021). Chunks of content should be able to be taught as a separate part of a larger body of content without needing to pull in a large amount of information (Monib et al., 2025). By isolating key concepts into manageable segments, micro-learning reduces cognitive overload while maintaining meaningful learning outcomes (Monib et al., 2025). Micro-learning's tightly focused structure further supports this process by helping students avoid cognitive overload and improving retention through the isolation of essential skills (Zhang & West, 2020). Dividing traditional training into micro-learning requires identifying "must-know information" and eliminating extraneous details, enabling students to process and recall content more efficiently (Zhang & West, 2020, p. 314). Together, these features highlight how precision in content design contributes to improved retention and cognitive efficiency across diverse student populations (Zhang & West, 2020).

Active Learning, Agency, and Skill Development

In addition to cognitive benefits, micro-learning environments support active learning behaviors and the development of transferable skills. Students enjoy active learning and the ability to apply their learning long-term (Heinert et al., 2021). A student's inner drive to learn can be understood through achievement motivation, which reflects the tendency to actively pursue goals and perform tasks with a focus on success and improvement (Liu & Correia, 2021).
Micro-learning and badges provide a way to address the challenge of soft skills such as time management, communication, and collaboration, which are essential for both academic success and career readiness (Besser & Newby, 2020). Micro-learning provides an alternative option for students to practice and demonstrate competencies that are often difficult to integrate into traditional classrooms.
Inquiry-based instruction (IBI) has been widely advocated as an effective pedagogical approach for fostering student engagement and deeper learning through authentic, problem-centered experiences (West et al., 2020). IBI emphasizes "open investigations of authentic problem scenarios in a student-centered and collaborative learning classroom context," allowing students to engage directly with the types of ill-structured problems they are likely to encounter in real-world settings (West et al., 2020, p. 828). The contextualized nature of these problems helps students recognize the relevance of key concepts, which in turn enhances motivation and engagement (West et al., 2020). Moreover, the open-ended structure of IBI promotes student agency by enabling students to take ownership of their learning process, a factor shown to support sustained engagement in problem-solving activities (West et al., 2020). As students actively construct meaning through these experiences, they develop higher-order cognitive skills such as causal reasoning, decision-making, and goal-directed thinking, while also facilitating schema formation and conceptual change (West et al., 2020). This approach is particularly valuable in fields requiring immediate performance, such as healthcare, engineering, or technical trades, where students may use micro-learning as just-in-time performance support to guide their work (Mostrady et al., 2024).

Importantly, the authentic and exploratory nature of inquiry tasks also contributes to increased self-efficacy and motivation, while supporting the transfer of knowledge to new and similar contexts (West et al., 2020). Although IBI is often implemented in extended instructional formats, recent work suggests that its core principles, including authentic problem engagement, student autonomy, and scaffolded meaning-making, can be adapted (West et al., 2020). In this way, integrating IBI-inspired design elements into micro-learning platforms presents a promising strategy for enhancing student engagement while maintaining the efficiency of shorter instructional units.

Digital Literacy and Technology-Mediated Learning

As micro-learning increasingly relies on digital platforms, students' ability to navigate and critically engage with technology becomes equally important. Digital literacy impacts the ability of students to retain information and learning in a micro-learning setting (Davinnov & Wiryawan, 2025). Skills such as critical thinking, information evaluation, and the capacity to produce and share information responsibly are a key part of a student's digital literacy (Davinnov & Wiryawan, 2025). Using digital literacy skills can increase comprehension for a student participating in micro-learning (Davinnov & Wiryawan, 2025). Students must actively engage with content and possess the digital skills necessary to navigate learning platforms effectively in order for meaningful learning to occur (Santana Gomes et al., 2021).

Multimedia, Social Interaction, and Engagement Design

Beyond individual interaction with content, multimedia design and social engagement play a critical role in shaping learning outcomes. Incorporating multimedia elements such as video and animation can improve motivation, participation, and learning retention (Shail, 2019). Research on short-form video–supported instruction highlights consistent gains in motivation, participation, and enjoyment, particularly in self-directed learning environments (Yang et al., 2025). At the same time, exposure to non-educational content can challenge students' self-regulation and focus, underscoring the need for intentional design and structured learning pathways (Yang et al., 2025). Social interaction further enhances learning by supporting dialogue, feedback, and collaborative engagement, which reinforces self-regulation and perceived learning outcomes (Gish-Lieberman et al., 2021).

Adult Learning

While these findings highlight the impact of micro-learning on student populations, similar principles extend to adult students, particularly those balancing education with professional responsibilities. Micro-learning has become increasingly relevant for adults seeking flexible, career-aligned opportunities for continuous skill development.

Workforce Relevance and Credentialing

Increasing numbers of adults already immersed in their careers are relying on micro-learning to help them demonstrate competencies in their field (Clausen, 2022). Employers are encouraging them to complete micro-learning courses as a way to meet the ever-changing needs of their careers and to continue to develop their knowledge and skills (Clausen, 2022). Many employers would prefer to hire applicants who could present verified digital badges demonstrating applied competency alongside a traditional transcript (Gauthier, 2020). Stackable credential systems further support this process by allowing students to build evidence of proficiency over time (Gauthier, 2020).

Flexibility, Autonomy, and Lifelong Learning

A key advantage of micro-learning for adult learners is flexibility. Now more than ever, many undergraduates work full- or part-time jobs and can only attend education classes part time. Mobile technology enables adult learners to engage in coursework across varied locations and schedules, supporting both lifelong and lifewide learning (Chen, 2017). This flexibility is particularly beneficial for

adult learners managing professional responsibilities, making micro-learning an effective approach for continuous skills development and career advancement (Eom, 2023). In these situations, students keep a flexible schedule to help them "complete their coursework at their own pace" (Eom, 2023, p. 81). Mobile micro-learning environments allow adults to choose "what, when, and how they learn," supporting personalized pacing and repeated practice (Shail, 2019, p. 7). These features make micro-learning particularly effective for working adults who must balance learning with professional and personal responsibilities (Shail, 2019).

Motivation, Support, and Engagement in Adult Learners

However, flexibility alone does not guarantee engagement. Organizations that are creating micro-learning for adult and student learners need to consider participant buy-in. Providing incentives beyond knowledge acquisition or badging can help get micro-learning off the ground when it is new and students are uncertain about its benefits (Luke & Young, 2020). Peer-to-peer collaboration or conversation, such as discussing learning or problems, provides feedback and has also proven to help motivate adults and students when it comes to micro-learning (Luke & Young, 2020). Being able to discuss problems or learning with a peer provides feedback that some adults and students need to motivate and encourage learning (Luke & Young, 2020). Additionally, feedback from the course reviewer affects learning by indicating whether students need to revise and resubmit an artifact or have met the course requirements (Luke & Young, 2020).

Peer collaboration and discussion opportunities provide essential feedback and encouragement, while structured guidance helps students remain engaged despite challenges such as time constraints and competing responsibilities.

Successful adoption of micro-learning tools among adult learners depends on a combination of user characteristics, technical support, and socio-cultural context (Yang et al., 2025). These factors shape whether short-form video platforms enhance or hinder sustained engagement, particularly for students balancing work and study demands (Yang et al., 2025). Challenges related to distraction and self-regulation have been documented, suggesting that adult learners benefit from clear structure and intentional scaffolding when engaging with micro-learning environments (Yang et al., 2025).

Barriers

One of the biggest barriers to micro-learning badging is establishing the credibility of the badge for external stakeholders (Heinert et al., 2021; C. R. Pitt et al., 2019; Gauthier, 2020). Without credibility and shared meaning, the badge loses its value (Horstman et al., 2020). External stakeholders, such as college admission officers, express concern about distinguishing between badges that reflect true skill development and those that represent participation alone (C. R. Pitt et al., 2019). Students submitting badges with their college applications can create another barrier, as it will require colleges and their admissions offices to adjust their workflow and processes to allow badges into their already tight timelines (C. R. Pitt et al., 2019). Students need instruction on how to share badges with potential colleges and employers; without that information provided in a course, it would create another barrier (Heinert et al., 2021). Another concern is the use of fake badges or falsified information used to prove a student has gained knowledge or a skill (C. R. Pitt et al., 2019).

Besides credibility issues, student motivation presents another challenge. Research suggests that participatory badges are less motivating than those requiring demonstrated effort and mastery (Facey-Shaw et al., 2020; Hickey & Chartrand, 2020). Participatory badges primarily affect extrinsic motivation, whereas badges tied to demonstrated skills may better support intrinsic motivation (C. R. Pitt et al., 2019). Badges can also lose their novelty and become less motivating, therefore decreasing student motivation if they lack intentional design and do not provide students with control over their learning (Facey-Shaw et al., 2020). Badges from micro-learning can have different effects on students based on prior knowledge, student characteristics, the topic of the course, and the type of badge being earned (C. R. Pitt et al., 2019).

Student-related factors further influence engagement with micro-learning. As students progress through the year, school work or their daily job, their motivation and time available can ebb and flow, affecting their ability to take the time needed for micro-learning or earning badges (Facey-Shaw et al., 2020). Technology-related challenges also affect learning outcomes. By learning through a mobile device, such as a phone, students can become distracted by other applications or social media, impacting their academic performance (Hattie et al., 2023; Xu et al., 2025). Broader digital trends reinforce these concerns. The rise of mobile connectivity has significantly altered how individuals access information, with widespread smartphone use shaping learning habits and attention patterns (Auxier et al., 2019). "Growth in mobile and social media use has sparked debates about the impact of screen time on America's youth – and others. More than half of teens (54%) believe they spend too much time on their cellphones, while 41% say they spend too much time on social media, and about one-quarter say the same about video games, a 2018 survey found" (Auxier et al., 2019). According to Pew Research Center, "Social media is not only a daily feature in the lives of teens, some report using these platforms 'almost constantly.' About one-in-five teens say this of TikTok and YouTube" (Faverio et al., 2025).

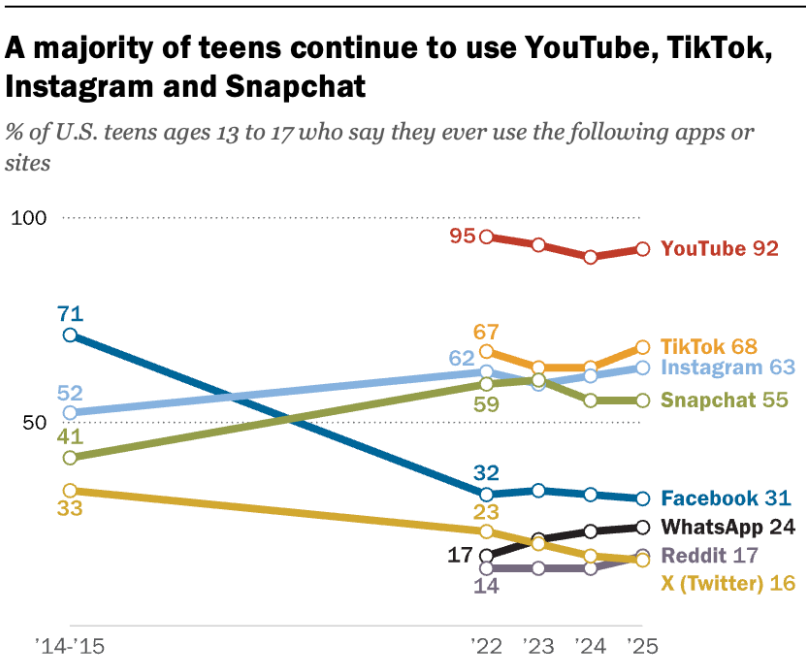

Figure 1. Teen Use of Major Social Media Platforms From 2014–2015 to 2025. From Teens, Social Media and AI Chatbots 2025, by Faverio et al. (2025), Pew Research Center.

According to Faverio et al. (2025), the Pew Research Center surveyed 1,458 U.S. teens (ages 13–17) and their parents online from Sept. 25 to Oct. 9, 2025, using Ipsos' KnowledgePanel, which recruited teens through their parents. Results represent U.S. teens living with parents and parents of teens in that age range (Faverio et al., 2025). The margin of error is ±3.3 percentage points for both groups. External institutional review board Advarra reviewed and approved the study to ensure participant protection (Faverio et al., 2025).

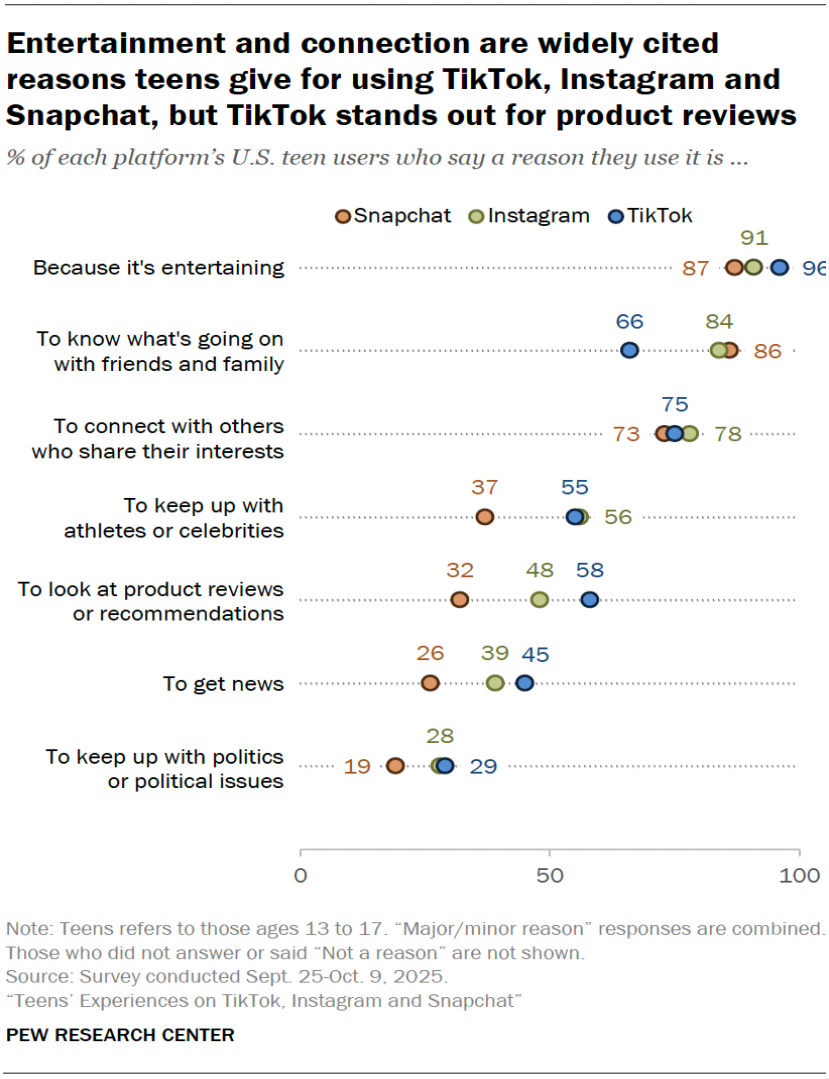

Figure 2. Reasons Teens Use TikTok, Instagram, and Snapchat. From Teens' Experiences on TikTok, Instagram, and Snapchat, by Faverio et al. (2026), Pew Research Center.

Access and equitable-use issues present additional barriers to implementation. Another major barrier is the lack of access to devices for all students (Hattie et al., 2023; Xu et al., 2025). Younger students in particular do not all have access to a smartphone or tablet outside the school day. This issue should be addressed by schools, universities, and organizations that plan to implement micro-learning for younger students or adults (Hattie et al., 2023). Lower-income students face the same issue, as they may not have access to a compatible device or a stable internet connection that allows them to access the content (Xu et al., 2025). Institutions implementing micro-learning initiatives must address these disparities. Instructional challenges must also be considered when designing micro-learning experiences. Abstract content can be more difficult for students to understand in a micro-learning course (Mercan et al., 2023).

Even when individual learning is enhanced, one cannot predict the best time or process for students to learn (Mercan et al., 2023). This is why students with learning disabilities or psychological disorders may struggle more with the benefit of micro-learning (Mercan et al., 2023).

Finally, design quality remains a critical factor influencing learning effectiveness. Without intentional design to promote interaction, feedback, and self-regulation, mobile learning tools may not fully support meaningful learning outcomes (Eom, 2023). Research highlights instructional and design challenges associated with mobile learning environments. Micro-learning courses or applications need to be well designed to positively impact student learning (Hattie et al., 2023). When courses lack quality, student learning suffers (Liyanage, 2026). Learners trust micro-learning when its title and content are clearly relevant, balanced, and grounded in factual information (McNeill & Fitch, 2023).

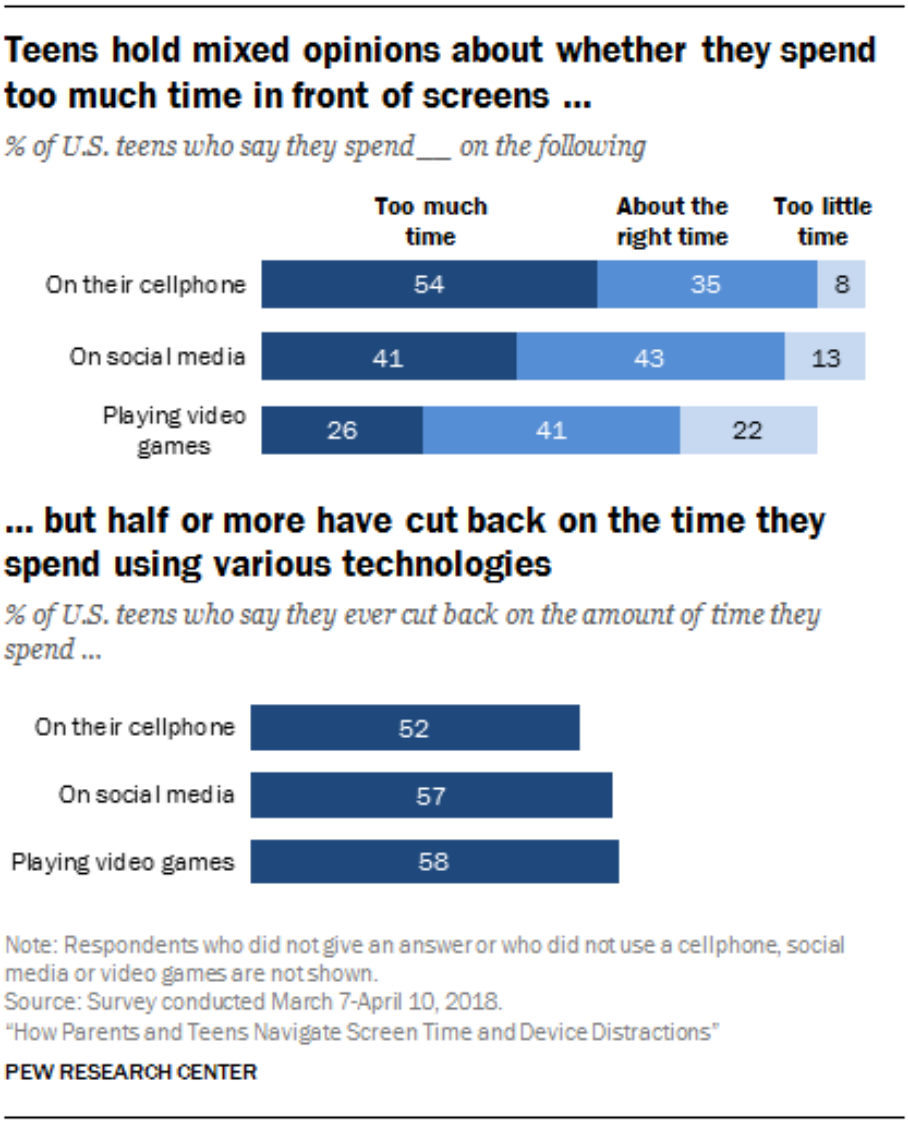

Figure 3. Teens' Perceptions of Screen Time and Efforts to Reduce Technology Use. From How Teens and Parents Navigate Screen Time and Device Distractions, by Jiang (2018), Pew Research Center.

According to Jiang (2018), "Teens have also become much more likely to use smartphones: More than nine-in-ten (95%) teens ages 13 to 17 report owning or having access to a smartphone, according to a 2018 survey."

Conclusion

The literature consistently demonstrates that the effectiveness of micro-learning is determined not simply by content brevity but by the intentional design of learning experiences that align objectives, engagement

strategies, delivery methods, and assessment systems (Boumalek et al., 2025; Davinnov & Wiryawan, 2025; Liyanage, 2026). Research shows that micro-learning platforms can improve learning outcomes (Monib et al., 2025). Across studies, well-designed micro-learning environments support engagement, reduce cognitive overload, and enhance retention by presenting content in focused, structured formats that align with how students process information (Mercan et al., 2023; Shail, 2019).

A clear pattern emerges across the research: effective micro-learning begins with purposeful frameworks and planning, is strengthened through interactive and multimodal delivery, and ultimately influences learning through active engagement, cognitive processing, and opportunities for real-world application (Boumalek et al., 2025; Mostrady et al., 2024; Zhang & West, 2020). These elements collectively support both student and adult learners by promoting flexibility, autonomy, and meaningful skill development (Clausen, 2022; Eom, 2023).

At the same time, the literature highlights important challenges that must be addressed for micro-learning to reach its full potential. Issues related to badge credibility, student motivation, access to technology, and the quality of instructional design can limit the effectiveness of micro-learning environments if they are not carefully considered (Facey-Shaw et al., 2020; Heinert et al., 2021; Horstman et al., 2020; Xu et al., 2025). These findings reinforce the need for intentional and evidence-based design practices that support not only engagement but also fair and meaningful learning outcomes (Eom, 2023; Hattie et al., 2023).

Taken together, this body of research suggests that micro-learning is most effective when it is thoughtfully designed to integrate cognitive, motivational, and technological principles. These insights provide a foundation for the development of micro-learning video resources aimed at supporting student engagement and learning, particularly in the context of college and career readiness, where students require accessible, relevant, and immediately applicable knowledge and skills (Mostrady et al., 2024; Yang et al., 2025).

References

Alias, H., Basri, H., Saprin, S., & Yuspiani, Y. (2025). Methods in learning: An introduction and conceptual Review. ETDC: Indonesian Journal of Research and Educational Review, 4(4), 1488–1502. https://doi.org/10.51574/ijrer.v4i4.3484

Astiwardhani, W., & A. Sobandi. (2024). Transforming educational paradigms: How micro learning shapes student understanding, retention, and motivation? Journal of Education Action Research, 8(2), 300–309. https://doi.org/10.23887/jear.v8i2.77711

Besser, E. D., & Newby, T. J. (2020). Exploring the role of feedback and its impact within a digital badge system from student perspectives. TechTrends, 64, 484–497. https://doi.org/10.1007/s11528-019-00386-2

Boesdorfer, S. B., & Daugherty, J. (2020). Using criteria-based digital badging in high school chemistry unit to improve student learning. Journal of Science Education and Technology, 29(3), 421–430. https://doi.org/10.1007/s10956-020-09827-7

Boumalek, K., Bakki, A., El Mezouary, A., Hmedna, B., & Eddahibi, M. (2025). Micro-learning design and micro-course structuring: A systematic literature review. Interactive Learning Environments, 0(0), 1–27. https://doi.org/10.1080/10494820.2025.2545955

Chen, J. C. (2017). Nontraditional adult learners: The neglected diversity in postsecondary education. SAGE Open, 7(1), 215824401769716. https://doi.org/10.1177/2158244017697161

Clausen, J. M. (2022). Learning to fly: Development and design of a micro-credentialing system for an educator preparation program in the absence of a required educational technology course. TechTrends, 66(2), 276–286. https://doi.org/10.1007/s11528-021-00673-x

Claxton, G. (2015). Intelligence in the flesh: Why your mind needs your body much more than it thinks. Yale University Press.

Clements, K., West, R. E., & Hunsaker, E. (2020). Getting started with open badges and open microcredentials. The International Review of Research in Open and Distributed Learning, 21(1), 153–171. https://doi.org/10.19173/irrodl.v21i1.4529

Conde-Caballero, D., Castillo-Sarmiento, C. A., Ballesteros-Yánez, I., Rivero-Jiménez, B., & Mariano-Juárez, L. (2024). Microlearning through tiktok in higher education. an evaluation of uses and potentials. Education and Information Technologies, 29(2), 2365–2385. https://doi.org/10.1007/s10639-023-11904-4

Corbeil, J. R., Khan, B. H., & Corbeil, M. E. (Eds.). (2021). Microlearning in the digital age: The design and delivery of learning in snippets. Routledge.

Davinnov, J. K. P., & Wiryawan, D. (2025). Microlearning factors to impact the digital literacy capabilities in the Tiktok application. 2025 IEEE 7th Symposium on Computers & Informatics (ISCI), 293–298. https://doi.org/10.1109/ISCI65687.2025.11167167

Ellis, R. A., & Bliuc, A.-M. (2019). Exploring new elements of the student approaches to learning framework: The role of online learning technologies in student learning. Active Learning in Higher Education, 20(1), 11–24. https://doi.org/10.1177/1469787417721384

Eom, S. (2023). The effects of the use of mobile devices on the E-learning process and perceived learning outcomes in university online education. E-Learning and Digital Media, 20(1), 80–101. https://doi.org/10.1177/20427530221107775

Facey-Shaw, L., Specht, M., Van Rosmalen, P., & Bartley-Bryan, J. (2020). Do badges affect intrinsic motivation in introductory programming students? Simulation & Gaming, 51(1), 33–54. https://doi.org/10.1177/1046878119884996

Faverio, M., Park, E., & Gottfried, J. (2026, April 15). Teens' experiences on TikTok, Instagram and Snapchat. Pew Research Center. https://www.pewresearch.org/internet/2026/04/15/teens-experiences-on-tiktok-instagram-and-snapchat/

Faverio, M., & Sidoti, O. (2025, December 9). Teens, social media and AI chatbots 2025. Pew Research Center. https://www.pewresearch.org/internet/2025/12/09/teens-social-media-and-ai-chatbots-2025/

Gauthier, T. (2020). The value of microcredentials: The employer's perspective. The Journal of Competency-Based Education, 5(2), e01209. https://doi.org/10.1002/cbe2.1209

Gish-Lieberman, J. J., Tawfik, A., & Gatewood, J. (2021). Micro-credentials and badges in education: A historical overview. TechTrends, 65(1), 5–7. https://doi.org/10.1007/s11528-020-00567-4

Gkintoni, E., Sortwell, A., Vassilopoulos, S. P., & Nikolaou, G. (2025). Neuroplasticity-informed learning under cognitive load: A systematic review of functional imaging, brain stimulation, and educational technology applications. Multimodal Technologies and Interaction, 10(1), 5. https://doi.org/10.3390/mti10010005

Harmon, J., & Copeland, A. (2016). Students' perceptions of digital badges in a public library management course. Education for Information, 32(1), 87–100. https://doi.org/10.3233/EFI-150964

Hattie, L. D., Sahlberg , C. W., & Comer, P. P. (2023). Impact of mobile learning apps on study habits and academic performance of college students in the United States: A review of literature. Journal of Education, 6(3), 13–22. https://doi.org/10.53819/81018102t4182

Heinert, S. W., Quasim, N., Ollmann, E., Socarras, M., & Suarez, N. (2021). Engaging youth through digital badges to promote health in underserved communities. Health Promotion Practice, 22(5), 631–637. https://doi.org/10.1177/1524839920934798

Hickey, D. T., & Chartrand, G. T. (2020). Recognizing competencies vs. completion vs. participation: Ideal roles for web-enabled digital badges. Education and Information Technologies, 25(2), 943–956. https://doi.org/10.1007/s10639-019-10000-w

Horstman, T., Tierney, G., & Tzou, C. (2020). Design principles for creating digital badges to support learning. Information and Learning Sciences, 121(11/12), 889–907. https://doi.org/10.1108/ILS-02-2020-0042

Jiang, J. (2018, August 22). How teens and parents navigate screen time and device distractions. Pew Research Center. https://www.pewresearch.org/internet/2018/08/22/how-teens-and-parents-navigate-screen-time-and-device-distractions/

Kim, H., Montague, M. L., & Castillo, L. G. (2025). Educational outcomes of GEAR up over two decades: A systematic review. Preventing School Failure: Alternative Education for Children and Youth, 69(2), 168–179. https://doi.org/10.1080/1045988X.2024.2367459

Kim, J., Gilbert, J., Yu, Q., & Gale, C. (2021). Measures matter: A meta-analysis of the effects of educational apps on preschool to grade 3 children's literacy and math skills. AERA Open, 7, 23328584211004183. https://doi.org/10.1177/23328584211004183

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. Theory Into Practice, 41(4), 212–218. https://doi.org/10.1207/s15430421tip4104_2

Laubersheimer, J., Ryan, D., & Champaign, J. (2016). Infoskills2go: using badges and gamification to teach information literacy skills and concepts to college-bound high school students. Journal of Library Administration, 56(8), 924–938. https://doi.org/10.1080/01930826.2015.1123588

Lee, Y.-M., Jahnke, I., & Austin, L. (2021). Mobile microlearning design and effects on learning efficacy and learner experience. Educational Technology Research and Development, 69(2), 885–915. https://doi.org/10.1007/s11423-020-09931-w

Leong, K., Sung, A., Au, D., & Blanchard, C. (2021). A review of the trend of microlearning. Journal of Work-Applied Management, 13(1), 88–102. https://doi.org/10.1108/JWAM-10-2020-0044

Liu, C., & Correia, A.-P. (2021). A case study of learners' engagement in mobile learning applications. Online Learning, 25(4). https://doi.org/10.24059/olj.v25i4.2827

Liyanage, N. G. L. S. J. (2026). A systematic review of reviews on micro-learning. Journal of Innovative Practices in Education, 2(1), 156–185. https://doi.org/10.4038/jipe.v2i1.80

Luke, C., & Young, V. M. (2020). Integrating micro-credentials into professional learning: Lessons from five districts. Digital Promise.

McNeill, L., & Fitch, D. (2023). Microlearning through the lens of Gagne's nine events of instruction: A Qualitative Study. TechTrends, 67(3), 521–533. https://doi.org/10.1007/s11528-022-00805-x

Mercan, G., Varol Selçuk, Z., & Köseoğlu, P. (2023). Technological approaches in mathematics and science education: Microlearning. Sosyal Bilimler ve Eğitim Dergisi, 6(Education Special Issue), 380–400. https://doi.org/10.53047/josse.1363314

Monib, W. K., Qazi, A., & Apong, R. A. (2025). Microlearning beyond boundaries: A systematic review and a novel framework for improving learning outcomes. Heliyon, 11(2), e41413. https://doi.org/10.1016/j.heliyon.2024.e41413

Mostrady, A., Sanchez-Lopez, E., & Gonzalez-Sanchez, A. F. (2024). Microlearning and its effectiveness in modern education: A Mini Review. Acta Pedagogia Asiana, 4(1), 33–42. https://doi.org/10.53623/apga.v4i1.496

Pitt, C., Bell, A., Onofre, E., & Davis, K. (2019). A badge, not a barrier: Designing for-and throughout-digital badge implementation. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems, 1–14. https://doi.org/10.1145/3290605.3300920

Pitt, C. R., Bell, A., Strickman, R., & Davis, K. (2019). Supporting learners' STEM-oriented career pathways with digital badges. Information and Learning Sciences, 120(1/2), 87–107. https://doi.org/10.1108/ILS-06-2018-0050

Rathnasekara, K., Yatigammana, K., & Suraweera, N. (2025). Innovative pedagogical framework in K12 education: Enhancing productivity and

engagement of digital natives within resource-constrained environments. Quality Education for All, 2(1), 415–440. https://doi.org/10.1108/QEA-11-2024-0129

Santana Gomes, N., Ximenes Martins, R., & Azevedo, D. (2021). Longform or microcontent? An analysis of supports for digital content courseware. Revista de Educación a Distancia (RED), 21(65). https://doi.org/10.6018/red.422371

Shail, M. S. (2019). Using micro-learning on mobile applications to increase knowledge retention and work performance: A Review of Literature. Cureus, 11(8), e5307. https://doi.org/10.7759/cureus.5307

Siagian, S., Sinambela, P. N. J. M., & Wau, Y. (2020). Effectiveness and efficiency of e-learning in Instructional Design. World Transactions on Engineering And Technology Education, 18(1).

West, R. E., Tawfik, A. A., Gishbaugher, J. J., & Gatewood, J. (2020). Guardrails to constructing learning: The potential of open microcredentials to support inquiry-based learning. TechTrends, 64(6), 828–838. https://doi.org/10.1007/s11528-020-00531-2

Xu, M., Abdul Mutalib, A., & Hamzah, H. I. (2025). The landscape of research on mobile learning material: coherent taxonomy, motivation, challenges and recommendations. PaperASIA, 41(1b), 195–208. https://doi.org/10.59953/paperasia.v41i1b.394

Yang, Y., Zhang, C., Zhang, S., & Shen, J. (2025). TikTok in higher education: A systematic review of disciplinary applications, learning outcomes, and implementation factors. Interactive Learning Environments, 1–21. https://doi.org/10.1080/10494820.2025.2564736

Zhang, J., & West, R. E. (2020). Designing microlearning instruction for professional development through a competency based approach. TechTrends, 64(2), 310–318. https://doi.org/10.1007/s11528-019-00449-4

Author Note

Document reorganized and revised using M365 Copilot (Microsoft, June 2026). Reviewed and edited by S. Franklin, K. Willems, and H. Harris for clarity, organization, and alignment with cited sources.