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Navigating the Terrain:

Emerging Frontiers in Learning Spaces, Pedagogies, and Technologies

(Re)defining Mobile Learning in the Post COVID-19 and GenAI Era

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Mobile learning, thrust into the spotlight during the COVID-19 pandemic, has a rich 40-year history with a robust body of research predating 2020. This concise paper revisits mobile learning in light of the accelerated technological advancements and shifting educational practices post-pandemic. By examining the evolution of mobile learning frameworks and integrating recent advancements in AI and wearable technologies, we propose a contemporary redefinition that emphasises an accessible mobile ecology. We further explore the theoretical foundations and emerging scenarios in mobile learning, focusing on authentic learning experiences with current trends.

Keywords: MLearning, M-Learning, Mobile Learning, Generative AI, DTML framework

Introduction

Mobile learning did not begin in response to COVID-19, contrary to some of the rhetoric published since 2020. In fact, mobile learning has a 40-year history and a substantial body of research pre-2020 (Cook & Santos, 2016; Sharples, 2000). As with many educational fields, a new generation of researchers is on the horizon with renewed interest in mobile learning post-COVID and in the generative AI era – particularly with the rapid development of AI integration on mobile devices. The COVID-19 pandemic significantly shifted the focus towards mobile learning, expanding its definition and application. Given this evolution, our research question is “how do we redefine mobile learning to be relevant to current educational practices and technological advancements?”

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Pre-COVID, the Design for Transformative Mobile Learning (DTML) framework was summarised as:

"Enabling socio-cultural pedagogies, learner-centred collaboration and the support of authentic, community-based learning experiences in which the use of the mobile device encourages learners to actively participate in genuine communities of practices, using authentic tools to complete real-world tasks" from Kearney et al., (2020b, p. 109, summarising Cochrane et al., 2017).

Since 2020 the ASCILITE Mobile Learning Special Interest Group (MLSIG) has revised the DTML framework (Cochrane et al., 2022), proposing a redefinition of mobile learning for the 2023 ASCILITE Contextualising the Horizon report:

"An accessible mobile ecology (including connectivity and infrastructure) across temporal, conceptual, physical, and digital spaces facilitating User Generated Content (UGC) and User Generated Contexts (UGCX)." (Birt et al., 2023).

This definition includes everything from learners' daily experiences and thoughts to the places they visit and the content they create both in and beyond the formal classroom. In this interconnected space, learners have the power to easily share their own content and shape the context in which learning occurs. This creates a digital environment where learners can express themselves, connect with others, and make sense of their surroundings through their mobile device. This new definition highlights the importance of creating an inclusive learning environment that adopts user-generated content and experiences while embracing the diverse nature of mobile learning spaces and devices.

Theoretical Foundations

Much of the literature on mobile learning has drawn upon socio-technical frameworks such as the Technology Acceptance Model (TAM) and Activity Theory. However, these frameworks do not explicitly focus upon developing learner agency and tend to substitute existing pedagogies onto new technologies. Our (re)definition of mobile learning avoids this by drawing upon two frameworks that focus upon designing authentic learning and transformative learning experiences – authentic learning and the DTML framework.

Authentic learning draws upon learning theories such as social constructivism, constructionism, self-determined learning. The authentic mobile learning triangle (Figure 1) (Cochrane, 2022) highlights the key elements of how mobile devices can be used to design authentic learning experiences and empower learner agency.

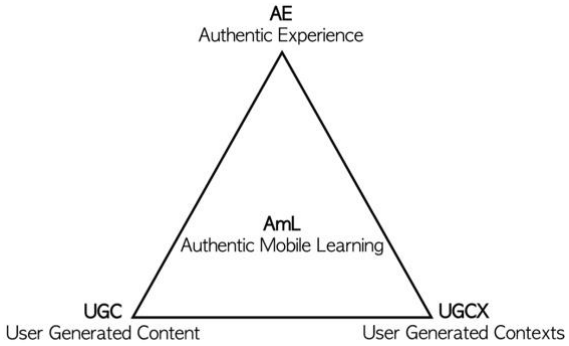

Figure 1. The Authentic Mobile Learning Triangle

The DTML framework (Figure 2) is one of the few identified mobile learning frameworks that explicitly focuses on designing transformative learning experiences (Kearney et al., 2020a; Cochrane et al., 2022). The DTML framework provides a mobile learning design framework for educators to address eight critical dimensions:

- **Pedagogical Focus:** Enabling a shift from teacher-directed pedagogies towards self-determined learning
- **Creativity:** Framing creativity as the development of new ideas (reinitiation) rather than reproduction

- **SAMR:** Redefining praxis rather than simply substitution of current practice
- **Cognition:** Transforming understanding from knowledge acquisition towards transforming world views
- **Locus of Control:** Reconceptualising learning environments to facilitate learner agency
- **Knowledge Production:** Moving beyond content delivery to learner-generated content and contexts
- **Self-Perception:** Building authentic learning communities
- **Ontological Shift**: Reimagining learning as what the learner does

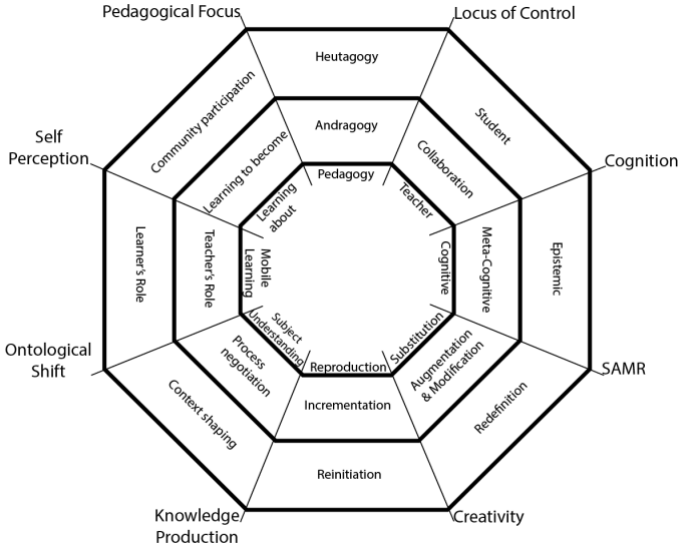

Figure 2. The DTML framework as a spider graph

There are three levels of implementation for each dimension (Figure 2) – starting from the inside (centre) of the web with a substitutionary application of practice to the outer level where there is significant redefinition of practice in each dimension enabled by mobile devices. For a detailed overview of the DTML framework and examples of applying the framework as a mobile learning design analysis tool in seven different discipline contexts, see (Cochrane et al., 2022). In the next section we briefly illustrate some emerging mobile learning scenarios and how the AmL triangle and the DTML framework can guide learning designs in each scenario.

Emerging Mobile Learning Scenarios

The integration of AI on mobile devices can significantly enhance the design of authentic learning experiences by empowering learner agency and fostering personalised learning paths (Alam & Mohanty, 2023). By leveraging the principles of the AmL triangle, educators can use AI to support self-determined learning, where personalised feedback and adaptive content respond to individual learner needs. The DTML framework further emphasises this by facilitating a shift towards self-directed learning through AI-driven recommendations. AI can also foster creativity by providing tools and prompts that encourage the development of new ideas, aligning with both AmL and the DTML framework's focus on innovative thinking. In terms of the SAMR model, AI should be used to redefine and enhance educational practices, promoting deeper learning and critical thinking rather than merely substituting traditional methods. Cognition can be transformed as AI provides tailored content and scaffolds learning experiences, helping students build connections and apply knowledge in new contexts. The locus of control shifts to the learner as AI tools empower them to make decisions about their learning process, promoting autonomy and agency. Additionally, AI supports the production of learner-generated content, moving beyond content delivery and fostering active participation. AI can also help build authentic learning communities by facilitating collaboration and peer interaction, supporting the DTML framework's emphasis on community building. Finally, AI encourages an ontological shift, helping students integrate learning into their daily lives and contexts, transforming their approach to education into an active, ongoing process.

Wearable technologies offer unique opportunities to design authentic, mobile learning experiences by providing real-time feedback and immersive, hands-on learning opportunities (Bower & Sturman, 2015). According to AmL, wearables can promote active, self-directed learning by offering immediate, contextualised data that learners can interact with. The DTML framework supports this by facilitating experiential and situated learning, allowing students to learn by doing and engaging directly with their environment. Wearables also enhance creativity by enabling learners to capture and analyse data on the go, fostering innovative thinking and problem-solving. The integration of wearables should not merely substitute traditional methods but transform learning activities into interactive, real-world experiences, as suggested by the SAMR model. Wearables can deepen understanding by providing contextualised learning experiences, supporting the DTML framework's goal of facilitating deeper learning through real-time application of knowledge. These devices empower learners to customize and control their learning experiences, promoting autonomy and agency as highlighted in the AmL. Wearables also support the creation of learner-generated content, encouraging students to produce and share meaningful data and fostering a sense of ownership and engagement. Building authentic learning communities is enhanced as wearables connect students, facilitating collaboration and shared experiences. Finally, wearables support an ontological shift in learning by integrating educational activities into daily life, helping learners perceive education as a continuous, immersive process.

Immersive reality (XR) technologies, such as virtual reality (VR) and augmented reality (AR), provide powerful tools for designing authentic, transformative learning experiences that engage and empower learners (Enyedy & Yoon, 2021). The AmL emphasises creating learner-centered environments through XR, promoting active participation and self-directed learning. The DTML framework supports this by designing transformative experiences that allow learners to explore and interact with complex concepts in virtual environments, facilitating a deeper understanding. XR technologies also foster creativity by enabling students to create and manipulate virtual objects and environments, encouraging innovative thinking and spatial problem-solving. According to the SAMR model, VR/AR should be used to transform traditional learning activities, providing new perspectives and interactive experiences that go beyond mere substitution. These technologies enhance cognition by offering experiential learning opportunities, allowing students to explore and experiment within virtual environments. Learners gain control over their immersive experiences, promoting autonomy and agency, as emphasised in both the AmL and the DTML framework. IR supports the production of learner-generated content, encouraging active participation and sharing within virtual platforms. Building authentic learning communities is also facilitated by VR/AR, as these technologies connect learners and support collaborative, community-driven learning experiences especially through multiuser experiences. Finally, XR technologies encourage an ontological shift in education, helping students integrate learning into real world contexts, transforming their perception of education into an active, interactive process.

Perhaps the strongest critique of mobile learning is the potential for the creation of a perceived or actual digital divide (Traxler, 2021). However, mobile technologies are, in fact, the most affordable and ubiquitous means of addressing issues of inequality in education. By focusing on inclusive mobile learning ecologies that integrate mobile devices with their local contexts, we believe that mobile learning can transform education and bridge gaps rather than create divides.

Conclusion

Our 2023 (re)definition of mobile learning, *"An accessible mobile ecology (including connectivity and infrastructure) across temporal, conceptual, physical, and digital spaces facilitating User Generated Content (UGC) and User Generated Contexts (UGCX)" (Birt et al., 2023)* is supported by a significant body of research indicating the potential of mobile learning to transform education through designing authentic learning experiences and developing learner agency (Cochrane et al., 2022). This redefinition connects frameworks such as AmL and DTML to empower educators and learners alike to leverage the unique affordances of mobile devices and AI integration in education. By doing so, we can continue to redefine and enhance mobile learning, ensuring it remains relevant and impactful in the post-COVID and generative AI era.

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