

Review on Developing Critical Thinking, Empathy, Self-awareness, and Emotional Self-Regulation on Smartphones

Mireia Montané-Balagué
EADA Business School

José-Antonio Corral-Marfil i Elisenda Tarrats-Pons
Universitat de Vic - Universitat Central de Catalunya

ABSTRACT

Future business leaders must possess digital competence and soft skills like critical thinking, assertiveness, and emotional self-regulation. Traditional training methods lack flexibility, hindering adaptability. Smartphones are ubiquitous, personable, and provide digital equality among m-learning platforms, playing a crucial role in education. The global learning mobile app market (online courses, languages, academic disciplines, etc.) is forecasted to grow at a compounded growth rate of over 20% until 2030. However, it remains unclear if user-generated interactions in mobile apps can develop soft leadership skills. This article reviews studies on mobile apps as an adult learner-driven, flexible, universal, and fast alternative to traditional training methods for leadership skills such as critical thinking, self-awareness, empathy, and emotional self-regulation. Four databases were searched using subheadings and terms related to mobile learning, education, and soft skills. The included studies were mapped according to the types of mobile learning platforms, adult subjects, specific 21st-century leadership skills, and outcomes. The search was limited to articles published between 2014 and 2024. The main findings indicate that while there is extensive research on m-learning platforms for PK-12 education, there is a significant lack of primary data on the use of mobile apps for developing leadership skills in adults. The few existing studies primarily evaluate critical thinking as a crucial business skill. These results reveal a notable gap between scientific research and market practices in the context of mobile learning for adult leadership skills.

Keywords: M-learning, soft leadership skills, digital competence, adult education, critical thinking.

1. Introduction

This section explains the selection of the group target, soft skills, and platform for the research.

Adults are the group target as they are the primary recipients for Lifelong Learning programs and governmental policies worldwide since the 1990s (Brine, 2006; Brown et al., 2008; Mikulec & Guimarães, 2023; OECD, 1996b, 1996a; Schuetze, 2006; Tuschling & Engemann, 2006). Mobile learning is chosen for research due to its significant market presence in online courses (Coursera, Udemy), language learning (Duolingo), and core academic disciplines like mathematics (Photomath), generating \$5.93 billion in revenue worldwide, up from \$1.68 billion in 2018. AI apps, particularly chatbots, lead this growth by offering personalized tutoring and comfort, which is especially appealing to adult learners. For adults, readiness for online learning, including comfort with e-learning and self-management, is crucial for engaging in m-learning activities (Al-Adwan et al., 2018; Alajmi et al., 2020; Asghar et al., 2021; Chaka & Govender, 2017; Davis, 1989; Reddy et al., 2017).

1.1 Decision Making, Self-awareness, Empathy and Emotional Self-regulation.

This section discusses the selection of four soft leadership skills: Critical Thinking, Self-awareness, Empathy, and Emotional Self-regulation.

The renowned author and 'guru' in the world of competencies, expert Richard Boyatzis has been researching and publishing about this concept since the 1980s short after David McClelland (1973) first proposed them as a critical differentiator of performance. His article on competencies for the leaders of this century, Competencies in the 21st Century (Boyatzis, 2008) and a more current literature

review on this topic that covers over 100 authors that write about competencies for leadership conducted by Fotso (2021), share some commonalities such as an emphasis on emotional and social intelligence, and the importance of cognitive skills that highlight the ability to analyze and synthesize information and formulate strategies. Specifically, Boyatzis and Fotso (Boyatzis, 2008; Ngayo Fotso, 2021) identify these common competencies:

- Emotional Intelligence (self-awareness and self-management)
- Social Intelligence (empathy and relationship management)
- Cognitive Skills (systems thinking and pattern recognition) *opers passos*

From this list, 1) Self-awareness, because it's the foundation for almost everything else, and because if you understand your own strengths, weaknesses, and motivations, you can better navigate complex situations, 2) Empathy and Emotional Self-regulation, and 3) Decision-Making, as the competence enhanced by both Systems Thinking and Pattern Recognition abilities have been chosen to conduct the research.

1.2 Mobile Learning, Digital Equality, Ubiquity and Personalization

This section introduces mobile learning, its core characteristics, the requirements for a mobile learning environment, and the factors driving its adoption. It then lists key qualities linked to the acceptance of mobile learning as a platform for adult education, based on the technology acceptance model by Davis (1989).

In 2024, there are of fifty-two mobile apps for

language learning ¹, ten of which totaled over twenty-six million

downloads in August 2024². These apps represent (only for language learning) around a 20% of the education app market revenue in 2023³, with over 50% being generated by apps offering online courses. The market value of mobile learning and education apps is growing, with a compounded average growth rate of 23.34% expected during 2024-2032⁴.

Mobile learning

Despite technical restrictions like small screen size and limited storage, mobile learning is an attractive deployment form of study due to its defining characteristics:

- M-learning is a subset of e-learning, focusing on learning across contexts with mobile devices.
- Mobile learning is ubiquitous (Pimmer et al., 2016), allowing learners to access education without place and time restrictions.
- It is delivered through mobile devices such as smartphones, tablets, and PDAs (Cárdenas-Robledo & Peña- Ayala, 2018).
- The requirements for a mobile learning environment include portability, individualization, adaptability, and user-friendliness.

Digital Equality

- M-learning provides digital equality, allowing access to training and education for all socio-economic levels using personal devices.
- It is guided by theories like Behaviorism,

Constructivism, and Collaborative Learning (Keskin & Metcalf, 2011; Naismith et al., 2004).

- Lifelong learning can happen anytime and anywhere, favored by adult learners for its flexibility.
- M-learning platforms inspire, increase satisfaction, enhance well-being, and support long-term student persistence (Shukla, 2021).

Ubiquity

- Extends m-learning by integrating digital content, physical surroundings, and wireless communication for an immersive experience.
- U-learning aims to provide context-aware, real-world learning experiences, including m-learning but extending it by incorporating a broader range of technologies creating a more immersive, context-aware, and seamless learning experience. All m-learning is part of u-learning, but not all u-learning is limited to m- learning.

Personalization

- M-learning adapts teaching to students' levels, meeting individual needs (Gumbheer et al., 2022; Mosquera Gende & del Rio, 2016).
- It reduces learning difficulties by accommodating preferred learning styles.
- M-learning supports learning and motivation to study through activities outside traditional environments (Gurung et al., 2016; Sattler et al., 2010)
- Mobile devices enable self-directed, voluntary learning based on individual needs and interests (Denk et al., 2007).

¹ <https://www.businessofapps.com/data/language-learning-app-market/>

² <https://www.statista.com/topics/8425/language-learning-apps/#topFacts>

³ <https://www.businessofapps.com/data/education-app-report/#stripe-edd-window>

⁴ <https://blog.libero.it/wp/imarcgroup/2023/12/07/education-apps-market-share-industry-trends-size-growth-and-for-ecast-2024-2032/>

2. Methodology

This comprehensive review follows the principles of an exploratory scoping review methodology. It serves to outline fundamental concepts on the effectiveness of mobile applications in facilitating the education and development of critical thinking, assertiveness, and emotional self-regulation in working adults.

2.1 Search strategy and study selection

Following this strategy, to identify relevant articles published in ERIC, Google Scholar, Scopus, and Web of Science databases were searched. These databases were chosen because they include journals on an extensive

range of educational technologies. The initial search was conducted according to Boolean logic as follows: "M-learning" AND "education" AND "soft skills" (OR "leadership skills"). Additional searches were conducted directly in publishers Sage, Elsevier, Springer, Taylor & Francis, and Wiley Online Library.

The focus was put on empirical field studies published in Q1 and Q2 journals first and due to a low number of results, broadened to include conference proceedings and Q3 and Q4 journals.

The following Inclusion and exclusion criteria were used to decide whether to select articles from database searches:

Inclusion Criteria	Exclusion Criteria
Empirical studies published in English and Spanish journals or conferences.	Studies not published in at least Q4 journals, non-primary studies (e.g., books, theses), and grey literature.
Studies focused on the use of smartphones for developing soft skills and measuring student involvement, exploring, or reporting, aspects of student self-direction to learning.	<i>Studies not focusing on the research objectives, previous versions of published articles using the same dataset, and studies developing only one tool without evaluating it in a learning setting.</i>
Articles published from January 1, 2014, to November 21, 2024¹	Articles published prior to 2014 in languages not understandable by the researching author (non-English, non-Spanish, non-Catalan, non-French, non-Italian).
Cross-educational and conducted on empirical research (qualitative and quantitative) in a practical setting.	<i>State of the art, Literature, Systematic, Scoping, and Meta-analysis reviews</i>

¹ This year selection span was chosen due to the significant increase in m-learning approaches and clearer definitions of mobile learning platforms starting in 2014

2.2 Databases

ERIC, an internet-based database, indexes about 1.7 million records, both peer-reviewed and non-peer-reviewed. Initially considered for this study due to its specialization in education, it was excluded as only twenty records related to adult education and only one included also mobile learning.

On the other hand, initial searches on **Google Scholar** combining three search terms "education" AND "m learning" OR "mobile learning" AND "soft skills" yielded 4,100 results, and "m-learning" AND "education" AND "soft skills" provided 1,320 articles. The excessive number of articles, which couldn't be filtered due to the lack of search fields in Google Scholar, led to their exclusion from further analysis.

The subsequent searches in **Scopus** and Web

of Science databases allowed closer results to the targeted population ("adult") and the specific soft skills of interest (Critical Thinking, Empathy, Self-awareness and Self-regulation).

Initial searches in Scopus yielded 705 articles, which were subsequently reduced to 372 and then to 57 relevant articles. Careful reading of abstracts further narrowed this to four articles.

In the **Web of Science** database, initial searches without limitations resulted in over 13,000 articles. After refining the search fields with specific sentences, research areas, and exclusion words, 66 relevant articles were identified. Abstract reading reduced this number to nine articles.

The four articles from Scopus and the nine from Web of Science were included in the analysis.

3. Results and Discussion

The overview of the results shows that most of the studies, nine, investigated the learning or development of the Critical Thinking competence using m-learning deployments, and two of them researched emotional self-regulation. One is in relation to student stress and the other to athletes' skills.

No peer-reviewed primary research studies (qualitative or quantitative) focusing on developing empathy and self-awareness as skills in adults (as opposed to conditions in populations receiving psychological care) were found in the databases.

Study Competency Focus	Number of studies	Type of paper	Quartile	Database
Critical Thinking	9	Journal articles	Q1, Q2,	WoS
Critical Thinking	1	Conference paper	Q3, Q4	Scopus
Empathy	0			
Self-awareness	0			
Emotional Self-regulation	2	Journal articles	Q3, Q4	Scopus

Overall, studies showed that mobile learning significantly enhances critical thinking, reduces stress, and improves overall learning outcomes. Highlights from the studies are:

- Mobile learning can help reduce stress and improve competency and self-regulation (DesClouds & Durand- Bush, 2023; Madhusudan, 2019).
- M-learning exerts positive effects on critical thinking (Frost et al., 2019; Ninghardjanti & Dirgatama, 2021), effectively supporting the development of this skill.
- An innovative model, MDRE, is developed for the purpose of evaluating the improvement of critical thinking (Hwang et al., 2022) via m-learning and it is proven effective.
- Digital Behavior Change Interventions (DB-CIs) using mobile platforms can significantly enhance critical thinking skills in university students as they provide real-time feedback on the development of such skill (Asiri et al., 2021).
- Games are developed and Instagram used to enhance and develop critical thinking via mobile applications (Lee et al., 2016; Song & Cai, 2024; Zalani & Yousofi, 2024).

To sum it up, the research underscores the importance of personalized, adaptive, and context-aware mobile learning environments, and the role of emerging technologies in enhancing educational methodologies and development of soft skills.

4. Conclusions and Recommendations

To conclude, it is crucial to conduct more primary research on the effectiveness of mobile apps in developing soft leadership skills and to continue to design comprehensive evaluation methods to assess the effectiveness of mobile learning platforms.

Secondly, the results highlight the potential of integrating mobile technology into educational strategies to prepare future leaders, and to boost student engagement and performance. They also advocate for the inclusion of digital competence training in leadership development programs.

Finally, collaboration between researchers and practitioners is essential to bridge the gap between theory and practice. Developing context-specific strategies tailored to unique challenges in different settings will optimize learning outcomes.

References

- Al-Adwan, A. S., Al-Madadha, A., & Zvirzdinaite, Z. (2018). Modeling Students' Readiness to Adopt Mobile Learning in Higher Education: An Empirical Study. *International Review of Research in Open and Distributed Learning*, 19(1), 221-241.
- Alajmi, N., Khambari, N., Wong, S., Luan, Aira, N., & Rahim, A. (2020). Mobile Learning in the Workplace: Employee's Perspectives on Readiness, Acceptance, Benefits and Limitations of Training with Mobile Technology in Kuwait.
- Asghar, M. Z., Barberà, E., & Younas, I. (2021). Mobile Learning Technology Readiness and Acceptance among Pre-Service Teachers in Pakistan during the COVID-19 Pandemic. *Knowledge Management & E-Learning*, 13(1), 83-101.
- Asiri, Y. A., Millard, D. E., & Weal, M. J. (2021). Assessing the Impact of Engagement and Real-Time Feedback in a Mobile Behavior Change Intervention for Supporting Critical Thinking in Engineering Research Projects. *IEEE TRANSACTIONS ON LEARNING TECHNOLOGIES*, 14(4), 445-459. <https://doi.org/10.1109/TLT.2021.3104817>
- Boyatzis, R. E. (2008). Competencies in the 21st century. *Journal of Management Development*, 27(1), 5-12. <https://doi.org/10.1108/02621710810840730>
- Brine, J. (2006). Lifelong learning and the knowledge economy: Those that know and those that do not—the discourse of the European Union. *British Educational Research Journal*, 32(5), 649-665. <https://doi.org/10.1080/01411920600895676>
- Brown, P., Lauder, H., Ashton, D., Yingje, W., & Vincent-Lancrin, S. (2008). Education, Globalisation and the Future of the Knowledge Economy. *European Educational Research Journal*, 7(2), 131-156. <https://doi.org/10.2304/eeerj.2008.7.2.131>
- Cárdenas-Robledo, L. A., & Peña-Ayala, A. (2018). Ubiquitous learning: A systematic review. *Telematics and Informatics*, 35(5), 1097-1132. <https://doi.org/10.1016/j.tele.2018.01.009>
- Chaka, J. G., & Govender, I. (2017). Students' Perceptions and Readiness towards Mobile Learning in Colleges of Education: A Nigerian Perspective. *South African Journal of Education*, 37(1).
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340.
- Denk, M., Weber, M., & Belfin, R. (2007). Mobile learning – challenges and potentials. *International Journal of Mobile Learning and Organisation*, 1(2), 122-139. <https://doi.org/10.1504/IJMLO.2007.012674>
- DesClouds, P., & Durand-Bush, N. (2023). The Self-Regulation and Smartphone Usage Model: A Framework to Help Athletes Manage Smartphone Usage. *Sport Psychologist*, 37(2), 128-139. Scopus. <https://doi.org/10.1123/tsp.2022-0091>
- Frost, P., Donahue, P., Goeben, K., Connor, M., Cheong, H. S., & Schroeder, A. (2019). An examination of the potential lingering effects of smartphone use on cognition. *APPLIED COGNITIVE PSYCHOLOGY*, 33(6), 1055-1067. <https://doi.org/10.1002/acp.3546>
- Gumbheer, C. P., Khedo, K. K., & Bungaleea, A. (2022). Personalized and Adaptive Context-Aware Mobile Learning: Review, challenges and future directions. *Education and Information Technologies*, 27(6), 7491-7517. <https://doi.org/10.1007/s10639-022-10942-8>
- Gurung, R. K., Alsadoon, A., Prasad, P. W. C., & Elchouemi, A. (2016). Impacts of Mobile Cloud Learning (MCL) on Blended Flexible Learning (BFL): International Conference on Information and Digital Technologies. *Proceedings of the International Conference on Information and Digital Technologies 2016*, 5-7 July 2016, Rzeszow, Poland, 108-114. <https://doi.org/10.1109/DT.2016.7557158>
- Hwang, G.-J., Yang, C.-L., Chou, K.-R., & Chang, C.-Y. (2022). An MDRE approach to promoting students' learning performances in the era of the pandemic: A quasi-experimental design. *BRITISH JOURNAL OF EDUCATIONAL TECHNOLOGY*, 53(6), 1706-1723. <https://doi.org/10.1111/bjet.13208>
- Keskin, N. O., & Metcalf, D. (2011). The current perspectives, theories and practices of mobile learning. *Turkish Online Journal of Educational Technology-TOJET*, 10(2), 202-208.
- Kumar Basak, S., Wotto, M., & Bélanger, P. (2018). E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. *E-Learning and Digital Media*, 15(4), 191-216. <https://doi.org/10.1177/2042753018785180>
- Lee, H., Parsons, D., Kwon, G., Kim, J., Petrova, K., Jeong, E., & Ryu, H. (2016). Cooperation begins: Encouraging critical thinking skills through cooperative reciprocity using a mobile learning game. *COMPUTERS & EDUCATION*, 97, 97-115. <https://doi.org/10.1016/j.compedu.2016.03.006>
- Madhusudan, K. S. (2019). A study on mobile-learning an innovative approach for a stress-free learning environment in engineering colleges in around Chennai. *International Journal of Innovative Technology and Exploring Engineering*, 8(5), 1031-1034. Scopus.
- McClelland, D. C. (1973). Testing for competence rather than for "intelligence." *American Psychologist*, 28(1), 1-14. <https://doi.org/10.1037/h0034092>
- Mikulec, B., & Guimarães, P. (2023). The OECD solutionism and mythologies in adult education policy: Skills strategies in Portugal and Slovenia. *Studies in Continuing Education*, 45(3), 324-343. Scopus. <https://doi.org/10.1080/0158037X.2022.2092090>
- Mosquera Gende, I., & del Rio, A. C. (2016). Personalising English Acquisition Through Mobile Learning. In L. G. Chova, A. L. Martínez, & I. C. Torres (Eds.), *EDULEARN16: 8TH INTERNATIONAL CONFERENCE ON EDUCATION AND NEW LEARNING TECHNOLOGIES* (pp. 2524-2533). Int Assoc Technology Education and Development. <https://www.webofscience.com/wos/woscc/summary/06a0a713-64cd-402f-a611-b8303c745d24-e3aeac5f/relevance/1>
- Naismith, L., Lonsdale, P., Vavoula, G. N., & Sharples, M. (2004). Mobile technologies and learning. https://figshare.le.ac.uk/articles/journal_contribution/Mobile_technologies_and_learning/10096943/1
- Ngayo Fotso, G. M. (2021). Leadership competencies for the 21st century: A review from the Western world literature. *European Journal of Training and Development*, 45(6/7), 566-587. <https://doi.org/10.1108/EJTD-04-2020-0078>
- Ninghardjanti, P., & Dirgatama, C. H. A. (2021). Building Critical Thinking Skills Through a New Design Mobile-Based Interactive Learning Media Knowledge Framework. *International Journal of Interactive Mobile Technologies*, 15(17), 49-68. Scopus. <https://doi.org/10.3991/ijim.v15i17.23801>
- OECD. (1996a). *Measuring What People Know: Human Capital Accounting for the Knowledge Economy*. Organisation for Economic Co-operation and Development. <https://www.oecd-ilibrary.org/>

education/measuring-what-people-know_9789264065482-en

- OECD. (1996b). The knowledge-based economy. OECD. Pimmer, C., Mateescu, M., & Gröbriel, U. (2016). Mobile and ubiquitous learning in higher education settings. A systematic review of empirical studies. *Computers in Human Behavior*, 63, 490-501. <https://doi.org/10.1016/j.chb.2016.05.057>
- Reddy, E., Sharma, B., Reddy, P., & Dakuidreketi, M. (2017). Mobile Learning Readiness and ICT Competency: A Case Study of Senior Secondary School Students in the Pacific Islands. *Proc. - Asia-Pacific World Congr. Comput. Sci. Engi., APWC CSE*, 137-143. Scopus. <https://doi.org/10.1109/APWConCSE.2017.00031>
- Sattler, B., Spyridakis, I., Dalal, N., & Ramey, J. (2010). The learning experience: A literature review of the role of mobile technology. 2010 IEEE International Professional Communication Conference, 38-45. 2010 IEEE International Professional Communication Conference (IPCC 2010). <https://doi.org/10.1109/IPCC.2010.5529811>
- Schuetze, H. G. (2006). International concepts and agendas of Lifelong Learning. *Compare: A Journal of Comparative and International Education*, 36(3), 289-306. <https://doi.org/10.1080/03057920600872381>
- Shukla, S. (2021). M-learning adoption of management students: A case of India. *Education and Information Technologies*, 26(1), 279-310. <https://doi.org/10.1007/s10639-020-10271-8>
- Song, H., & Cai, L. (2024). Interactive learning environment as a source of critical thinking skills for college students. *BMC MEDICAL EDUCATION*, 24(1), 270. <https://doi.org/10.1186/s12909-024-05247-y>
- Tuschling, A., & Engemann, C. (2006). From Education to Lifelong Learning: The emerging regime of learning in the European Union. *Educational Philosophy and Theory*, 38(4), 451-469. <https://doi.org/10.1111/j.1469-5812.2006.00204.x>
- Zalani, M., & Yousofi, N. (2024). The influence of using Instagram on EFL learners' critical thinking in language institutes. *SMART LEARNING ENVIRONMENTS*, 11(1), 33. <https://doi.org/10.1186/s40561-024-00320-x>