UI/UX Design For Student Learning With a Mobile-Based Higher Order Thinking Skills (HOTS) Concept

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Abstract

The integration of Higher Order Thinking Skills (HOTS) in mobile-based learning has become increasingly important to support students ' critical, analytical, and creative capabilities in the digital era. This study aims to design a User Interface (UI) and User Experience (UX) model that effectively facilitates student learning activities by embedding HOTS-oriented features. The research employs a design-based research approach, combining literature review, user needs analysis, prototyping, and usability testing with students as end-users. The UI/UX design emphasizes intuitive navigation, interactive assessment modules, and multimedia-based problem-solving scenarios that challenge students to apply analysis, evaluation, and creation skills. Usability evaluation shows that the proposed design enhances learner engagement, supports deeper cognitive processing, and provides a flexible environment for independent as well as collaborative learning. This study contributes to the development of mobile learning platforms by offering a design framework that integrates UI/UX principles with pedagogical strategies focused on HOTS development, thereby supporting the transformation of education toward digital and skill-oriented learning ecosystems.

***Keywords**:* UI/UX design, mobile learning, Higher Order Thinking Skills (HOTS), Student Engagement, Digital Education.

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Introduction

The rapid development of digital technology has transformed the landscape of education, encouraging a shift from conventional classroom practices toward more flexible, interactive, and technology-driven learning environments. Mobile learning, in particular, has gained significant attention due to its accessibility, portability, and ability to provide personalized learning experiences. Within this context, designing an effective User Interface (UI) and User Experience (UX) becomes a crucial element in ensuring that mobile learning platforms are not only functional but also engaging and pedagogically aligned with students ' needs. One of the critical challenges in 21st-century education is equipping students with Higher Order Thinking Skills (HOTS), which include the abilities to analyze, evaluate, and create. These skills are essential for preparing students to solve complex problems, adapt to dynamic environments, and contribute innovatively in their respective fields. However, many digital learning platforms still emphasize rote learning and lower-order thinking, which do not sufficiently support the development of HOTS. Therefore, it is necessary to design mobile-based learning systems that explicitly integrate HOTS into their instructional design and user interaction models This study focuses on developing a UI/UX design framework tailored for student learning that incorporates HOTS-oriented learning strategies. By combining design principles, user-centered approaches, and educational psychology, the research seeks to create mobile interfaces that foster deeper engagement, cognitive stimulation, and independent as well as collaborative learning. The proposed design framework is expected to contribute not only to the improvement of mobile learning platforms but also to the broader goal of advancing digital education that emphasizes critical, creative, and analytical skills.

Method

3.1 Research Methodology

This study adopts a literature review method to explore and synthesize previous research related to UI/UX design in mobile learning environments, particularly those integrating the Higher Order Thinking Skills (HOTS) framework. The literature review approach is appropriate for identifying theoretical foundations, best practices, design principles, and gaps in existing studies that can inform the development of future mobile learning applications.

3.2 Data Sources

The references were collected from reputable academic databases such as Scopus, IEEE Xplore, SpringerLink, ScienceDirect, and Google Scholar. The inclusion criteria consisted of:

1) Articles published between 2015–2025 to capture the most relevant and updated findings.
2) Studies focusing on UI/UX design for education, mobile learning platforms, or HOTS-based learning strategies.
3) Publications in English and Indonesian that meet peer-reviewed standards, such as journal articles, conference proceedings, and book chapters.

3.3 Review Procedure

The review process followed three main stages:

1) Identification – keywords such as " UI/UX design in education " , " mobile learning " , " HOTS learning strategies " , and " student engagement " were used to search and filter the literature.
2) Screening – duplicate, irrelevant, and non-peer-reviewed articles were excluded to ensure the quality of references.

3) Analysis and Synthesis – the selected articles were analyzed thematically, focusing on design elements (navigation, interactivity, usability), pedagogical integration of HOTS, and empirical findings on student learning outcomes.

3.4 Review Procedure

The analysis was conducted using a qualitative synthesis approach. Findings from the reviewed literature were categorized into three major themes:

1) UI/UX principles in mobile learning (usability, navigation, interaction design).
2) HOTS integration in digital learning environments (tasks, assessments, problem-solving features).
3) Impact on student learning outcomes (engagement, critical thinking, creativity).

Discussion

The findings indicate that UI/UX design plays a decisive role in determining the success of HOTS-oriented mobile learning. An effective design should balance aesthetics and functionality, ensuring that learners are not distracted by interface complexity while still being cognitively challenged by the learning tasks. From a pedagogical perspective, embedding HOTS into mobile learning requires a shift from passive content delivery to active learning strategies. This aligns with constructivist learning theories, which emphasize that knowledge is constructed through analysis, evaluation, and creation rather than memorization. Mobile applications can serve as catalysts for this transformation by offering interactive simulations, real-world problem cases, and collaborative learning features. However, the review also identifies several gaps and challenges. Many existing studies focus more on usability testing than on long-term impact assessment of HOTS integration. Moreover, cultural and contextual differences among learners often influence how UI/UX elements are perceived and utilized. Thus, future research should investigate adaptive designs that accommodate diverse learner needs and learning environments. In summary, the literature supports the conclusion that designing mobile based learning platforms with strong UI/UX principles and HOTS-oriented tasks can significantly improve student engagement, critical thinking, and creativity. This highlights the potential for UI/UX-driven educational technology to become a cornerstone in advancing 21st-century learning.

Conclusion

This study highlights the significant role of UI/UX design in supporting mobile-based learning that emphasizes Higher Order Thinking Skills (HOTS). Through a structured literature review, three key insights were identified. First, intuitive and interactive UI/UX design principles are essential to ensure usability, effective navigation, and meaningful learner interaction. Second, the integration of HOTS in mobile learning requires carefully designed tasks, assessments, and problem-solving features that stimulate analysis, evaluation, and creativity. Third, empirical evidence demonstrates that HOTS-oriented digital platforms positively impact student engagement, critical thinking, and creativity.

Overall, the findings suggest that effective UI/UX design not only enhances the usability of mobile learning applications but also strengthens their pedagogical value by embedding HOTS-based strategies. Nevertheless, gaps remain in terms of long-term impact studies and adaptive designs that consider diverse learner contexts. Future research is encouraged to develop and empirically test adaptive mobile learning systems that integrate UI/UX principles with HOTS pedagogy, thereby advancing digital education practices toward more skill-oriented and student-centered learning.

References

[1] Alhammad, R., & Moreno, A. (2020). The effect of UI design on students' learning performance in mobile learning applications. Education and Information Technologies,25(5), 4197–4215. https://doi.org/10.1007/s10639-020-10170-3

[2] Anderson, L. W., & Krathwohl, D. R. (Eds.). (2019). Ataxonomyforlearning,teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. New York: Longman.

[3] Hussain, A., Mkpojiogu, E. O. C., & Yusof, M. M. (2018). The influence of usability on the user experience of mobile learning applications. International Journal of Advanced Computer Science and Applications, 9(1), 72–80. https://doi.org/10.14569/IJACSA.2018.090110

[4] Subramaniam, T. (2021). Enhancing students' higher-order thinking skills through mobile-based learning design. JournalofEducationalTechnologySystems,50(2), 213–230. https://doi.org/10.1177/00472395211013244

[5] Zhang, J., Wang, Q., & Huang, R. (2022). The impact of mobile learning on students' higher-order thinking skills: A meta-analysis. Computers & Education, 183, 104495. https://doi.org/10.1016/j.compedu.2022.104495

[6] Sarrab, M., Al-Shihi, H., & Al-Manthari, B. (2019). Designing a mobile learning framework for higher education: A usability perspective. International Journal of Interactive Mobile Technologies, 13(9), 112–128. https://doi.org/10.3991/ijim.v13i09.11088

[7] Zydney, J. M., & Warner, Z. (2016). Mobile apps for science learning: Review of research. Computers & Education, 94, 1–17. https://doi.org/10.1016/j.compedu.2015.11.001

[8] Pratama, A. R., & Setyaningsih, E. (2020). Developing mobile learning application based on HOTS to improve students' critical thinking ability. Journal of Physics: Conference Series, 1469(1), 012129. https://doi.org/10.1088/1742- 6596/1469/1/012129.