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Mobile Learning Experiences of Gifted Students: A Systematic Literature Review

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The rapid advancement of mobile technologies has enabled a shift from traditional education toward more personalized learning, especially beneficial for gifted students. Mobile learning offers flexible, student-centered environments that align with the unique needs of these students,and has gained increasing attention from educators and researchers. This study explores the mobile learning experiences of gifted students through a systematic literature review. Relevant studies were identified via keyword searches in databases such as Web of Science and Scopus and analyzed using qualitative methods. The review process followed PRISMA guidelines to ensure a structured and transparent methodology. Findings show that mobile learning enhances academic achievement, self-regulation, and problem-solving skills in gifted students. The flexibility to learn at their own pace and explore topics of interest supports their cognitive and personal growth. However, challenges such as limited funding, insufficient infrastructure, and lack of teacher training hinder wider adoption. Despite its benefits, mobile learning may lead to reduced motivation due to limited social interaction. To address this, educational policies should promote balanced integration-supporting both digital learning opportunities and social engagement. Investing in infrastructure and professional development is essential to maximize the impact of mobile learning in gifted education. Further research is needed to strengthen its implementation and long-term effectiveness.

Introduction

In recent years, the rapid increase in the use of mobile devices has enabled individuals from various age groups to quickly adapt to these technologies. Mobile technologies have led to significant transformations in all aspects of daily life, particularly in sectors such as education, business, and entertainment. In this context, it is emphasized that the field of education should move beyond traditional methods and adopt more flexible and innovative approaches such as mobile learning. Mobile learning stands out with its flexibility, geographic independence, and its ability to support individual learning processes. As Lan and Sie (2010) pointed out, mobile technologies are reshaping educational processes and creating new opportunities in learning experiences.

Khaddage et al. (2016) define mobile learning as a flexible learning environment in which individuals can decide when, where, and how to learn. These features make it possible for mobile applications to be utilized across a wide range of learners with varying educational needs. For instance, Hopcan and Tokel (2021) examined the effectiveness of mobile applications in improving the writing skills of students with special educational needs, while Ismaili and Ibrahimi (2017) explored mobile learning experiences from various perspectives. However, a review of the existing literature reveals that studies specifically focusing on mobile learning environments for gifted students are quite limited. This indicates a need for more comprehensive research on the mobile learning processes of gifted individuals.

Gifted individuals are distinguished by their ability to learn rapidly, process information, and solve complex problems compared to their peers. Renzulli's (2005) conception of giftedness highlights it as a combination of high intellectual ability, task commitment, and creativity. The learning processes of these students should be supported with enriched and complex content, and educational models should be developed to address their advanced cognitive needs. Gifted students also stand out for their effective use of technology in addition to their cognitive abilities. In this context, information and communication technologies play a critical role in helping gifted students access information rapidly, conduct research, communicate, and develop creative projects (Öngöz & Sözel, 2018). Their use of these technologies includes activities such as accessing information, overcoming barriers, participating in distance education, and engaging in electronic mentoring and collaboration. Mobile technologies serve as essential tools that support their learning processes and help them enhance their cognitive skills more effectively.

The growing economic, technological, and political competition at the international level has significantly increased the demand for gifted individuals in strategic fields. In particular, investing in gifted individuals in areas such as technology, science, and innovation—critical for global development—has become imperative for enhancing national competitiveness. In order to harness the high potential of gifted individuals on both national and international levels, education systems must be restructured to meet their unique needs (Pfeiffer, 2015). Notably, the launch of the Soviet satellite Sputnik in 1957 prompted the Western world to reconsider education policy as a strategic priority. This event highlighted the strong relationship between the education of gifted individuals and national security, scientific advancement, and economic growth, leading many countries—especially the United States—to develop special education programs for these students (Robins, 2010).

Mobile learning offers significant potential, especially for gifted students. Mobile technologies provide access to vast and unlimited information, allowing learners to tailor their learning processes according to their curiosity and interests. Furthermore, mobile learning supports individualized learning paces and enables students to manage their own educational journeys more effectively. In this regard, mobile learning technologies represent a new paradigm in education by offering personalized learning experiences tailored to the needs of individuals (Traxler, 2007). Such an approach holds great potential for making learning processes more efficient, particularly for gifted learners. Educators and policymakers should recognize this potential and develop strategies to more broadly implement these technologies in the education of gifted students.

In recent years, the potential of mobile and adaptive learning technologies to support the cognitive, emotional, and motivational needs of gifted students has been increasingly

emphasized in educational research. Aydın Gönültaş and Yaman (2023) found that gifted secondary school students demonstrate significantly higher levels of mobile learning readiness—particularly in self-directed learning, motivation, and technological self-efficacy—when compared to their typically developing peers. In a related study, Haneefa (2024) revealed that teacher support significantly mediates the relationship between gifted students' attitudes toward self-regulated mobile learning and their learning satisfaction, underscoring the importance of pedagogical guidance even among autonomous learners.

The role of mobile technologies in enhancing students' creative thinking has also been highlighted in recent literature. Sukatiman, Saputro, and Budiarto (2024) conducted a quasi-experimental study in which a smartphone-based application was found to significantly improve students' creative thinking abilities. In a broader context, Pahrudin et al. (2024) examined global perspectives on adaptive learning models for gifted and talented students, identifying the Enrichment Triad, Differentiated Instruction, and Autonomous Learner models as commonly implemented frameworks. These models emphasize deep learning, curriculum flexibility, and mentoring, while also integrating technological tools. However, the study also pointed out several challenges in implementation, especially in resource-limited educational environments.

Taken together, these findings suggest that mobile learning environments—when well-structured and pedagogically supported—can offer substantial benefits for gifted learners by fostering autonomy, creativity, and advanced cognitive engagement. Nevertheless, there is a need for more systematic inquiry into how mobile learning practices affect the educational experiences of gifted students and how such experiences are conceptualized and evaluated in the literature. In this regard, the present study aims to address the following research questions:

1. What are the effects of mobile learning methods on the educational processes of gifted students?

2. How have the mobile learning experiences of gifted students been addressed and evaluated in the literature?

Method

This study adopts an interpretive approach aimed at deeply understanding events and phenomena. This approach stems from the need to thoroughly and comprehensively explore the impact of mobile learning environments on the education of gifted students. In addition to its descriptive nature, the study employs a qualitative analysis method to gain an in-depth understanding of these educational settings. Qualitative research focuses on examining a particular event, individual, or phenomenon in a holistic and comprehensive manner and is typically conducted with smaller sample groups (Denzin & Lincoln, 1998). This method offers an effective means for gaining deep insights into the contextual aspects and dynamics of complex and multidimensional social phenomena.

The primary methodological approach of this study is document analysis, a technique that enables the systematic and detailed examination of written content to yield qualitative data (Wach, 2013). Through this method, the existing literature on mobile learning and the education of gifted individuals was analyzed in depth. Document analysis is widely used in qualitative research and involves the systematic examination and evaluation of all types of documents,

both printed and electronic. Similar to other qualitative research methods, this approach aims to extract meaning, develop an in-depth understanding of the topic, and generate empirical knowledge through the careful analysis and interpretation of data sets (Corbin & Strauss, 2008).

In order to examine the experiences of gifted students in the mobile learning process, which is the focus of the research, a detailed analysis was carried out on existing academic publications. This analysis contributed to the generation of a comprehensive report on educational processes based on various scholarly works. In this regard, qualitative methods such as document analysis are considered especially suitable for gaining a deep understanding of the subject matter. Since the documents analyzed were not written by the individuals who directly experienced mobile learning but rather by researchers observing those experiences, the study employed a secondary document analysis method (Balcı, 2006).

The data for this research were obtained from reputable academic databases including Web of Science, Scopus, ScienceDirect, and Taylor & Francis. Studies conducted under the themes of "Mobile Learning" and "Gifted Education" or "Gifted" were examined. During the selection process, a rigorous screening procedure was followed based on the eligibility criteria set out in the PRISMA guidelines (Aşık & Özen, 2019). After the initial searches, relevant publications aligned with the scope of the study were identified and subjected to a systematic selection process. Studies were evaluated based on predetermined inclusion and exclusion criteria defined by the authors, and those that met the criteria were included in the literature review. Priority was given to studies that aligned with the predefined themes and research questions.

The inclusion criteria were established to favor studies that explored the nature of the sample groups, employed appropriate methodologies, provided valid results, and thoroughly examined the relationship between mobile learning and the education of gifted students. Any study that met all the inclusion criteria listed in Table 1 was incorporated into the systematic literature review. As a result of this process, a total of 14 empirical studies were selected and analyzed in accordance with the objectives of the review. These studies aim to fill existing gaps in the literature and contribute to the field by addressing mobile learning in the context of gifted education. Throughout the analysis phase, all necessary methodological steps were followed to ensure a meticulous review of the data sets and the extraction of meaningful findings.

In conclusion, this study provides significant findings within a qualitative framework to better understand the role of mobile learning processes in the education of gifted students. Figure 1 presents a flow diagram that visually represents the study selection process.

Inclusion Criteria

The implementation process of the document analysis method used in this study is visually presented in Figure 1. This process illustrates, step by step, the selection stages conducted according to the criteria determined by the systematic literature review approach. Initially, a total of 142 records were identified through searches conducted in academic databases such as Web of Science, Scopus, ScienceDirect, Taylor & Francis, and ERIC using the keywords "Mobile Learning" and "Gifted Education" or "Gifted." These records represent existing studies in the literature concerning mobile learning and the education of gifted students.

Duplicate records were eliminated, resulting in 102 entries considered eligible for further analysis. These remaining records were then subjected to a detailed content review. During this screening stage, records were excluded based on language criteria and whether the keywords were used meaningfully within the study. At this point, 65 studies were excluded: 2 did not meet the language requirements, and 63 were excluded because the keywords appeared only in the references, not in the body of the text. This exclusion process helped focus the study on literature that was suitable for qualitative synthesis and allowed for deeper analysis.

The remaining 37 records were subjected to a more detailed eligibility screening, and as a result, 27 full-text articles were deemed suitable for inclusion. These articles met the predefined inclusion criteria and were incorporated into the qualitative synthesis to examine the impact of mobile learning processes on the education of gifted students. However, 13 articles were ultimately excluded based on eligibility assessments. These exclusions were due to either the absence of a pedagogical framework or the content being outside the scope of the study. Specifically, four articles were excluded for not specifying a pedagogical approach, while nine were deemed out of scope and therefore excluded from the systematic review.

At the end of this selection process, a total of 14 empirical studies were included in the qualitative synthesis. These studies examine the contributions of mobile learning processes to the education of gifted students and aim to address gaps in the existing literature. The flowchart in Figure 1 clearly demonstrates the transparent and systematic nature of the research process.

Each step in Figure 1 is explicitly detailed, showing how many studies were excluded at each stage and for what reasons. The inclusion and exclusion criteria used in the study are presented in Table 1. Inclusion criteria consisted of accessibility of the full text, explicit use of the term “gifted” to refer to giftedness, clear articulation of a pedagogical approach, and no restrictions based on publication type. On the other hand, studies were excluded if the full text was not accessible, if they were written in languages other than English, or if the keywords “gifted” and “mobile learning” appeared only in the references.

These criteria were meticulously applied to ensure that the study focused on works relevant to its objectives and to facilitate a more targeted and efficient qualitative analysis process. As a result, the 14 selected empirical studies were analyzed in depth to understand the role of mobile learning environments in the education of gifted students. Each study was carefully reviewed within the framework of qualitative analysis, and the findings were compared with existing literature. This comprehensive approach led to a deeper understanding of how mobile learning impacts the education of gifted learners. The results contribute significantly to the existing body of research and offer a valuable reference for future studies in the field.

Table 1: Criteria for Inclusion or Exclusion from the Research

Inclusion Criteria	Exclusion Criteria
	Publications for which the full text was not available
“Studies that explicitly referred to the term ‘gifted’ using the expression ‘superior talent’”	Non-Turkish and non-English language publications
Studies that clearly articulated their pedagogical approach	Studies in which the terms ‘gifted’ and ‘mobile learning’ appeared only in the reference list

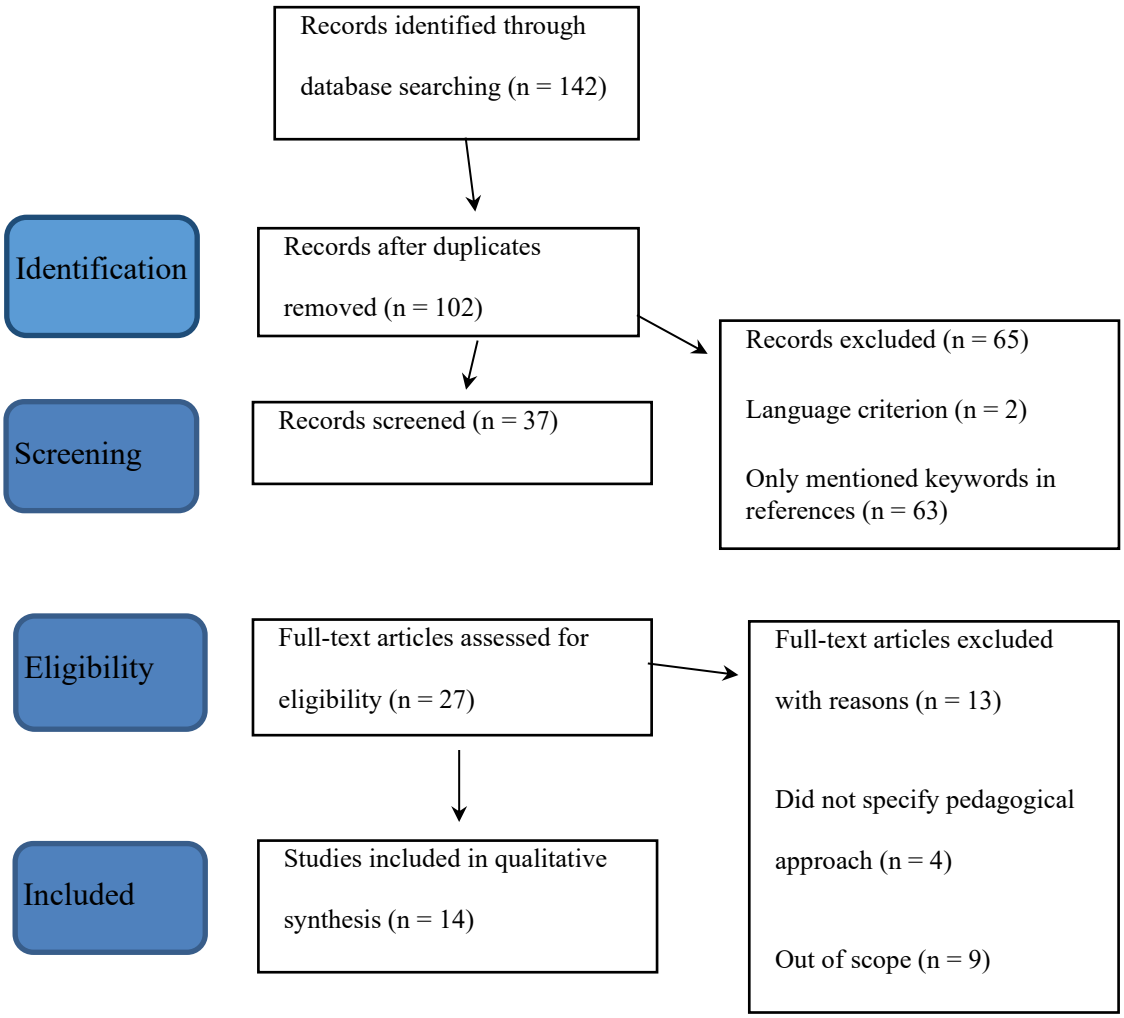

Figure 1. PRISMA Guidelines (Aşık ve Özen,2019)

Data Collection Tools

During the data analysis process, the full texts of fourteen articles were coded using the *line-by-line coding* method, one of the fundamental techniques in qualitative research. This method involves carefully reading and analyzing each line of the text to identify meaningful segments. Its application allowed for a detailed examination of the data and the systematic extraction of information relevant to the research questions. In line with the main objective of the study, the aim was to gain a deep understanding of the experiences of gifted students in mobile learning environments. To code the data, the *open reading* method was adopted. This approach entails reading the text freely while highlighting key concepts, events, or expressions during the reading process. It enables the natural interpretation and coding of data in accordance with the research context. The codes derived from open reading provided meaningful insights into the specific issues addressed by the study and contributed to a deeper understanding of the data.

The data obtained during the coding process were then categorized. Categorization involves grouping similar codes together and transforming them into larger units of meaning. In this process, codes focusing on certain topics or themes were grouped based on their common characteristics. These categories helped organize the data into a more coherent and understandable structure and laid the foundation for identifying themes aligned with the overall framework of the research. In the final step, themes were derived from the categories.

Themes represent broader units of meaning that can provide answers to the study's central research questions and allow for in-depth analysis. The transition from categories to themes enabled a more abstract and higher-level interpretation of the data. The resulting themes shed light on essential questions such as how mobile learning contributes to the education of gifted students, how it shapes their learning experiences, and how it can be integrated into broader educational processes.

This analytical process is crucial for gaining deep insights and making sense of the data. The meticulous application of qualitative research methods such as line-by-line coding, open reading, coding, and thematic analysis ensured that the study yielded valid and reliable results consistent with its objectives. This comprehensive analysis also enhanced the scientific value of the research and allowed for comparisons with findings in the existing literature. The themes derived at the end of the study offer significant contributions to the literature on mobile learning and the education of gifted students and serve as reference points for future research in the field.

Findings

The studies were examined based on their research design, the educational level at which they were conducted, and whether they were published in national or international contexts.

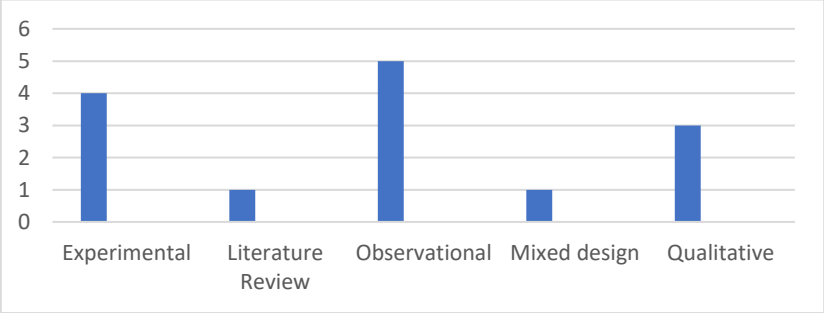

Figure 2. Distribution of Studies by Research Design

Figure 2 illustrates the distribution of the research designs used in the reviewed articles. Among these, observational research design was the most commonly employed. Observational studies are a type of research in which the researcher observes relationships between variables without manipulating them (Tezcan, 2017). While such studies are less effective in establishing causal relationships, they are valuable for identifying correlations between variables. In the context of this study, observational designs were used to monitor the behaviors of gifted students within mobile learning environments.

The second most frequently used design was experimental research design. Experimental studies involve controlling one variable to measure the effect on other variables (Isaac &

Michael, 1981). These studies typically compare different instructional applications to determine their relative effectiveness.

Qualitative research design ranked third in terms of frequency. Qualitative research involves collecting data through in-depth interviews or observations with participants. This type of research is particularly effective for understanding people's perspectives and experiences. Additionally, the dataset included one review study and one mixed-methods study, demonstrating the diversity of methodological approaches represented in the literature.

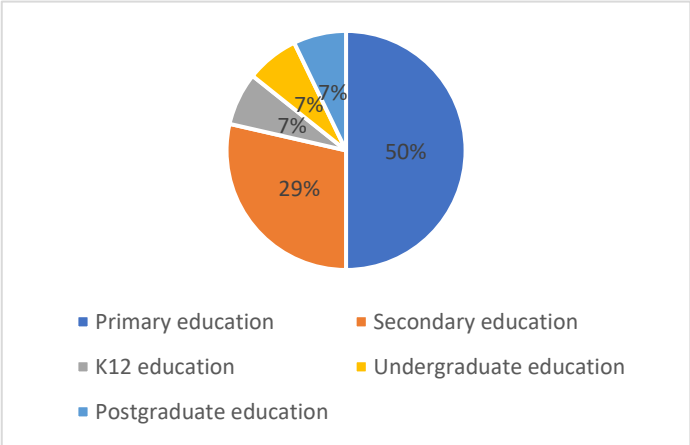

Figure 3. Distribution of Studies by Level of Education

The majority of the reviewed studies reflect the experiences of gifted students at the primary education level in mobile learning environments. An analysis of the graph reveals that 7 studies (50%) were conducted at the primary school level. This indicates a strong research focus on mobile learning processes during early stages of education among gifted learners.

Four studies (29%) were conducted at the secondary education level. While not as prevalent as primary-level research, these studies still provide valuable insights into the mobile learning experiences of students in this age group. One study (7%) addressed the K–12 level, highlighting the presence of research focusing particularly on high school students and how they interact with and are affected by mobile learning environments.

In addition, postsecondary or higher education level studies also accounted for 7% of the reviewed literature. This suggests that research on mobile learning at the higher education level is relatively limited compared to studies conducted in primary and secondary education settings. The small number of studies at the university level demonstrates that the mobile learning experiences of older gifted students have been explored less extensively.

The majority of the reviewed studies were conducted in countries such as Turkey, Taiwan, the Netherlands, Thailand, the United States, Canada, and Russia. These studies examined how educational systems and technological infrastructures in these countries are integrated with mobile learning processes and how this integration affects gifted students. The distribution of national and international studies offers valuable opportunities to explore both similarities and differences in educational approaches across different nations.

In the reviewed articles, the effects of mobile learning on gifted students were categorized under three main themes: positive, negative, and recommendation-oriented. Each main theme included subthemes, which were derived from codes representing specific observations and findings.

For example, in the study by Ravaglia et al. (1995), mobile learning programs implemented in mathematics and physics courses significantly enhanced the academic abilities of high-achieving students, thereby improving their academic success. These tailored programs also made the lessons more enjoyable and accessible for the students. The findings underscore the importance of specialized educational programs that aim to unlock the potential of gifted learners.

Similarly, Bakar (2016) demonstrated that platforms such as social media, email, and online tools substantially improved the academic skills of gifted students by offering flexible and personalized learning experiences. These tools allow students to engage in learning processes that are more flexible, tailored to their individual needs, and self-paced.A range of studiesincluding those by Tan (2022), Thomson (2010), Mooij (2008), Ravaglia et al. (1995), and Heavner (2005)further highlighted the positive impacts of mobile learning on gifted students, emphasizing its role in supporting individual development.

For instance, Ravaglia et al. (1995) noted that mobile learning environments in science and math courses provided a significant advantage in preparing students for higher education. Hung et al. (2012), Thomson (2010), and Heavner (2005) found that during the COVID-19 pandemic, enriched content and gamification elements in mobile learning enhanced flexibility in teacher-student interactions and positively influenced the overall learning process—sometimes outperforming traditional classrooms.

Mobile learning environments offer flexibility in terms of location, time, and learning process. This flexibility supports the development of creative thinking skills in gifted students and enables effective use of social media as part of their learning (Ngiamsunthorn, 2020). Additionally, Kandlhofer et al. (2019)showed that mobile mini-robot projects conducted in collaborative settings helped reduce test anxiety and supported students' stress management.

Thomson (2010) found that effective teachers entrusted students with greater responsibility, enabling more independent learning. In the same vein, Kay (2018) demonstrated that STEM-based mobile applications improved problem-solving abilities among gifted students by encouraging them to engage with real-world challenges. These findings suggest that mobile learning not only enhances academic performance but also fosters creative and critical thinking.

Bakar (2016) emphasized that mobile learning environments significantly enhanced not just problem-solving skills but also the creative potential of gifted learners. These results indicate that creative thinking processes can be nurtured more effectively through mobile learning environments, helping students better realize their potential. Chernenko et al. (2019) added that mobile learning environments supported effective communication and allowed students to express themselves more comfortably.

In the study by Kandlhofer et al. (2019), mobile learning environments enriched with robotics applications improved students' communication skills, particularly when tools such as social media were involved. Students reported not only improved communication with peers but also

greater engagement in lessons. Gifted students, in particular, found more opportunities for self-expression and developed their communication skills by actively using social media tools (Ozcan & Bicen, 2016).

Ngiamsunthorn (2020) emphasized that mobile learning environments helped increase student motivation in mathematics classes, enabling gifted students to better leverage their potential. Finally, Ravaglia et al. (1995) concluded that mobile learning environments enhanced academic support and facilitated the transition of gifted students to higher education by providing access to essential learning materials.

Studies by Mooij (2008) and Heavner (2005) revealed that mobile learning environments were perceived as more engaging and motivating compared to traditional classrooms. These results suggest that mobile learning offers gifted students more personalized and meaningful educational experiences. In summary, mobile learning environments not only enhance academic success but also support the development of creativity, problem-solving, and communication skills—making them powerful, multidimensional tools for gifted education.

These studies highlight the need for further research to better understand the contributions of mobile learning to educational processes and to address the current gaps in the literature.

Table 2: "Positive" Themes of Mobile Learning in Gifted Education

Main Themes	Sub-Themes	Codes	Articles
POSITIVE	Support for academic skills	Educational needs are met.	(Ravaglia vd., 1995)
	Academic support	Enhances academic achievement.	(Ravaglia vd., 1995)
		Improves research skills.	(Bakar, 2016)
	Support for individual and personal development	Preparation for higher education	(Ravaglia vd., 1995)
		Provides flexibility	(Hung vd., 2012), (Thomson, 2010),(Heavner, 2005)
		Independent study (self-paced learning)	(Tan, 2022), (Thomson, 2010), (Mooij ,2008),(Ravaglia vd., 1995),(Heavner, 2005)
		Promotes positive attitudes and satisfaction	(Gönültaş ve Yaman, 2022), (Ngiamsunthorn, 2020)
		Reduces test anxiety	(Kandlhofer vd.,2019)
		Enhances problem-solving skills	(Bakar, 2016), (Kay, 2018), (Chernenko vd., 2019)
		Encourages expression of creativity	(Bakar, 2016)
		Fosters responsibility	(Thomson, 2010)

Ecological awareness	Improved observation skills in ecology	(Hung vd., 2012)
Support for communication skills	Comfort in emotional expression	(Kandlhofer vd.,2019)
	Effective communication	(Kandlhofer vd.,2019), (Bakar, 2016), (Ngiamsunthorn, 2020), (Ozcan ve Bicen, 2016), (Chernenko vd., 2019)
	Kendini ifade etme	(Kandlhofer vd.,2019), (Ravaglia vd., 1995), (Ozcan ve Bicen, 2016)
Support for learning	Opportunity for interest-based learning	(Ravaglia vd., 1995)
Support from the learning environment	Provides diverse learning environments	(Thomson, 2010)
	More engaging than traditional classrooms	(Mooij ,2008), (Ravaglia vd., 1995), (Heavner, 2005)
	More motivating than traditional classrooms	(Mooij ,2008), (Ngiamsunthorn, 2020)
Support for STEM	Support for learning	(Tan, 2022)
	Meaningful learning experiences	(Hung vd., 2012)
	Better understanding of STEM concepts	(Kay, 2018)
	Increased interest in STEM	(Kay, 2018)
	Personalized engagement with STEM	(Kay, 2018)

As presented in Table 3, the studies reviewed indicate that gifted students face several negative themes during mobile learning processes, which can be grouped into three main categories: lack of financial resources, lack of human resources, and lack of social interaction (Chernenko et al., 2019; Tan, 2022).

In a study conducted by Tan (2022) during the COVID-19 pandemic, mobile applications were acknowledged for offering significant technological advantages. However, it was also found that gifted students were unable to engage in sufficient social interaction through these tools. Due to the social isolation imposed by the pandemic, mobile learning environments were unable to adequately support interpersonal communication, which was cited as a major shortcoming despite the potential benefits of mobile technologies. Tan also emphasized that this lack of social interaction negatively impacted students' academic motivation and engagement.

On the other hand, a study by Chernenko et al. (2019) highlighted institutional challenges encountered in mobile learning processes. This research focused particularly on the

insufficiency of financial and human resources, noting that such limitations hinder the delivery of personalized mobile learning experiences tailored to gifted students. When institutions face constraints in allocating sufficient budget to mobile learning initiatives, it becomes difficult to both develop appropriate learning materials and provide qualified instructors.

The study emphasized that the customization of mobile learning environments to meet the needs of gifted learners particularly in designing content aligned with their specific requirements is highly dependent on adequate financial and human resources. Chernenko and others (2019) argued that institutions could significantly improve the effectiveness of mobile learning by expanding their budgets and enhancing their capacity to employ qualified educators. Moreover, the study stressed that for mobile learning to be truly effective for gifted students, it is not sufficient to simply strengthen the technological infrastructure. The instructors and support staff who implement and manage these systems must also possess the necessary knowledge and skills. Without addressing these shortcomings, the full potential of mobile learning cannot be realized, and it will fall short in providing effective solutions tailored to the unique educational needs of gifted learners.

In this context, mobile learning emerges as a critical area that requires improvement not only in technological infrastructure but also in financial and social resources to enable gifted students to reach their full potential in education. For institutions to sustain effective mobile learning processes, it is essential not only to allocate sufficient budget but also to invest in the quality of the educators involved. Ensuring both adequate funding and competent instructors will be key to enhancing the effectiveness and long-term educational impact of mobile learning for gifted students.

Table 3: “Negative” Themes of Mobile Learning in Gifted Education

Main Themes	Sub-Themes	Codes	Articles
NEGATIVE	Lack of financial resources	Lack of financial resources	(Chernenko vd., 2019)
	Lack of human resources	Lack of human resources	(Chernenko vd., 2019)
	Lack of social interaction	Lack of social interaction	(Tan, 2022)

The studies presented in Table 4 comprehensively address recommendations proposed to overcome various challenges that gifted students face in mobile learning processes. These strategies, categorized under the main theme of recommendations, are organized into sub-themes such as the need for implementation support during the learning process, careful and effective lesson design, integration of traditional classrooms with mobile learning, adoption of student-centered approaches, and provision of regular feedback. These recommendations offer practical strategies to enhance the effectiveness of mobile learning for gifted students and provide solutions aimed at supporting their academic success.

One of the most frequently emphasized elements in the reviewed studies is the need for implementation support. Gönültaş and Yaman (2022) stress that providing application-based support is crucial, particularly from the perspective of teachers, for mobile learning to be effective. They argue that such support is essential for teachers to adapt to mobile learning environments and offer more efficient education to their students. Likewise, Eriksson (2015)

highlights that both students and teachers require support to engage effectively in mobile learning, indicating that this support plays a critical role in the overall learning process.

Similarly, Chernenko et al. (2019) emphasize that in STEM-based learning, both teachers and students must possess adequate knowledge and skills regarding mobile technologies. They point out that bridging the digital literacy gap between educators and learners is a critical step for successful implementation of mobile learning.

Recommendations regarding the need for well-designed lessons are another vital point for improving the quality of mobile learning. Heavner (2005), in a study on music education, argues that designing lessons aligned with students' interests can enhance their motivation and foster a more effective learning environment. Lesson content tailored to students' individual abilities enriches the learning process and maximizes their educational potential. Kandlhofer et al. (2019), focusing on robotics education, state that carefully designed lessons can significantly improve the quality of education. These studies demonstrate that lesson design plays a decisive role in student success. Additionally, Ozcan and Bicen (2016) suggest that research involving gifted students and social media use should be conducted with larger sample sizes to yield more generalizable results.

Eriksson (2015) further asserts that lesson designs should be aligned with learning objectives, emphasizing that every lesson should be carefully structured and goal-oriented, particularly in the context of gifted education. The integration of traditional classrooms with mobile learning is also considered a critical factor for success. Mooij (2008) argues that mobile learning should not replace traditional classrooms, but rather complement them for more productive outcomes. Supporting classroom education with mobile technologies can lead to more flexible and individualized learning experiences. This integrated approach enables mobile learning to address individual learning needs more effectively, allowing gifted students to benefit from both classroom-based and digital learning environments simultaneously.

A student-centered approach is another key recommendation that emerges from the literature. Eriksson (2015) notes that student-centered methods increase learners' active participation in the learning process. For gifted students, designing instructional content that matches their individual learning styles can boost their motivation and support their success. When combined with the flexibility of mobile learning, student-centered design empowers learners to take more control of their educational experiences.

Lastly, the provision of regular feedback is identified as a complementary element of student-centered learning processes. Heavner (2005) argues that giving students consistent feedback throughout the learning process can enhance their performance and help them stay focused. Eriksson (2015) also emphasizes that feedback is a critical tool in mobile learning environments, enabling students to evaluate their own performance and monitor their development. Establishing regular feedback mechanisms helps students manage their own learning, identify weaknesses, and address them effectively.

In summary, these recommendations offer a comprehensive roadmap for improving the success of gifted students in mobile learning environments. Providing implementation support, designing lessons with care, integrating mobile learning with traditional classrooms, embracing student-centered approaches, and delivering consistent feedback are all strategies that can

significantly enhance the impact of mobile learning and help gifted students achieve even greater educational outcomes.

Table 4: Recommendations" Themes for Mobile Learning in Gifted Education

Main Themes	Sub-Themes	Codes	Articles
RECOMMENDATION	Implementation support is required during the educational process	Implementation support in the educational process	(Gönültaş ve Yaman, 2022), (Eriksson, 2015), (Chernenko vd., 2019)
	Lessons should be well designed	Should be designed in accordance with students' interests	(Heavner, 2005)
		Well-designed instruction enhances the quality of education	(Kandlhofer vd.,2019)
		Sample sizes should be expanded	(Ozcan ve Bicen, 2016)
		Should be integrated with learning objectives	(Eriksson, 2015)
		Course design should be done carefully	(Mooij ,2008)
	Should complement the traditional classroom	Does not replace but complements the traditional classroom	(Mooij ,2008)
	Should adopt a student-centered approach	Student-centered approach	(Eriksson, 2015)
	Regular feedback should be provided	Regular feedback	(Eriksson, 2015), (Heavner, 2005)

Discussion and Conclusion

This systematic review explored how mobile learning experiences of gifted students have been addressed and evaluated in the literature. The findings were categorized under positive outcomes, negative aspects, and recommendation-based themes. In general, mobile learning environments were found to provide significant benefits to gifted students in terms of academic development, motivation, and personal growth.

One of the key themes emerging from the literature was the contribution of mobile learning to academic and cognitive skill enhancement. Students demonstrated improved problem-solving, creative thinking, and self-regulated learning abilities through mobile environments, aligning with the findings of Ravaglia et al. (1995) and Kay (2018), who previously emphasized the cognitive and academic benefits of technology-based instruction for high-ability learners. Similarly, Saputro & Budiarto (2024) reported that smartphone-integrated digital classrooms significantly stimulate creative thinking skills. Additionally, this review identified the role of mobile learning in raising awareness of STEM fields and environmental issues, consistent with Crompton and Burke (2018), who highlighted the positive impact of mobile technologies on STEM education outcomes.

In line with the literature, studies by Dabbagh and Kitsantas (2012) and Sisouvong and Pasanchay (2024) confirmed that mobile learning supports independent learning by enabling self-regulation, time management, and learner autonomy. These findings correspond with the study of Aydın Gönültaş and Yaman (2023), who found that gifted students exhibited high readiness for mobile learning. Haneefa (2024) further emphasized the mediating effect of

teacher support on mobile learning satisfaction, an element also revealed in this review. Dimitriadou et al. (2024) supported these results by demonstrating how ICT integration in European gifted education programs enhances differentiated instruction and autonomous learning.

Despite these advantages, the review also brought attention to key challenges. These included the lack of teacher training in mobile pedagogy, infrastructural limitations, and the social isolation of students. Pahrudin et al. (2024) and Eriksson (2015) emphasized similar structural constraints in their studies on adaptive learning for gifted students. Additionally, Tan (2022) and Chernenko et al. (2019) noted that insufficient peer interaction and unstructured environments in mobile learning can reduce motivation and engagement. These concerns indicate that while mobile learning environments are cognitively enriching, they may fall short in supporting the emotional and social dimensions of learning if not carefully designed.

The importance of integrating mobile learning into conventional classroom settings was another recurring theme in the literature. Mooij (2008) and Thomson (2010) recommended a blended approach to ensure both individualized learning and collaborative interaction. Traxler (2007) and O'Malley et al. (2005) also highlighted the need for instructional design strategies that prevent distraction and promote meaningful engagement in "anytime, anywhere" learning environments. These perspectives support the idea that mobile learning must be pedagogically guided and socially embedded to reach its full potential.

This review confirms that mobile learning environments hold considerable promise for gifted learners. They support the development of higher-order thinking skills, foster learner autonomy, and enable interdisciplinary learning. However, successful implementation depends on addressing infrastructural gaps, strengthening teacher competencies, and promoting socially interactive learning environments. When strategically designed and supported, mobile learning has the potential to transform gifted education by offering personalized, engaging, and effective learning pathways.

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