The Eurasia Proceedings of
Educational and Social Sciences (EPESS)
ISSN: 2587-1730

The Eurasia Proceedings of Educational and Social Sciences (EPESS), 2026

Volume 49, Pages 215-227

ICRET 2026: International Conference on Research in Education and Technology

An Investigation of Pre-Service Science Teachers' Perceptions and Levels of Use of Mobile Computing and Mobile Learning

Oguz Cetin
Nigde Omer Halisdemir University

Kaan Degirmenci
Nigde Omer Halisdemir University

Salih Karaca
Nigde Omer Halisdemir University

Abstract: The aim of this study is to examine science pre-service teachers' perceptions of mobile computing and mobile learning, as well as their levels of use of these technologies. The research was conducted with fourth-year pre-service teachers enrolled in the Science Education programme at the Faculty of Education, Nigde Omer Halisdemir University. A qualitative research approach was adopted in the study, and a semi-structured interview form consisting of open-ended questions was used as the data collection tool. The interview questions were designed to explore participants' ownership of mobile devices, the purposes for which they use them, the frequency of their use in lessons, and their perceptions of mobile learning. The data obtained were analysed using a descriptive analysis method. The research findings indicate that the vast majority of pre-service teachers own mobile devices such as smartphones and laptops and actively use these devices in their daily lives. It was determined that participants most frequently used mobile technologies for social media use, accessing information online, and accessing digital content. However, it was observed that the use of mobile devices for learning purposes in lessons is relatively limited, and the potential of these technologies in learning processes is not being fully utilised. Furthermore, it was found that pre-service teachers hold positive perceptions regarding the advantages of mobile learning, such as providing rapid access to information, supporting learning, and making the learning process more flexible. Conversely, it was noted that mobile devices have certain drawbacks, such as potentially causing distraction during lessons, increasing the risk of unauthorised use, and creating difficulties in maintaining control during the learning process. Based on the findings, various recommendations are presented for the more effective, conscious and pedagogically appropriate use of mobile learning in educational settings.

Keywords: Mobile learning, Mobile computing, Pre-Service teachers, Educational technologies, Use of mobile devices

Introduction

Problem Statement

Rapid developments in information and communication technologies have significantly transformed the ways in which individuals access information and their learning processes (Castells, 2010; Selwyn, 2021). In particular, the integration of digital technologies into daily life has enabled learning to extend beyond formal educational settings into diverse contexts (Sharples et al., 2007). During this transformation, the widespread adoption of portable digital devices has not only enabled individuals to access information instantly but has also contributed to learning processes becoming more flexible and dynamic (Crompton, 2013).

- This is an Open Access article distributed under the terms of the Creative Commons Attribution-Noncommercial 4.0 Unported License, permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

- Selection and peer-review under responsibility of the Organizing Committee of the Conference

© 2026 Published by ISRES Publishing: www.isres.org

Mobile technologies have evolved beyond merely serving as communication tools; today, they play an active role in the processes of producing, sharing and acquiring knowledge (Traxler, 2007). Mobile devices such as smartphones, tablets and laptops enable learning activities to be carried out independently of time and place and allow learning processes to be tailored to individual needs (Kukulska-Hulme, 2012). This has increased the use of mobile technologies in education and made the concept of mobile learning increasingly prominent.

Mobile learning is defined as a learning approach that enables individuals to participate in learning activities anytime and anywhere via portable digital technologies (Crompton, 2013; Traxler, 2007). This approach offers significant advantages in terms of bringing flexibility to learning processes and enabling learners to access information quickly (Sharples et al., 2007). In particular, by eliminating time and place constraints, it makes learning processes more accessible and enables individuals to experience a learning journey suited to their own pace (Kukulska-Hulme & Shield, 2008).

Furthermore, mobile learning supports personalised learning experiences by enabling learners to access content tailored to their interests, needs and learning styles (Park, 2011). This increases active participation in the learning process and supports learner autonomy (Sharples et al., 2007). Furthermore, the ability to ensure the continuity of learning through mobile technologies contributes to learning continuing not only within the classroom environment but also in out-of-school settings (Traxler, 2009). In this respect, mobile learning acts as a bridge between formal and informal learning processes.

Despite the advantages offered by mobile learning, it is evident that it also brings with it various limitations. In particular, the intensive and uncontrolled use of mobile devices can lead to distractions during the learning process and cause individuals to drift away from learning-focused activities (Gikas & Grant, 2013). Furthermore, the ease of accessing information in mobile environments can lead individuals to exhibit a tendency towards superficial learning rather than processing information in depth (Kirschner & De Bruyckere, 2017).

Furthermore, the diversity of information in digital environments brings with it issues of information overload and reliability (Selwyn, 2021). This situation can make it difficult for learners to access accurate and reliable information. Furthermore, prolonged and intensive use of mobile devices can lead to issues such as screen addiction and negatively impact learning processes (Kuss & Griffiths, 2017). Furthermore, the limited face-to-face interaction in mobile learning environments can lead to a weakening of social learning processes (Graham, 2006). This situation highlights the need for mobile learning to be carefully considered from a pedagogical perspective.

The effective integration of mobile learning into educational processes depends largely on teachers' perceptions of these technologies and their proficiency in using them (Ertmer & Ottenbreit-Leftwich, 2010). In this regard, pre-service teachers are of critical importance, both in their current capacity as learners and in their future roles as teachers. Pre-service teachers' perceptions of mobile learning can directly influence how they will use technology in their classroom practice in the future (Tondeur et al., 2012).

Furthermore, pre-service teachers' awareness of and experiences with mobile learning environments play a decisive role in the pedagogical integration of technology (Koehler & Mishra, 2009). The ability to use mobile technologies not merely as tools, but in a way that supports and transforms learning, is closely linked to teachers' knowledge and skills regarding these processes. For this reason, it is considered important to examine pre-service teachers' perceptions of and usage practices regarding mobile learning within the teacher training process.

A review of the literature reveals various findings indicating that mobile learning supports learning processes, facilitates access to information and enhances learner autonomy (Park, 2011; Traxler, 2007). However, some studies indicate that mobile learning largely remains at the level of accessing information and supportive use, and that its application in supporting higher-order cognitive processes is limited (Sharples et al., 2007).
On the other hand, it is emphasised that perceptions of mobile learning are closely linked to individuals' technological equipment, usage habits and digital literacy (Selwyn, 2021). This situation indicates that mobile learning must be addressed within a multidimensional framework.

However, upon reviewing the existing literature, it is observed that there is a limited number of studies that adopt a holistic approach to examine pre-service science teachers' perceptions of mobile learning in the context of usage purposes, advantages and limitations, the effects of out-of-school learning, and necessary

competencies. In this context, it is expected that this study will contribute to the relevant literature and shed light on the role of mobile learning in the teacher training process in a more comprehensive manner.
Within this framework, the research question has been defined as: "What are science pre-service teachers' views on mobile learning?" The sub-questions identified within this framework are listed below.

1. What are science pre-service teachers' perceptions of mobile learning?
2. For what purposes do science pre-service teachers use mobile learning environments?
3. What are the advantages and limitations of mobile learning according to science pre-service teachers?
4. What are the views regarding the effects of mobile learning on out-of-school learning processes?
5. What are the views regarding the competencies learners should possess in mobile learning environments?
6. How can participants' technological ownership status and technology usage characteristics be evaluated in conjunction with findings on mobile learning?

The Aim of the Study

The aim of this study is to examine science pre-service teachers' perceptions of mobile learning in terms of their purposes of use, perceived advantages and limitations, effects on out-of-school learning processes, and the competencies deemed necessary in mobile learning environments. Furthermore, the aim is to evaluate the findings in relation to participants' levels of technological ownership and technology usage habits.

Significance of the Study

The rapid development of digital technologies has significantly transformed learning processes, reshaping the ways in which individuals' access, process and structure information. In this context, mobile technologies have emerged as powerful tools that enable learning to extend beyond the confines of traditional classrooms, allowing learners to engage with educational content in diverse contexts and environments (Crompton & Burke, 2018). Mobile learning is not merely a concept limited to technological accessibility; rather, its educational value depends largely on how it is pedagogically integrated into teaching and learning processes. Research emphasises that the effectiveness of mobile learning environments is closely linked to instructional design, learner engagement and meaningful interaction rather than the technology itself (Kearney et al., 2012; Sung et al., 2016).

In this context, pre-service teachers emerge as a critical group, as their perceptions and experiences of technology directly shape their future classroom practices. Their beliefs regarding mobile learning play a decisive role in determining how they will adopt, adapt and implement these technologies in their professional lives (Instefjord & Munthe, 2016; Scherer et al., 2019).

Although the literature highlights that mobile learning offers significant potential in terms of flexibility, engagement and accessibility, it is evident that most existing studies have focused primarily on general effectiveness or the technological dimension. Consequently, there is a need for studies that examine pre-service teachers' use of mobile learning—including their purposes, perceived benefits, limitations, and the impact on learning processes—in a more comprehensive manner (Bond, 2020; Zheng et al., 2016).

In this context, this study aims to contribute to the literature by examining pre-service science teachers' perceptions of mobile learning from a multidimensional perspective. It is anticipated that the findings will reveal how future teachers interpret mobile technologies and contribute to the development of teacher training processes in a more effective and pedagogically grounded manner.

Method

Research Model

This study was designed as a qualitative research project aimed at examining in depth the perceptions and experiences of science pre-service teachers regarding mobile learning. The qualitative research approach was chosen as it enables the exploration of individuals' perceptions, experiences and processes of meaning-making regarding a specific phenomenon (Tekindal & Arsu, 2020). In this context, the study provides a framework that allows participants to express their views on mobile learning from their own perspectives.

Qualitative research is an approach aimed at uncovering the meanings individuals ascribe to their experiences and examining social phenomena within their natural context (Tutar, 2023). In this respect, qualitative research focuses on participants' experiences and the meanings they ascribe to these experiences rather than on measurement and numerical data (Creswell & Poth, 2016). The researcher's endeavour to understand participants' perspectives and to analyse the data using a holistic approach are among the fundamental characteristics of qualitative research (Merriam, 2009).

The primary reason for opting for a qualitative research approach in this study is the desire to examine pre-service science teachers' perceptions of mobile learning not merely at a superficial level, but in a thorough and multi-dimensional manner. Qualitative research provides a suitable research framework for such studies as it allows for the detailed exploration of participants' thoughts, experiences and perspectives (Patton, 2014). Furthermore, the qualitative research approach offers a flexible structure during the research process, allowing data collection and analysis procedures to be tailored to the research objective (Baltacı, 2019). This situation makes it possible to address a phenomenon such as mobile learning—which is multidimensional and can vary contextually—in a more comprehensive manner (Yıldırım & Şimşek, 2018). For this reason, the qualitative research approach was adopted in this study, as it allows participants to express their perceptions of mobile learning in line with their own experiences.

Study Group

The study group consists of a total of 36 fourth-year pre-service teachers enrolled in the Science Education Programme at the Faculty of Education, Niğde Ömer Halisdemir University. In the study, purposive sampling, a type of non-probability sampling, was used as the sampling method. Purposive sampling is an approach that enables the selection of individuals or situations that are information-rich and capable of providing comprehensive data regarding the phenomenon under investigation, in line with the research objectives; this allows the researcher to examine the relevant situations not superficially, but in-depth and in detail (Büyüköztürk et al., 2021). The selection of fourth-year students was influenced by the fact that they are closer to the teaching profession in terms of teaching practice and subject-specific courses. This ensures that participants provide more informed and experience-based views on mobile learning. The demographic characteristics of the pre-service teachers participating in the study are presented in Tables 1, 2, 3 and 4.

Table 1. Distribution of participants by gender

Gender	f	%
Female	27	75
Male	9	25
Total	36	100

Table 1 shows that 75% of the participants (n=27) were female and 25% (n=9) were male. This indicates that the study group consisted predominantly of female participants.

Table 2. Mobile devices owned by participants

Mobile Device	n	f	%
PDA	36	0	0
Storage Devices	36	17	47.2
Smartphone	36	35	97.2
Laptop	36	26	72.2
Tablet	36	15	41.7
Handheld Game Console	36	1	2.8

Table 2 shows that the vast majority of participants own a smartphone (97.2%; n=35). This is followed by laptops (72.2%; n=26) and storage devices (47.2%; n=17). Whilst tablet ownership (41.7%; n=15) remains at a moderate level, the use of handheld game consoles (2.8%; n=1) and PDAs (0%; n=0) is notably low. These figures indicate that participants have a high level of access to mobile technologies.

Table 3 shows that participants most frequently use their mobile devices for social media use (88.9%; n=32), using artificial intelligence tools (86.1%; n=31) and visiting websites (86.1%; n=31). In addition, daily life activities such as banking transactions (86.9%; n=31), shopping (83.3%; n=30) and photo/data transfer (80.6%; n=29) also stand out. In contrast, activities such as gaming (11.1%; n=4) and word processor use (13.9%; n=5)

are observed to be at a lower level. This indicates that mobile devices are primarily used for daily life and communication purposes.

Table 3. Participants' mobile device usage activities

Activity	n	f	%
Social media usage	36	32	88.9
Use of artificial intelligence tools	36	31	86.1
Visiting websites	36	31	86.1
Banking transactions	36	31	86.9
Shopping	36	30	83.3
Photo/data transfer	36	29	80.6
SMS usage	36	28	77.8
Photo/video editing	36	27	75
Presentation software	36	25	69.4
Navigation	36	25	69.4
Watching videos	36	24	66.7
Email	36	22	61.1
Instant messaging	36	20	55.6
Calculation tools	36	15	41.7
File transfer	36	12	33.3
E-book reading	36	11	30.6
Listening to podcasts	36	10	27.8
Gaming	36	4	11.1
Word processor	36	5	13.9

The table below shows the frequency of mobile learning use during classroom activities. Data on participants' frequency of mobile device use in lessons is presented in Table 4.

Table 4. Frequency of mobile device use in lessons

Frequency of Use	f	%
Never	2	5.6
Rarely	15	41.7
Frequently	14	38.9
Very often	5	13.9
Total	36	100

Examining Table 4, it is observed that 41.7% of participants (n=15) rarely use mobile devices in class, 38.9% (n=14) use them frequently, and 13.9% (n=5) use them very frequently. In contrast, 5.6% of participants (n=2) stated that they never used mobile devices in class. These results indicate that the use of mobile devices remains at a limited level within the classroom environment.

Data Collection Tool

In this study, a semi-structured interview form developed by the researcher was used as the data collection tool. A semi-structured interview is a data collection method conducted within the framework of questions pre-determined by the researcher yet allowing for flexibility where necessary to enable participants to express their views in detail (Büyüköztürk et al., 2021). This method ensures that data is collected within a specific systematic framework whilst also allowing participants' experiences and thoughts to be explored in depth (Creswell & Poth, 2016). In this study, the semi-structured interview technique was chosen to enable science pre-service teachers to articulate their perceptions, purposes of use and experiences regarding mobile learning in detail, in their own words. The form consists of a total of five interview questions, which have been designed to cover different dimensions, including perceptions of mobile learning, purposes of use, advantages, limitations and necessary competencies.

Accordingly, the questions included in the semi-structured interview form are presented below:

1. How would you define the concept of mobile learning?
2. For what purposes do you use mobile learning environments?
3. What do you consider to be the advantages and limitations of mobile learning?

4. What are your thoughts on the impact of mobile learning on out-of-school learning processes?
5. What competencies should learners possess in mobile learning environments?

To ensure the content validity of the data collection tool, the views of subject matter experts were sought, and the questions were revised in line with the feedback received from these experts. During this process, care was taken to ensure that the questions were clear, understandable and appropriate for the research objective.

Data Collection Process

Research data was collected during the spring term of the 2025–2026 academic year within the classroom environment where the participants were studying. During the data collection process, participants were informed about the purpose of the research, and participation was based on voluntary consent. Data were collected through one-to-one interviews with participants, and sufficient time was allowed for them to answer the questions. Attention was paid to the principles of anonymity and confidentiality to ensure that participants could express their views freely.

Data Analysis

The data obtained in the study were analysed using the content analysis method. In the content analysis process, the data were first read using a holistic approach and then divided into meaningful units. Codes were created through open coding based on these units, and categories and themes were identified by grouping similar codes together (Elo & Kyngäs, 2008). In line with the themes identified, the data were systematically organised and findings were supported by calculating their frequencies. Furthermore, direct quotations were included to accurately reflect the participants' views.

Validity and Reliability

Various strategies were employed to ensure the validity and reliability of the research. Firstly, content validity was ensured by consulting three different experts during the development of the data collection instrument. During the data analysis process, independent coding was carried out by two researchers, and the resulting codes were compared. Inter-coder agreement was calculated using the reliability formula proposed by Miles and Huberman (1994), and an agreement rate of 93% was determined. This rate indicates that the study's reliability is high. Furthermore, to enhance the credibility of the findings, direct participant statements were included, and the analysis process was reported in detail.

Ethical Principles

Ethical principles were adhered to throughout the research process. Participants were informed about the purpose of the study, and participation was entirely voluntary. Participants' personal details were kept confidential, data were anonymised, and codes were used instead of real names during the reporting process. Research data were used solely for scientific purposes.

Findings

In this study, pre-service science teachers' views on mobile learning were examined using content analysis, and the findings were presented under five main themes: perceptions of mobile learning, purposes of use, advantages and limitations, out-of-school effects, and learner competencies. The findings were supported by tables and direct quotations based on the codes, categories and frequencies established.

Perceptions of Mobile Learning

The codes and categories revealing science pre-service teachers' perceptions of mobile learning are presented in Table 5.

Table 5. Codes and categories regarding perceptions of mobile learning

Category	Code	f
Access to Information	Access to digital information	6
	Obtaining information from the internet	4
	Easy access	2
Technology-Based Perception	Learning through technology	3
	Mobile devices (phones, tablets, etc.)	4
	Digital learning	2
Digital platforms	EBA / online platforms	2
	YouTube / video content	3
Perception of Artificial Intelligence	Artificial intelligence	4
	ChatGPT	1
Uncertainty	No idea / blank	2

Upon examining Table 5, it is evident that participants perceive mobile learning primarily within the context of accessing information. In particular, the prominence of the codes “access to digital information” (f=6) and “acquiring information from the internet” (f=4) indicates that participants primarily view mobile learning as a means of rapid access to information. However, it is also noteworthy that mobile learning is perceived as a technology-based structure. Codes such as “learning using mobile devices” (f=4) and “learning with technology” (f=3) support this view. For example, one participant described mobile learning as “learning taking place anywhere using mobile devices such as smartphones, tablets or laptops” (Ö8).

Furthermore, it is evident that mobile learning is associated with artificial intelligence and digital platforms. Codes such as “artificial intelligence” (f=4) and “YouTube/video content” (f=3) demonstrate that mobile learning is integrated with current digital tools. However, the fact that some participants were unable to express any views on the concept of mobile learning (f=2) indicates that conceptual awareness is limited. This finding suggests that participants perceive mobile learning primarily as a tool-oriented and information-access-focused structure (Elçiçek, 2022) .

Purposes of Using Mobile Learning Environments

Findings regarding the purposes of using mobile learning environments are presented in Table 6.

Table 6. Purposes of mobile learning use

Category	Code	f
Research	Conducting research	9
Supporting Learning	Lesson revision / consolidation	5
	Topic explanation / video	6
Assessment	Test / exam preparation	4
Visualisation	Simulation / concretisation	4
Access	Quick access to information	3
Uncertainty	Blank / don’t know	2

Upon examining Table 6, it is evident that participants most frequently used mobile learning for the purpose of conducting research (f=9). This indicates that the use of mobile learning as a means of accessing information is predominant. Furthermore, it was determined that mobile learning is used as a tool to support learning. The codes “lesson revision and reinforcement” (f=5) and “learning through video” (f=6) support this finding. For example, one participant described mobile learning as “revising lessons and watching educational videos” (Ö9). A smaller number of participants mentioned the use of mobile learning for assessment and evaluation (f=4) and visualisation/simulation (f=4). This indicates that mobile learning is used primarily in basic learning processes, whilst its use for higher-level pedagogical purposes remains limited. These findings indicate that mobile learning is predominantly used as a tool to support learning, but its use for transformative and deep learning processes remains limited (Gökbulut, 2021) .

Advantages and Limitations of Mobile Learning

Findings regarding the advantages and limitations of mobile learning are presented in Table 7.

Table 7. Advantages and limitations of mobile learning

Category	Code	f
Advantages	Time and place flexibility	6
	Quick access	4
	Repeatability	2
	Safe learning (risky experiments)	2
Limitations	Distraction	4
	Screen addiction / health	5
	Information overload	3
	Lack of interaction	3
	Passive learning	3
The Advantages of Face-to-Face Learning	Face-to-face is more effective	5

Upon examining Table 7, it is evident that the most significant advantage of mobile learning is flexibility in terms of time and place (f=6). Participants stated that mobile learning offers the opportunity to learn in any environment. Furthermore, advantages such as 'quick access' (f=4) and 'repeatability' (f=2) also stand out. These findings demonstrate that mobile learning provides a robust learning environment in terms of flexibility and accessibility (Güler, 2018) .

Conversely, various limitations of mobile learning have also been identified. In particular, screen dependency and health issues (f=5), distraction (f=4) and information overload (f=3) are among the most frequently cited drawbacks. For example, one participant highlighted this situation using the term "screen dependency" (P1). Furthermore, the codes "lack of interaction" (f=3) and "passive learning" (f=3) point to the pedagogical limitations of mobile learning. However, it is observed that some participants found face-to-face learning to be more effective (f=5). Conversely, factors such as distraction, screen addiction and lack of interaction emerge as significant factors limiting the pedagogical effectiveness of mobile learning (Kukulska-Hulme & Shield, 2008; Traxler, 2009) .

The Effects of Mobile Learning in Out-of-School Settings

Findings regarding the effects of mobile learning in out-of-school settings are presented in Table 8.

Table 8. Effects of mobile learning in non-school settings

Category	Code	f
Access and Continuity	Learning anywhere	6
	Conducting research	4
Supportive Role	Supporting learning	5
	Preparation	2
Positive Impact	Useful / effective	5
Limitations	Ineffective use	2
	Incorrect use / information issue	2
Uncertainty	Blank	5

Upon examining Table 8, it is evident that the most significant contribution of mobile learning is the ability to learn and access information anywhere (f=6). Participants stated that mobile learning extends learning beyond the school environment. For example, one participant emphasised this point by stating, "I can conduct research anywhere" (P15). It was also determined that mobile learning plays a supportive role in learning (f=5) and can be utilised in preparatory processes (f=2). However, some participants indicated that awareness regarding the effective use of mobile learning is limited. The relatively high number of blank responses (f=5) suggests that some participants may have limited experience or awareness regarding the out-of-school dimension of mobile learning (Ocak & Korkmaz, 2018) .

Learner Competencies in Mobile Learning Environments

Findings regarding the competencies required for mobile learning are presented in Table 9.

Table 9. Competencies required in mobile learning

Category	Code	f
Technological Competence	Ability to use technology	10
Digital Literacy	Digital literacy	4
Cognitive Skills	Research / inquiry	5
	Openness to learning / curiosity	4
Personal Characteristics	Discipline / self-discipline	3
	Patience	1
Other	Accessibility	2
Uncertainty	Blank / not required	4

Upon examining Table 9, it is evident that technological skills (f=10) are the competencies most frequently highlighted by participants. This indicates that mobile learning is perceived as technology-based. In addition, digital literacy (f=4) and research/inquiry skills (f=5) feature among the key competencies. Furthermore, individual characteristics such as 'curiosity and openness to learning' (f=4) were also highlighted. A smaller number of participants mentioned higher-order learning skills such as self-discipline and self-regulation (f=3). This suggests that mobile learning is associated more with technical skills. This finding indicates that participants largely associate mobile learning with technical competencies, whilst cognitive and self-regulatory competencies are perceived to a more limited extent (Balçın & Ergün, 2018) .

Results and Discussion

The results obtained in this study indicate that science pre-service teachers largely associate mobile learning with access to information and the use of technology. These data reveal that mobile learning is perceived not as a pedagogical approach to learning, but rather as a tool-based structure. The research suggests that mobile learning has not yet been sufficiently internalised pedagogically within educational settings. Similarly, (Zawacki-Richter, 2009) emphasises that technological access alone is insufficient for mobile learning to be effective; it must be integrated with learning design. Furthermore, (Hwang, 2014) notes that neglecting the pedagogical dimension of mobile learning can render learning processes superficial. In this context, the fact that pre-service teachers tend to equate mobile learning primarily with device usage indicates that their pedagogical integration skills are still in the developmental stage (Aydın & Kara, 2013). Within this framework, it is suggested that teacher training programmes should address mobile learning not merely from a technical perspective, but also in terms of its pedagogical dimensions (Dadandı & Kalyon, 2016).

Research findings indicate that mobile learning is predominantly used for supportive learning activities such as conducting research, revising lessons and watching videos. In contrast, higher-order pedagogical uses, such as production, collaboration and discovery-based learning, appear to be limited. This situation highlights that mobile learning is used primarily in a way focused on information consumption. Indeed, it is stated that the potential of mobile learning can only be realised in collaborative and constructivist learning environments (Looi et al., 2010). Similarly, Kearney and colleagues also emphasise that the pedagogical value of mobile learning increases through student-centred and interactive forms of use (Kearney et al., 2012). In this context, it can be said that pre-service teachers are not yet able to utilise mobile learning at a deep pedagogical level and tend to view it primarily as a supportive tool. This indicates that mobile learning must be supported by active learning, production and collaboration-based practices within the teacher training process (Kumaş, 2023). Research findings reveal that whilst mobile learning offers significant advantages such as flexibility in time and place, it also brings with it significant limitations such as distraction and screen dependency. Within this framework, it is evident that mobile learning possesses a dual-natured structure that encompasses both opportunities and risks.

This dual nature is frequently emphasised in literature. Ophir et al. (2009) note that multitasking in digital environments may negatively affect attention control (Ophir et al., 2009) , whilst Junco (2012) states that the uncontrolled use of mobile technologies may reduce academic performance (Junco, 2012). Consequently, the flexibility offered by mobile learning can have a negative impact on the learning process if it is not supported by appropriate pedagogical guidance. This highlights the need for pre-service teachers to develop not only the ability to use technology, but also the skills to organise and manage learning processes (Orkun & Bayırlı, 2019).

The research indicates that mobile learning holds significant potential in terms of extending learning processes beyond the school environment and ensuring the continuity of learning. The fact that participants view mobile learning as a tool for learning and conducting research anywhere supports this potential. This finding demonstrates that mobile learning offers a framework that integrates formal and informal learning processes.

Sefton-Green (2013) states that digital technologies have made learning an integral part of everyday life (Sefton-Green, 2013). Similarly, Pachler et al. (2010) note that mobile learning is an important tool for supporting the continuity of learning (Pachler et al., 2010). However, the fact that some participants demonstrated limited awareness of this potential highlights the need for the out-of-school use of mobile learning to be consciously guided. This situation indicates that mobile learning should be addressed in teacher training not only from an in-class perspective but also from a lifelong learning perspective (Boztepe & Demirtaş, 2018). Research data indicates that participants largely associate the competencies required for mobile learning with technological skills. In contrast, cognitive and higher-order skills such as self-regulation, critical thinking and learning strategies appear to be given less consideration.

In this context, it suggests that mobile learning is perceived as a technical skill and that its pedagogical dimension is not sufficiently recognised. Redecker (2017) points out that digital competences are not merely technical skills but also encompass cognitive and pedagogical dimensions. In this context, it is necessary to broaden pre-service teachers' perceptions of competence regarding mobile learning and to foster a more holistic understanding of digital competence. This situation indicates that teacher training programmes should place greater emphasis on skills such as self-regulation, critical thinking and pedagogical awareness (Karademir & Saracaloğlu, 2017).

Conclusion

This study has revealed the perceptions and usage levels of science pre-service teachers regarding mobile learning in a multidimensional manner. The findings indicate that mobile learning is viewed by pre-service teachers as an important learning tool; however, this potential largely remains at the level of accessing information and supportive use (Maviş et al., 2024). Research findings reveal that the pedagogical integration of mobile learning is limited and that pre-service teachers tend to evaluate this technology primarily from a instrumental perspective. However, it has been established that mobile learning offers significant advantages in terms of flexibility and accessibility, whilst also harbouring risks such as distraction and uncontrolled use (Çamalan & Demirbaş, 2024). Furthermore, it has been concluded that mobile learning has the potential to support out-of-school learning processes, but that this potential requires conscious use (Özdamar & Aydın, 2020). In addition, it has been observed that pre-service teachers' perceptions of their competence regarding mobile learning are largely limited to technical skills. In this context, the development of skills such as digital literacy, self-regulation and pedagogical awareness is of great importance for the effective use of mobile learning (Seyhan, 2024).

Recommendations

Mobile learning environments should be designed not merely as tools for accessing information, but to support active learning. In this regard, mobile learning applications should be supported by collaborative learning, problem-solving and production-based activities (Efe & Bakçı, 2022). Furthermore, mobile learning can offer a more effective learning experience when structured within blended learning models. To enable students to use mobile learning environments effectively, their digital literacy skills must be developed. Furthermore, skills such as information verification, critical thinking and self-regulation should be supported. Students should be encouraged to use mobile technologies not merely for consumption, but for production and learning-oriented purposes (Yavrutürk, 2025). Future research could examine mobile learning using different methods (quantitative and mixed-methods designs). Furthermore, the relationships between mobile learning and variables such as academic achievement, motivation and self-regulation could be investigated. Studies conducted across different disciplines and educational levels could yield more comprehensive findings regarding the effects of mobile learning.

Scientific Ethics Declaration

* The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

Conflict of Interest

* The authors declare that they have no conflicts of interest

Funding

* This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgements or Notes

* This article was presented as an oral presentation at the International Conference on Research in Education and Technology (www.icret.net) held in Konya/Türkiye on April 02-05, 2026.

References

Aydın, F., & Kara, F. N. (2013). Pre-service teachers' attitudes towards technology: A scale development study. *Journal of Turkish Science Education*, *10*(4), 103–118.

Balçın, M., & Ergün, A. (2018). Determining and examining the technological pedagogical content knowledge (TPCK) self-efficacy of science pre-service teachers in relation to various variables. *Journal of the Faculty of Education, Mehmet Akif Ersoy University*, (45), 23–47. https://doi.org/10.21764/maeuefd.311316

Baltacı, A. (2019). The qualitative research process: How to conduct qualitative research? Journal of the *Institute of Social Sciences, Ahi Evran University, 5*(2), 368–388. https://doi.org/10.31592/aeusbed.598299

Bond, M. (2020). Facilitating student engagement through the flipped learning approach in K-12: A systematic review. *Computers & Education*, *151*, 103819. https://doi.org/10.1016/j.compedu.2020.103819

Boztepe, Ö., & Demirtaş, Z. (2018). An investigation of pre-service teachers' levels of satisfaction with lifelong learning and communication. *Journal of Higher Education and Science*, *8*(2), 327–335. https://doi.org/10.5961/jhes.2018.279

Boztepe, Ö., & Demirtaş, Z. (2018). An investigation of pre-service teachers' levels of satisfaction with lifelong learning and communication. *Journal of Higher Education and Science*(2), 327-335.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö., Karadeniz, Ş., & Demirel, F. (2021). *Research methods in education* (29th ed.). Pegem Academy.

Castells, M. (2010). *The rise of the network society* (2nd ed.). Wiley-Blackwell.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.

Crompton, H. (2013). A historical overview of mobile learning: Toward learner-centred education. In Z. L. Berge & L. Y. Muilenburg (Eds.), *Handbook of mobile learning* (pp. 3–14). Routledge.

Crompton, H., & Burke, D. (2018). The use of mobile learning in higher education: A systematic review. *Computers & Education*, *123*, 53–64. https://doi.org/10.1016/j.compedu.2018.04.007

Çamalan, V. F., & Demirbaş, E. (2024). Studies aimed at avoiding the risks posed by technology in children and promoting conscious internet use. *Karatay Journal of Social Research*, (13), 31–58. https://doi.org/10.54557/karataysad.1519907

Dadandı, İ., & Kalyon, A. (2016). Self-efficacy beliefs, anxiety levels and attitudes towards the teaching profession among teacher candidates studying at a faculty of education and undergoing pedagogical training. *Bayburt Faculty of Education Journal*, *11*(1), 253-269. https://izlik.org/JA29TN38ZE

Efe, H. A., & Bakçı, S. (2022). A meta-synthesis of studies on science education in Turkey related to the theory of multiple intelligences. *Academia Journal of Educational Research*, *7*(1), 24-43. https://doi.org/10.53506/egitim.1063187

Elçiçek, M. (2022). Continuous learning, mobile learning. *Digitalisation in Education and New Approaches*, *155*, 68-84.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107–115. https://doi.org/10.1111/j.1365-2648.2007.04569.x

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, *42*(3), 255–284. https://doi.org/10.1080/15391523.2010.10782551

Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, *19*, 18–26. https://doi.org/10.1016/j.iheduc.2013.06.002

Gökbulut, B. (2021). Distance education and mobile learning from the perspective of distance education students. *Educational Technology Theory and Practice*, *11*(1), 160–177. https://doi.org/10.17943/etku.797164

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), *Handbook of blended learning* (pp. 3–21). Pfeiffer.

Güler, E. (2018). Flexibility in open and distance learning environments. *Journal of Open Education Applications and Research*, *4*(3), 75-95.

Hwang, G.-J. (2014). Definition, framework and research issues of smart learning environments-a context-aware ubiquitous learning perspective. *Smart Learning Environments*, *1*(1), 4. https://doi.org/10.1186/s40561-014-0004-5

Instefjord, E., & Munthe, E. (2016). Preparing pre-service teachers to integrate technology: An analysis of the emphasis on digital competence in teacher education curricula. *European Journal of Teacher Education*, *39*(1), 77–93. https://doi.org/10.1080/02619768.2015.1100602

Junco, R. (2012). In-class multitasking and academic performance. *Computers in Human Behavior*, *28*(6), 2236–2243. https://doi.org/10.1016/j.chb.2012.06.031

Karademir, Ç. A., & Saracaloğlu, A. S. (2017). The effect of prospective teachers' inquiry and critical thinking skills on their level of teaching self-efficacy. *Turkish Studies*, *12*(33), 261-290 https://doi.org/10.7827/TurkishStudies.12708

Kearney, M., Schuck, S., Burden, K., & Aubusson, P. (2012). Viewing mobile learning from a pedagogical perspective. *Research in Learning Technology*, *20*(1). https://doi.org/10.3402/rlt.v20i0.14406

Kirschner, P. A., & De Bruyckere, P. (2017). The myths of the digital native and the multitasker. *Teaching and Teacher Education*, *67*, 135–142. https://doi.org/10.1016/j.tate.2017.06.001

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, *9*(1), 60–70.

Kukulska-Hulme, A. (2012). Mobile learning and the future of learning. *International HETL Review*, *2*, 13–18.

Kukulska-Hulme, A., & Shield, L. (2008). An overview of mobile-assisted language learning: From content delivery to supported collaboration and interaction. *ReCALL*, *20*(3), 271–289. https://doi.org/10.1017/S0958344008000335

Kumaş, A. (2023). The use of technology as an active learning in science lessons. *Trakya Education Journal*, *13*(2), 943–961. https://doi.org/10.24315/tred.1100907

Kuss, D. J., & Griffiths, M. D. (2017). Social networking sites and addiction: Ten lessons learnt. *International Journal of Environmental Research and Public Health*, *14*(3), 311. https://doi.org/10.3390/ijerph14030311

Looi, C. K., Seow, P., Zhang, B., So, H. J., Chen, W., & Wong, L. H. (2010). Leveraging mobile technology for sustainable seamless learning: A research agenda. *British Journal of Educational Technology*, *41*(2), 154–169. https://doi.org/10.1111/j.1467-8535.2008.00912.x

Maviş, A., Gürkan, K., Maral, İ., Sarısakal, A., & Peynirci, M. (2024). An examination of primary school teachers' views on mobile learning. *International QMX Journal*, *3*(11), 2256–2283. https://doi.org/10.5281/zenodo.14253058

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.

Ocak, İ., & Korkmaz, Ç. (2018). An examination of science and pre-school teachers' views on out-of-school learning environments. *International Journal of Field Education*, *4*(1), 18–38.

Ophir, E., Nass, C., & Wagner, A. D. (2009). Cognitive control in media multitaskers. *Proceedings of the National Academy of Sciences*, *106*(37), 15583–15587. https://doi.org/10.1073/pnas.0903620106

Orkun, M. A., & Bayırlı, A. (2019). Learning strategies and instruction. *Maarif Mektepleri International Journal of Social and Human Sciences*, *2*(1), 64–74. https://izlik.org/JA65GG25EU

Özdamar, N., & Aydın, O. (2020). Mobile learning and an examination of mobile learning applications at universities offering open education in Turkey. *Journal of Open Education Applications and Research*, *6*(4), 113–154. https://izlik.org/JA99YZ47MR

Pachler, N., Bachmair, B., Cook, J., & Kress, G. (2010). *Mobile learning: Structures, agency, practices*. London, NY: Springer. https://doi.org/10.1007/978-1-4419-0585-7

Park, Y. (2011). A pedagogical framework for mobile learning: Categorising educational applications of mobile technologies into four types. *International Review of Research in Open and Distributed Learning*, *12*(2), 78–102. https://doi.org/10.19173/irrodl.v12i2.791

Patton, M. Q. (2014). *Qualitative research & evaluation methods: Integrating theory and practice*. Sage Publications.

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modelling approach to explaining teachers' adoption of digital technology in education. *Computers & Education*, *128*, 13–35. https://doi.org/10.1016/j.compedu.2018.09.009

Sefton-Green, J. (2013). *Learning at not-school: A review of studies, theory, and advocacy for education in non-formal settings*. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/9351.001.0001

Selwyn, N. (2021). *Education and technology: Key issues and debates*. London, UK: Bloomsbury Publishing https://doi.org/10.1007/s11159-022-09971-9

Seyhan, H. G. (2024). Mobile learning in education. In H. G. Seyhan (Ed.), *New-generation technologies in education – 2023* (p. 93). Lyon: Logy Academy.

Sharples, M., Taylor, J., & Vavoula, G. (2007). A theory of learning for the mobile age. In R. Andrews & C. Haythornthwaite (Eds.), *The SAGE handbook of e-learning research* (pp. 221-247). London: Sage. https://doi.org/10.4135/9781848607859.n10

Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education*, *94*, 252–275. https://doi.org/10.1016/j.compedu.2015.11.008

Tekindal, M., & Arsu, Ş. U. (2020). A review of the scope and process of the phenomenological approach as a qualitative research method. *Ufkun Ötesi Bilim Dergisi*, *20*(1), 153–172.

Tondeur, J., Van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. *Computers & Education*, *59*(1), 134–144. https://doi.org/10.1016/j.compedu.2011.10.009

Traxler, J. (2007). Defining, discussing and evaluating mobile learning: The moving finger writes and having writ…. *International Review of Research in Open and Distributed Learning*, *8*(2). https://doi.org/10.19173/irrodl.v8i2.346

Traxler, J. (2009). Learning in a mobile age. *International Journal of Mobile and Blended Learning (IJMBL)*, *1*(1), 1–12. https://doi.org/10.4018/jmbl.2009010101

Tutar, H. (2023). Criteria for determining qualitative research designs and their justification. *Journal of the Faculty of Economics and Administrative Sciences, Kastamonu University*, *25*(1), 334–355. https://izlik.org/JA58TY53YN

Yavrutürk, A. R. (2025). A model for technology integration in education: ZFCL learning space. *Kahramanmaraş Sütçü İmam University Journal of Education, 7*(2), 182-208..

Yıldırım, A., & Şimşek, H. (2018). *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in the social sciences] (11th ed.).* Seçkin Yayıncılık

Zawacki-Richter, O. (2009). Mobile learning: Transforming the delivery of education and training. *The International Review of Research in Open and Distributed Learning*, *10*(4). https://doi.org/10.19173/irrodl.v10i4.751

Zheng, B., Warschauer, M., Lin, C.-H., & Chang, C. (2016). Learning in one-to-one laptop environments: A meta-analysis and research synthesis. *Review of educational research*, *86*(4), 1052-1084. https://doi.org/10.3102/0034654316628645

Author(s) Information

Oguz Cetin
Nigde Omer Halisdemir University, Nigde-Türkiye
ORCID iD: https://orcid.org/0000-0002-0986-5137
*Contact e-mail: *oguzcetin@ohu.edu.tr*

Kaan Degirmenci
Nigde Omer Halisdemir University, Nigde-Türkiye
ORCID iD: https://orcid.org/0009-0005-7543-5951

Salih Karaca
Nigde Omer Halisdemir University, Nigde-Türkiye
ORCID iD: https://orcid.org/0009-0008-9006-4548

*Corresponding author(s) contact email

To cite this article:

Cetin, O., Degirmenci, K., & Karaca, S. (2026). An investigation of pre-service science teachers' perceptions and levels of use of mobile computing and mobile learning. *The Eurasia Proceedings of Educational and Social Sciences (EPESS), 49,* 215-227.