

The Eurasia Proceedings of Educational and Social Sciences (EPESS), 2026**Volume 53, Pages 1-11****ICETI 2026: International Conference on Education in Technology and Innovation****Perspectives on Informal Learning with Digital Tools****Oguz Cetin**

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Abstract: The aim of this study is to explore pre-service teachers' perspectives on informal learning with digital tools, focusing on their motivational sources, challenges, acquired skills, learning strategies, and the implications of these experiences for future learning and teaching practices. The study employed a phenomenological research design. Data were collected from 15 pre-service teachers through semi-structured interviews and analyzed using content analysis. The findings revealed that motivation for informal learning with digital tools was primarily driven by rapid access to information and the facilitation of learning. The main challenges involved inadequate technical infrastructure, particularly internet connectivity, and limited knowledge of digital tool use. Participants addressed these difficulties by using alternative applications and artificial intelligence tools. Key gains included information literacy, the ability to identify accurate and reliable information, and more conscious use of technology. Participants managed their learning processes mainly through active inquiry, information verification, and exploratory trial-and-error strategies. Digital informal learning was perceived not only as a means of obtaining information but also as a strategy that facilitates learning and promotes independent learning. Its implications for future teaching practices emphasized effective digital tool use alongside student-centered and inquiry-based approaches. In informal learning environments such as science centers, participants preferred simulations, mobile devices, visual recording and data-collection tools, artificial intelligence applications, and augmented and virtual reality technologies, particularly for their potential to concretize learning and provide direct experiences. Overall, the findings indicate that informal learning with digital tools constitutes an important learning domain that supports information evaluation, individual learning strategies, and future teaching practices. However, challenges related to technical infrastructure and digital competence highlight the importance of adequate access and digital literacy skills in effectively supporting these learning processes.

Keywords: Informal learning, Digital tools, Information literacy

Introduction

With the transition to an increasingly networked and digitally mediated society, the ways in which individuals access, produce and use knowledge have undergone substantial transformation. Learning is no longer confined to formal educational institutions; it is also embedded in everyday experiences, digital interactions and online networks. Castells (2010) argues that the rise of the network society has transformed the production and circulation of knowledge and has consequently contributed to the redefinition of the boundaries of learning. Within this context, learning may extend beyond predetermined places and times and become intertwined with the routines of everyday life.

Informal learning is particularly important within this broader understanding of learning. Livingstone (2001) describes informal learning as learning that occurs within everyday life and is often undertaken without a clearly defined instructional intention, while Eraut (2004) emphasizes experience, observation, social interaction and problem solving as important routes through which informal learning develops. OECD (2010) and the European

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Commission (2012) have also highlighted the importance of informal and non-formal learning in supporting individuals' adaptation to changing social and professional demands. For teachers and pre-service teachers, these processes are especially significant because professional learning extends beyond initial teacher education and may continue through everyday experiences and informal professional activities (Kyndt et al., 2016).

The expansion of digital technologies has further transformed the contexts in which informal learning takes place. Digital technologies do not merely provide additional resources for learning; they can reshape access to information, interaction, and the ways learners organize their own learning processes (Selwyn, 2016). Social media, online learning communities, video-sharing platforms, artificial intelligence applications and digital content-production tools have become part of individuals' everyday learning ecologies (Greenhow & Lewin, 2016). Learning through these tools may emerge from personal interests, immediate needs and curiosity rather than from a formally prescribed instructional sequence.

For pre-service teachers, digital informal learning may have implications extending beyond personal learning. Teachers and pre-service teachers increasingly use online and digitally mediated networks to follow developments in their fields, exchange ideas, access professional resources and support their professional learning (Trust et al., 2017; Kearney et al., 2019). In this sense, informal learning with digital tools may contribute to the development of information literacy, technology use, self-directed learning and professional adaptation. Redecker and Punie (2017) conceptualize educators' digital competence as a multidimensional construct that involves using digital technologies purposefully and effectively in educational contexts. Understanding how pre-service teachers experience and interpret such learning is therefore important for teacher education.

The experiential and self-directed character of digital informal learning also makes it relevant to the development of individual learning strategies. Digital environments provide access to abundant and diverse information, but this abundance may require learners to evaluate sources, verify information and decide how to use available tools purposefully. Consequently, digital informal learning should not be considered solely in terms of access to information; it also involves the meanings learners attach to their experiences, the strategies they develop, and the ways in which these experiences influence future learning and teaching. Although digital competencies and technology use have been widely discussed, the experiences through which pre-service teachers construct meanings around informal learning with digital tools require further qualitative attention. In particular, understanding what motivates pre-service teachers to use digital tools informally, what challenges they encounter, how they respond to these challenges, which skills they perceive themselves to develop, and how these experiences are reflected in their future learning and teaching practices can provide a more experience-oriented understanding of the phenomenon. A phenomenological approach is therefore appropriate for examining the meanings participants attribute to their lived experiences of informal learning with digital tools.

Aims and Significance of the Study

The purpose of the study is to examine in depth pre-service teachers' perspectives on informal learning with digital tools. More specifically, the study focuses on participants' lived experiences, sources of motivation, challenges, acquired skills, learning strategies, future learning practices, future teaching approaches, and preferences regarding digital tools that may support learning in science centers. By focusing on participants' own accounts, the study seeks to clarify how digital informal learning is experienced and what meanings are attributed to it within the context of teacher education.

Research Questions

In line with this main purpose, the following research questions were addressed:

1. What are pre-service teachers' perspectives on informal learning through digital tools?
2. What are pre-service teachers' sources of motivation for informal learning with digital tools?
3. What challenges do pre-service teachers encounter when using digital tools for informal learning?
4. What skills do pre-service teachers perceive themselves to acquire through informal learning with digital tools?
5. What strategies do pre-service teachers use to manage their informal learning processes with digital tools?
6. How do experiences of informal learning with digital tools influence pre-service teachers' future learning and teaching approaches?

7. Which digital tools do pre-service teachers prefer for learning in science-center environments?

Method

Research Model

This study was designed as a qualitative phenomenological investigation. Phenomenology was employed because the study sought to understand how pre-service teachers experience informal learning with digital tools and what meanings they attribute to these experiences. Rather than attempting to measure participants' digital learning competence through numerical indicators, the study focused on the subjective meanings, interpretations, motivations, difficulties and strategies articulated in participants' own accounts. The phenomenon examined in the study was pre-service teachers' lived experience of informal learning with digital tools.

The Population and Sample of the Study

The study group consisted of 15 pre-service teachers enrolled at the Faculty of Education of Niğde Ömer Halisdemir University. Participants were selected through purposive sampling, with attention to including pre-service teachers from different class levels and with differing experiences in using digital tools for learning. The selection of information-rich participants was intended to provide varied descriptions of the phenomenon and to support a detailed phenomenological interpretation of informal learning experiences. Participants are identified in the findings using codes such as K1, K2 and K15 in order to protect confidentiality. No personally identifying information is reported.

Data Collection Tools and Process

Semi-structured Interview Form

The qualitative data were collected using a semi-structured interview form developed by the researchers. The form consisted of seven open-ended questions. The questions addressed the dimensions that were central to the phenomenon under investigation: factors motivating the use of digital tools for informal learning, challenges encountered during use, skills gained from these experiences, strategies used to manage learning, perceived effects on future learning practices, perceived effects on future teaching approaches, and digital tools that might be preferred in science-center learning environments. The open-ended structure of the interview form enabled participants to describe their experiences in their own words and allowed the researchers to follow relevant issues emerging during the interviews.

Data Collection Process

Following the necessary institutional permission, participants were informed about the purpose and scope of the study. Participation was voluntary, and participants were informed that their responses would be used only for scientific purposes and that their identities would be kept confidential. Individual semi-structured interviews were conducted with 15 participants. The interviews focused on concrete experiences of using digital tools for informal learning and on the meanings participants attributed to those experiences. The collected interview records were subsequently transcribed for analysis.

Data Analysis

Analysis of Qualitative Data

The interview data were analyzed through inductive content analysis. First, the interview records were transcribed into written form and read repeatedly to gain familiarity with the data. Meaningful units within participants' statements were then identified and coded. Codes with similar meanings were brought together to form categories, and categories were subsequently organized into broader themes. The coding process was data-driven, and the conceptual structure was developed from participants' accounts rather than from predetermined

statistical categories. The final thematic structure consisted of seven themes. Direct quotations were used to demonstrate how the themes were grounded in participants' statements, and the coding framework was reviewed repeatedly to improve internal consistency. As multiple coding was used, the frequencies reported in the tables refer to coded mentions within the interview data rather than to numbers of participants. Accordingly, frequency values may exceed the number of participants.

Validity and Reliability of the Research (Trustworthiness)

Several procedures were used to strengthen the trustworthiness of the qualitative analysis. The researchers repeatedly reviewed the interview records and coding framework to maintain consistency between participant statements, codes, categories and themes. Direct quotations were incorporated into the findings so that interpretations could be examined in relation to the participants' own expressions. Attention was also paid to grouping statements with similar meanings under consistent codes and to distinguishing conceptually different categories. These procedures were intended to strengthen the credibility and consistency of the interpretation.

Ethical Approval of the Research

The research process was conducted in accordance with ethical principles for scientific research. Before the interviews, participants were informed about the purpose of the research, voluntary participation and confidentiality. Necessary institutional permission was obtained from the Faculty of Education of Niğde Ömer Halisdemir University. Participant identities were protected through the use of codes rather than names in the findings.

Results and Discussion

Qualitative Findings

The content analysis of the interview data revealed seven themes related to pre-service teachers' experiences of informal learning with digital tools: factors strengthening motivation, challenges encountered and solution strategies, valuable skills acquired, strategies for managing the learning process, effects on future learning practices, effects on future teaching approaches, and preferred digital tools in science-center environments. The themes, categories, codes and coded frequencies are presented in Table 1.

Table 1. Motivational experiences in digital tool use

Category	Code	Description	f
Factors Facilitating the Learning Process	Rapid access	Ability to access information quickly	4
	Ease of access	Effortless access to desired information	3
	Time saving	Saving time during the learning process	3
	Accelerating learning	Enabling learning in a shorter time	2
	Making tasks easier	Making learning tasks more practical	2
Attention and attractiveness	Enjoyable learning	Making learning enjoyable	2
	Engaging and visually rich learning	Being visually engaging	1
	Attractiveness	Arousing curiosity and attracting attention	2
	Use of animation	Support through animated content	1
	Visualization	Making abstract information visual	1
Interaction and participation	Interaction	Active communication with the user	1
	Participation	Active involvement of the learner in the process	1
Academic and professional development	Receiving feedback	Receiving appropriate answers to questions	1
	Supporting academic performance	Contributing to academic performance	1
	Desire for self-improvement	Creating motivation for personal development	2
Individual competence	Using technology efficiently	Enhancing professional competence	2
	Knowing how to use the tool	Ability to use the digital tool effectively	1
Lack of motivation	Self-confidence	Confidence in using technology	1
	No motivating factor	Absence of a factor that increases motivation	1

Motivational Experiences in the Use of Digital Tools

The findings indicate that the factors strengthening motivation were primarily organized around functions that facilitated learning. Rapid access, ease of access, time saving and the practicalization of learning tasks were repeatedly mentioned, showing that participants tended to interpret digital tools through their functional contribution to the learning process. Attention and attractiveness also appeared as motivational dimensions, particularly through enjoyable learning, visualization and animation. Academic and professional development, individual competence and interaction were mentioned less frequently but reveal additional meanings attached to digital learning experiences.

“Immediate, easy and rapid access to information makes learning easier.” (K2)

“It helped me learn quickly and saved me time.” (K8)

“It makes learning more colorful, enjoyable and faster.” (K1)

“Like animation.” (K2)

Challenges Encountered in the Use of Digital Tools

The challenges encountered by the participants are presented in Table 2.

Table 2. Challenges encountered

Category	Code	Description	f
Technical infrastructure problems	Internet connectivity problems	Disruptions in network connectivity	5
	Insufficient Wi-Fi	Wireless internet access problems	2
	Technological inadequacy	Hardware deficiencies or device problems	1
	Technical disruptions	System failures and interruptions	2
Usage proficiency problems	Lack of know-how	Lack of knowledge about using applications	2
	Complex use	Finding the tools difficult and complicated	2
	Lack of technical knowledge	Lack of digital competence	2
	Length of the learning period	Taking time to learn how to use the tool	1
Attention and focus problems	Distractibility	Disruption of learning focus	2
	Effect of social media	Attention loss caused by phones and social media	1
	Focus problem	Difficulty concentrating on content	2
Content and language problems	Accessing incorrect information	Risk of obtaining unreliable information	1
	Incomplete information	Encountering insufficient content	1
	English-oriented applications	Difficulty caused by language barriers	1
Solution strategies	Using alternative applications	Turning to other digital tools	2
	Repeated practice	Becoming familiar through experience	1
	Internet sharing	Solving the problem using mobile data	1
	Artificial intelligence support	Using artificial intelligence for problem solving	1

Technical infrastructure emerged as the most prominent challenge, with internet connectivity appearing as the most frequently coded difficulty. Participants described connectivity as a barrier to continuity and access, while Wi-Fi and technical disruptions were also mentioned. Usage proficiency problems indicated that access to a tool did not necessarily mean that participants knew how to use it effectively. Attention and focus problems, content and language issues, and the need to develop solutions were also present. The participants’ accounts suggest that challenges were not experienced only as barriers; they also prompted alternative applications, repeated practice, internet sharing and artificial intelligence support as solution strategies.

“Connection problem.” (K2)

“The main challenge was internet connectivity. I overcame it by sharing my own internet.” (K9)

“Some applications require a certain level of knowledge to use. For example, I needed to use Canva.” (K5)

Most Valuable Skills Acquired through Digital Tools

The skills acquired through digital informal learning are presented in Table 3.

Category	Code	Description	f
Information access and information literacy	Rapid access to information	Ability to access necessary information quickly	3
	Ability to select accurate information	Ability to distinguish information accuracy	2
	Information literacy	Ability to analyze and evaluate information	2
	Selecting reliable sources	Ability to identify an appropriate source	1
Technology use competence	Conscious use of technology	Purposeful and controlled use of digital tools	2
	Mastery of technology use	Ability to manage technological processes	2
	Use of artificial intelligence	Ability to use AI tools effectively	2
Time management	Time saving	Using time efficiently	2
	Rapid learning	Grasping information quickly	2
Productivity and design	Creating visuals	Producing digital content and visuals	1
	Creating graphics	Presenting information graphically	1
	Designing a storybook	Developing creative digital content	1
Research and problem solving	Problem solving	Ability to develop solutions to problems	1
	Research skills	Ability to conduct scientific inquiry	1
	Questioning skills	Ability to formulate clear and appropriate questions	1

Information access and information literacy constituted the central category in participants' descriptions of their most valuable gains. The ability to access information quickly, distinguish accurate information and select reliable sources was repeatedly emphasized. Participants also described increased competence in using technology consciously and effectively, including artificial intelligence tools. Time management, productivity and design, and research and problem solving were also identified, indicating that digital informal learning was perceived as contributing to a broader repertoire of learning skills rather than to technical use alone.

"It was the ability to access information quickly and choose the correct information. There is so much information on the internet." (K2)

"Information literacy and selectivity." (K3)

"I can use technology consciously and turn it into something useful." (K8)

Strategies Adopted to Manage the Learning Process

The strategies used by the participants to manage their learning processes are presented in Table 4.

Category	Code	Description	f
Active inquiry and self-assessment	Active inquiry	Critically questioning information	2
	Verifying information	Checking accuracy	2
	Correcting errors	Recognizing and correcting mistakes	1
Review and note-taking	Note-taking	Recording learned information	1
	Reviewing	Repeating to reinforce information	1
	Summarizing the topic	Learning by simplifying information	1
Trial and error	Trial and error	Learning through practice	4
Planning and time management	Planning	Organizing the process in advance	1
	Using time effectively	Using learning time efficiently	2
Purposeful use of digital tools	Creating graphs	Making information visual	1
	Elaborating with artificial intelligence	Deepening learning through questions	2
Attention and focus management	Focusing on the topic	Preventing distraction	1

The strategies used to manage learning were characterized by active engagement with information and by individual experimentation. Trial and error was the most frequently coded strategy, suggesting that participants often learned how to use digital tools through direct practice rather than through formal guidance. Active inquiry and self-assessment also occupied an important place, particularly in verifying information and correcting mistakes. Reviewing and note-taking, planning and time management, purposeful use of digital tools, and attention management further demonstrate that participants developed a set of individualized strategies for regulating their learning.

“Learning through trial and error.” (K10)

“I use it to have my own ideas checked. This allows me to correct my mistakes.” (K5)

Impact of Digital Informal Learning Experiences on Future Learning Practices

The perceived impacts of digital informal learning experiences on future learning practices are presented in Table 5.

Category	Code	Description	f
Facilitating learning	Easy learning	Making the learning process more practical and accessible	3
	Rapid learning	Acquiring information in a shorter time	2
	Independence from time and place	Providing opportunities to learn anywhere and anytime	1
Independent learning	Becoming research-oriented	Directing one’s own learning	2
	Critical thinking	Ability to question and evaluate information	1
Use of digital resources	Alternative learning methods	Providing learning paths beyond textbooks	2
	Use of digital resources	Supporting learning through technological resources	2
Professional development	Development of teaching practice	Contributing to future teaching skills	2
	Communication with students	Facilitating teacher-student interaction	1
Technological adaptation	Use of contemporary tools	Adapting to current technologies	2
	Continuous development	Updating oneself in line with technological developments	2

Participants described digital informal learning as likely to make future learning easier, faster and more accessible. The category of facilitating learning was most prominent, while independent learning and the use of digital resources indicated that participants associated these experiences with taking greater responsibility for their own learning. Professional development and technological adaptation were also evident, suggesting that digital informal learning was understood as a continuing strategy that could accompany future academic and professional learning.

“It makes learning easier and more accessible. I think I will use it frequently.” (K1)

“For future learning, I think it will be very practical and fast.” (K8)

“Because there is so much information, it will make me independent and research-oriented.” (K2)

Impact of Digital Informal Learning Experiences on Future Teaching Approaches

The perceived impacts of digital informal learning experiences on future teaching approaches are presented in Table 6. The participants’ accounts indicated that their experiences with digital informal learning informed their expectations about future teaching. Effective use of digital tools, student-centered teaching, and ease and efficiency in teaching were central dimensions. Participants described technology not only as a medium for presenting content but also as a means of organizing learning experiences around discovery, active participation

and learning by doing. Professional development, equal opportunity and technological adaptation were additional categories, suggesting that participants interpreted digital tools as part of their emerging conception of teaching practice.

“I think it will make teaching much easier in the future.” (K8)

“We will have the ability to teach lessons using digital teaching tools.” (K5)

“Rather than only transferring information to my students, I would like them to discover it.” (K5)

Table 6. Impact on future teaching approaches

Category	Code	Description	f
Student-centered teaching	Learning by doing and experiencing	Experience-based teaching approach	2
	Discovery-based learning	Active involvement of the learner in the learning process	2
Effective use of digital tools	Teaching through digital tools	Integrating technology into the teaching process	3
	Integrating technology into instruction	Providing digital support in lessons	2
Ease and efficiency in teaching	Facilitating teaching	Making instruction more effective	3
Professional development	Gaining experience	Developing through teaching practice	2
	Learning from mistakes	Learning from previous experiences	1
Equal opportunity	Use of simulations	Providing students with equal opportunities for experience	1
	Accessible teaching	A teaching model that can reach every student	1
Technological adaptation	Necessity of the digital age	Adapting to technological developments	2

Digital Tools Preferred in Science Centers

The digital tools preferred by the participants for science-center learning environments are presented in Table 7.

Table 7. Digital tools preferred in science centers

Category	Code	Description	f
Simulation and experience-based tools	Use of simulations	Experiencing real-life situations	3
	Experiencing real situations	Providing opportunities for hands-on learning	2
AR and VR applications	AR applications	Providing concrete learning through augmented reality	1
	3D glasses	Providing three-dimensional learning experiences	1
	Virtual reality	Providing experience in a virtual environment	1
Access to information through mobile devices	Phone use	Providing rapid access to information	3
	Tablet use	Providing portable learning support	1
	Computer use	Providing access to digital materials	1
Artificial intelligence-supported learning	Use of Gemini	Providing information and learning support	1
	Use of Claude	Accessing more scientific information	1
	Obtaining information through artificial intelligence	Obtaining information quickly and accurately	2
Visual recording and data collection	Camera use	Recording the learning process	2
	Taking photographs	Documenting observations	2
	Data collection	Supporting scientific process skills	1

Participants' preferences in science-center environments concentrated on tools that could transform abstract content into concrete and experiential learning opportunities. Simulation and experience-based tools, mobile devices, visual recording and data-collection tools, artificial intelligence applications, and AR/VR technologies were mentioned as potentially useful because they could provide opportunities to observe, experience, record and interact with phenomena. The findings suggest that participants associated digital tools with direct experience and experiential learning rather than with information delivery alone.

"I would use simulators and experience what I should do in a real situation or event." (K1)

This study examined pre-service teachers' perspectives on informal learning with digital tools from a phenomenological perspective. The findings show that participants interpreted digital informal learning as a lived and self-directed process shaped by access, practicality, experience and individual strategies. Rather than treating digital tools simply as technological objects, participants attached meanings to them according to how these tools influenced their learning processes, the problems they created or helped solve, and the ways in which they might be used in future teaching.

The first prominent finding concerned motivation. Participants repeatedly emphasized rapid access to information, time saving and the facilitation of learning. This is consistent with the broader view that digital technologies can extend learning beyond fixed times and places and make learning more flexible and accessible (Livingstone, 2001; Selwyn, 2016). Brown and Adler (2008) similarly conceptualize learning as embedded in everyday activity and participation. In the present study, the motivational value of digital tools was therefore associated less with technology itself than with the practical opportunities it created for immediate and purposeful learning.

The second theme concerned challenges. Participants primarily referred to internet connectivity and technical infrastructure, but they also highlighted difficulties related to knowing how to use applications, concentrating on content, encountering incomplete or unreliable information, and dealing with language barriers. Park (2016) emphasizes that digital competence involves more than technical operation and includes purposeful and informed use. The participants' accounts support this broader interpretation by showing that access and technical availability do not automatically translate into effective learning. The strategies participants used to overcome difficulties, including alternative applications, repeated practice, internet sharing and artificial intelligence support, further illustrate the self-directed nature of their experiences.

Information literacy emerged as the most prominent skill category. Participants emphasized not only finding information quickly but also distinguishing accurate information and choosing reliable sources. This finding is important because the informal digital learning environment offers abundant information, making evaluation an essential part of learning. The participants' references to artificial intelligence, questioning and verification also indicate that digital informal learning involves an evaluative dimension in which learners must actively determine how information should be trusted and used. Bandura's (1997) emphasis on self-efficacy provides a conceptual lens through which the participants' increasing confidence in managing digital tools may be understood, particularly where participants described independent exploration and purposeful use.

The strategies identified in the fourth theme also reinforce the active character of the phenomenon. Trial and error, active inquiry, verification and self-assessment were repeatedly mentioned. These findings suggest that participants did not position themselves as passive recipients of digital information; instead, they interacted with tools, checked information, corrected mistakes and adjusted their strategies. This interpretation is compatible with the idea that learners construct and regulate their learning through experience and interaction rather than simply receiving predetermined knowledge.

The fifth and sixth themes extended these experiences into participants' anticipated futures. Participants described digital informal learning as a means of becoming more independent, research-oriented and adaptable, while also anticipating more effective, student-centered and discovery-based teaching. Mishra and Koehler (2006) emphasize the importance of integrating technological and pedagogical knowledge in teacher practice. Similarly, Papert (1993) places active construction and technology-mediated learning experiences at the center of learning. In the present study, participants' future-oriented accounts suggest that their own informal digital learning experiences were becoming part of how they imagined teaching: technology was associated with facilitating instruction while also supporting students' active participation and discovery.

The final theme concerned preferred digital tools in science-center environments. Participants particularly emphasized simulations, mobile devices, visual recording and data collection tools, artificial intelligence, and

AR/VR technologies. The common feature across these preferences was the possibility of making learning concrete and experience-based. This is consistent with Selwyn's (2016) view that digital technologies can reshape learning processes and with the broader understanding of informal learning as embedded in experiences and everyday contexts (Eraut, 2004; Kyndt et al., 2016).

Conclusion

Overall, the findings portray digital informal learning as a multidimensional phenomenon. Participants experienced it as a way of accessing information, managing learning independently, solving problems, evaluating information, developing technology use and imagining future pedagogical practices. At the same time, the findings show that technical infrastructure and digital competence remain important conditions for effective participation. For teacher education, the findings point to the value of providing opportunities in which pre-service teachers can experience digital tools in meaningful, inquiry-oriented and pedagogically purposeful informal learning contexts. Such experiences may help bridge personal digital learning practices and future classroom practice.

The study should also be interpreted in light of its qualitative scope. The findings represent the experiences and meanings articulated by 15 participants in a single teacher-education context and are intended to provide depth of understanding rather than statistical generalization. Future research may examine the phenomenon with pre-service teachers from different institutions and subject areas, and may explore how these experiences develop over time.

Recommendations

In practical terms, teacher education programmes may benefit from learning experiences that encourage purposeful digital tool use, information verification, reflective use of artificial intelligence, exploratory learning and technology-supported student-centered teaching. Attention to infrastructure, access and digital literacy is also necessary so that informal digital learning opportunities can be used effectively and equitably.

Scientific Ethics Declaration

* The research process was conducted in accordance with ethical principles for scientific research. Necessary institutional permission was obtained from the Faculty of Education of Niğde Ömer Halisdemir University. Participation was voluntary, and participants were informed about the purpose of the study, confidentiality, and the scientific use of the data. Participant identities were protected throughout the research process.

* 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.

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