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Research Article

Digital and online tools employed by prospective teachers to access information

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Abstract: The proliferation of digital information technologies has underscored the heightened necessity for online information search. This study is directed towards the analysis of the strategies adopted by prospective teachers in the selection of digital content employed for accessing information, their preferences concerning the use of digital and online tools, and the rationale that underpins these preferences. To achieve this aim, the case study method was used. Employing the purposive sampling method, the study involved a participant pool of 72 teacher candidates in the 3rd and 4th grades within the faculties of education. To collect data, a personal information form, an online interview form, a focus group interview form, and a word association test were employed. The data were analyzed using the content and descriptive analysis methods. At the end of the study, the prospective teachers expressed a common tendency that when it comes to scientific research, they often prefer to search for articles whereas for more general inquiries, they have a propensity for utilizing internet searches. Most of the prospective teachers follow a step-by-step research process when accessing information. In addition, they employ both goal-oriented and general-content resources while in pursuit of scientific information. They pay attention to data reliability, accurate information, speed, and access to the Internet in the process of obtaining information. They consider the tools they use adequate and reliable. Teacher candidates establish complex conceptual networks among the array of tools they employ to access information. A comprehensive discussion concerning the outcomes of the research is also presented.

1. INTRODUCTION

Today's world is marked by the pervasive influence of digitalization, particularly within the domain of information and communication technologies. This shift has led to a near-total transformation of people's habits and lifestyles. Over the past few years, the emergence of digital online content, programs, and applications has replaced conventional face-to-face lectures and scientific activities, largely attributable to the COVID-19 outbreak. Hence, the utilization of digital and online tools, characterized by their potential to yield both advantageous

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and detrimental effects, has gained substantial prevalence today, thus accentuating the critical import of "digital literacy" as a pivotal concept.

In the digitalized global landscape, the skill of accessing information through the processes of interpretation and evaluation stands out as an important skill. However, even though it is often seen as a fast and easy medium, extracting accurate information from the extensive array of information in the digital environment proves to be an intricate undertaking (Topal & Süner, 2020). During daily affairs, the practices of seeking and reaching information employed to fulfill a majority of requirements associated with both personal and corporate work contexts assume substantial significance (Berget & MacFarlane, 2020). The expansion of digital information technologies has elevated the necessity of online information search, and today, students are expected to manage online information. However, not every student is adept at searching and finding information effectively and efficiently. Students can apply different search strategies to obtain information (Zhou & Lam, 2019) and exhibit different information-seeking practices in the digital environment.

Digital literacy skills are necessary to confirm the reliability of the information source and the accuracy of the information encountered on the internet (Hamutoğlu et al., 2017). Adapting to the digitalizing world requires the acquisition of skills encompassing digital information search, along with the proficiency to evaluate and interpret the obtained information. Digital literacy skills extend beyond merely utilizing information and communication technologies or conducting information searches through search engines. Students need to be supported in order to develop the knowledge, skills, and understanding they need (Ministry of National Education [MoNE], 2020). Teachers who are adept at digital literacy skills are capable of offering guidance to students as they navigate the application of these skills. It therefore holds significance to provide prospective teachers (PTs) with digital literacy skills at universities prior to embarking on their careers (Boyacı, 2019; Öztürk, 2020). Consequently, it is essential to establish whether teacher candidates have the requisite knowledge and skills concerning digital literacy.

1.1. Conceptual Framework

It is posited that digital literacy intersects with other interconnected terms such as information literacy, media literacy, computer literacy, network literacy, and e-literacy (Koltay, 2011). Media literacy, computer literacy, and e-literacy constitute skills-oriented literacies that foster the cultivation of information literacy (Martin & Grudziecki, 2006). These 'new literacy skills', including critical and digital literacy types, require new forms of strategic knowledge as they are multifunctional and versatile (Leu et al., 2017). Digital technology, a fundamental aspect of globalization within the educational context, necessitates the acquisition of emerging literacy skills. Teachers are expected to develop their own literacy skills and to guide their students in developing theirs. For this reason, teachers and PTs need to have up-to-date digital literacy skills in order to use online digital tools, artificial intelligence, and virtual applications, as well as traditional literacy skills.

The concept of "digital literacy" was initially formulated by Paul Gilster (1997), who characterized it as the integration of diverse knowledge and skills by students so that they can proficiently engage with the internet environment and its associated educational content. Although Gilster primarily associates this concept with education, Park et al. (2020) state that the concept of digital literacy can also be associated with fields as diverse as science, health, language education, and information and communication technologies. In addition, digital literacy is characterized by Polizzi (2020) as a process involving the adept use of functional and digital skills for accessing information, facilitated by utilizing multiple sources and establishing contextual relationships. For this process to work, individuals need to be able to use a multitude of skills such as scanning, researching, questioning, criticizing, analyzing, synthesizing, evaluating, and decoding.

1.2. Literature Review

The current literature involves several studies that undertake a comparative analysis of the digital literacy levels exhibited by teachers and PTs, with a focus on certain variables (Erdem et al., 2022; Kara, 2021; Korkmaz, 2020). Research focusing on the digital literacy level of teacher candidates (Kozan & Bulut-Özek, 2019; Méndez et al., 2023; Üstündağ et al., 2017) suggests that their digital literacy levels are generally good. However, there are also studies (Altıner, 2019; Boyacı, 2019; Kaya-Özgül et al., 2023; Onursoy, 2018) concluding that their level of digital literacy is insufficient.

The literature contains various studies addressing the process of accessing and evaluating information through online and digital content. Examining students' strategies for searching and interpreting information on the internet, scholarly investigations (Çelen & Seferoğlu, 2017; Enochsson, 2019; Geçer & İra, 2015; Gürsoy, 2019; Kurulgan & Argan, 2007; Yalçınalp & Aşkar, 2003) indicate that students generally exhibit an acceptable level of internet competence and that a connection exists between strategies used for information search and strategies for analysis and synthesis. Further studies carried out on PTs (Kolburan Geçer et al., 2017; Sırakaya & Çakır, 2014; Tekin & Polat, 2017) emphasize that their assessment and problem-solving strategies stand at a moderate level, underscoring the need for improvement in their abilities to select information online, engage in comparisons, and provide solutions. The results of studies (Chen et al., 2019; Turan et al., 2015; Wu & Tsai, 2007) undertaking a comparative analysis of teachers and PTs in various aspects (experience, demographic features, etc.) demonstrate that current teachers do in-depth research and use advanced online search strategies more than teacher candidates.

In some studies, participants are compared according to the difficulty level of the tasks assigned to them. Reisoğlu et al. (2022) contend that changes in PTs' online information-seeking behaviors depend on the complexity of tasks. According to this view, experienced PTs use the strategies of problem-solving, determining the main idea, evaluating, and purposeful thinking in a shorter time when dealing with challenging tasks, while less experienced PTs resort to using irrelevant keywords or clicking on irrelevant links. According to Sendurur et al. (2019), even successful students face difficulties navigating online information searches for complex tasks and are inclined to the practice of copy-pasting. It has been observed that as assigned tasks transition into higher levels of complexity, there is a noticeable shift in information search strategies, leading to a surge in the number of opened tabs and websites, the employment of keywords, and the duration dedicated to research. Lai (2020) also confirms that PTs use both complex (e.g., multiple sources and content) and simple assessment standards (e.g., authority and interactive interface) when searching for information online.

1.3. Rationale

The distinctive aspects that set this study apart from previous research in the literature involve the participation of the PTs pursuing their studies in different departments across two separate universities. Particularly noteworthy is the pivotal role of distance education in shaping the majority of their educational experiences, leading to a more profound acquaintance with digital information technologies. Due to the development of technology, the digitalization of the world, and some extraordinary circumstances, the internet has been the most preferred source for individuals to access information. Cultivating attitudes and perceived competencies to effectively teach and apply technology within practical contexts becomes a crucial endeavor in harnessing the potential of information and communication technologies (Pozas & Letzel, 2023). In the context of mindful internet usage, it is necessary to engage in information search and interpretation as essential steps toward accessing accurate information. For this reason, there is an increasing need to identify PTs' strategies for searching and interpreting digital and online information to determine their information search strategies on the internet, to ensure the development of these strategies, and to obtain more efficient results.

In addition to examining strategies employed by teacher candidates in the selection of digital content for information access in response to the digitalizing world, this study elucidates their preferences for using digital and online tools and explores the motivations underpinning these predilections. In line with research endeavors dedicated to technological progress, this study also holds a dual significance both in the background and forefront for its potential contribution to academic research in the field, as well as its utility in the realm of education. Considering its potential to serve as a valuable resource for future academic endeavors and its role in aiding PTs in their personal development and guiding students in their educational journeys, it carries a two-fold importance.

1.4. Purpose of the Study

Nowadays, it is inevitable for PTs to utilize online and digital information, particularly within the educational environment, and to share this information with their students. Given that teacher candidates will interact with a multitude of students from the outset of their professional careers, their influence on these students becomes a pivotal consideration (Öztürk, 2020). While the concept of distance has nearly been eliminated through the internet, there are still advanced processes that need to be carried out to access information, such as using correct search strategies, selecting, and evaluating information, and performing analysis and synthesis. For instance, PTs may have the opportunity to access a library's database miles away from their location or visit a museum located far away through online tools. However, the question of whether they possess the competence to utilize these opportunities is debatable. Although PTs have the potential to question from which sources they can access scientific knowledge, whether certain information is found in verifiable and reliable sources, and while they take courses at university that should enable them to distinguish scientific knowledge (research techniques), access information from online environments (information technologies), and evaluate the reliability of information sources (information literacy), it cannot be said that these courses are highly applicable in academic life. The low performance of PTs in their assignments and research involving online and digital content throughout their academic careers indicates both the problem and the need for such work. Investigating teacher candidates' digital literacy skills, their preferred digital tools for accessing information, the motivations influencing their preferences, and their strategies for assessing the reliability of information and conducting information evaluations is a critical endeavor. Therefore, this study aims to assess the digital literacy behaviors exhibited by teacher candidates enrolled in different undergraduate programs, describe the tools they employ for accessing information, and elucidate their strategies for selecting these tools. In keeping with the central purpose of the study, the research questions are as follows:

1. What approach do PTs adopt when seeking information during a scientific study?
2. What tools do PTs employ when seeking information during a scientific study?
3. What are the opinions of PTs regarding the significance of the process of accessing information?
4. What are the opinions of PTs regarding the sufficiency and reliability of the digital tools they use during a scientific study for scientific knowledge?
5. How do PTs associate words related to the process of accessing information with other concepts?

2. METHOD

2.1. Design

This research, which investigates the digital and online tool preferences of teacher candidates in accessing information, has been structured based on the case study method as one of the qualitative research designs. The case study method involves examining the phenomenon in

question within its real-world setting (Yin, 2018). In this study, the identified case pertains to the "digital and online tools employed by PTs to access information."

2.2. Participants

A total of 72 teacher candidates currently pursuing their studies within faculties of education located in two cities in Türkiye took part in this research. During the initial phase of involving teacher candidates in the study, the purposive sampling method was employed. Accordingly, interviews were conducted with the PTs who were in their 3rd and 4th grades in various departments of two faculties of education. Participants were included in the study on a voluntary basis. In the faculties of education, there are classes on Information Technologies and Instructional Technologies offered as compulsory courses in the first or second year. All the participants in this study have taken these courses. Table 1 presents the personal information of the participating teacher candidates (with 51 of them reporting they have received training on internet-based information search and 21 stating they have not).

Table 1. *Personal information of PTs.*

Feature		*n*	%
Gender	Female	44	61.11
	Male	28	38.89
Grade level	3rd grade	28	38.89
	4th grade	44	61.11
Major	Science Education	4	5.56
	Mathematics Education	5	6.94
	English Language Education	5	6.94
	Special Education	20	27.78
	Guidance and Psychological Counseling	4	5.56
	Elementary School Teaching	3	4.17
	Social Sciences Education	3	4.17
	Turkish Language Education	28	38.89
Grade point average	<1.50	-	-
	1.51-2.00	-	-
	2.01-2.50	6	8.33
	2.51-3.00	15	20.83
	3.01-3.50	45	62.5
	3.51-4.00	6	8.33
Internet usage in a day	Less than 1 hour	-	-
	1-3 hours	15	20.83
	3-5 hours	30	41.67
	More than 5 hours	27	37.5
Frequency of internet usage	None	-	-
	Rarely	-	-
	Sometimes	10	13.89
	Generally	42	58.33
	Always	20	27.78
Constant internet access	Available	51	70.83
	Unavailable	21	2917
Feature		**f**	**%**
Purpose of internet usage	Research	40	30.53
	Corporate actions	11	8.40
	Game	10	7.63
	Social media	64	48.86
	Other*	6	4.58

* Other purposes: lesson listening-watching (*f*=3), series-movies (*f*=2) and communication (*f*=1).

Based on the data provided in Table 1, it can be observed that the participating teacher candidates in this study consist of 44 females (61.11%) and 28 males (38.89%). The PTs are currently enrolled in either their third year (*n*=28) or fourth year (*n*=44) of study. The teacher candidates from a variety of departments participated in the research, with representation from Turkish Language Education (*n*=28), Special Education (*n*=20), Mathematics Education (*n*=5), English Language Education (*n*=5), Science Education (*n*=4), Guidance and Psychological Counseling (*n*=4), Elementary School Teaching (*n*=3), and Social Sciences Education (*n*=3). The academic grade point average (GPA) of more than half of the participants (*n*=45) falls in the 3.01-3.50 range, and none of the PTs included in the study have a grade point average of 2.00 or below. Among the participating candidates, 15 (20.83%) use the internet for 1-3 hours daily, 30 (41.67%) for 3-5 hours, and 27 (37.5%) for over five hours each day. Most of the participants (*n*=51) always have access to the internet. The internet is most used by the PTs for social media (*f*=64) and research activities (*f*=40). The teacher candidates also report that their preferred device to connect to the internet is a smartphone.

2.3. Data Collection Tools

To collect data, a personal information form, an online interview form, a focus group interview form, and a word association test were employed. The research was approved by Selçuk University Faculty of Education Ethical Committee Report No. 54, dated 05.06.2023. The details of the ethical committee report are kept confidential in accordance with the rules of blind review. Comprehensive details regarding the data collection methods are presented below. The development of data collection instruments involved obtaining the opinions of three experts for each data collection tool. The readability and comprehensibility of the data collection instruments were reviewed and confirmed by a Turkish language education specialist. Based on the input received from a computer education specialist for the online interview form, focus group interview form, and word association test, questions related to digital and online tools and the words to be applied in the word association test were adjusted. Input from a science education specialist was also obtained regarding conducting research in an online environment. The final versions of the data collection instruments were prepared in accordance with the recommendations provided by the experts.

2.3.1. *Personal information form*

The personal information form consists of questions related to gender, department, university affiliation, and grade, among other details. This form was developed by the researchers and made available to the participants in an online format.

2.3.2. *Online interview form*

The interview consists of five open-ended questions as a structured questionnaire, which aims to reveal PTs' preferences for digital and online tools used in accessing information. The research questions focus on how PTs approach a scientific study (such as assignments or exam preparation), the sources they use, the key aspects they consider important in the process of accessing information, and whether the tools they use are adequate and reliable for assignments or scientific knowledge. The interview questions were developed by the researchers based on a review of the literature. The implementation was conducted electronically via Google Forms.

2.3.3. *Focus group interview form*

Focus group interviews are conducted within the framework of a semi-structured interview plan created by researchers for the purpose of providing an overall plan for the interviews, including the date, time, location, participant names, and an overview of the interview stages (Krueger & Casey, 1994). This interview form consists of introductory questions, transition questions, key questions, research questions, and closing questions. The interview form developed for this research was utilized to gain in-depth insights in line with the research aim. Accordingly, the

responses of PTs to the questions in the online interview form, which were reached through easily accessible sampling in the initial phase of the data collection process, were examined. Subsequently, researchers found it necessary to conduct in-depth research to obtain clearer results for certain questions. In this process, focus group interviews were conducted with 15 PTs selected through purposive sampling. The focus group interview form was created to clarify points where responses to interview questions were not understood or where there was a dilemma.

2.3.4. *Word association test*

This test was used to support data obtained from the online interview form and focus group interview form. In the word association test, PTs participating in the focus group interview process were given terms such as internet, digital tools, online tools, artificial intelligence, and information reliability and were asked to generate related words for each keyword within 1 minute. In the literature, it is seen that various periods are given for writing the words to be written for the keyword at different education levels. For example, Özkaral and Akdoğan (2022) in a study conducted with middle school students gave 1 minute. Additionally, Bahar and Özatlı (2003) recommended 30 seconds for high school students; Alaca et al. (2020) used 30 seconds for teacher candidates. In our study, since the data were collected online, it was deemed appropriate to allow 1 minute to avoid any disruption in communication with all participants. The students were informed before the word association test was conducted that the time to be given was determined according to this situation. The word association test aimed to identify PTs' associations with digital and online tools and to determine their conceptual networks/relationships. It is believed that this will contribute to identifying the perceptions of PTs participating in the research regarding fundamental concepts related to accessing information through digital and online tools.

2.4. Data Collection Process

The research data were gathered in two consecutive stages. During the period spanning 2020 to 2022, as was the case worldwide, Türkiye also transitioned from in-person classes and scientific activities to digital online content, programs, and applications as a response to the COVID-19 pandemic. In 2023, Türkiye experienced an earthquake that necessitated the reintegration of digital and online content instead of some face-to-face classes and scientific gatherings. For this reason, the data collection process for this study took place online. The initial phase of the study involved sending the personal information form and interview questions to the PTs through Google Forms. A time frame of around one month was allocated for them to complete the interview questions. The second phase involved conducting word association tests and focus group interviews with the teacher candidates selected through purposive sampling via the Zoom platform. Before the start of the word association process, the participants were given a brief reminder and explanation about the word association test. In the word association process, which took approximately 15 minutes, each participant was tasked with writing down related words to the provided key terms within a 1-minute timeframe. Subsequently, the focus group interview process commenced. During focus group interviews, the key priority is placed on understanding rather than interpreting, identifying diversity instead of generalizing, and elucidating how participants perceive the situation rather than providing explanations (Kreuger & Casey, 1994). As an illustration, in the study, a teacher candidate (PT 25) was included in the focus group process after reporting during the initial interview phase that they conducted general research on the methods of accessing information. The outcome of the focus group interview revealed that general research diversified into conducting article searches, exploring scientific websites, and utilizing textbooks. Hence, the focus group interview served as a valuable asset in accomplishing the goals of this study. In focus group interviews, the required time is usually determined based on the number of participants, and it is possible to conduct the interviews in two rounds to ensure that all participants have the opportunity to provide their in-

depth views. In this study, the focus group interview process was divided into two parts, each lasting 25 and 35 minutes, to allow for an equal share of speaking time for all participants and to facilitate a comprehensive exploration of any unclear aspects. During the interviews, one of the researchers assumed the role of moderator, while the second researcher was responsible for serving as the reporter. The moderator's primary task was to foster a thorough examination of the research topic while directing the questions to the participants, and the reporter played a role in ensuring an equal share of participation time, providing an opportunity for non-speaking participants to contribute, keeping track of time, and documenting key points highlighted during the interview.

2.5. Data Analysis and Validity-Reliability

The data obtained from interview questions and focus group interviews were analyzed using the content analysis method, in which the collected data are converted into codes and then categorized and organized into themes to facilitate interpretation (Yıldırım & Şimşek, 2021). Since there was no coding key in the relevant literature, an open coding method was adopted. Categories were derived from the generated codes. Once the planned number of participants was secured to obtain sufficient data, the initial stage of data analysis was set in motion. In this stage, both authors initially analyzed the responses of the first 10 PTs for each question. Following a comparative examination of the findings obtained by the researchers through their analysis, a 100% agreement was calculated for questions 2, 3, 4, and 5, while question 1 showed a 97% agreement (Miles & Huberman, 1994). Subsequently, the researchers separately analyzed the responses of the remaining teacher candidates. At the end of this process, the initial stage of data analysis was then finalized with an inter-rater agreement of 100% for all questions. In the second stage, the researchers worked together to analyze the word association test and focus group interview data. The data obtained from the word association test were subjected to descriptive analysis by the researchers, and a cut-off point (CP=3) was determined. The cut-off point technique proposed by Bahar et al. (1999) was utilized in determining the cut-off point. The related words with frequencies above the cut-off point were presented in a conceptual network figure. Microsoft PowerPoint was used to create the conceptual network of words. Considering that the data derived from the focus group interviews consistently contributes to either supporting or deepening the interview questions, the researchers integrated their queries into the analysis tables. Examples obtained from the analysis of the focus group interview questions were also added to the relevant sections to ensure clarity. For example, PT 23, who was identified as providing answers in the online interview form that were not clearly understood, and was consequently included in the focus group interview, provided a clearer explanation of their expression regarding scientific research as a result of the focus group interview. Similarly, since the responses of PTs did not clearly indicate the adequacy or reliability of the tools they used for scientific knowledge, the focus group interview was used to provide clarity. Following the focus group interview, PTs provided more detailed information about the adequacy and reliability of these tools. The word association test also provides data supporting how information is sought, the tools used, and perceptions regarding the adequacy and reliability of the information access process.

To ensure internal validity in the study, participant confirmation was obtained at the beginning and continuously throughout the data collection process. Additionally, in the initial part of the data collection process, the data collection tool was directed to PTs in all departments of two universities. This allowed the researchers to conduct the research process without bias or subjectivity since they had no prior knowledge about the participants. To establish external validity in the study, participants were introduced in detail, and detailed information about the data collection tools was provided to them. In the second part of the data collection process, participants were included in the study according to certain inclusion criteria based on purposive sampling to clarify the data. To ensure the reliability of the study, a review of the

literature was conducted in the development of data collection tools, and continuous expert opinions were sought for each data collection tool.

3. RESULTS

3.1. Views on the approaches PTs adopt for searching scientific information

This section provides the teacher candidates' opinions concerning the methods they employ when seeking information during a scientific research study (Table 2).

Table 2. *The approaches the PTs employ in accessing information.*

Categories	Codes	*f*	PT
Scientific research	Article searches	24	2, 5, 8, 12, 13, 14, 15, 16, 19, 21, 23, 24, 31, 38, 42, 55, 58, 61, 63, 65, 68, 69, 72, 25
	Research on scientific websites	12	6, 11, 18, 19, 28, 30, 32, 33, 35, 41, 51, 25
	Thesis search	8	6, 8, 14, 19, 31, 41, 65, 72
General research	General internet searches	29	1, 3, 4, 7, 8, 15, 16, 17, 20, 22, 27, 37, 40, 41, 43, 44, 45, 46, 49, 50, 53, 54, 56, 57, 58, 60, 66, 70, 71
	General research	11	10, 25, 26, 29, 34, 36, 47, 48, 57, 59, 62
Traditional research	Research from textbooks	13	12, 19, 20, 27, 28, 30, 37, 44, 49, 60, 66, 71, 25
	Using lecture notes	6	4, 12, 21, 33, 37, 70
	Research from libraries	3	22, 44, 72
	Using printed materials	1	40
Safe research	Researching trusted websites	6	6, 16, 23, 28, 61, 67
	Using reliable sources	3	9, 28, 39
	Searching on corporate sites	2	14, 68
Contemporary-technological research	Watching videos on the Internet	3	19, 21, 65
	Using artificial intelligence	3	46, 65, 68
	Review distance education resources	1	24
Uncategorized answer	Homework	2	52, 64

According to Table 2, the teacher candidates are conducting their research in the following categories: scientific research (*f*=42), general research (*f*=40), traditional research (*f*=23), safe research (*f*=11), and contemporary-technological research (*f*=7). Among these research types, they mostly access information through general internet searches (*f*=29), article searches (*f*=24), research from textbooks (*f*=13), and general research (*f*=11). The subsequent section offers a selection of distinctive findings.

Several of the PTs stated that they do not adopt a step-by-step approach to accessing information; instead, they rely on a single method. A few illustrative statements are as follows:

> *"I look up articles related to it on the internet" (PT 13, general internet search/general research)*

> *"I use the Google search engine. I usually make use of articles there." (PT 58, article search/scientific research; general internet search/general research)*

Additionally, most of the PTs reported using the step-by-step search process presented in this table. The statements below serve as examples, illustrating how the teacher candidates used this gradual process to verify or integrate information:

> *"I consult the internet for additional information after reviewing the content in my books or course materials. I cross-reference the information with one another. I generally pay attention*

to reading articles on the internet so that the information I gather aligns with previously researched and watched information and instructions." (PT 12, article search/scientific research; research from textbooks/traditional research; using lecture notes/traditional research)

"I start by conducting research on multiple websites to build a foundational understanding of the subject. Then, I verify it using articles and trusted websites." (PT 16, article search/scientific research; general internet search/general research; searching on trusted websites/safe research)

"1) First, I break down the topic into subheadings. 2) I identify reliable sources for research. 3) I carry out sequential research on the subheadings. 4) After the research, I review the information I have gathered. 5) I organize and consolidate the reviewed information into a coherent form." (PT 39, using reliable sources/safe research).

Some teacher candidates have summarized the research process in general terms. The following expressions can serve as examples:

"Understanding the topic - researching sources - evaluating sources - categorizing the information - using the information." (PT 26, general research/general research)

"I conduct research on how to do the assignment, gather information about the assignment - try to access content that supports the assignment." (PT 29, general research/general research)

Some of the PTs sorted the articles into categories. As demonstrated in the following examples, there are statements suggesting that the articles can be sourced from national or international outlets:

"I conduct a relevant source search, read articles from peer-reviewed international journals, examine publications from universities and institutions, conduct a Google Scholar search, and then categorize and analyze the data I obtain according to a specific plan. Or I make use of artificial intelligence tools." (PT 68, article search/scientific research; using artificial intelligence/contemporary-technological research)

"I typically start my research process by reading articles in foreign languages, followed by those written in Turkish, and conclude by conducting research on trusted websites." (PT 23, article search/scientific research)

However, during the focus group interview, the same participant expressed that when it comes to countries other than Türkiye, they select resources specific to the respective foreign country but opt for Turkish-language sources when conducting research related to their field:

"For example, I believe that accessing detailed and accurate information about an uprising that occurred in a country other than Türkiye should be done using the sources of that country. However, when it comes to research related to my own field, I first look at Turkish articles. In the field of science education (my own field), there are experts in Türkiye. I prioritize them, and then I also look at articles from other countries and synthesize the information." (PT 23, article search/scientific research, focus group interview)

"I pay attention to articles that are in Turkish, not English... I believe that translations from English are not suitable for assignments in their full sense. Because I can't translate from English myself, I can't make sense of it..." (PT 65, Article search/scientific research, focus group interview)

One PT's statement below, in which they outlined their article research process as akin to that of an "academician," has truly excited us as researchers:

"I will search on Google Scholar for articles related to the topic. First, I download them one by one, then select the most suitable ones to store on Google Drive. I skim through them briefly to identify the main arguments. I enter my arguments in the search bar of Drive and note how they are discussed in each article on a Word document. Finally, I compile a synthesis." (PT 63, article search/scientific research)

As a result of the focus group interview, it was understood that the PTs who mentioned benefiting from articles used the term "article" in a broad sense, encompassing any piece of writing related to the subject matter rather than strictly referring to a scientific article. It was

also noted that they used the term to indicate content based on current or societal issues. Below are expressions from the participants:

> *"An article is suitable for me if it contains the information I'm looking for in my assignment in terms of diversity and if it provides a comprehensive explanation..." (PT 25, article search/scientific research, focus group interview)*

> *"It should consist of introduction, development, and conclusion sections. It's important that the article is recent, and its content is relevant to my research or assignment." (PT 65, article search/scientific research, focus group interview)*

> *"For example, I believe that accessing detailed and accurate information about an uprising that occurred in a country other than Türkiye should be done using the sources of that country." (PT 23, article search/scientific research, focus group interview)*

3.2. Views on the tools PTs employ for searching scientific information

This section provides the teacher candidates' opinions concerning the tools they employ when seeking information during a scientific research study (Table 3).

Table 3. *Tools used by PTs when searching for scientific information.*

Categories	Codes	*f*	PT
Purpose-specific sources	Textbooks	15	1, 4, 9, 19, 20, 22, 25, 29, 30, 32, 34, 37, 49, 50, 57
	Google Scholar	15	2, 6, 12, 14, 18, 21, 22, 24, 33, 39, 45, 52, 64, 70, 49
	CoHE*	10	2, 3, 6, 8, 12, 18, 36, 39, 41, 49
	Dergipark	8	3, 12, 14, 28, 36, 42, 66, 68
	TR Index	3	12, 39, 42
	ULAKBİM***	1	39
	Articles and theses with unspecified sources of access	14	8, 10, 17, 26, 27, 31, 32, 34, 37, 38, 47, 55, 68, 69
	Open-course wares	4	11, 30, 68, 70
	PPSE** books	10	13, 15, 27, 28, 30, 40, 41, 53, 54, 61
	Academia	1	25
	Field-specific websites	4	15, 16, 58, 65
	Lecture notes	3	29, 30, 37
	Scientific-academical websites	2	26, 35
	Presentation files	1	37
	University publications	2	68, 70
	Artificial intelligence applications	2	25, 65
General content resources	İnternet	12	1, 4, 5, 20, 29, 31, 47, 49, 50, 53, 56, 71
	YouTube	8	15, 21, 23, 44, 53, 54, 55, 57
	Trusted internet websites	3	28, 62, 68
	Wikipedia	2	8, 43
	Web 2.0 tools	2	44, 65
	Social media	2	65, 70

*CoHE [Council of Higher Education's Thesis Center]: Thesis center in Türkiye where postgraduate theses that are prepared at universities are collected and opened for students and researchers.

**PPSE [Public Personnel Selection Exam]: It is an exam used by the Student Selection and Placement Center for appointments to some staff and positions of public institutions and organizations (SSPC, 2023). Teachers are expected to take this exam and meet certain other requirements in order to work in government institutions.

***ULAKBİM: Turkish Academic Network and Information Center

According to Table 3, the teacher candidates use purpose-specific sources (*f*=95) and general content sources (*f*=29) for seeking scientific information. They have stated that they utilize sources such as textbooks (*f*=15), Google Scholar (*f*=15), articles and theses for which the source of access has not been specified (*f*=14), the internet (*f*=12), and PPSE (Public Personnel

Selection Exam) books (*f*=10) the most. Below are sample statements from teacher candidates regarding the sources they use:

> *"I examine that topic in my teaching principles and methods book from the educational sciences set. To delve deeper, I conduct research online. However, there are very few websites that can be considered reliable sources for educational sciences on the internet. The website I trust the most in this regard is https://dergipark.org.tr/tr/." (PT 28, PPSE books/purpose-specific sources; trusted internet websites/general content sources; Dergipark/purpose-specific sources)*

> *"I generally use YouTube videos as a source. I prefer listening to professors who give lectures on YouTube. Additionally, I purchase source books from some publishing houses." (PT 57, YouTube/general content sources; textbooks/purpose-specific sources)*

> *"For articles, I use Google Scholar, or I benefit from the PDF documents on Telegram. The name of the Telegram group is 'Babilkütüphanesi,' and on the internet, I use the open university's and Gazi University's documents." (PT 70, Google Scholar/purpose-specific sources; social media/general content sources; open-course wares/purpose-specific sources; university publications/purpose-specific sources).*

> *"I usually benefit from articles published in this field. More specifically, I use platforms such as Dergipark and CoHE." (PT 36, Dergipark/purpose-specific sources; CoHE/purpose-specific sources)*

Some of the PTs have provided further specifications of the sources they use:

> *"Lecture notes, Open Education Faculty books, PPSE books, etc. If I were to specify an example source of reference: Genç, F. (2020). Öğretim ilke ve yöntemleri konu öğretimi. İsem Yayıncılık." (PT 30, textbooks/purpose-specific sources; lecture notes/purpose-specific sources; PPSE books/purpose-specific sources; open-course wares/purpose-specific sources)*

> *"PPSE educational sciences books (Pegem, Benim Hocam), http://www.kpsskonu.com/egitim-bilimleri/ogretim-yontem-ve-teknikleri, YouTube videos." (PT 15, PPSE books/purpose-specific sources; YouTube/general content sources; field-specific websites/purpose-specific sources)*

> *"1) CoHE: https://tez.yok.gov.tr/UlusalTezMerkezi/*

> *2) Google Scholar: https://scholar.google.com/schhp?hl=tr*

> *3) ULAKBİM: https://ulakbim.tubitak.gov.tr/*

> *4) The TR Index: https://trdizin.gov.tr/" (PT 39, CoHE/purpose-specific sources; Google Scholar/purpose-specific sources; the TR Index/purpose-specific sources; ULAKBİM/purpose-specific sources)*

> *"Wordwall https://wordwall.net/tr, sosyalbilgilerbiz https://www.sosyalbilgiler.biz/, Pinterest application." (PT 65, field-specific websites/purpose-specific sources; Web 2.0 tools/general content sources; social media/general content sources)*

As a result of the focus group interview, the PTs expressed that they conduct research using artificial intelligence applications. Here is a sample statement:

> *"I believe that the assignments I've completed using artificial intelligence applications are consistent, and they are adequate sources of information for me." (PT 25, artificial intelligence applications/purpose-specific sources, focus group interview)*

3.3. Views on the significance of the information access process

This section provides the PTs' opinions concerning the importance of the process of accessing information (Table 4).

According to Table 4, teacher candidates have expressed the importance of reliability (*f*=63), content (*f*=22), access (*f*=20), time (*f*=15), self-efficacy (*f*=5), and technological infrastructure (*f*=5) in the process of accessing information. Among these categories, information reliability/security (*f*=28), accurate information (*f*=23), speed (*f*=12), and internet access (*f*=9) stand out the most. A few sample responses are presented below.

Table 4. *The PTs' views on the significance of the information access process.*

Categories	Codes	*f*	PT
Reliability	Information reliability/security	28	2, 3, 6, 8, 9, 11, 12, 13, 16, 22, 23, 28, 29, 34, 35, 37, 39, 45, 47, 49, 52, 55, 58, 59, 62, 63, 66, 67
	Accurate information	23	4, 8, 9, 11, 14, 15, 16, 18, 20, 24, 31, 36, 43, 48, 49, 50, 52, 54, 60, 69, 70, 72, 27
	Comparison of sources	4	6, 10, 72, 27
	Verified information	1	14
	Objectivity	3	22, 28, 29
	Scientific-academical resource	3	30, 38, 64
	Official source	1	39
Access	Internet access	9	1, 7, 27, 32, 40, 61, 65, 70, 71
	Information access	2	19, 33
	Accessibility	1	42
	Source diversity	4	10, 19, 32, 41
	Library access	2	44, 65
	Information diversity	2	12, 26
Content	Intelligibility	4	12, 15, 45, 51
	Simplicity	2	11, 27
	Clarity	3	11, 12, 45
	Inclusion of references	1	12
	Inclusion of in-depth information	1	12
	Brief/concise information	3	15, 48, 47
	Obviousness	2	20, 45
	Consistency	3	22, 25, 26
	Inclusivity	1	33
	Qualification	2	51, 70
Time	Speed	12	2, 4, 5, 8, 12, 21, 32, 34, 40, 53, 61, 66
	Practicality	2	5, 12
	Functionality	1	33
Technological infrastructure	Tools and resources	1	25
	Technological support	1	7
	User-friendly interface	1	12
	Technological equipment	1	70
	Artificial intelligence	1	65
Self-efficacy	Accurate scanning of information	2	24, 54
	Ability to use media tools	2	65, 68
	Foreign language knowledge	1	68

While some teacher candidates emphasized the importance of a single aspect, most of them highlighted the significance of various aspects in the process of accessing information:

> *"To ensure that the content of the accessed source is reliable, I usually click on links with official domain extensions." (PT 3, information reliability/reliability)*

> *"Gathering information from verified and widely recognized websites is the most important issue." (PT 14, verified information/reliability)*

"I prioritize the reliability of sources, user-friendly and clear website interfaces, and books and websites containing the most in-depth information with proper references. I mean, sometimes a website may have limited information about a topic. It might be better not to waste time collecting information individually and gather it from fewer sources." (PT 12, information reliability / security; information diversity/access; clarity/content; inclusion of references/content; inclusion of in-depth information/content; speed/time; practicality/time; user-friendly interface/technological infrastructure)

"The reliability of sources, their consistency with each other, and the fact that the information is not based on belief but on objectivity and experimentation are important to me." (PT 22, information reliability/reliability; objectivity/reliability; consistency/content)

"Inclusivity, accessibility, and functional as well as applicable resources are important." (PT 33, information access/access; inclusivity/content; functionality/time)

"Trying to access more sources and testing the accuracy of information by comparing them is quite important because information can become outdated or there is a possibility of acquiring incorrect information." (PT 72, accurate information/reliability; comparison of sources/reliability)

"I prioritize conducting research from various sources and then compiling, of course." (PT 10, information diversity/access; comparison of sources/reliability)

"The availability of an internet network and access to a good nearby library are important. Having good software and media literacy is also essential. Effective use of artificial intelligence and being able to transform it hold significance as well." (PT 65, internet access/access; library access/access; artificial intelligence/technological infrastructure; ability to use media tools/self-efficacy)

Furthermore, after the focus group interview, one teacher candidate expressed the need to verify information obtained from artificial intelligence due to its virtual nature.

"I have some reservations concerning artificial intelligence. It seems like when it's written by artificial intelligence, it's not real. It's necessary to verify the information from other sources. Looking at just one place is not sufficient for me. I compare all the content that comes up on the internet. I check out more reliable sources." (PT 27, simplicity/content, focus group interview)

3.4. Views on the sufficiency and reliability of the tools PTs use for searching scientific information

This section provides the teacher candidates' opinions concerning the sufficiency and reliability of the tools they employ when seeking information during a scientific research study (Table 5).

Table 5. *PTs' views on the sufficiency and reliability of the tools they use for searching scientific information.*

Sufficiency/reliability of tools	*f*	%
Sufficient	33	45.83
Generally sufficient	13	18.06
Partly sufficient	9	12.50
Insufficient	17	23.61
Reliable	36	50.00
Generally reliable	13	18.06
Partly reliable	17	23.61
Unreliable	6	8.33

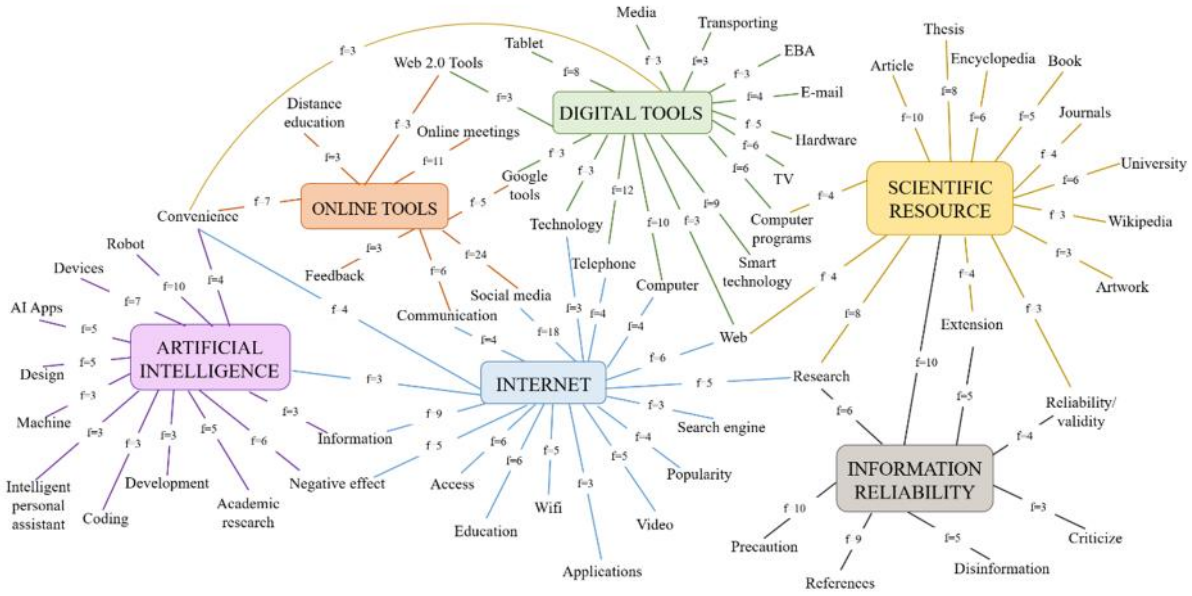
According to Table 5, teacher candidates commonly regard the tools they use as largely sufficient and reliable. However, because the responses of PTs do not clearly specify in what respect they find them sufficient or reliable, these issues were revisited and discussed with the participants during the focus group interview process. According to this, the candidates

generally find the sources they use to be sufficient and reliable for the following reasons: accessing websites recommended by professors, consistency among sources, being based on scientific principles, ensuring consistency in a study, validity and reliability, richness of references, using cult sources (those written by well-known people in the field), including sources with "*edu*" and "*gov*" extensions, including university publications, up-to-dateness of sources, the number of citations for a source, and ease of access.

3.5. Word Association Test Results

The results of the word association test carried out among teacher candidates are delineated below (Figure 1). The PTs wrote a total of 132 words for "internet". Among these, the words social media (*f*=18) and information (*f*=9) were repeated the most. For "digital tools," they wrote a total of 101 words. Among these, the words telephone (*f*=12), computer (*f*=10), smart technologies (*f*=9), and tablet (*f*=8) were repeated the most. For "online tools," they wrote a total of 79 words. Among these, the words social media (WhatsApp, Twitter, Facebook, Instagram, Messenger, and Snapchat) (*f*=24), online meetings (Zoom, Google Meet, and Microsoft Teams) (*f*=11), and convenience (*f*=7) were repeated the most. For "artificial intelligence," they wrote a total of 90 words. Among these, the words robot (*f*=10) and devices (smartphone, microphone, computer, Togg, and 3D glasses) (*f*=7) were repeated the most. For the word "information reliability," they wrote a total of 73 words. Among these, the words precaution (*f*=10), scientific resource (article, thesis, encyclopedia, and book) (*f*=10), and references (*f*=9) were repeated the most. For "scientific resource," they wrote a total of 84 words. Among these, the words article (*f*=10), thesis (*f*=8), and research (*f*=8) were repeated the most.

Figure 1. *Conceptual network of teacher candidates regarding the concepts in the process of accessing information.*



It is also noteworthy that the teacher candidates associated some keywords with multiple common words that are related to one another. For example, they associated the words "internet", "digital tools", "online tools", and "artificial intelligence" with convenience; "internet" and "online tools" with communication and social media; "internet", "digital tools", and "scientific resource" with Web; and "internet", "scientific resource," and "information reliability" with research.

The word association test supports findings for the first research question in a qualitative manner (articles, books, theses, web); it supports findings for the second research question in a

qualitative manner (Wikipedia, books, journals, articles, theses, web, university, web 2.0 tools, Google tools, artificial intelligence); it supports findings for the third research question in a qualitative manner (reliability/validity, convenience, access, devices, references, technology, artificial intelligence, media, scientific resource, information reliability); and it supports findings for the fourth research question in a qualitative manner (references, convenience, scientific resource, reliability/validity, extension, university, popularity, access).

Upon a more in-depth examination of the results, the majority of participants (n=51) mentioned receiving education related to internet information searching. However, among the participants included in the focus group and word association processes for clarification purposes, only 2 of them (PT 25 and PT 54) had received education specifically related to internet information searching. The fact that the majority of participants in the second research process had not received education on this topic aligns with the researcher's decision to include these participants in the process to clarify their responses since they did not provide clear statements in the initial research process.

4. DISCUSSION

This study basically highlights the tools that pre-service teachers use in the process of accessing information and their strategies for selecting these tools. The analysis of the ways that pre-service teachers follow while searching for information during a scientific study shows that they manage the process on the basis of scientific research and general research. In the course of conducting general research, pre-service teachers frequently perform general searches on the internet. However, they stated that they focused on searching for articles in the scientific research process. This result is similar to both the findings obtained by Kurulgan and Argan (2007) and the results obtained by Gürsoy (2019) in terms of the participants' general information search behavior on the internet and their use of search engines. On the other hand, we concluded that the pre-service teachers who stated that they researched articles meant any article with up to date/social content rather than a scientific article through deeper research applied by us. Despite a pre-service teacher summarised the process like a scholar in the article research opens a significant door for us as researchers, the fact that only one pre-service teacher among all participants explained the research process in an academic way revealed that pre-service teachers do not receive adequate support in terms of academic behavior in accessing information. This result highlights the digital literacy skills that need to be developed in pre-service teachers as stated by Sırakaya and Çakır (2014). On the other hand, Çaka et al. (2016 stated that students are not aware of their search orientations, they have incomplete information about how to start searching for information, where they are and where to go, and that the strategy of using appropriate keywords in the searching process should also be developed. Toquero (2021) concluded that multicultural pre-service teachers have novice research skills and that the application of research skills in the real world improves research competencies. Due to the participation of pre-service teachers from various departments, our study reveals the existence of points that need to be developed in the research skills of pre-service teachers in line with the results of this study.

Even though most of the pre-service teachers follow a gradual research process in accessing information, some of them access information over a single source. In our study, pre-service teachers who reached knowledge in a gradual manner stated that they used this process to confirm or integrate the knowledge. Wu and Tsai (2007) concluded that students used the strategy of organizing information, and Geçer and İra (2015) concluded that students used the strategies of integrating information on different sites and organizing them. Zimmermann et al. (2022) concluded that pre-service teachers were competent in using multiple search engines, adapting or reconstructing search terms and selecting at least one Web item from advanced search strategies on the internet. Enochsson (2019) observed that students are capable of finding information on a site when they are guided, but they are unable to establish relationships

between information. The results obtained from this study show that students' awareness levels should be increased in terms of using high-level strategies such as searching, interpreting, selecting, and combining information. This need is supported by the fact that even though the participants in our study stated that they used progressive research strategies to integrate information, they could not even distinguish the content (scientific, social, political, etc.) of the information obtained from the information source as a result of in-depth research. McGarr and Ó Gallchóir (2020) also suggest a greater emphasis on professional development. Despite the statement by Zipke et al. (2019) that the participants gained knowledge and confidence by using educational technologies, yet there were quite large differences between what they learned at university and their classroom experiences, it can be said that there is still a need for this support in the course of university education as a result of our study. As a result of their research, Reisoğlu and Çebi (2020) stated that pre-service teachers should be trained in areas such as information and data literacy or security and problem-solving. Alelaimat et al. (2020) and Avcı and Candan (2023) suggested that teacher education programmes and curricula should be strengthened and improved in order to enable future teachers to provide reliable teaching in technology-integrated classrooms.

As they search for information during a scientific study, pre-service teachers use purpose-oriented and generalised sources. The goal-oriented research results of pre-service teachers overlap with the skill of being goal-oriented, one of the individual skills suggested by List et al. (2020) to be necessary for digital literacy in their study. Yalçınalp and Aşkar (2003) stated that students who used goal-directed information-seeking strategies used planned and purposeful search styles, whereas students who followed data-directed information-seeking strategies used more superficial information-seeking types in scanning styles. Çelen and Seferoğlu (2017) also revealed that students with a data-driven search strategy did not start their research with a specific purpose but used all the information they randomly accessed without making a selection. These students, who have deficiencies in their information-seeking styles, make superficial searches without any purpose. The result obtained from this study is in line with the findings of both Yalçınalp and Aşkar (2003) and Çelen and Seferoğlu (2017). Textbooks, Google Scholar, and articles and theses with unspecified access sources are among the sources most frequently used by pre-service teachers. This result coincides with the results of the studies of Kurulgan and Argan (2007) and Zimmermann et al. (2022) in terms of the use of Google and Yahoo among internet search engines. Sendurur et al.'s (2019) observation that students tend to use websites such as wikipedia.org also supports this result.

Pre-service teachers find reliability, content, access, and time important in the process of accessing information. In particular, information reliability/security, accurate information, speed, and access to the internet stand out. While certain pre-service teachers mentioned the importance of only one feature, most of the pre-service teachers discussed the importance of the process of accessing information considering many features. Aşkar and Mazman (2013) emphasised that the main reason why the Internet is preferred so much is that it eliminates time and space limitations and Ackerman et al. (2020) emphasised the importance of the reliability of the website and consistency in terms of content. Çebi et al. (2022) stated that information and data literacy skills such as accessing accurate information and ways to verify information were used by the participants in the transition from digital competencies to technology integration. In our study, the fact that pre-service teachers found both information-data literacy and multiple features essential in accessing information coincides with this study.

Pre-service teachers find the tools they use adequate and reliable to a great extent. In general, they associated the conditions such as the tools they used being recommended by a reliable person, being consistent, containing rich sources, being based on scientific foundations, and being available on reliable internet pages with the adequacy and reliability of the sources. The fact that pre-service teachers find these tools reliable differs from the results compiled by

Torres-Hernández and Gallego-Arrufat (2022). On the one hand, they stated that the education of individuals about data protection and privacy, ethics, and responsible use of technology should be emphasised, on the other hand, our study shows that pre-service teachers find the sources they use reliably. However, since the pre-service teachers in our study based the reasons for this reliability mostly on the recommendations of the lecturers who helped them in accessing the source, the fact that it was published by experts in the field and reliable internet links, the difference between the results can be seen as normal. In such a case, Reisoğlu and Çebi (2020) suggest that lecturers should structure their courses with technology support, as pre-service teachers may perceive their lecturers as role models. This situation also raises the concern that pre-service teachers may accept all the information given without questioning it. For this reason, it is thought that pre-service teachers should receive more detailed and comprehensive instructions on academic information-seeking behaviors in their education life.

The analysis of the conceptual network of pre-service teachers regarding the process of access to information showed that the concepts of social media, telephone-telephone, computer, online meetings, robots, security, scientific sources, articles and thesis stand out. The analysis of the relationships between these concepts showed that the pre-service teachers associated the words internet, digital tools, online tools and artificial intelligence with "convenience"; internet and online tools with "communication" and "social media"; internet, digital tools and scientific source with "Web"; internet, scientific source and information reliability with "research", indicating that complex conceptual connections were established between these concepts. Especially the feature of being appropriate/favourable among the associated concepts led us to the conclusion that pre-service teachers attach importance to research-oriented to their purposes. The fact that PTs provided examples such as articles, books, theses, etc., when making word associations, illustrates their understanding of the avenues for accessing information. Likewise, their examples such as university, Google tools, artificial intelligence, etc., indicate the tools commonly used when searching for scientific knowledge. The results of Erdoğan and Bozkurt's (2023) study on the metaphors produced by PTs regarding the perceptions of artificial intelligence also show that PTs' perceptions of artificial intelligence point to similar conceptual categories. Additionally, their examples such as reliability/validity, convenience, access, devices, references, technology, artificial intelligence, media, scientific resources, and information reliability highlight the significance of the information access process. Lastly, their use of terms like references, scientific resource, reliability/validity, extension, and convenience largely support their views on reliability in the information access process.

Despite most participants mentioning that they received training related to web searching, the researchers included participants in the second research process to clarify certain expressions, regardless of this background. The fact that most of these participants had not received education on this topic aligns with the idea that the subject needed to be investigated in-depth.

5. LIMITATIONS, FUTURE DIRECTIONS AND CONCLUSION

In this study, data was collected through an online data collection process due to a natural disaster in the country. The inability to conduct face-to-face data collection in this research is a limitation, as it could have allowed participants to access different sources while answering the questions. In studies that could be conducted face-to-face, the results obtained from the simultaneous responses of teacher candidates could be compared with the results of this study in terms of possible different aspects.

Even though most of the participants mentioned searching for articles on the internet, there were very few responses in which the process was properly explained. The implication of this finding extends to offering guidance for both current researchers of this study and future researchers who will address this field in their upcoming studies. Providing participants with

specific tasks in the process of accessing information (such as tasks where researchers determine the information to be accessed, the subject area, and the access method) can allow for a detailed examination of how teacher candidates manage the process. In addition to recommending digital tools that students can use to access information, training should also be provided on strategies for selecting these sources of information and improving their digital skills. It was found that teacher candidates who claimed to search for articles within the scope of scientific research were not accurately aware of what exactly scientific articles mean. Therefore, it is recommended to provide teacher candidates with hands-on training concerning the proper methods of scientific research.

All the participants took courses in Information Technologies and Instructional Technologies, and most of them indicated that they received training in searching for information on the Internet. However, given that Media Literacy is an elective course, not all teacher candidates chose to enroll in it. Hence, it is reasonable to anticipate differences among participants concerning their approaches to information access and their perceptions of information source reliability. It is recommended that the development of skills such as media literacy, digital literacy, information literacy, and technology literacy be encouraged for all teacher candidates.

The integration of the digital world into our daily lives has catalyzed a shift in our information-seeking behaviors. As a result, individuals have developed certain skills such as understanding the source of information, harnessing a variety of access channels as well as digital resources, and being able to connect and contextualize information. The process of evaluating data within the vast expanse of the internet is achievable through the concurrent use of various skills.

In digital and online media, there are numerous options with different content, making it crucial to question the accuracy of acquired information and the reliability of information sources with respect to information literacy and digital literacy. The proper use of digital technologies plays a key role in terms of enabling remote access to information. However, the indiscriminate use of digital content without questioning and awareness can lead to information pollution. Therefore, especially in terms of accessing information, it is important to consider not only the information obtained from various sources but also the scientific validity, reliability, and validity of these sources.

The results of this study indicate that PTs preferred articles for scientific research and internet searches for general research. During their pursuit of scientific information, they tended to use goal-oriented and general content sources. However, they exhibited a limited grasp of the specific definition and extent of what qualifies as an “article”. In light of this, it is worth noting that while they professed to adhere to a structured research process for accessing information, they exhibited resemblances to children who still require training wheels on their bicycles. Additionally, it is demonstrated that PTs prioritized information reliability, accuracy, speed, and internet accessibility during the information access process. Nonetheless, participants tended to accept information from trusted individuals without verifying it. Finally, teacher candidates displayed their capacity to establish complex conceptual networks among information access tools and processes.

Declaration of Conflicting Interests and Ethics

The authors declare no conflict of interest. This research study complies with research publishing ethics. The scientific and legal responsibility for manuscripts published in IJATE belongs to the authors. **Ethics Committee Number**: Selçuk University, 06.06.2023, E-16343714-605.02-531014.

Contribution of Authors

N. Tayyibe Ateş: Investigation, Resources, Software, Formal Analysis, and Writing-original draft. **Nurcan Tekin**: Methodology, Visualization, Supervision, Validation, Formal Analysis, and Writing.

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