The Relationship Between Teachers' Digital Literacy Levels and Research Literacy Skills[*]

Öğretmenlerin Dijital Okuryazarlık Düzeyleri ile Araştırma Okuryazarlığı Becerileri Arasındaki İlişki

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ABSTRACT: In the information age, individuals' ability to access, use, and transfer information is fundamental for personal and professional success. Digital and research literacy are critical skills that strengthen teachers' professional competencies in contemporary educational processes. This study examines the correlation between teachers' proficiency in digital literacy and their proficiency in research literacy. A quantitative research approach is utilized, employing a relational survey design. The study sample consists of all subject-area educators who are employed in a central district within the eastern region of Türkiye. A total of 604 teacher participated in the study online Data gathering entails the utilization of a "Personal Information Form" devised by the researchers, in conjunction with the "Digital Literacy Scale" and "Research Literacy Scale," all of which have undergone meticulous testing to ensure their validity and reliability. According to normality analyses, the data are not normally distributed. Mann-Whitney U, Kruskal-Wallis H tests, Spearman Correlation Analyses were used as analyses The findings reveal substantial disparities in the digital literacy skills of instructor based on demographic parameters including gender, department, age, computer ownership, and daily internet usage time. Likewise, there are differences in instructors' research literacy skills based on gender, level of education, and ownership of computers. Moreover, a strong positive association is seen between digital literacy and research literacy skills, suggesting that when one ability improves, the other skill also improves. These findings emphasize the importance of addressing digital and research literacy in teachers' professional development processes.

Keywords: Digital literacy, research literacy, literacy, teachers.

ÖZ: Bilgi çağında, bireylerin bilgiye erişme, bilgiyi kullanma ve aktarma becerileri kişisel ve mesleki başarı için temel önem taşımaktadır. Dijital ve araştırma okuryazarlığı, çağdaş eğitim süreçlerinde öğretmenlerin mesleki yeterliliklerini güçlendiren kritik becerilerdir. Bu çalışma, öğretmenlerin dijital okuryazarlık becerileri ile araştırma okuryazarlığı yeterlilikleri arasındaki ilişkiyi incelemeyi amaçlamaktadır. Nicel araştırma yaklaşımının kullanıldığı çalışmada ilişkisel tarama modeli kullanılmıştır Çalışmanın örneklemi, Türkiye'nin doğu bölgesindeki bir merkez ilçede görev yapan tüm branş öğretmenlerinden oluşmaktadır. Çalışmaya toplam 604 öğretmen çevrimiçi olarak katılmıştır. Verilerin toplanmasında araştırmacılar tarafından geliştirilen "Kişisel Bilgi Formu" ile geçerlilik ve güvenilirliği titizlikle test edilen "Dijital Okuryazarlık Ölçeği" ve "Araştırma Okuryazarlığı Ölçeği" kullanılmıştır. Normallik analizlerine göre veriler normal dağılmamaktadır. Analizlerde Mann-Whitney U, Kruskal-Wallis H testleri ve Spearman Korelasyon Analizleri kullanılmıştır. Bulgular, cinsiyet, bölüm, yaş, bilgisayar sahipliği ve günlük internet kullanım süresi gibi demografik parametrelere dayalı olarak öğretmenlerin dijital okuryazarlık becerilerinde önemli farklılıklar olduğunu ortaya koymaktadır. Benzer şekilde, öğretmenlerin araştırma okuryazarlığı becerilerinde de cinsiyet, eğitim düzeyi ve bilgisayar sahipliğine dayalı farklılıklar bulunmaktadır. Ayrıca, dijital okuryazarlık ve araştırma okuryazarlığı becerileri arasında güçlü bir pozitif ilişki görülmekte, bu da bir beceri geliştiğinde diğer becerinin de geliştiğini göstermektedir. Bu bulgular, öğretmenlerin mesleki gelişim süreçlerinde dijital okuryazarlık ve araştırma okuryazarlığının ele alınmasının önemini vurgulamaktadır.

Anahtar kelimeler: Dijital okuryazarlık, araştırma okuryazarlığı, okuryazarlık, öğretmenler.

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The features brought by the new era are more than just storage; the practical emergence of features and, as a result, their genetic use and the production of new information have become important. Changing and developing technology: The methods of accessing information have changed the methods used in storing and transferring the acquired information (Albion et al., 2015), and different methods (browsers, databases, etc.) have become important United Nations Educational, Scientific and Cultural Organization [UNESCO] (2017).

The teaching profession is the basis of social change and development (Mikkilä-Erdmann et al., 2019). For this reason, it becomes mandatory for teachers to keep up with technological developments (Escudero et al., 2019) and evaluate information using various methods. (Admiraal et al., 2017). Educators should be trained by considering what the age brings (Seferoğlu, 2001). The education provided by well-trained teachers before and during the service will ensure the training of a qualified workforce that ensures the development of society (Mutlu & Erdem, 2013; Seferoğlu, 2001). At this point, teachers need to have these competencies. Only by developing these skills can teachers maintain their professional progress and benefit their students (Rodriguez-Gomez et al., 2018). The utilization of computer-based technology in the global information society has been steadily rising daily. As a result, information and communication technologies in educational institutions have also come to the agenda (Starkey, 2016). Teachers' digital literacy skills are essential in keeping up with these changes (JISC, 2018; Kaufman, 2014; Lund et al., 2014).

Educational research is essential for obtaining valid and reliable experiences free from personal illusions (Tatto & Furlong, 2015). Therefore, in the interest of all groups affected by education, teachers who shape society have adequate skills in the emergence of scientific experiences (Holincheck, 2012). In line with 21st-century requirements (Akın & Solmaz, 2019; Shidiq & Yamtinah, 2019), education and training in a scientific way can only be done with teachers with high research skills (Christie et al., 2012). Instead of providing students with access to knowledge (Kılıç, 2006) and transferring knowledge, teachers take the task of guiding students in accessing knowledge (Gömleksiz & Fidan, 2013) and making students active in this process (Ulvik, 2014). Therefore, it can be said that teachers should be good research-literate (Boyd, 2021).

Digital Literacy

Digital literacy refers to proficiency in utilizing various sources to retrieve information (Hutchinson & Novotny, 2018), to make connections between the information accessed, and to have the necessary functional and digital skills to access information (Polizzi, 2020). Digital literacy is understanding and using large-scale multimedia information presented through computers (Knobel & Lankshear, 2006). Digital literates should be able to access digital content in digital environments and should be individuals who can make decisions on sites with simulations, multimedia and interactive graphics by interacting with links (Hamutoğlu et al., 2017; Pérez-Escoda et al., 2019; Zhang et al., 2023). Digitally literate individuals should be able to choose the right tools to share information and transfer information to others effectively and safely. (Hague & Payton, 2010). Figure 1 shows the components which form the basis of digital literacy and are related to each other.

Figure 1

Elements of Digital Literacy (Hague & Payton, 2010)
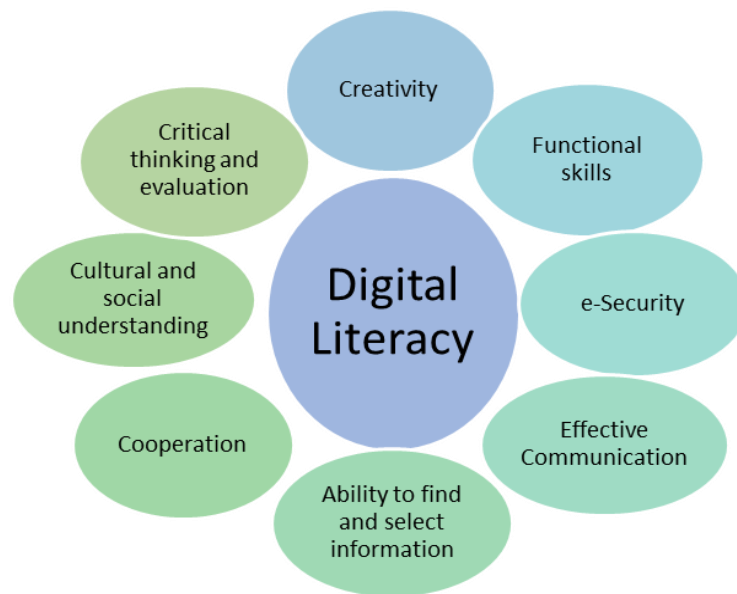
It is seen that digital literacy, which has become an indispensable element of daily life with its components, has attracted more attention in Türkiye after 2005 with applications such as the Ministry of National Education's Opportunities Enhancement and Technology Improvement Movement (FATİH) Project (Ministry of National Education [MoNE], 2017). MoNE emphasized the importance of teachers training this skill in digital literacy (Kulaca, 2023). With digital literacy skills, teachers can transform students from consumer mode to active and creative students by using different types and forms of multimedia (List, 2019). In addition, digital tools facilitate the teaching and learning process by improving two-way communication between teachers and students (Mellati & Khademi, 2020).

According to the literature review, many studies have been done on digital literacy in recent years. When the domestic and foreign studies on technology use and digital literacy are examined; in the study groups, parents (Öçal, 2017), secondary school students (Kulaca, 2023), high school students (Kaya, 2020), education faculty students (Kara, 2021; Kartika et al., 2021; Kozan & Özek, 2019; Özerbaş & Kuralbayeva, 2018; Üstündağ et al., 2017; Utama & Nurkamto, 2019) and teachers from different subject groups (Allen & Berggren, 2016; Arslan, 2019; Cote & Milliner, 2018; Goh & Sigala, 2020; Kibici, 2022; Kilincer, 2021; Korkmaz, 2020; Potyrała & Tomczyk, 2021). In the studies conducted with teachers, it is generally understood that teachers perceive their digital literacy skills adequately. While it is seen that gender, age, seniority, and educational status variables are included in the studies, variables such as department, having a computer, and daily internet usage time are included in a few studies. Since there is a need for studies to include these variables, this research is expected to make a valuable contribution to the existing body of literature.

Research Literacy

According to O'Brien and Rugen (2001), research literacy is the capacity to carry out new research without referencing the outcomes of earlier studies that have been analyzed and concluded. Evans et al. (2017) define it as the ability of individuals

to engage in active research. Research literacy encompasses not just cognitive abilities such as creativity, critical thinking, and problem-solving, but also the capacity of individuals to actively and proficiently engage with their surroundings (Lillejord & Børte, 2016; Westbury et al., 2005). Yıldız et al. (2019) state that persons who possess research literacy are anticipated to effectively handle all research procedures about their specific area of knowledge.

Educators assume the duty of nurturing the next generation in the process of teaching and training. In many countries, teachers and pre-service teachers are expected to make research-based, professional, and personal choices and develop inquiry-based thinking skills as part of their 21st century skills. This expectation for teachers and pre-service teachers is clearly expressed in Finland (Niemi, 2016), Türkiye (Görgülü-Arı & Arslan, 2020; Kazancı-Tınmaz & Sezgin, 2023; Kır-Yiğit & Özalemdar, 2022; Velioğlu & Özdemir, 2023; Yıldız et al., 2019) Norway and Ireland (Conway & Munthe, 2014), China (Cui et al., 2023; Liu et al., 2024). It discussed how research literacy can influence teacher education in developing a way of thinking. (Eriksen & Brevik, 2023). Research literacy is more than engaging with research through research-based education (Waring & Evans, 2014). To ensure the development of research literacy in education and teacher training institutions, it is argued that there should be an emphasis on linking research and education by actively involving students in research (Shank & Brown, 2013). Instructors and pre-service instructors must possess research literacy (Furlong, 2015) to effectively guide their students in conducting research.

The correct evaluation of the information obtained from educational practices is possible with the researcher's teacher behavior, who knows the school's functioning and the students. According to Bilgili (2005), teachers who conduct research shape their behaviors, and beliefs in classroom practices according to research results. This situation is seen as a reform for teacher education. The fact that teachers have a research structure contributes to them giving the right direction to the teaching process, implementing new strategies to be used in the classroom and gaining competencies for solving the problems experienced (Cain & Allan, 2017).

For a considerable amount of time, several countries have enforced laws about research literacy (British Educational Research Association [BERA], 2014; Organisation for Economic Co-operation and Development [OECD], 2007) and have accentuated the significance of research-based methodologies. However, further research is needed to determine Turkish teachers' level of research literacy. Furthermore, studies demonstrate the beneficial effects of teachers' involvement in research on students' education (Cordingley, 2015; Crain-Dorough & Elder, 2021; Evans et al., 2017; Rose et al., 2017). According to systematic reviews, student results are positively impacted by instructors' involvement in research (Bell et al., 2010; Heikkilä & Eriksen, 2024).

In the literature, it has been determined that many studies have been conducted on research literacy with pre-service teachers (Aşiroğlu, 2016; Çakmak et al., 2015; Dombaycı & Ercan, 2017; Groß-Ophoff et al., 2017; Gyurova, 2020; Küçükoğlu et al., 2013; Kürşad, 2015; Taşdemir & Taşdemir, 2011). Studies conducted with teachers are limited, especially in Türkiye (Baş & Kıvılcım, 2017; Görgülü-Arı & Arslan, 2020; Sadıç, 2019), while there are more studies on this subject abroad (Bell et al., 2010; Booher et al., 2020; Katayev et al., 2023; Koshmaganbetova et al., 2020; Kostoulas et

al., 2019; Nikola, 2021; Roman, 2021; Syahrial et al., 2022; Waite & Davis, 2006; Williams & Coles, 2007). The scarcity of studies investigating research literacy in Türkiye hinders comparing studies.. In similar concepts such as research skills, attitudes towards educational research, and research competencies, it is seen that studies in which variables such as age and gender of teachers were used in the study. At the same time, the differentiation according to departments is determined were very few in the literature. The study is essential in associating variables such as having a computer and daily internet usage time with research literacy and examining differences according to departments.

Importance of Study

Compared to the studies in the literature, this study addresses different variables in digital literacy and research literacy skills. This study is expected to enhance the existing literature by examining the correlation between these two forms of literacy. In addition, since the limited number of studies examining research literacy makes it difficult to compare studies, this study is considered significant. This study is thought to inform teachers from all departments about the significance of digital literacy and research skills. The subject and findings of the study are also considered significant for teacher training institutions, as they will guide them.

Purpose of the Study

This research investigates digital literacy proficiency and research literacy competencies among educators. The research problem "Is there a significant relationship between teachers' digital literacy levels and research literacy skill levels?" is determined as the problem statement of the research.

Based on this problem, the following sub-problems were formed:

1. Do teachers' digital literacy levels significantly differ according to gender, departments, age, having a computer and daily internet usage time?
2. Do teachers' research literacy skill levels significantly differ according to gender, educational level, and having a computer?
3. Is there a significant relationship between teachers' digital literacy levels and research literacy skills?

Method

Research Model

This study is a relational survey, a type of quantitative research method. Quantitative research aims to reach facts through description or causality by measuring events externally, experimenting, or observing (Creswell, 2014; McMillan & Schumacher, 2010). This study used the relational survey model to determine the current situation and reveal the relationship between variables.

Study Group

The study population consists of teachers working in a province east of Türkiye. According to the official data announced by the Provincial Directorate of National Education, in 2021, teachers from various specialties were working in schools in the

central district. The study's sample was determined by convenient sampling, which is one of the non-random sampling methods. The convenience sampling method to select the sample from easily accessible and applicable units due to limitations such as time, cost, and labor force (Büyüköztürk, 2010). Six hundred-four teachers participated in the study. Gender, department, education level, and age variables of the teachers were considered.

Data Collection Tools

Personal Information Form

The researcher has devised a "Personal Information Form" to collect data voluntarily provided by educators participating in the study. This form gathers information regarding participants' gender, age, department, educational background, computer ownership status, and daily internet usage habits. The distribution of teachers in the sample participating in our research according to different variables is given in.

Table 1

Distribution of the Sample by Various Variables

Variable		f	%
Gender	Female	344	57
	Male	260	43
Education level	Undergraduate	535	88.6
	Postgraduate	69	11.4
Year	21-30 years old	354	58.6
	31-40 years old	195	32.3
	41 years and above	55	9.1
Departments	Language departments	41	6.7
	Art/Sport	70	11.5
	Numerical departments	111	18.3
	Verbal departments	176	29.1
	Class departments	206	34.1
Having a computer	Yes	535	88.6
	No	69	11.4
Daily İnternet Usage Time	Less than 1 hour	20	3.3
	1-2 hours	153	25.3
	3-5 hours	262	43.3
	Over 5 hours	169	27.9
Total		604	100

57% of the teachers participating in the study were female and 43% were male. It is seen that more than half of the teachers participating in the research are between the

ages of 21-30. Most of the teachers participating in the research are classroom teachers. Most of the teachers have a computer. 43% of the teachers use the internet 3-5 hours a day.

Digital Literacy Scale

The scale created by Hamutoğlu et al. (2017) is divided into four different domains: attitude, cognitive capacity, technical knowledge, and social interaction and consists of 17 items. It is a modified version of Ng's (2012) first scale. The 5-point Likert scale does not have any items that are scored in the opposite direction. The study included both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to assess convergent validity. The overall score had a high level of internal consistency as indicated by the Cronbach's alpha value of .93. When the fit indices of the CFA model were analyzed, a statistically significant minimum chi-square value ($\chi2$=268.45, Sd=113, p=0.00) was found. However, other indices such as RMSEA, GFI, AGFI, CFI, NFI, NNFI, and SRMR indicated a satisfactory or acceptable fit. In this study, Cronbach's alpha coefficient of the scale was .84.

Research Literacy Scale

The scale developed by Yıldız et al. (2019) assesses educators' competencies in research literacy. Exploratory factor analysis was performed, and as a result, the Research Literacy Skills (RLS) scale, which consisted of 26 items, was developed. The reliability of the scale was evaluated using Cronbach alpha, Spearman-Brown, and Guttman Split Half tests, and it was found to be reliable with a result of .898. The scale covers four dimensions: conduct of the study, rationale for conducting the research, understanding of the research methodology, and accessibility of resources. The results of the confirmatory factor analysis of the scale: chi-square 696,296, degrees of freedom, 288 (p=.00), chi-square/degree of freedom=2.418, the goodness of fit index GFI .912, comparative fit index CFI .953, adjusted fit index AGFI .892, root mean square of approximate errors RMSEA .052 and root mean square of standardized residuals SRMR .043.In the study, Cronbach's alpha coefficient of the scale was found to be .82.

Data Collection

In the implementation of this research, Firstly, the necessary permissions were obtained for the Digital Literacy Scale, Research Literacy Scale, and Personal Information Form. The researcher converted the data collection tools into an online application format, and data were collected over approximately three months

Analysing the Data

In this inquiry, the first phase evaluates whether the data conform to a normal distribution. The data is assessed for normality using various statistical tests such as the Kolmogorov-Smirnov and Shapiro-Wilk tests and by examining the arithmetic mean and median values. While interpreting the results, the confidence interval was accepted as 95%. When looking at the results obtained from Kolmogorov-Smirnov and Shapiro Wilk tests, if p>.05, it was accepted that the distribution was normal, and p<.05 was accepted that the distribution was not normal (Tabachnick & Fidell, 2007). Based on these analyses, it is concluded that the data does not follow a normal distribution.

In the analyses, the Mann-Whitney U test, one of the nonparametric tests used in non-normal distributions, examines the significant difference between a two-category variable and a continuous variable. Kruskal Wallis H analysis examined the significant difference between a continuous variable and a variable with more than two categories. Finally, we test the direction and level of the relationship between the two scales with Spearman Correlation Analysis.

Results

The total mean value of the teachers' Digital Literacy Scale is 4.09, and the total mean value of the Research Literacy Scale is 4.15. Table 2 gives the results of the Mann-Whitney U test to determine whether the digital literacy levels of teachers differ according to gender.

Table 2

Mann-Whitney U Test Results for the Examination of Teachers' Digital Literacy Levels According to Gender Variable

	Gender	n (604)	Mean Rank	Sum of Ranks	U	p
Attitude	Female	344	315.13	108404.50	40375.500	.040
	Male	260	285.79	74305.50		
Technical	Female	344	287.49	98896.50	39556.500	.015
	Male	260	322.36	83813.50		
Cognitive	Female	344	316.23	108781.50	39998.500	.022
	Male	260	284.34	73928.50		
Social	Female	344	288.83	99358.50	40018.500	.024
	Male	260	320.58	83351.50		
Total	Female	344	299.88	103159.50	43819.500	.671
	Male	260	305.96	79550.50		

Upon scrutinizing Table 2, which presents the results of the Mann-Whitney U Test concerning the digital literacy levels of participating teachers categorized by gender, no statistically significant disparity is observed in the overall scale score ($p>.05$). However, upon further examination of the sub-dimensions, it becomes apparent that women's rank mean values significantly differ in the attitude and cognitive dimensions of the digital literacy scale ($p<.05$), whereas men's rank mean values significantly differ in the technical and social dimensions ($p<.05$). Kruskal-Wallis H results for the examination of teachers' digital literacy levels according to the department variable are given in Table 3.

Table 3

Kruskal-Wallis H Test Results Regarding the Examination of Teachers' Digital Literacy Scale According to Department Variable

	Departments	n (604)	Mean Rank	df	X^2	p	Significant difference
	1. Language departments	41	354.89	4	9.497	.048	1>4, 5>4
	2. Art/Sport	70	291.42				
Total	3. Numerical departments	111	314.97				
	4. Verbal departments	176	275.28				
	5. Class departments	206	312.37				

English and German teachers are included in the language departments group, music, painting, and physical education teachers in the art/sport departments group, mathematics, science, physics, chemistry, biology, and information technologies teachers in the numerical departments group and the remaining branches in the verbal group. The Kruskal-Wallis H Test was conducted to assess whether there were variations in digital literacy levels across different departments, yielding a significant difference between the groups' rank averages in the overall score of the digital literacy scale (X^2=9.497, p<.05). Further pairwise comparison tests revealed that the mean ranks of teachers from language departments (354.89) were significantly higher than those from verbal departments (275.28), and the mean ranks of classroom departments (312.37) were also significantly higher than those of verbal departments (275.28) in the total mean ranks of the digital literacy scale. Kruskal-Wallis H results for the examination of teachers' digital literacy levels according to age variable are given in Table 4.

Table 4

Kruskal-Wallis H Test Results for the Examination of Teachers' Digital Literacy Levels and Sub-Dimensions According to Age Variable

Survey	Classified Age	n (604)	Mean Rank	df	X^2	p	Significant difference
	1.21-30	354	318.41	2	8.584	.014	1>2 1>3
Total	2.31-40	195	287.07				
	3.41 and above	55	254.81				

Kruskal Wallis H Test was performed to test whether the digital literacy levels of the teachers differed according to the age variable in total. It is understood that there is a significant difference between the rank averages of the groups in the total digital literacy scale (X^2=8.584, p<.05). As a result of the pairwise comparisons test to examine the difference in detail, it is seen that the mean ranks of teachers aged 21-30 years (318.41) are significantly higher than those of teachers aged 31-40 years (287.07)

and teachers aged 41 and over (254.81) in the total mean ranks of the digital literacy scale. In this direction, it can be interpreted that younger teachers have higher digital literacy levels. The Mann-Whitney U results of the digital literacy levels of the teachers in terms of having a computer are given in Table 5.

Table 5

Mann-Whitney U Test Results of Teachers' Digital Literacy Levels According to Having a Computer in Total

Survey	Having a Computer	n	Mean Rank	Sum of Ranks	U	p
Total	Yes	538	312.77	168269.50	12229.50	.000
	No	66	218.80	14440.50		

Upon reviewing Table 5, which displays the outcomes of the Mann-Whitney U Test concerning the digital literacy levels of participating teachers categorized by computer ownership status, a statistically significant disparity is observed in the total digital literacy scale ($p<.05$). As indicated in the table, teachers who possess computers exhibit higher levels of digital literacy. The results of the Kruskal-Wallis H test for examining the total score of teachers' digital literacy levels according to the variable of daily internet usage time are given in Table 6.

Table 6

Kruskal-Wallis H Test Results for the Examination of Teachers' Digital Literacy Levels According to the Variable of Total Daily Internet Usage Time

	Daily Internet Usage time	n (604)	Mean Rank	df	X^2	p	Significant Difference
	1. Less than 1 hour	20	219.25	3	16.970	.001	3>1, 3>2
Total	2. 1-2 hours	153	266.11				4>1, 4>2
	3. 3-5 hours	262	310.33				
	4. Over 5 hours	169	333.16				

The Kruskal-Wallis Test is conducted to assess whether there exists a discrepancy in the digital literacy levels of teachers based on their total daily internet usage time. It becomes evident that there is a significant difference between the groups' rank averages in the total digital literacy scale (X^2=16.970, $p<.05$). Upon conducting pairwise comparisons to delve deeper into this distinction, it is observed that teachers with a daily internet usage time of 3-5 hours (310.33) exhibit significantly higher mean ranks compared to those with less than 1 hour (219.25) and 1-2 hours (266.11) daily internet usage times. Similarly, teachers with a daily internet usage time of more than 5 hours (333.16) have significantly higher mean ranks than those with less than 1 hour (219.25) and 1-2 hours (266.11) daily internet usage times. The Mann-Whitney U test

results for examining teachers' research literacy skill levels based on gender are provided in Table 7.

Table 7

Mann-Whitney U Test Results for the Investigation of Teachers' Research Literacy Skill Levels According to Gender Variable

Factor	Gender	*n* (604)	Mean Rank	Sum of Ranks	*U*	*p*
Research Process	Female	344	301.72	103792.00	44452.000	.899
	Male	260	303.53	78918.00		
Research Preparation	Female	344	299.01	102859.00	43519.000	.569
	Male	260	307.12	79851.00		
Methodology	Female	344	299.01	102859.00	43519.000	.570
	Male	260	307.12	79851.00		
Accessing Resources	Female	344	285.03	98051.50	38711.500	.004
	Male	260	325.61	84658.50		
Total	Female	344	295.51	101655.00	42315.000	.257
	Male	260	311.75	81055.00		

In Table 7, when the results of the Mann-Whitney U Test are analyzedanalyzed according to the gender of the teachers participating in the research in research literacy total score, there is no statistically significant difference (*p*>.05). Research literacy skill does not make a difference in total score according to gender variable. When the sub-dimensions are analyzed, it is seen that in the dimension of accessing the sources, the mean values of men's ranks created a significant difference (*p*<.05). Mann-Whitney U Test Results for the Examination of Teachers' Research Literacy Skill Levels and Sub-Dimensions according to Education Level Variable are given in Table 8.

Table 8

Mann-Whitney U Test Results for the Investigation of Teachers' Research Literacy Skill Levels and Sub-Dimensions according to Education Level Variable

Factor	Education level	*N*	Mean Rank	Sum of Ranks	*U*	*p*
Research Process	1. Undergraduate	535	295.88	158297.50	14917.50	.009
	2. Postgraduate	69	353.80			
Accessing Resources	1. Undergraduate	535	295.27	157971.00	14591.00	.004
	2. Postgraduate	69	358.54			
Total	1. Undergraduate	535	297.84	159343.00	15963.00	.067
	2. Postgraduate	69	338.65			

Upon reviewing Table 8, which presents the outcomes of the Mann-Whitney U Test regarding the research literacy skill levels of participating teachers categorized by their educational attainment, no statistically significant discrepancy is observed in the overall scale score ($p>.05$). It appears that research literacy does not vary based on the level of education. However, it is noted that the mean rank values of teachers holding postgraduate degrees exhibit a significant difference in the research process and access to resources dimensions of the scale ($p<.05$). The results of the Mann-Whitney U Test concerning teachers' research literacy skill levels and sub-dimensions concerning computer ownership are provided in Table 9.

Table 9

Mann-Whitney U Test Results of Research Literacy Skill Levels and Sub-Dimensions of Teachers' Having a Computer

Factor	Having a Computer	*n*	Mean Rank	Sum of Ranks	*U*	*p*
Research Process	Yes	538	304.28	163701.00	16798.00	.472
	No	66	288.02	19009.00		
Research Preparation	Yes	538	305.53	164374.00	16125.00	.220
	No	66	277.82	18336.00		
Methodology	Yes	538	304.51	163824.00	16675.00	.418
	No	66	286.15	18886.00		
Accessing Resources	Yes	538	308.27	165851.00	14648.00	.020
	No	66	255.44	16859.00		
Total	Yes	538	306.23	164696.50	15802.50	.145
	No	66	272.93	18013.50		

Upon examination of Table 9, which presents the results of the Mann-Whitney U Test concerning the research literacy skill levels of participating teachers categorized by computer ownership, no significant disparity is observed in the total score of the Research Literacy Skill Scale based on computer ownership ($p>.05$). However, in the sub-dimension of accessing resources, it is evident that teachers who possess a computer attain higher rank total scores, leading to a significant difference ($p<.05$). Spearman Correlation Analysis values to about the association between Digital Literacy Scale Scores and Research Literacy Scale scores are provided in Table 10.

Table 10

Spearman Correlation Analysis Values Related to the Relationship Between Digital Literacy Scale Scores and Research Literacy Scale Scores

		Research Process	Research Preparation	Methodology	Accessing sources	Research Literacy
Attitude	*r*	.402**	.391**	.326**	.346**	.421**
Technical	*r*	.544**	.512**	.515**	.511**	.604**
Cognitive	*r*	.498**	.482**	.405**	.323**	.495**
Social	*r*	.479**	.455**	.471**	.529**	.552**
Digital Literacy	*r*	.541**	.517**	.486**	.502**	.591**

**p<.01*

According to the Spearman correlation analysis, a positive, medium, and strong significant relationship exists between teachers' digital literacy levels and the sub-dimensions of research literacy skills. There is a positive and robust ($r=.591$; $p<.05$) significant relationship between digital literacy and total research literacy skills.

It is seen that there is a positive, medium level ($r=.421$; $p<.05$), positive, strong level ($r=.604$; $p<.05$), positive, medium level ($r=.495$; $p<.05$) and positive, strong level ($r=.552$; $p<.05$) significant relationship between research literacy skills and "attitude", "technical", "cognitive", "social", "cognitive" and "social".

There is a positive and strong relationship between digital literacy and "research process" ($r=.541$; $p<.05$); the positive and strong relationship between "preparation for research" ($r=.517$; $p<.05$); the positive and moderate relationship between "method knowledge" ($r=.486$; $p<.05$); the positive and strong relationship between "accessing resources" ($r=.502$; $p<.05$). Although there are various classifications in the literature, generally (.00-.30) is interpreted as weak, (.31-.49) as moderate, (.50-.69) as vital, (.70-.100) as powerful relationship (Tavşancıl, 2006).

Discussion and Conclusion

This study's primary goal is to discover how educators' digital and research literacy skills relate to one another. 'Within the framework of the first sub-problem of the research, teachers' digital literacy and research literacy levels are investigated. The mean value of the digital literacy scale is 4.09. According to the 5-point Likert-type scale scoring, since the median value corresponds between completely agree (5) and agree (4), it is understood that teachers' digital literacy levels are at a reasonable level. This is an indication that teachers have a good level of digital literacy. According to the findings, 58.6% of the teachers participating in the study are in the 21-30 young age group. The median score of digital literacy is reasonable because the young teachers participating in the study are closely related to technological tools. Several investigations (Cote & Milliner, 2018; Doğan & Benzer, 2023; Karanjakwut & Sripicharn, 2024; Öçal, 2017; Şad & Nalçacı, 2015; Su, 2023) have produced findings that align with the conclusions of this study. Across several countries and samples, in

multiple research, it is found that teachers have problems with technology use (Hutchison & Reinking, 2011; Kibici, 2022; Kilincer, 2021; Syvänen et al., 2016) and do not see themselves at a reasonable level in the use of digital technology (Basargekar & Singhavi, 2017; Buabeng-Andoh, 2012; Goh & Sigala, 2020).

The mean value of teachers' 'research literacy is found to be 4.15, considered reasonable. Similar to this study, Görgülü-Arı and Arslan (2020) find that graduate science teachers' research literacy skills are at a medium level, and their attitudes towards conducting research are at a reasonable level. Armağan, on the other hand, concluded in 2012 that most teachers do not consider themselves sufficient to conduct a scientific study. Kazancı-Tınmaz (2019) determined that the theoretical and research-based knowledge utilization levels of school administrators and utilization teachers are medium. In addition, it was concluded that teachers do not use research method techniques widely. There are studies in different countries (Freebody, 2007; Koshmaganbetova et al., 2020; Nag et al., 2014; Nikola, 2021; Roman, 2021; Syahrial et al., 2022; Waite & Davis, 2006) that concluded that teachers have moderate and low research skills. Inadequate resource availability, inadequate professional development and research capabilities, and reduced motivation (Koshmaganbetova et al., 2020; Nag et al., 2014; Nikola, 2021; Syahrial et al., 2022) have been identified as key factors leading to reduced research effectiveness among educators.

In this study, gender, department, age, education level, computer ownership status, and daily internet usage time variables are analyzed. Gender does not have a notable impact on digital literacy levels. However, there is a significant difference between the attitude and cognitive dimensions of female participants and the technical and social dimensions of male participants in terms of mean scores. Similar to the study, the findings of Arslan (2019), and Kozan and Özek (2019) do not make a difference in digital literacy levels in gender variables. There are studies that men have higher digital literacy and bit proficiency than women (Kara, 2021; Korkmaz, 2020; Özerbaş & Kuralbayeva, 2018; Tzafilkou et al., 2023). It was determined that the research findings differed according to the gender of teachers' digital literacy levels. This is thought to be due to the sample group with different characteristics in the studies.

Departmental variables and digital literacy levels show significant disparities. It is discovered that teachers in the verbal department group are less digitally literate than teachers in the language branch group. Teachers in the classroom branch group have better digital literacy skills compared to teachers in the verbal department group. In line with Arslan (2019) and Üstündağ et al. (2017) this study also reveals that computer and science teachers possess advanced digital literacy skills. Additionally, similar to the findings of this study, it is observed that teachers of English, French, and German rank second in terms of their high levels of digital literacy.

According to the results obtained, it is determined that the digital literacy levels of teachers aged 21-30 are higher than those of teachers aged 31-40 and teachers aged 41 and over. According to the data, there is an inverse proportion between age and digital literacy. The digital literacy levels of these teachers aged 21-30 are high because young teachers are intertwined with digital tools from childhood to adulthood. It is seen that the data obtained are consistent with the literature (Boyacı, 2019; Öçal, 2017). Similarly, it is concluded that digital literacy levels decreased with increasing age. This

phenomenon can be elucidated by the fact that young folks of the contemporary generation are deeply interconnected with technology from an early stage of their lives.

Statistical analysis reveals a considerable disparity in the digital literacy levels of instructors based on whether they possess a computer. Specifically, teachers who own computers demonstrate greater levels of digital literacy. This finding aligns with the outcomes derived from the studies conducted by Arslan (2019), Özerbaş and Kuralbayeva (2018), and Elçi and Sarı (2016) in the existing body of literature. As instructors increasingly utilize digital tools on computers, their digital literacy skills also experience a favorable improvement.

There appears to be a notable distinction in teachers' digital literacy levels based on the duration of their daily internet usage.'. The data suggests that as time spent online increases, proficiency in digital literacy also escalates.. Teachers who use the Internet frequently have high digital literacy levels because they use technological devices such as phones, computers, etc., more frequently. Çetin et al. (2012) and Özerbaş and Kuralbayeva (2018) found similar results in their studies.

In the study of teachers' research literacy skill levels according to gender variable, research literacy skill does not make a difference in total score. In the sub-dimensions, it is observed that men's rank mean values created a significant difference in the dimension of accessing resources of the scale. In the studies of Rawls (2008) and Sadıç (2019), male teachers' research competence levels are higher than female teachers. Mutlu (2019), Konokman et al. (2013), and Petko et al. (2020) find that gender does not make a significant difference in research efficacy. These results coincide with the findings obtained.

In the research process and access to resources dimensions of the research literacy scale, it was seen that the rank mean values of the teachers with postgraduate education created a significant difference ($p<.05$). It can be said that teachers with postgraduate education have better research skills than others in terms of mastering the research process and accessing resources. This finding is an expected situation. Because the purpose of postgraduate education is to conduct comprehensive studies related to the field of research by scientific problem-solving steps, it is normal for teachers who have completed their postgraduate education to have better research literacy skills. This finding coincides with the study conducted by Mutlu (2019) on teachers with administrative duties.

In the dimension of access to resources, it is seen that the rank total scores of the teachers who have computers are high and there is a significant difference. It can be said that teachers who have computers can access resources more easily and effectively while doing research. This result is similar to the study of Günsel (2019), who found a significant relationship between pre-service teachers' personal computer ownership and information seeking. The information-seeking and research skills of pre-service teachers who have computers are better than other pre-service teachers.

It was found that there is a strong and significant relationship between teachers' digital literacy levels and research literacy skills. Aydemir (2017) found a strong and significant relationship between research skills and the capacity to obtain and verify information from the Internet. Kara (2021) found a moderate positive relationship between the digital literacy skills of pre-service teachers and their ability to search and

understand materials on the internet. In line with the findings of the study, Katayev et al. (2023) discovered a positive and moderate relationship between instructors' research competencies and their degree of ICT use. These results are similar to the results of the study.

Recommendations

According to the teachers' digital literacy proficiency results, it can be said that teachers aged 41 and over need activities to increase their digital literacy levels. In-service training programs might be recommended to improve the digital literacy skills of humanities teachers (those teaching history, religion studies, Turkish, social sciences, etc.) who need to improve in this area. Moreover, there is a clear correlation between the digital literacy scores of instructors and the duration of their daily internet usage, indicating that higher digital literacy scores are linked to increased online involvement. MoNE should develop initiatives to facilitate trainers' internet access. The study's findings indicate that teachers with computers exhibit high levels of digital literacy. However, there needs to be more research literacy levels. Consequently, it is advisable to furnish teachers with computers.

When the results are analyzed, postgraduate educators attain higher scores than undergraduate teachers regarding the dimensions of the research process and access to resources within the Research Literacy Scale. In this direction, MoNE should c conduct studies for teachers to receive postgraduate education.

Limitations

Since this research coincided with the pandemic, online data collection tools became mandatory. However, it became difficult to reach the participants while collecting the data. In addition, the study's sample is limited to 604 teachers working in a province in eastern Türkiye.

Statement of Responsibility

Conceptualization MCD; Data collection AT, MCD; Data Analysis MCD, Methodology AT; Visualization MCD; Writing—original draft SK, AT, MCD; Writing—review and editing AT. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare that they have no competing interests.

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