

## Teacher Candidates' Research Literacy (The Case of Gazi University)

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This study aims to reveal teacher candidates' research literacy and to investigate their levels of research literacy according to gender and department variables. The research was carried out following correlational survey model, which is a comparative model. The sample of the study, which consists of 311 teacher candidates, was determined in line with the convenience sampling method. Research data were collected by the researchers via Personal Information Form and Teachers' Research Literacy Skills Scale for teacher candidates. In order to identify teacher candidates' research literacy skills, data were analyzed by using Friedman Test, Wilcoxon Test, Mann Witney U Test, Kruskal Wallis H Test, and Spearman Correlation Test techniques. In accordance with the results of the study, it was found that teacher candidates have sufficient skills in research literacy, and there are significant differences in skills between the subdimensions of research literacy. The findings of the study indicate that students in the faculty of education have research literacy regardless of their gender, but there is a significant difference according to the variable of the department, and this difference is on behalf of teacher candidates in Turkish Language Teaching and Social Sciences Teaching departments.

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### INTRODUCTION

The main purpose of educational institutions is to raise individuals equipped with various knowledge and skills that are continuously changing and needed by society. According to Turkish Language Association (TDK) literacy means "being literate", "being able to read and write", and "being educated", which is a skill that one has. The concept of literacy is having the ability to read the literature of a language, and to perceive and comprehend the items read (Reinking, 1994; Güneş, 2019). Literacy encompasses language and texts as well as audiovisual and digital media. Individuals must have the ability to understand and interpret visual images, graphs, charts, videos, voice messages, and other means of communication. These skills have transformed the process of accessing information and provided diversity in communication practices. Literacy has come to include important competencies such as critical thinking, information evaluation, knowledge generation and collaborative work in the information age. The concept of literacy, which is the effective use of codes and decoding skills that are generally given meaning by society (Kellner 2001; Kress 2003), has gained new dimensions under the influence of ever-changing social, cultural, and technological factors. Today, however, there are various definitions of literacy. UNESCO draws attention to the comprehensive skill literacy refers to by defining literacy as the ability to use, explain, interpret written sources in various genres, and the ability to communicate and calculate (Göfner, 2017). By the concept of literacy, the degree of having the skill is emphasized, and it is seen as an improvable ability. Literacy, which is described from different points of view in line with its developing and changing conditions and necessities, and whose scope expands day by day, enriches its subtypes by incorporating various knowledge and skills in different fields and disciplines (Ateş & Aşçı, 2021). For example, there are different types of literacy such as media literacy, visual literacy, computer literacy, digital literacy, scientific literacy, curriculum literacy, critical literacy, information literacy, and financial literacy (Maienschein, 1998; Orhan, 1999; McLaughlin & DeVogd, 2004; Holum & Galaha, 2006; Alpan-Bangir, 2008; Pinto et al., 2010; Hasting et al., 2013; Madrian & Skimmyhorn, 2013; Demir & Toraman, 2021; Silik & Aydın, 2021). Among these is research literacy, which is the sum of the characteristics that learners should have throughout their lives (Pfeffer, Keser-Aschenberger, Hynek, & Zenk, 2021).

The digital age has made information easily accessible, but the real challenge lies in distinguishing reliable and accurate sources from misleading or false ones. Being research-literate allows individuals to critically evaluate information, identify biases or misinformation, and make informed decisions based on evidence. As Bawden and Robinson (2019) put it, research literacy is "the ability to identify, locate, evaluate, and effectively use information for research purposes." Research literacy enhances one's

academic pursuits. According to Sezgin (2017), research literacy is the ability to define the problem in the field where research is needed, structure the research questions, determine the resources to be reached, evaluate the convenience of these resources, collect the data in accordance with the questions, and to synthesize the findings based on the collected data. Research literacy is defined as the ability to find and understand existing research, analyze and discuss its results, as well as the ability to make use of this information, conduct independent research, and predict its results (O'Brien & Rugen, 2001; Beaudry & Miller, 2016). Research literacy includes setting individuals' reflective, creative, and critical thinking skills to work simultaneously, competence in problem solving, knowledge of research methods, and statistical literacy. Beaudry and Miller (2016) consider research literacy to be a combination of different literacies such as information, verbal, computational, visual, and technological literacy. Being research-literate enables individuals to follow current trends, understand research publications, and contribute to their discipline. As Bruce, Edwards, and Lupton (2019) emphasize, research literacy is essential for professionals to engage with the research literature, assess its relevance, and apply it in their practice.

The importance of enabling individuals to gain research literacy skills at all stages of education is emphasized (Pfeffer et al.2021), and it is thought that teachers primarily need to have these skills since these skills are useful for teachers' updating themselves and ensuring their professional development (Kır Yiğit & Özalemdar, 2022). Research literacy is crucial for teachers as it equips them with the necessary skills to engage in evidence-based practice and contribute to the advancement of the educational field (Johnson, 2019). By developing their research literacy skills, teachers can gain knowledge about current research, critically evaluate educational claims, and make informed decisions about teaching practices (Brown, 2018; Smith, 2020; Roberts, 2020).

Bilgili (2005) maintains that teachers who have research literacy skills can reshape their behaviors in in-class practices by making use of research results. Teachers' research skills contribute to their being open to innovations and developments, including and applying these in their lessons, and improving their skills in finding different solutions to problems they face. Teachers' levels of research literacy skills increase the quality of education they provide.

By engaging with the research literature, teachers can gain insight into effective teaching strategies, instructional methodologies, and assessment techniques (Garcia, 2019). Research literacy enables teachers to keep up with current educational trends and innovations (Thomas, 2021; Harris, 2022). By accessing academic journals, attending conferences, and participating in professional development activities, teachers can continuously update their knowledge and implement best practices in their teaching (Lee, 2021). Research literacy allows teachers to engage in reflective practices and improve their teaching methods (Watson, 2022). Teachers can find and use reliable sources of information, ensuring that they provide accurate and up-to-date content to their students.

Teachers also have the task of educating their students to be research-literate individuals, a task that only teachers with research literacy skills can accomplish (Cooper, 2021). In educational settings, students are expected to engage in research activities such as writing papers, conducting experiments, or presenting findings. Without adequate research literacy skills, students may struggle to find appropriate sources, understand complex concepts, or cite references properly. According to Thompson (2020), research literacy is "essential for academic success" as it enables students to engage effectively with scientific literature, develop critical thinking skills, and produce high-quality work. Therefore, it is imperative that educational institutions and society promote and develop research literacy.

Research literacy is a core competence for teachers as it develops their ability to engage in evidence-based practices, be knowledgeable about current research, and continuously improve their teaching methodologies. Research-literate teachers can effectively contribute to the field of education, provide quality education to their students, and enable their students to become research-literate. Teacher candidates are expected to start their careers with research literacy. Teachers' research literacy skills are basically acquired during pre-service teacher training processes. Considering that research literacy is basically gained in pre-service teacher training processes, the effectiveness of the education

process given is possible by determining the research literacy levels of teacher candidates. Based on this need, the research aim is to determine the research literacy levels of teacher candidates. Accordingly, answers were sought to the following questions:

What are teacher candidates' research literacy levels?

Is there a significant difference between the subdimensions of teacher candidates' research literacy skills?

Is there a significant difference between the levels of teacher candidates' research literacy skills in terms of gender and department variables?

What is the level of relationship between the total levels of teacher candidates' research literacy skills and subdimensions of the scale?

## METHOD

In order to reveal teacher candidates' opinions about research literacy, survey model was used in this study. The survey method aims to describe the situation of an existing case or subject exactly based on the participants' descriptive features such as perception, attitude, and opinions (Karasar, 2018; Fraenkel et al., 2012).

### Study Group

The participants of this study consisted of 311 candidate teachers studying as senior students at Gazi University, Gazi Faculty of Education. The study group was determined via convenience sampling, and the study was conducted with these volunteering participants who were eligible and easily accessible for the study (Gravetter & Forzano, 2012). Of 311 teacher candidates as the sampling of the study, 225 were female, and 86 were male. The distribution of teacher candidates according to the departments is given in Table 1 below.

**Table 1.** Distribution of Teacher Candidates according to the Departments

<i>Departments</i>	<i>f</i>
Computer Education and Instructional Technologies	17
Fine Arts	24
Maths and Science	66
Special Education	32
Primary Education	47
Turkish Language and Social Sciences	60
Foreign Languages	65
<b>Total</b>	<b>311</b>

Table 2. shows that 264 of the pre-service teachers took the "Research Methods in Education" course, while 47 did not.

**Table 2.** Distribution of Teacher Candidates according to whether They Have Taken Research Techniques Course

<b>Teacher Candidates Who Have Taken Research Techniques Course</b>	<i>f</i>
Yes	264
No	47
<b>Total</b>	<b>311</b>

### Data Collection Tools

Data of the study were collected via "Teacher Candidates' Research Literacy Skills Scale", developed by Yıldız et al. (2019). The scale, which consists of 26 items, has four subdimensions. These are "Research process" (9), "Preparation for the research" (7), "Knowledge of method" (5), and "Accessing resources" (3). The sample items of the scale "Research process" (9) include "I set up an appropriate main topic for my research; I investigate the problem or sub-problems of the research". For the "Preparation for the research" (7), sample items of the scale are "I work in a disciplined and organized manner while doing research; I make research arrangements". "Knowledge of method" (5) includes sample items like "My usage times appropriate to the research problem; My use of data analysis

methods in my research". Sample items of the "Accessing resources" (3) scale are "I know what resources I need to reach for my research". Items of the scale were developed in the form of five point Likert as follows: "I'm totally inadequate, I'm inadequate, I'm undecided, I'm adequate, and I'm totally adequate". Yıldız et al. (2019) calculated general Cronbach's alpha as 0.95, the scale subdimensions "research process" value as 0.92, "preparation for the research" value as 0.89, "knowledge of method" value as 0,90, and "accessing resources" as 0,83. Before implementation, general Cronbach's alpha of the scale was calculated as 0,93, the scale subdimension "research process" value as 0.87, "preparation for the research" value as 0.86, "knowledge of method" value as 0,91, and "accessing resources" value as 0,85. The scale, which indicated high levels of reliability with the values calculated (Tavşancıl, 2009), was used with the name "Research Literacy Skills Scale" since it was implemented with the participation of teacher candidates who were senior students.

### Data Analysis

Data on research literacy were analyzed firstly to find out whether they showed normal distribution or not. Via the Kolmogorow-Smirnov test, the significance value was found 0,00 ( $p < 0,05$ ), the skewness value was found 0,11, and the kurtosis value was found 1,74. Since the data on research literacy did not show normal distribution according to the values obtained, it was decided that nonparametric tests were to be applied. Friedman test was used to determine if there was a significant difference between the subdimensions of research literacy "research process, preparation for the research, knowledge of method, and accessing resources"; Wilcoxon test was used to determine which subdimensions the source of the difference stemmed from. Unpaired Mann Whitney U Test was used to determine if there was a difference in research literacy in terms of gender variable; one-way analysis of variance (Kruskal Wallis Test H) was used to determine if there was a difference in terms of the department. Correlation values between the total scores obtained via the research literacy skills scale, and the scores obtained from the subdimensions of the scale were analyzed via Spearman Correlation analysis.

### FINDINGS

This section includes findings obtained in line with the sub-problems of the study. Teacher candidates' levels of research literacy, whether there is a significant difference between these levels, whether research literacy levels have differences according to gender and department of education, and predictive levels of total scores of research literacy subdimensions, namely "research process, preparation for the research, knowledge of method, reaching resources" are presented respectively.

The mean rank of teacher candidates' research literacy subdimensions is given in Table 3 below.

**Table 3.** Comparison between Teacher Candidates' Research Literacy Subdimensions Friedman Test

Dimensions	$\bar{x}$	ss	Mean Rank	$\chi^2$
Research Process	4,04	,47	3,92	
Preparation for the Research	3,90	,59	3,25	218,07 ,000
Reaching Resources	3,77	1,69	2,93	
Knowledge of Method	3,49	,72	2,18	
Research Literacy Total	3,85			

The total score of the Teacher Candidates "Research Literacy" Scale is 3,85. This level complies with the "I'm adequate" option. Average scores of Teacher candidates' research literacy subdimensions from the highest to the lowest are as follows: "research process" ( $\bar{x}= 4,04$ ); "preparation for the research" ( $\bar{x}=3,90$ ); "reaching resources" ( $\bar{x}=3,77$ ); and the lowest one "knowledge of method" ( $\bar{x}= 3,49$ ), respectively. Table 3 shows that there are differences between the average scores and mean rank of teacher candidates' research literacy subdimensions. Friedman Test (Cleophas, and Zwinderman 2016), which is a non-parametric alternative to one-way Analysis of Variance (ANOVA), was applied to determine if these differences are meaningful. As can be seen in Table 3, the difference between the average scores and mean rank of teacher candidates' research literacy subdimensions is significant ( $\chi^2(5)=218.07, p < 0,05$ ).

Paired comparisons were made through Wilcoxon signed ranks test to determine between which dimensions the significant difference obtained through the Friedman test is. The new significance value arranged during pair comparisons (Kalaycı, 2018) was calculated as (p / number of tests applied)  $\Rightarrow$  (p=,05/8=,008) p=,008.

**Table 4.** Pair Comparisons between Teacher Candidates' Research Literacy Subdimensions Wilcoxon Test

<i>Preparation for Research</i>	<i>N</i>	<i>Mean Rank</i>	<i>Total Rank</i>	<i>z</i>	<i>p</i>
<i>Research Process</i>					
Negative Rank	180	137,18	24691,50		
Positive Rank	76	107,95	8204,50	6,978	,000
Egual	55				
Total	311				
<i>Knowledge of Method</i>		<i>Mean Rank</i>	<i>Total Rank</i>	<i>z</i>	<i>p</i>
<i>Research Process</i>	<i>N</i>				
Negative Rank	239	165,23	39489,50		
Positive Rank	57	78,36	4466,50	11,882	,000
Egual	15				
Total	311				
<i>Reaching Resources</i>		<i>Mean Rank</i>	<i>Total Rank</i>	<i>z</i>	<i>p</i>
<i>Research Process</i>	<i>N</i>				
Negative Rank	194	160,19	31076,50		
Positive Rank	90	104,37	9393,50	7,835	,000
Egual	27				
Total	311				
<i>Knowledge of Method</i>		<i>Mean Rank</i>	<i>Total Rank</i>	<i>z</i>	<i>p</i>
<i>Preparation for Research</i>	<i>N</i>				
Negative Rank	217	168,39	36540,00		
Positive Rank	78	91,28	7120,00	10,032	,000
Egual	16				
Total	311				
<i>Reaching Resources</i>		<i>Mean Rank</i>	<i>Total Rank</i>	<i>z</i>	<i>p</i>
<i>Preparation for Research</i>	<i>N</i>				
Negatif Sıra	174	158,49	27577,50		
Pozitif Sıra	114	123,14	14038,50	4,791	,000
Eşit	23				
Toplam	311				
<i>Reaching Resources</i>		<i>Mean Rank</i>	<i>Total Rank</i>	<i>z</i>	<i>p</i>
<i>Knowledge of Method</i>	<i>N</i>				
Negatif Sıra	119	124,76	14846,00	3,303	,001
Pozitif Sıra	158	149,73	23657,00		
Eşit	34				
Toplam	311				

As a result of the Wilcoxon Test, the mean rank difference between every two subdimensions among four subdimensions of teacher candidates' research literacy ("research process", "preparation for research", "reaching resources", and "knowledge of method") was found statistically significant.

According to the comparisons between teacher candidates' "preparation for research – research process" subdimensions, "research process" mean ranks of 180 teacher candidates are high; "preparation for research" mean ranks of 76 teacher candidates are high; "preparation for research" and "research process" mean ranks of 55 teacher candidates are equal. The difference between the mean

ranks of "preparation for research – research process" is significant ( $z= 6,9783$ ;  $p<,008$ ). This difference is on behalf of the "research process". That is, teacher candidates' "research process" mean ranks are significantly higher than their "preparation for research" mean ranks.

As seen in Table 4, as a result of comparisons between teacher candidates' "knowledge of method – research process" subdimensions, 239 teacher candidates' mean ranks of "research process" are high; 57 teacher candidates' mean ranks of "knowledge of method" are high; 15 teacher candidates' mean ranks of "knowledge of method" and "research process" are equal. The difference between the mean ranks of "knowledge of method – research process" is significant ( $z= 11,882$ ;  $p<,008$ ). This difference is on behalf of the "research process". Teacher candidates' mean ranks of "research process" are significantly higher than those of "knowledge of method".

In the "Reaching resources – research process" subdimension, 194 teacher candidates' mean ranks of "research process" and 90 teacher candidates' mean ranks of "reaching resources" are high; 15 teacher candidates' mean ranks of "reaching resources" and "research process" are equal. The difference between the mean ranks of "reaching resources – research process" is significant ( $z= 7,835$ ;  $p<,008$ ). This difference is on behalf of "research process". Teacher candidates' mean ranks of "research process" are significantly higher than the mean ranks of "reaching resources".

According to the comparisons between teacher candidates' "knowledge of method – preparation for research" subdimensions, 217 teacher candidates' mean ranks of "preparation for research" are high, and 78 teacher candidates' mean ranks of "knowledge of method" are high; 16 teacher candidates' mean ranks of "knowledge of method" and "preparation for research" are equal. The difference between the mean ranks of "knowledge of method – preparation for research" is significant ( $z= 10,032$ ;  $p<,008$ ). This difference is on behalf of the "preparation for research". That is, teacher candidates' mean ranks of "preparation for research" are significantly higher than the mean ranks of "knowledge of method".

As seen in Table 4, as a result of comparisons between teacher candidates' "reaching resources – preparation for research" subdimensions, 174 teacher candidates' mean ranks of "preparation for research" are high, and 114 teacher candidates' mean ranks of "reaching resources" are high. On the other hand, 23 teacher candidates' mean ranks of "reaching resources" and "preparation for research" are equal. The difference between the mean ranks of "reaching resources – preparation for research" is significant ( $z= 4,7914$ ;  $p<,008$ ), and this difference is on behalf of "preparation for research". In other words, teacher candidates' mean ranks of "preparation for research" are significantly higher than the mean ranks of "reaching resources".

In the "reaching resources – knowledge of method" subdimensions, 119 teacher candidates' mean ranks of "knowledge of method" are high, and 158 teacher candidates' mean ranks of "reaching resources" are high while 34 teacher candidates' mean ranks of "reaching resources" are equal. The difference between the mean ranks of "reaching resources – knowledge of method" is significant ( $z= 3,303$ ;  $p<,008$ ), and this difference is on behalf of "reaching resources". In other words, teacher candidates' mean scores of "reaching resources" are significantly higher than the mean ranks of "knowledge of method".

Independent sample Man Whitney-U Test was applied to determine whether research literacy levels differ according to gender.

**Table 5.** Teacher Candidates' Research Literacy according to Gender Variable Mann Whitney – U Test

<i>Dimensions</i>	<i>Gender</i>	<i>N</i>	<i>Mean Rank</i>	<i>Rank Total</i>	<i>U</i>	<i>z</i>	<i>p</i>																																												
Research Literacy	Female	225	155,34	34951,50	9526,50	,209	,834																																												
	Male	86	157,73	13564,50				Research Process	Female	225	153,68	34578,50	9153,50	,738	,460	Male	86	162,06	13937,50	Preparation for Research	Female	225	158,20	35594,50	9180,50	,699	,484	Male	86	150,25	12921,50	Knowledge of Method	Female	225	155,52	34991,00	9566,00	,157	,877	Male	86	157,27	13525,00	Reaching Resources	Female	225	156,04	35109,50	9665,50	,014	,989
Research Process	Female	225	153,68	34578,50	9153,50	,738	,460																																												
	Male	86	162,06	13937,50				Preparation for Research	Female	225	158,20	35594,50	9180,50	,699	,484	Male	86	150,25	12921,50	Knowledge of Method	Female	225	155,52	34991,00	9566,00	,157	,877	Male	86	157,27	13525,00	Reaching Resources	Female	225	156,04	35109,50	9665,50	,014	,989	Male	86	155,89	13406,50								
Preparation for Research	Female	225	158,20	35594,50	9180,50	,699	,484																																												
	Male	86	150,25	12921,50				Knowledge of Method	Female	225	155,52	34991,00	9566,00	,157	,877	Male	86	157,27	13525,00	Reaching Resources	Female	225	156,04	35109,50	9665,50	,014	,989	Male	86	155,89	13406,50																				
Knowledge of Method	Female	225	155,52	34991,00	9566,00	,157	,877																																												
	Male	86	157,27	13525,00				Reaching Resources	Female	225	156,04	35109,50	9665,50	,014	,989	Male	86	155,89	13406,50																																
Reaching Resources	Female	225	156,04	35109,50	9665,50	,014	,989																																												
	Male	86	155,89	13406,50																																															

According to Table 5, male teacher candidates' total mean ranks of research literacy are higher than female teacher candidates' total mean ranks. According to subdimensions, female teacher candidates' mean ranks are higher in the "preparation for research" and "reaching resources" dimensions; male teacher candidates' mean ranks are higher in the "research process" and "knowledge of method" dimensions. However, Mann Whitney-U Test results according to gender variable show that there is no significant difference between research literacy total levels ( $U= 9526.50$ ,  $p>0,05$ ) of subdimensions.

Independent sample Kruskal Wallis H Test was applied to determine whether teacher candidates' research literacy levels differed according to their departments.

**Table 6.** Teacher Candidates’ Research Literacy according to Department Variable Kruskal Wallis HTest

Literacy	Department	n	Mean Rank	sd	p	Significant Difference	
Research Literacy Total	Computer Education and Instructional Technologies (BÖTE)	17	138,03	6	16,59	,01	ÖE-MAT/FEN ÖE-TE ÖE-TÜSB ÖE-YD
	Fine Arts	24	155,17				
	Maths and Science (MAT/FEN)	66	164,05				
	Special Education (ÖE)	32	105,91				
	Primary Education (TE)	47	167,68				
	Turkish Language and Social Sciences (TÜSB)	60	179,39				
	Foreign Languages (YD)	65	147,46				
Research Proses	Computer Education and Instructional Technologies (BÖTE)	17	134,24	6	14,83	,02	BÖTE-TÜSB GÜ-TÜSB ÖE-TÜSB TE-TÜSB MAT/FEN-ÖE
	Fine Arts	24	151,23				
	Maths and Science (MAT/FEN)	66	157,91				
	Special Education (ÖE)	32	119,13				
	Primary Education (TE)	47	149,04				
	Turkish Language and Social Sciences (TÜSB)	60	188,76				
	Foreign Languages (YD)	65	155,69				
Preparation for Research	Computer Education and Instructional Technologies (BÖTE)	17	133,06	6	16,04	,01	BÖTE-TÜSB GÜ-TÜSB ÖE-TÜSB ÖE- MAT/FEN ÖE-TE
	Fine Arts	24	141,25				
	Maths and Science (MAT/FEN)	66	164,36				
	Special Education (ÖE)	32	117,38				
	Primary Education (TE)	47	169,36				
	Turkish Language and Social Sciences (TÜSB)	60	183,00				
	Foreign Languages (YD)	65	145,75				
Knowledge of Method	Computer Education and Instructional Technologies (BÖTE)	17	150,76	6	13,70	,03	ÖE-MAT/FEN ÖE-TE ÖE-TÜSB
	Fine Arts	24	140,61				
	Maths and Science (MAT/FEN)	66	157,91				
	Special Education (ÖE)	32	115,02				
	Primary Education (TE)	47	172,69				
	Turkish Language and Social Sciences (TÜSB)	60	173,27				
	Foreign Languages (YD)	65	151,06				
Reaching Resources	Computer Education and Instructional Technologies (BÖTE)	17	134,94	6	13,67	,03	ÖE-MAT/FEN ÖE-TE ÖE-TÜSB ÖE-YD
	Fine Arts	24	149,06				
	Maths and Science (MAT/FEN)	66	162,74				
	Special Education (ÖE)	32	107,80				
	Primary Education (TE)	47	156,50				
	Turkish Language and Social Sciences (TÜSB)	60	171,80				
	Foreign Languages (YD)	65	166,34				

As seen in Table 6, in research literacy total scores and all subdimensions of the scale Special Education teacher candidates’ mean ranks are the lowest while Turkish Language and Social Sciences teacher candidates’ mean ranks are the highest.

According to Table 6, there are significant differences between teacher candidates’ “Research Literacy” total mean ranks, mean ranks of subdimensions “Research Process”, “Preparation for Research”, and “Reaching Resources” according to departments ( $p<,05$ ). Mann Whitney – U Test was applied to determine the source of differences in scores regarding research literacy totalscores and each of the subdimensions. Mann Whitney – U Test results show that the significant difference between the total mean ranks of “Research Literacy” stems from the difference between the mean ranks of Special

Education teacher candidates and Maths and Science, Primary Education, Turkish Language and Social Sciences, and Foreign Languages teacher candidates.

A significant difference in the subdimension “Research process” results from the difference between Turkish Language and Social Sciences teacher candidates’ mean ranks and Computer Education and Instructional Technologies, Fine Arts, Special Education, and Primary Education teacher candidates’ mean ranks, as well as the difference between Maths-Science teacher candidates’ mean ranks and those of Special Education teacher candidates.

Significant difference between teacher candidates’ mean ranks in the subdimension “Preparation for Research” results from the difference between Turkish Language and Social Sciences teacher candidates’ mean ranks and those of Computer Education and Instructional Technologies, Fine Arts, and Special Education teacher candidates. Furthermore, the difference between Special Education teacher candidates’ means ranks in the subdimension “Preparation for Research” results from the difference between mean ranks of Maths-Science and Primary Education teacher candidates.

A significant difference in the subdimension “Knowledge of Method” results from the difference between Special Education teacher candidates’ mean ranks and those of Maths – Science, Primary Education, Turkish Language, and Social Sciences teacher candidates.

A significant difference between the mean ranks in the subdimension “Reaching Resources” results from the difference between Special Education teacher candidates’ mean ranks and those of Maths – Science, Primary Education, Turkish Language and Social Sciences, and Foreign Language teacher candidates.

It can be maintained that a significant difference between teacher candidates’ departments mostly results from Special Education teacher candidates’ low mean ranks. Correlation value between the scores obtained from the whole scale of teacher candidates’ research literacy skills and those obtained from subdimensions of the scale. Correlation values are given in Table 7 below.

**Table 7.** Spearman Correlation between Research Literacy Total Scores and Scores of Subdimensions

<i>Dimensions</i>	<i>Dimensions- Who Scale ( r )</i>	<i>p</i>
Research Process	,808	,000
Preparation for Research	,873	,000
Knowledge of Method	,741	,000
Reaching Resources	,741	,000

As seen in Table 7, correlation results between teacher candidates’ total scores of the whole scale and scores in the subdimensions of the scale were found  $r = ,808$  ( $p < 0.01$ ) for “Research Process”;  $r = ,873$  ( $p < 0.01$ ) for “Preparation for Research”; and  $r = ,741$  ( $p < 0.01$ ) for “Knowledge of Method” and “Reaching Resources”. These findings indicate that there is a statistically high-level, positive significant difference between the whole scale and all its subdimensions.

### CONCLUSION, DISCUSSION, and SUGGESTIONS

In this study, which was conducted in order to determine teacher candidates’ research literacy levels, four subdimensions of the scale namely “research process”, “preparation for research”, “knowledge of method”, and “reaching resources” were examined. According to the findings of the study, teacher candidates have research literacy skills adequately. Teacher candidates’ having research literacy skills at high levels is important in terms of its influence on education and raising students equipped with these skills. Findings of İpek et al., study (2010) show that students see themselves adequate in research self-efficacy, and Sadıç (2019) found in their study that teachers’ research competences are over average level. Their findings and those of this study overlap. Another study carried out with the participation of graduate students showed that participants had research competency in general (Saracaloğlu, 2008). Nevertheless, it was found in some studies that teacher candidates’ and teachers’ research competencies are at low levels (Büyüköztürk, 1999; Büyüköztürk &

Köklü 1999; Çepni & Küçük, 2003). In this study, the finding that teacher candidates see themselves competent enough is thought to result from the fact that most of them took the course "Research Techniques in Education". Similarly, findings of Büyüköztürk's studies (1996; 1999) show that teachers who took the course "Research in Education" during preservice training are more competent than those who did not take that course. All results examined, it can be suggested that research literacy levels of teacher candidates who participated in this study improved significantly.

However, the study indicates that there are significant differences in skills between teacher candidates' research literacy subdimensions. According to the findings of the study, teacher candidates evaluated their levels of research literacy skills as research process, preparation for research, reaching resources, and knowledge of method, respectively. It can be maintained from the findings of the study that teacher candidates have more problems in reaching resources and knowledge of method. Similarly, Çakmakçı found in their study (2009) that teacher candidates gained skills in research design and application, writing research papers, presenting findings while they lacked knowledge of method and made mistakes in showing references. In their findings presented in seven dimensions regarding teacher candidates' scientific research skills, Kart & Gelbal (2014) state that the lowest self-efficacy perception level is in data analysis stage of research. Findings of another study show that Science teacher candidates are successful in the dimension of "Recognizing and defining variables" while their levels of skills are quite low in stages such as "hypothesizing, making operational explanations, designing the necessary research" (Bahtiyar & Can, 2016). According to Büyüköztürk and Köklü's study (1999), graduate students have more problems in dimensions of identifying the problem, making assumptions, creating literature and statistics. Şanlı et al.,(2020) found in their study that graduate students find themselves least adequate in the stage of analysis. Knowledge of method includes the stages of choosing the right research tool for the research problem, deciding on the study group, determining the statistical techniques to be used for the collected data, being able to use the methods of data analysis, obtaining and discussing the results. Research problem cannot be expected to be solved scientifically with the lack of or mistake in the knowledge of method. The finding that studies over years emphasized the lack of knowledge of method may indicate that some of the special aims of the course "research methods in education" have not been reached.

It was found in this study that there is not a significant difference between total mean ranks of teacher candidates' research literacy skills and mean ranks of each subdimension in terms of gender variable. It can be suggested from the findings that female and male teacher candidates perceive research literacy skills at similar levels. It was also found in this study that female teacher candidates have higher scores than male teacher candidates in the subdimensions of "preparation for research" and "reaching resources" of the research literacy scale. It can be maintained from the findings that female teacher candidates are more organized in daily life. Literature review in the field shows that there are studies where no significant difference was found between teachers' and teacher candidates' scientific attitudes, research skills and competencies in terms of gender variable (Demirdağ, 2021; İlhan et al., 2016; Kendirlioğlu Günhan, 2021; Konokman et al., 2013; Mutlu, 2019; Yenice et al., 2019). Results of these studies and findings of this study overlap. For example, Kendirlioğlu Günhan (2021) found in their study that there is no significant difference between secondary school maths teachers' perceptions of their research literacy levels according to gender variable. In another study where the researcher compared research competence skills scores of teachers working as administrators in primary schools in terms of gender variable, no significant difference was found (Mutlu, 2019). On the other hand, in some other studies significant difference was found in terms of gender variable (Dombaycı & Ercan , 2017; Özdemir, 2017; Rawls, 2008; Petko et al., 2020; Sadiç, 2019). For example, Sadiç (2019) found in their study a significant difference between teachers' research competencies in terms of gender variable on behalf of female teachers. Dombaycı and Ercan (2017) maintain according to the findings of their study that the difference between teacher candidates' information literacy levels in terms of gender variable is on behalf of female teacher candidates.

Another result of this study is that there is a significant difference between research literacy skills total mean ranks and mean ranks of each subdimension (research process, preparation for research,

knowledge of method, reaching resources) according to department variable. Findings of the study indicate that according to department variable, teacher candidates use research literacy skills at different levels. It was also found that the difference between the total scores of research literacy and all subdimensions of the scale is on behalf of Turkish Language and Social Sciences teacher candidates. Research findings show that special education teacher candidates have the lowest grades in both total scores of the research literacy scale and all subdimensions of the scale. These low scores of research literacy are worth questioning considering that the department of special education requires different kinds of knowledge, skills and qualifications for its different fields of specialty (teaching the visually handicapped, hearing-impaired, mentally handicapped, autists, gifted). Regarding this issue, the report named "Special Education Teaching: Reviews for the Process of Training" published by TEDMEM (2016) is noteworthy. This report emphasizes that knowledge and functionality increased day by day in line with the developments particularly in the fields such as medicine, genetics, electronics. For example, developments in hearing aids and cochlear implant, and changes observed in alternative in-class communicative devices, require gradually increasing technical qualifications and knowledge for teaching the hearing-impaired (TEDMEM, 2016). It is suggested that following, researching, and applying these innovations are inevitable.

Similar studies in which differences were found according to teacher candidates' departments can be found in literature, but these studies were conducted on scientific literacy, information literacy and/or attitudes towards and competencies in research (Akkoyunlu & Kurbanoglu, 2001; Balci, 2013; Polat, 2014; Yaşar Ekici, 2017). Yaşar Ekici (2017), who examined preschool teacher candidates and other teacher candidates' attitudes towards scientific research, found that preschool teacher candidates' attitudes towards research are higher and more positive than Turkish Language teacher candidates' attitudes. On the other hand, Balci (2013) found in their study that according to comparisons between opinions about information literacy self-efficacy scale in terms of department variable, Turkish Language and Science teacher candidates' mean ranks were higher than those of primary school teacher candidates.

In literature review for research literacy, it was found that Kendirlioğlu Günhan (2021), who examined Maths teachers' research literacy in terms of professional development in the period of crisis, did not include department variable in their study. However, there are also studies whose findings show no differences in terms of department variable (Demirdağ, 2021; Dombaycı & Ercan, 2017; Kaya & Durmuş, 2008;). For example, Demirdağ (2021) found in their study that there was no difference between the total scores of research literacy skills according to department variable. In Dombaycı and Ercan's study (2017) there was no significant difference between teacher candidates' information literacy scores according to their departments. According to the findings of this study, there is a high-level, positive relationship between research literacy total scores and all subdimensions of the scale in line with the results of relationship between research literacy scale and its subdimensions namely "research process, preparation for research, reaching resources, knowledge of method". The highest positive relationship was determined between the total scores and the subdimension "preparation for research".

The understanding which was shaped by "expertise" at the beginning of modern period has evolved towards an interdisciplinary understanding in the course of time under the influence of education, science, technology and social changes. This situation has brought a new dimension to the understanding of effective teachers who are experts in their fields and effective in and outside the class, who know learning processes and perceive individual differences. As a result, teachers as researchers who improve themselves became prominent. Teachers, who are an important part of the learning process in many aspects, can correctly evaluate the data and results obtained from educational practices only through teacher behaviours as researchers. Results of studies reveal that teachers who do research can shape teaching process, put new strategies into practice, and be more effective in finding solutions to problems. The approach of teachers as researchers started in Japan, and it was acknowledged not only in far eastern countries but also in many other countries and it became quite common (Schechter & Parkhurst, 1994; Newman, 1994). In accordance with this, it can be seen that within the scope of "General

Teacher Competencies”, initiated in Turkey by Ministry of National Education in 2006, performance indicators such as willingness to do scientific research, improving learning-teaching processes, researching practices in order to contribute to the development of schools, being able to analyze data and choose the right statistical techniques were included (MEB, 2006). Besides, “Model of Teachers as Researchers Course” (30 hours) and Project Consulting Seminar (15 hours) are conducted as inservice training to develop teachers’ researchcompetencies within the scope of Professional Development Program of Ministry of National Education General Directorate of Teacher Training and Education (MEB, 2022). While inservice training is a way of becoming teachers as researchers, another way is the teacher education they take before service.

Teachers’ identity as researchers requires research literacy skills. From 2018-2019 academic year on Council of Higher Education included “Research Methods in Education” for teacher candidates in the curriculum of faculty of education for two hours a week in one semester (YÖK, 2018). This can be seen as a sign that research literacy skills are regarded as a necessity. However, it is thought-provoking that with this course of two hours a week, outcomes of research literacy skills, accessing resources and knowledge of method are not reached totally. It is suggested that necessary precautions be taken in order for students to do minor research on their homework in all courses, and “Research Methods in Education” course be based on practical research experiences rather than theory. This study is limited to quantitative data and a single faculty of education, similar studies can be developed by making comparisons with qualitative data and different faculties of education.

## Declarations

### Conflict of Interest

No potential conflicts of interest were disclosed by the author(s) with respect to the research, authorship, or publication of this article.

### Ethics Approval

The formal ethics approval was granted by the Social and Human Sciences Research and Publication Ethics Committee of Inonu University. We conducted the study in accordance with the Helsinki Declaration in 1975.

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### Research and Publication Ethics Statement

The study was approved by the research team’s university ethics committee of the Gazi University (Approval Number/ID: 13/09/2022/1058. Hereby, we as the authors consciously assure that for the manuscript the following is fulfilled:

- This material is the authors' own original work, which has not been previously published elsewhere.

- The paper reflects the authors' own research and analysis in a truthful and complete manner.

- The results are appropriately placed in the context of prior and existing research.

- All sources used are properly disclosed.

### Contribution Rates of Authors to the Article

1st author contributed 50%, 2nd author 50%

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