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| Research Article / Araştırma Makalesi |

Determination of Scientific Literacy Levels of Primary School Teachers and Investigation in Terms of Different Variables

Sınıf Öğretmenlerinin Fen Okuryazarlık Düzeylerinin Belirlenmesi ve Farklı Değişkenler Açısından İncelenmesi

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Keywords

1. Scientific literacy
2. Scientific content knowledge
3. Nature of science
4. Science-technology-society
5. Primary school teacher

Anahtar Kelimeler

1. Fen okuryazarlığı
2. Bilimsel içerik bilgisi
3. Bilimin doğası
4. Fen-teknoloji-toplum
5. Kelime

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Abstract

Purpose: The purpose of this study is to investigate how variables gender, seniority, age and graduated department affect the science literacy levels of primary school teachers.

Design/Methodology/Approach: In the study, the survey method used. The study group of the study consists of 506 primary school teachers, 337 females, and 169 male teachers, working in primary schools in Bursa province and its districts during the 2020-2021 academic year. "Science for All Americans" publication, which was prepared by Laugksch and Spargo in 1996 and translated into Turkish by Duruk in (2012), “Basic Science Literacy Test”, which all validity and reliability tests were carried out,was used to obtain research data. Data were analyzed with descriptive statistics, Mann Whitney U and Kruskal Wallis techniques.

Findings: As a result of examining the research data; no significant difference was observed between the variables of gender, seniority, graduated department and the science literacy levels of primary school teachers. However, it is observed that the age variable has a significant difference for the science-technology-society sub-dimension. It has been determined that this difference is in favor of the groups under 25 years old among the groups between ages of 31-35, under the age of 25, and over the age of 40.

Highlights: This research provides valuable data to holistically evaluate many different affective variables that affect the scientific literacy level of primary school teachers. Although this research includes the results of primary school teachers in a single province, the obtained evidence predicts the need for them to be supported in terms of scientific literacy and its sub-dimensions.

Öz

Çalışmanın Amacı: Bu araştırma, sınıf öğretmenlerinin fen okuryazarlık düzeylerini belirlemek ve cinsiyet, kıdem, yaş ve mezun olunan bölüm değişkenlerinin bu düzeyde herhangi bir farklılığa sebep olup olmadığının incelenmesini amaçlamaktadır.

Materyal ve Yöntem: Araştırmada ilişkisel tarama yöntemi kullanılmıştır. Araştırmanın örneklemini, 2020-2021 eğitim öğretim yılında Bursa ili ve ilçelerinde ilkokullarda görev yapan, 337 kadın ve 169 erkek olmak üzere toplamda 506 sınıf öğretmeni oluşturmaktadır. Araştırmaya konu edilen veriler, kişisel bilgi formu ve “Bilimsel İçerik Bilgisi”, “Bilimin Doğası” ve “Fen-Teknoloji ve Toplum” olmak üzere 3 alt boyuttan oluşan “Temel Fen Okur Yazarlık Testi” kullanılarak toplanmış ve SPSS paket programı yardımıyla analiz edilmiştir.

Bulgular: Araştırma verilerinin incelenmesi sonucunda; sınıf öğretmenlerinin fen okuryazarlık düzeyleri ile cinsiyet, kıdem ve mezun olunan bölüm değişkenleri arasında herhangi bir anlamlı farklılığa rastlanmamıştır. Ancak yaş değişkeninin fen-teknoloji-toplum alt boyutu için anlamlı bir farklığa sebep olduğu anlaşılmaktadır. Bu farklılığın; 31-35 yaş, 25 yaş altı ve 40 yaş üstü gruplar arasında olmak üzere, 25 yaş altı gruplar lehine olduğu sonucuna ulaşılmıştır.

Önemli Vurgular: Bu araştırma, sınıf öğretmenlerinin fen okuryazarlık düzeylerini etkileyen birçok farklı duyuşsal değişkeni bütüncül olarak değerlendirmek için değerli veriler sunmaktadır. Bu araştırma, tek bir ildeki sınıf öğretmenlerinin sonuçlarını içermekle birlikte, elde edilen kanıtlar onların fen okuryazarlığı ve alt boyutları açısından desteklenmesi gerektiğini öngörmektedir.

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INTRODUCTION

Science education is a long-term process that involves teaching the use and applications of scientific ideas to explore and explain how nature works (Asoko, 2002). Effective management of this process is directly related to the development of countries (Demirci Güler, 2017). Within the framework of the "Science lesson Curriculum" published in our country in 2018, technology and The aim is to raise individuals who can keep up with the rapid changes experienced by technology and science, produce information, use the information they produce in a functional way in their daily lives, think critically, have advanced problem-solving skills, and have entrepreneurship and determination (MEB, 2018). The individuals mentioned are defined as "scientific literate individuals" within the scope of the program's specific objectives, specific to the field of science. Since the ways of accessing information and information are changing rapidly in today's world, teachers have a great role in order to raise scientifically literate individuals who can ensure that individuals do not remain unfamiliar with information in the field of science throughout their lives, and who can access information easily and at all times (Yavuz, 2015).

A scientifically literate individual understands and explains some scientific concepts and facts at a basic level, follows technological developments and can use them in life (Duban, 2010). In the process of raising science literate individuals in our country, the role of the teacher; It is stated that it is encouraging, guiding, and at the same time, guiding students in the integration of technology, engineering, mathematics and science skills, enabling students to reach the level of high-level thinking skills, invention, innovation and product development (MEB, 2018). Therefore, teachers who can carry out this whole process should be individuals who have sufficient professional skills and are scientifically literate. In this context, it is very important for developing societies to raise these individuals who can make decisions when teachers encounter a science-related problem, express their opinions in scientific discussions, know the general concepts of science and use them in their life problems (Cepni et al., 2003). Since science is a course that students at almost every level have difficulty with, teachers must be equipped and qualified (Hançer et al., 2003). This situation reveals the importance of professional competencies of teachers for raising science literate individuals. It is undoubtedly one of the most important priorities that the teacher, who should educate student as a science literate person, should also be a "scientific literate individual". In other words, raising literate individuals depends on the fact that the teachers who will train them are literate in their fields and have strong professional skills. The rapid developments in scientific and technological issues in recent years have increased the importance of raising scientifically literate individuals.

The Concept of Literacy and Science Literacy

Literacy refers to the ability to transfer the skills gained in the individual to life, to make positive changes in his life, to bring solutions to the problems he encounters, to use it in all areas of his life, up to human relations (Yılmaz, 1989). The values and expectations of societies change with the characteristics of the age, and literacy skills appear as a skill required by the age we live in (Vardar and Sarioglu, 2017). at the beginning of the century; We come across many types of literacy, especially scientific literacy, technology literacy or technological literacy, visual literacy, economy and information literacy (Akyol, 2015). For example, in some studies, media literacy, information literacy, visual literacy, electronic literacy (Kurudayıoğlu & Tüzel, 2010), technology literacy (Bacanak et al., 2003), science literacy (Dehart Hurd, 1958) are shown as examples of these literacy types.

Although the concept of science literacy emerged in the 16th century, when the modern understanding of education was burgeoning, it started to take an important place in science education since the 60s (Bacanak, 2002). Although it started to gain importance as a concept in these years, many different views were put forward on the definition and criteria of scientific literacy in the contemporary sense, and a common definition could not be agreed upon. In the 90s, criteria and standards began to be determined (Bacanak, 2002). However, the situation that has been agreed upon in recent years; In this age, where we see that the pace of innovations and developments are now difficult for individuals to follow, the ability of individuals to use information comes to the fore, not access to information.

In the literature review, different definitions have been made with the understanding that has developed over the years to explain the concept of science literacy. Science literacy was first introduced as a concept by Paul DeHart Hurd in 1958 (Dehart Hurd, 1958). Hurd (1958), describing science literacy as understanding science, made the following definition; Scientific literacy is understanding science, knowing something about theoretical inquiry orientations, and recognizing these orientations as tools through which the human imagination and the laws of nature focus on unresolved problems. In our country, science literacy was mentioned for the first time in the 2000 year curriculum without mentioning its name, but by including its achievements in some sub-dimensions (Yetisir & Kaptan, 2007). This concept, which found its place in the science curricula of foreign countries many years ago, entered our country's education programs with the Science and Technology Curriculum in 2005 and the vision of the program was determined as "Raising all students as science and technology literate regardless of their individual differences" (MEB, 2005). Günhan (2004) science literacy; He defined science literacy as the individual's adopting science to the extent that he sees and experiences it in his life, and feeling the concepts and theories of science beyond knowing them enough to apply them in his life. Hastürk (2017) defines science literacy; He expressed it as "the general definition of individuals who can make sense of the essence and nature of science, the dynamic relations between science and technology, explain the events that occur in daily life, have curiosity, research and analysis skills, think analytically, question, and have a positive attitude towards science". Based on similar definitions, we can define science literacy as incorporating 21st century skills, using basic concepts and skills related to

science effectively and efficiently in daily life or scientific research processes, and the ability to access and use information. comprehend scientific developments and the nature of science, use basic science concepts and scientific processes while solving the problems encountered, understand the interaction between science, technology and the environment and its impact on society, and have a more productive and happy life (Köseoğlu et al., 2003 cited by Kavak et al., 2006).

The most important principle required for individuals to be well literate in any field is to know their interests and to enable them to meet with resources that can satisfy their interests (Özbay, 2006). Therefore, while transferring scientific knowledge and technological developments to their students, teachers should guide them to develop their research skills and provide students with experiences in which they can use their knowledge and skills related to science and technology in decision-making (Bacanak, 2002). It is one of the most important stages of literacy education to have a good command of the students and to transfer the knowledge to the students with the practices they put forward in the classroom environment (Özbay, 2006). Therefore, the teacher is one of the most important variables that affect the process of students having the necessary attitudes, values, knowledge and skills to become science literate (Yetisir & Kaptan, 2007).

Teaching science well can be summarized as giving students the ability to read and understand science, the ability to understand and use science, the ability to develop and present ideas about science, to attach importance to the present and future state of science, and to comprehend the interaction of society with science and technology (Çepni et al. ., 2009). The fact that all these skills are embodied in the teacher may not mean that the education will be at the expected level in every situation, but still, it is obvious that teachers must have these competencies in order to raise science literate individuals in terms of the effectiveness and efficiency of teaching. It is thought that the teacher's professional and personal self-belief comes to the fore in order to use the aforementioned skills effectively and efficiently. So that; For an effective teaching, students should be provided with an environment that will open the doors of science and arouse their curiosity towards the unknown (Dehart Hurd, 1958).

In the light of all this information, one of the important requirements for teachers to be able to manage the science education process effectively is to be scientifically literate and the teachers are adequately trained in this field (Duban, 2010). With this movement, it is important to reveal the science literacy levels of the teachers who are the practitioners of science education, as well as to determine the factors that determine the state of science literacy levels, to reveal the quality of science education in our country and to increase productivity (Özdemir, 2010). Considering the aforementioned statements, it is seen that the science literacy levels of the teachers will closely affect the student development, which is the product of the teaching profession, and therefore, especially as a result of the detailed literature review, there is not enough examination for the classroom teachers and the branch of the teacher that brings the children together with science in the classroom environment for the first time. It is thought that it is also important to reveal the subject in this context because of the fact that it is important. Based on this idea, "What are the basic science literacy levels of primary school teachers and is there a difference in terms of different variables at these levels?" This question constitutes the problem statement of the research.

Research Questions (Sub-Problems)

1. “Do the sub-dimensions of the science literacy levels of the primary school teachers in Bursa province show a significant difference when the gender variable is considered?”

2. “Do the science literacy levels of primary school teachers in Bursa province differ significantly when their sub-dimensions and seniority are considered?”

3. "Do the sub-dimensions of the science literacy levels of the primary school teachers in Bursa province show a significant difference when the age variable is considered?"

4. “Do the sub-dimensions of the science literacy levels of the primary school teachers in Bursa province differ significantly when the departments they graduated from are taken into account?

METHOD/MATERIALS

In this study; non-experimental comparative model, one of the quantitative research methods, was used. In comparative models, it is an approach that takes descriptive studies one step further when investigating whether there is a relationship between two or more groups in the situation under study, since there is no interference with the experienced conditions and it is a method that focuses on the relationship between variables rather than simply the differences between two variables. (McMillan ve Schumacher, 2006).

Population and Sample

The universe of the research consists of classroom teachers who are currently working in the city center and districts of Bursa under the Ministry of National Education in the 2020-2021 academic year. The sample of the research consists of 506 classroom teachers. In the selection of the sample, the "random sampling" method was preferred, in which it is possible to choose a completely random sample from the population with the size and sufficiency of representing the population with statistical calculation methods. In random sampling methods, the power of the sample to represent the universe is high, and this method is

a sampling method that allows valid generalizations about the universe (Büyüköztürk et al., 2015, p.88). Demographic information of the sample of the study is given in Table 1.

Table 1. Demographic Information of Teachers Participating in the Research

	Gender		Graduation		Working time		Age	
	f	%	f	%	f	%	f	%
Female	337	66,6						
Male	169	33,4						
Class Teacher			384	75,9				
Education Fac./Education Ins.			25	4,9				
Education Fac. Other			42	8,3				
Education Fac. Outside			55	10,9				
less than 5 years					86	17		
6-10 years					104	20,6		
11-15 years					106	20,9		
16-20 year					69	13,6		
over 20 years					141	27,9		
less than 25							39	7,7
26-30							76	15
31-35							119	23.5
36-40							90	17,8
over 40							182	36
Total	506	100	506	100	506	100	506	100

When the findings are examined, it is understood that 33.4% of the sample is female and 66.6% is male, and the distribution of the sample differs according to the study period. In terms of the age variable, it is seen in Table 1 that most of the sample is over 35 years old, and that the number of teachers graduated from class teacher is much higher than the graduates of other departments.

Data Collection Tools

The Basic Science Literacy Test (hereafter TFOT) was used in this study. The scale was used in the "Basic Science Literacy Test", which was translated into Turkish by Duruk (2012) from the publication "Science for All Americans" by Lauksch and Spargo in 1996, and whose validity and reliability tests were performed. The test consists of 49 items. Participants respond to the items by choosing one of the "True-False-I don't know" options. The test includes three sub-dimensions as Scientific Content Knowledge (bib,33), Nature of Science (bd,9) and Science-Technology and Society (ftt,7). Evaluation of the test; correct answers were given “1 point”, and incorrect and blank answers were given “0 points”.

The Basic Science Literacy Test was translated from English to Turkish by Duruk (2012), and the sentence structure of the question items was not changed in order to prevent the items from losing their meaning. There are 33 items in the Scientific content knowledge sub-dimension, which is one of the sub-dimensions of the scale, 22 of these items are correct and 11 of them are incorrect. In the sub-dimension of the nature of science, 1 of 9 questions is wrong, and 8 of them are correct. In the science and technology society sub-dimension, there are 7 items and 4 of these items are correct and the remaining 3 are incorrect. The reliability coefficient of the test performed by the researcher was calculated as 0.82. In addition, the test was used by Yolagiden

(2017) in a study called "Investigation of the relationship between pre-service science teachers' science teaching skills, science literacy and attitudes towards socioscientific issues". In the aforementioned study, the test was applied to a total of 432 teacher candidates, 199 science candidates and 233 classroom teacher candidates, from Kahramanmaraş Sütçü İmam University Faculty of Education students in the 2016-2017 academic year, and the reliability coefficient of the test was calculated as 0.80. In this study, the Cronbach alpha's reliability coefficient for the TFOT scale was calculated as 0.712. Necessary permissions have been obtained for the use of the test.

Data Collection and Analysis

Necessary permissions and Ethics Committee Approval were obtained from Bursa Provincial Directorate of National Education for the application of the scales applied in the study. "Personal Information Form" and "Basic Science Literacy Test" were applied to 506 classroom teachers working in Bursa province and its districts during the 2020-2021 academic year. Both scales were combined to collect data. The scales were applied online to the on-duty classroom teachers on a voluntary basis.

The collected data were analyzed using the SPSS package program. First of all, the normality distributions of the obtained data were calculated. In calculating the normality distributions, the normality analysis was evaluated according to the z values calculated by the ratio of the skewness/kurtosis coefficients to the standard error of the skewness and kurtosis. The fact that this value is between -1.96≤z ≤1.96 indicates that the data show a normal or close to normal distribution (Eroğlu, 2006, p.212). In cases where the data did not show normal distribution as a result of this calculation, the Mann Whitney U test was used for the analyzes for gender and the Kruskal Wallis tests for the other variables. If the data obtained showed normal or near-normal distribution, independent group t-test was used to determine whether gender had any effect, and one-way analysis of variance (One Way ANOVA) test was used to determine whether other variables had any effect. In order to determine between which groups a possible statistical significance occurs when applying ANOVA; The homogeneity of the variances was measured and Tukey tests were used if they were homogeneous, and Tamhane tests were used if they were not homogeneous. In statistical calculations, the level of significance was taken as 0.05.

FINDINGS

In this section, in accordance with the purpose of the research, findings based on the analysis of the data obtained from the classroom teachers are included. Findings for each research question are presented in its own title.

1. Findings of the Sub-Problem (“Does the science literacy levels of the primary school teachers in Bursa province show a significant difference when the gender variable is considered?”)

In order to understand whether the science literacy levels of the teachers participating in the research show a significant difference in terms of gender, first of all, the suitability of the distribution of the data was examined for the test to be applied. According to the results of the normality analysis, the TFOT_bib, TFOT_bd, TFOT_ftt and TFOT total scores of the female and male teachers participating in the research do not show a normal or close to normal distribution (-1.96≤z≤+1.96). Considering that the groups are independent from each other (two groups) and the data do not show normal distribution, whether there is a difference between the scores of the teachers according to the gender groups was analyzed using the Mann Whitney U test, which is one of the non-parametric tests, and the analysis results are presented in Table 2.

Table 2. Analysis of the answers given by the teachers according to the gender variable.

Point	Gender	N	Rank Avarage	Rank Total	U	Z	p
TFOT_bib	Female	337	249,73	84159,50	27206,500	-0,824	0,410
	Male	169	261,01	44111,50			
TFOT_bd	Female	337	244,54	82411,00	25458,000	-1,988	0,047*
	Male	169	271,36	45860,00			
TFOT_ftt	Female	337	249,95	84233,50	27280,500	-0,816	0,414
	Male	169	260,58	44037,50			
TFOT_total	Female	337	246,27	82991,50	26038,500	-1,576	0,115
	Male	169	267,93	45279,50			

When Table 4 is examined, it is understood that gender causes a significant difference only for the "nature of science" sub-dimension (Z=1.988; p<0.05), which is one of the sub-dimensions of the Basic Science Literacy test. When the average scores in Figure 1 (Male=7.25, Female=6.94) are taken into account, it is seen that this difference develops in favor of male teachers.

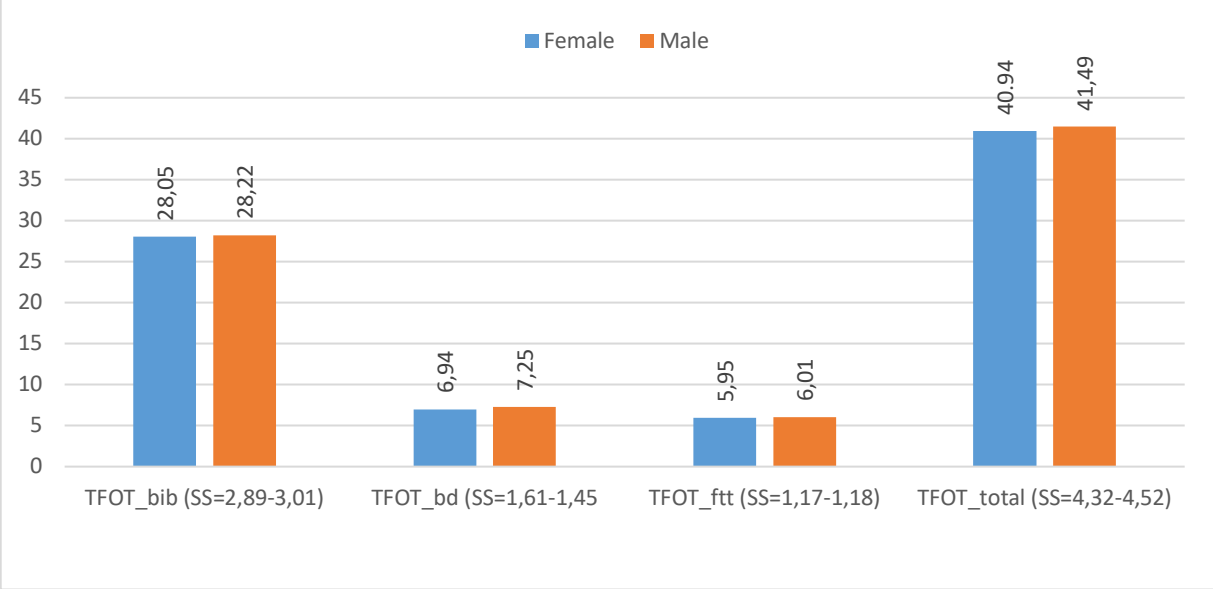

Figure 1. Mean scores of teachers according to gender variable from TFOT(Parentheses show the standard deviation values, respectively.)

2. Findings of the Sub-Problem ("Does the science literacy levels of primary school teachers working in Bursa province differ significantly when their seniority is considered?")

In order to understand whether the science literacy levels of the teachers participating in the research differ significantly in terms of working time, first of all, the appropriateness of the distribution of the data was examined for the test to be applied. It is understood that it does not show a distribution close to normal (-1.96≤z≤+1.96). The Kruskal Wallis test was used in order to understand whether the study period showed a difference in terms of Science Literacy and its sub-dimensions, since the groups were independent from each other (5 groups) and the distribution did not show normality, and the analysis results are shown in Table 3.

Table 3. Analysis of the answers given by the teachers according to the working time variable.

Point	Working time	N	□	SS	Rank Average	$\chi 2$	p
TFOT_bib	<5 year	86	28,07	2,87	252,19	4,033	0,402
	6-10 year	104	27,72	3,14	235,25		
	11-15 year	106	28,09	2,90	253,99		
	16-20 year	69	28,07	2,61	245,17		
	>20 year	141	28,44	2,98	271,47		
TFOT_bd	<5 year	86	6,94	1,71	249,13	1,926	0,749
	6-10 year	104	7,02	1,61	251,81		
	11-15 year	106	6,96	1,53	244,04		
	16-20 year	69	7,28	1,47	273,57		
	>20 year	141	7,09	1,51	254,71		
TFOT_ftt	<5 year	86	5,95	1,06	243,97	2,592	0,628
	6-10 year	104	5,84	1,32	242,38		
	11-15 year	106	5,91	1,28	250,81		
	16-20 year	69	6,00	1,18	258,31		
	>20 year	141	6,12	1,01	267,18		
TFOT_total	<5 year	86	40,96	4,36	248,57	3,275	0,513
	6-10 year	104	40,58	4,80	238,05		
	11-15 year	106	40,97	4,40	247,87		
	16-20 year	69	41,34	4,14	258,11		
	>20 year	141	41,64	4,20	269,88		

When Table 3 is examined, the working time, Both in the total of the basic science literacy levels of the teachers ($\chi 2=4,033$, $p>0.05$) and in any of its sub-dimensions ($\chi 2=1.926$ for the scientific content knowledge sub-dimension, $\chi 2=2.592$ for the nature of science sub-dimension, and science-technology-society) sub-dimension $\chi 2=3,275$) did not cause a significant difference.

3. Findings of the Sub-Problem ("Does the science literacy levels of the primary school teachers in Bursa province show a significant difference when the age variable is considered?")

In order to understand whether the science literacy levels of the teachers participating in the research differ significantly in terms of their ages, first of all, the appropriateness of the distribution of the data was examined for the test to be applied. As a result of the normality analysis of the TFOT_bib, TFOT_bd, TFOT_ftt and TFOT_total scores of the teachers participating in the research in terms of age variable, it is understood that the data do not show a normal or close to normal distribution ($-1.96\leq z\leq+1.96$). The Kruskal Wallis test was used to understand whether the age variable showed a difference in terms of Science Literacy and its sub-dimensions, since the groups were independent from each other (5 groups) and the distribution did not show normality, and the analysis results are shown in Table 4.

Table 4. Analysis of the answers given by the teachers according to the age variable.

Point	Age	N	Rank Average	χ^2	p
	<25	39	266,81		
	26-30	76	253,99		
TFOT_bib	31-35	119	237,26	5,974	0,201
	36-40	90	234,06		
	>40	182	270,68		
	<25	39	251,09		
	26-30	76	258,30		
TFOT_bd	31-35	119	247,94	1,371	0,849
	36-40	90	242,19		
	>40	182	261,24		
	<25	39	285,77		
	26-30	76	246,64		
TFOT_ftt	31-35	119	225,83	9,800	0,044*
	36-40	90	248,55		
	>40	182	269,99		
	<25	39	268,73		
	26-30	76	251,47		
TFOT_total	31-35	119	232,92	7,118	0,130
	36-40	90	237,02		
	>40	182	272,69		

When Table 4 is examined, it is understood that the ages of the teachers cause a significant difference (χ2=9,800, p>0.05) only in terms of the science-technology-society sub-dimension of the science literacy level. For the other sub-dimensions, scientific content knowledge (χ2=5.974), nature of science sub-dimension (χ2=1.371) and basic science literacy level (χ2=9.800), it was understood that the age variable did not cause any difference. On the other hand, in order to determine between which groups the difference emerged for the science-technology-society sub-dimension, the groups belonging to the independent variable were grouped in pairs and the Mann Whitney U test was performed. Analysis results are given in Table 5.

Table 5. Mann Whitney U analysis for Science-Technology-Society sub-dimension (p value results).

Point	Age	<25	26-30	31-35	36-40	>40
	<25		0,154	0,022*	0,156	0,498
	26-30	0,154		0,317	0,924	0,215
TFOT_ftt	31-35	0,022*	0,317		0,237	0,007*
	36-40	0,156	0,924	0,237		0,219
	>40	0,498	0,215	0,007*	0,219	

*p<0,05

When Table 5 is examined, it was found that the age variable for the science-technology-society sub-dimension caused a significant difference between them, as the 31-35 age range, under 25 years old and over 40 years old. Considering the mean score in Figure 2, this difference emerged in favor of the groups under 25 (□<25=6.28, Z=-2.299) and over 40 years old (□>40=6.14, Z=-2.711).

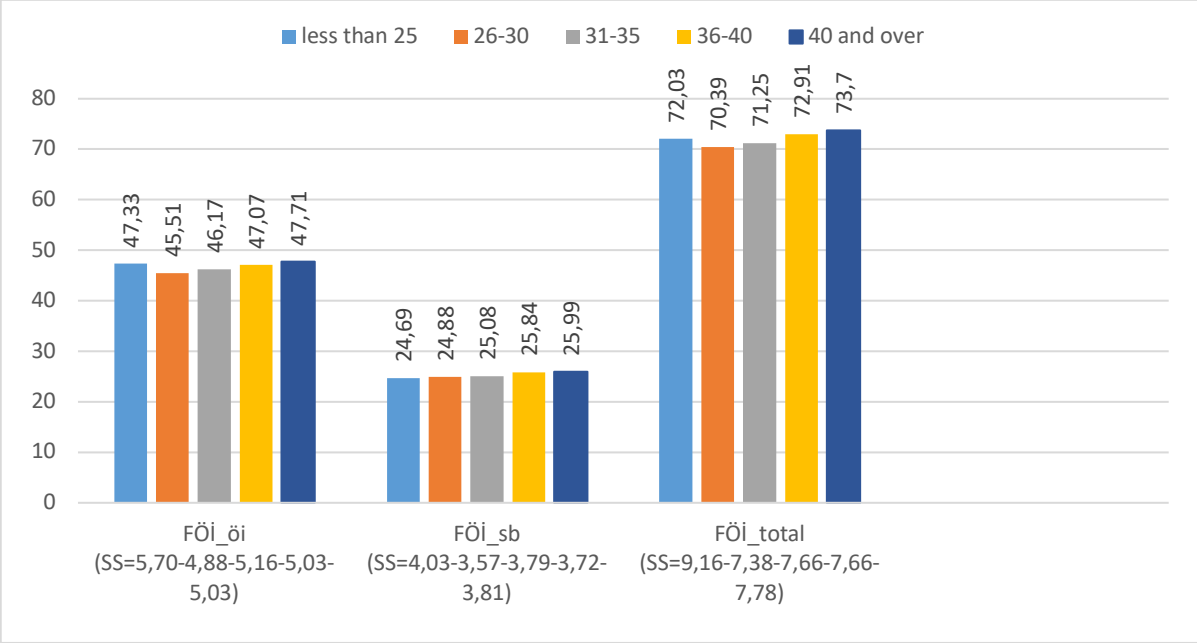

Figure 2. Mean scores of teachers according to age variables(Parentheses show the standard deviation values, respectively)

4. Findings of the Sub-Problem (“Does the science literacy levels of primary school teachers in Bursa province differ significantly when the departments they graduated from?”)

As a result of the normality analyzes of the TFOT_bib, TFOT_bd, TFOT_ftt and TFOT_total scores of the female and male teachers participating in the research, when the departments they graduated from are taken into account, it is understood that the data do not show a normal or close to normal distribution (-1.96≤z≤+1.96). The Kruskal Wallis test was used to understand whether the age variable showed a difference in terms of Science Literacy and its sub-dimensions, since the groups were independent from each other (4 groups) and the distribution did not show normality, and the analysis results are shown in Table 6.

Table 6. Analysis of the answers given by the teachers according to the graduated department variable

Point	Graduated Department	N	□	SS	Rank Average	$\chi 2$	p
TFOT_bib	Class Teacher	384	28,16	2,87	255,27	1,485	0,686
	Education Fac./Ins.	25	28,24	3,431	264,24		
	Education Fac. Other	42	27,45	3,35	228,14		
	Education Fac. Outside	55	28,18	2,81	255,59		
TFOT_bd	Class Teacher	384	7,08	1,51	255,20	1,173	0,760
	Education Fac./Ins.	25	6,68	1,77	225,86		
	Education Fac. Other	42	7,10	1,63	261,07		
	Education Fac. Outside	55	6,93	1,80	248,44		
TFOT_ ftt	Class Teacher	384	5,95	1,24	254,44	1,215	0,750
	Education Fac./Ins.	25	6,04	0,84	244,72		
	Education Fac. Other	42	5,92	0,97	235,33		
	Education Fac. Outside	55	6,12	0,94	264,82		
TFOT_ total	Class Teacher	384	41,19	4,36	255,28	0,377	0,945
	Education Fac./Ins.	25	40,96	4,63	249,54		
	Education Fac. Other	42	40,47	5,18	241,24		
	Education Fac. Outside	55	41,23	3,91	252,23		

When Table 6 is examined, the department from which the teachers graduated, both in the total of basic science literacy levels ($\chi 2$=0.377, p>0.05) and in any of its sub-dimensions (Respectively $\chi 2$=1,485 for scientific content knowledge, $\chi 2$=1,173 for the nature of science sub-dimension and $\chi 2$=1,215 for science-technology-society sub-dimension, respectively) for science-technology-society sub-dimension, it is understood that there is no significant difference.

DISCUSSION

When the science literacy skills of classroom teachers are examined according to the gender variable; Considering the total scores of the scale, it is seen that there is no significant difference between female and male teachers. However, it was observed that there was a significant difference in favor of male teachers in the "Nature of Science" sub-dimension, which is one of the sub-dimensions of the scale. In the study conducted by Yolagiden (2017) within the scope of science literacy among teacher candidates, a significant difference was found in favor of women. The results obtained by Yolagiden contradict the results of this research. The emergence of different results with this research can be thought of as the fact that the scale was applied to teacher candidates and the time spent in the profession and the professional experience gained decreased the difference in favor of women over time. Considering the total scores of the scale used in the study conducted by Özdemir (2011) to determine the science and technology literacy levels of classroom teachers, a significant difference was found in favor of women. The results of the related study contradict with the findings of this study. The reason for this contradiction is considered to be the socioeconomic difference of the region where the research was conducted and the difference in sample size between the two studies. Likewise, in the study conducted by Bacanak (2002), a significant difference was found in favor of males in the scope of science and technology literacy. Although a difference was found in favor of males in the sub-dimension of the nature of science in this study, the study carried out by Bacanak (2002) contradicts this research in this context, since no significant difference could be determined when the scores that can be obtained from the whole TFOT of the scale are taken into account. This contradiction; The fact that the pre-service teachers who constitute the sample of the related research are students studying in the department of primary education science teaching, and therefore the difference in the courses they take within the framework of the field they study, can be explained in the way that this difference may positively affect the science literacy skills of the pre-service teachers. When the researches in this field were examined, as a result of examining the science literacy levels of the teachers according to the gender

variable, findings supporting the result of this research were also found. In the study conducted by Işık-Terzi (2008), it was stated that although there was a slight difference in favor of women, there was no significant difference. In a study conducted by Huyugüzel-Çavaş (2009), it was determined that the science and technology literacy of classroom teachers did not show a significant difference according to the gender variable. In a study conducted by Uludüz (2017) and examining the science literacy of primary school teacher candidates, it was concluded that the gender variable did not have a significant effect on science literacy levels. The mentioned studies support the results of this research in terms of their results.

According to the results obtained in this research about whether the science literacy of classroom teachers shows a significant difference according to their seniority; It was determined that the study period did not show a significant difference on the science literacy levels of the classroom teachers when considered in terms of both the total score and the sub-dimensions. These results are compatible with the results of the study conducted by Özdemir (2011) in which the science and technology literacy of classroom teachers was examined.

When the results obtained regarding whether the science literacy levels of classroom teachers differ significantly according to the age variable are examined; It has been determined that the age variable does not cause any difference in terms of scientific content knowledge, nature of science and basic science literacy level, which are the sub-dimensions of the scale used in the research. However, it is understood that the age variable causes a significant difference for the science-technology-society sub-dimension. This difference; It has been concluded that being between the 31-35 years old, under 25 years old and over 40 years old groups is in favor of the groups under 25 years old. These results contradict with the findings of the research conducted by Özdemir (2011) to examine the science and technology literacy of classroom teachers. It is thought that this discrepancy may be due to the difference between the sample size and the professional experience of the sample. The findings of this study are compatible with the results of the study conducted by Işık-Terzi (2008) to determine the science literacy levels of classroom teachers. In the aforementioned study; A significant difference was found between the groups 20-25 years old, 25-30 years old and over 45 years old, which are the groups with a significant difference, in favor of the groups 20-25 years old and over 45 years old. Although the results of the relevant research seem to contradict the results of this study in terms of the fact that the findings are also in favor of the groups over the age of 45, they support the results of this study in terms of showing a significant difference in favor of the groups aged 20-25.

When the results obtained regarding whether the science literacy levels of classroom teachers differ significantly according to the departments they graduated from; When the department that graduated from was examined within the scope of both the TFOT score average and the sub-dimensions, it was seen that it did not cause any significant difference. These results; It is compatible with the findings of the research conducted by Özdemir (2011) to examine the science and technology literacy of classroom teachers.

CONCLUSION AND RECOMMENDATIONS

This research was carried out with classroom teachers working in Bursa province and its districts in the 2020-2021 academic year. Conducting similar studies with different and/or larger samples would be beneficial in terms of contributing to the field.

In this study, demographic variables such as gender, age, seniority and graduated department were examined in terms of affecting the science literacy levels of classroom teachers. In the case of similar studies in the future, it is considered that the inclusion of many different variables such as the regional socioeconomic status, the quality of the school, managerial experience, participation in in-service trainings or the nature of the in-service trainings received may be beneficial in terms of giving more comprehensive results.

Considering that the importance of literacy levels in private fields has increased in recent years, it is thought that it would be beneficial to develop current literacy scales in many different fields and to use these scales in research with large sample groups.

Considering that classroom teachers are the first teachers that students encounter during their primary school years and this effect can continue for years; In particular, it is considered that it is important to determine both the self-efficacy beliefs and literacy levels of teachers regarding all courses and skills taught and to contribute to the professional development of teachers in the light of these results.

Finally, the Ministry of National Education; With in-service trainings, training, workshops, conferences, etc., for the development of literacy skills of teachers in the field of science and other special fields. studies are thought to be beneficial.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

The Ethics Committee Permission required for the study was obtained by Bursa Uludağ University Research and Publication Ethics Committees on 26.02.2021, in the session numbered 2021-02, with the decision no. 20.

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