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Examination of Water Literacy Levels Secondary School Students in Terms of Different Variables

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ABSTRACT

The aim of this research is to examine the water literacy levels of secondary school students in Turkey in terms of different factories. The research is designed within the survey model. The sampling of the research consists of 408 secondary school students enrolled in schools in Turkish cities of Istanbul, Ankara, Trabzon, Kutahya, and Yozgat. Data is collected via 3 sub-dimensional water literacy scale developed by Sözcü and Türker, (2020a) as well as personal information sheet developed to determine water literacy levels of secondary school students. As a result of the research, when the scores of the secondary school students from the sub-dimensions of the water literacy scale were evaluated, it was found that the gender variable did not make a significant difference on the water literacy, but there was a significant difference in terms of the class level variable, advantaging class 5 and 6. There was a significant difference in the parent education variable, disadvantaging illiterate parents. Likewise, the significant difference was in favour of those with lower family income in the family income variable; in advantage of internet users in internet usage variable; in advantage of city dweller students for the sub-dimension of water conservation in the variable of the settlement they live in; in advantage of villager students for the sub-dimension of water sensitivity; in advantage of those who had less time to be in nature for the sub-dimension of water sensitivity in the variable of being in the natural environment. Water literacy can be added to environmental issues in order to make students gain water literacy in the primary education program.

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INTRODUCTION

People have both been affected by, and have affected, the environment from the past to the present, and this interaction will continue in the future because the environment has always been, and will always be, important for people. However, the main issue that needs to be taken into consideration here is what impact humans have on the environment. The answer to this question is not very pleasant for us because most of the environmental problems seem to be caused by human beings. However, it should be borne in mind that it is again human beings, who will prevent environmental problems, and in this sense, it is necessary for them to be responsible towards the environment.

As human beings began to shape the natural environment with their own will since they have been on Earth, the natural balance in the ecosystem has begun to deteriorate more rapidly (Güçlü, 2021, p.103). As a result of this situation, environmental problems caused by the deterioration of the balance of nature and the impact of people affect not only a region but the whole world in an increasing pace. Minimising environmental problems for a sustainable world will undoubtedly be possible with the efforts of people.

The rapid growing in population, increase in urbanisation rate, economic activities, diversification of consumption habits have increased and continue to raise the pressure on the environment and natural resources. In a world where demand and consumption intensify, environmental and natural resources management become a progressively significant and challenging issue. Global environmental issues such as environmental pollution, climate change, desertification, land degradation, deforestation, loss of biodiversity, and drought, whilst retaining their significance, continue to affect human life more clearly every single day. Fast economic improvement, population growth, and changing climate leads to the expansion of issues connected to resource scarcity. Soil, water, and energy are among the most critical resources for human beings. These resources also have a structure that affects each other (Ministry of Development, 2018, p.2). Water is one of the major natural resources that lean towards depletion, and as a result, both the amount of water to be used per person today decreases and the distribution of water on earth varies. In addition to all these, water is rapidly polluted/contaminated (Ergin, Akpınar, Küçükcankurtaran & Çoban, 2009, p.9; Özdemir, 2017, p.26). The consequences of this affect people negatively.

97.5% of water that accommodates two-thirds of water in the entire world is consisted of the salty water in the oceans. The remaining 2.5% is fresh water, most of which is found as groundwater in glaciers and very deep geological layers at the poles (i.e., Antarctica, Greenland). Accessible clean water resources are found in lakes, reservoirs, rivers, and streams. The amount of water in these sources constitutes 0.10% of the total fresh water amount in the world (https://mgm.gov.tr/genel/hidrometeoroloji.aspx?s=3). When these rates are evaluated, the importance of conscious use of especially fresh water resources becomesbecomes clearer.

Water is one of the most basic substances of human life and has a vital importance for humans because water plays an important role in sustaining human life in a healthy way. From the simplest living organism to the most advanced living being, it is water that sustains all biological life and all human activities (Çankaya, 2014, p.17; Güçlü, 2021, p.80). Today, there are serious concerns about the sustainability of water in the ecosystem. Sustainability of water resources is at the core of many issues, from food safety and energy security to economic growth, combating climate change and preventing biodiversity loss. Therefore, limited or excessive use of water resources concerns all humanity (https://www.wwf.org.tr/calismalarimiz/tatli_su/). Today, 80 countries with 40% of the world's population suffer from water shortages and the need for water is increasing day by day due to the rapid increase in population vis-a-vis stable water resources (Cansaran & Yıldırım, 2021, p.118). Among the reasons why there are limited water resources and water pollution are global climate change, drought, deforestation, increase in the use of fossil fuel, change in consumption habits, economic growth, increase in global population and urbanisation rate, tourism activities in coastal areas, erosion, pollution, lack of awareness of personal water use, water management policies that are inappropriate for resources and developed within political agendas (Güçlü, 2021, p.81; Şahin, 2016, p.2). Considering these situations that cause water pollution, it can be stated that water pollution is more common especially in places where industrialisation and urbanisation are more dense.

Water as a humane, industrial, and ecological resource is a key component to build a sustainable future (McCarroll & Hamann, 2020). Water literacy has become a fundamental part of the contemporary society as the protection, conservation, and management of water is the key to ensuring human survival (Moreno-Guerrero, Romero-Rodríguez, López-Belmonte and Alonso-García, 2020). It covers basic information about water literacy, water resources, and other related factors. One indicator of understanding the importance and role of water literacy is to have a basic understanding of how to use or manage the world's water in a sustainable way (Febriani, 2017). Water literacy is an educational need as water has effects in many areas from health to energy, from culture to economy (Sherchan, Pasha, Weinman, Nelson, Sharma, Therkelsen, & Drexler, 2016), and water-conscious individuals should be raised in order to ensure the sustainability of water. The most important way to instil water awareness in individuals is education.

Thus, this research is undertaken to determine the water literacy levels of secondary school students in terms of different variables. Alongside, answers to the following questions are sought:

Main Research Problem

What are the water literacy levels of secondary school students?

Sub-problems of the Research

(1) Does water literacy of secondary school students differ significantly by gender?

(2) Does the water literacy of secondary school students differ significantly according to their class levels?

(3) Does the water literacy of secondary school students differ significantly according to their mothers' education level?

(4) Does the water literacy of secondary school students differ significantly according to their fathers' education level?

(5) Does water literacy of secondary school students differ significantly according to family income?

(6) Does the water literacy of secondary school students differ significantly according to the time of their internet use?

(7) Does the water literacy of secondary school students differ significantly according to their residence status?

(8) Does the water literacy of secondary school students differ significantly according to their frequency of being in nature?

The Aim of the Research

The aim of this research is to determine the water literacy levels of secondary school students studying in Turkey and to reveal the effects of different variables on their water literacy levels.

METHOD

Research Design

The study was designed in the survey model to determine the water literacy levels of secondary school students and the difference between those levels based on different variables. Survey model is the most widely used method in social sciences. Survey research is research that examines the characteristics, attitudes and opinions of people who are included in the whole universe or a group of samples taken from the universe in order to reach a general opinion about the universe consisting of many people (Karasar, 2014, p.79). The purpose of survey research is generally to make a description by taking the picture of the current situation related to the research subject (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2012, p.177).

Research Sample

The sampling group of the research consists of 408 secondary school students studying in Istanbul, Ankara, Trabzon, Kutahya, and Yozgat provinces of Turkey in the 2021-2022 academic year. Convenience sampling method was used in the research. It completely relies on such items that are available and quick and easy to access. In this method, the researcher determines a sufficient number of items from the existing ones as a sample (Baltacı, 2018).

Data Collection Tools

In this research, a personal information sheet and a 5-point likert-type water literacy scale developed by Sözcü and Türker (2020a) were used to identify the water literacy levels of secondary school students. As a result of the exploratory factor analysis carried out by the researchers, it is found that the water literacy scale consists of 30 items and 3 sub-dimensions, and the analyses performed to test the validity and reliability of the scale are as follows: Kaiser-Meyer-Olkin sample adequacy measurement value was found to be significant as .901 and the Barlett test of sphericity as .000. The total variance clarified by the scale was determined as 48.361%. When the load values of the items forming the scale were examined, it was determined that they had values between 0.565 and 0.784. The Cronbach alpha internal consistency coefficient values of the water literacy scale were found to be .89 in the “water conservation” sub-dimension, .88 in the “water awareness” sub-dimension, and .69 in the “water sensitivity” sub-dimension. In general, the Cronbach alpha internal consistency coefficient value was determined as .90. These values show that the scale is highly valid and reliable.

Data Collection Process

The questionnaire form created to collect research data was collected from secondary school students studying in Istanbul, Ankara, Trabzon, Kutahya, and Yozgat in Turkey through Google forms in the spring semester of 2021-2022 academic year.

Data Analysis

The analysis of the data collected for the research was made through the SPSS 22.0 package statistics programme. In the study, in addition to descriptive statistics, the non-parametric Mann-Whitney U test and Kruskal Wallis H test were used for variables where the data did not display normal distribution.

Ethic

This research was discussed at the Gazi University Ethics Commission's meeting dated 10.11.2020 and numbered 11 and was found ethically appropriate with the 2021-54 Research Code Number.

FINDINGS

Within the content of the research findings, the water literacy levels of the participants; Statistical analyzes regarding whether it differs according to gender, class level, settlement area, mother and father education level, frequency of being in the natural environment, social studies course grades, daily internet usage times and monthly family income levels are included.

Table 1.*Findings and comments on the water literacy levels of the participants*

	N	X	S
Water Conservation	408	4.29	.038
Water Awareness	408	3.74	.042
Water Sensitivity	408	2.52	.056
Overall Average	408	3.78	.032

Table 1 demonstrates that the average scores of secondary school students in the water conservation sub-dimension of the water literacy scale were determined as (x=4.29), the average of the scores in the sub-dimension of water awareness as (x=3.74), and the average of the scores in the sub-dimension of water sensitivity as (x=2.52) and the average of the scores in the general water literacy scale as (x=3.78).

Table 2.*U-Test results of the participants' water literacy levels by gender variable*

	Gender	N	MeanRank	RowSum	z	p
Water Conservation	Woman	230	213.70	49151.50	-1.799	.072
	Man	178	192.61	34284.50		
	Total	408				
Water Awareness	Woman	230	204.47	47027.50	-.006	.995
	Man	178	204.54	36408.50		
	Total	408				
Water Sensitivity	Woman	230	200.91	46208.50	-.702	.483
	Man	178	209.14	37227.50		
	Total	408				

Table 2 presents the results of the Mann-Whitney U-test regarding the effect of secondary school students' gender on their water literacy levels.

When the table is examined, the U test results of group-based scores of secondary school students for the water literacy scale are found. According to these results, the water literacy scores of secondary school students do not show a significant difference in the "water conservation" sub-dimension in relation to the gender variable [U=-1.799; p>.05]. While the mean rank of women was 213.70, the mean rank of men was 192.61.

There is no significant difference in the "water awareness" sub-dimension of the water literacy scale in relation to the gender variable [U=-.006; p>.05]. While the mean rank of women was 204.47, the mean rank of men was 204.54.

In the "water sensitivity" sub-dimension of the water literacy scale, there is no significant difference in relation to the gender variable [U=-.702; p>.05] either. While the mean rank of women was 200.91, the mean rank of men was 209.14.

These findings can be interpreted as the gender variable does not make a significant difference on water literacy.

Table 3. *Kruskal-Wallis H test results of participants' water literacy levels by class level variable*

	Class Level	N	MeanRank	x^2	p	Different U
Water Conservation	5	107	215.94	2.741	.433	
	6	96	211.11			
	7	114	192.15			
	8	91	199.54			
	Total	408				
Water Awareness	5	107	225.57	13.857	.003	5-7
	6	96	226.83			5-8
	7	114	186.20			6-7
	8	91	179.09			6-8
	Total	408				
Water Sensitivity	5	107	181.08	12.349	.006	5-6
	6	96	236.58			6-7
	7	114	194.95			
	8	91	210.16			
	Total	408				

Table 3 shows the results of the analysis of the Kruskal Wallis H test regarding the effect of secondary school students' class levels on their water literacy levels.

According to the results of the analysis, no significant difference was found in the water literacy levels of secondary school students at different class levels in the "water conservation" sub-dimension of the scale [x^2(df=3; n=408) =2.741; p>,05].

According to the results of the analysis, a significant difference was found in the "water awareness" sub-dimension of the scale in the water literacy levels of secondary school students at different class levels [x^2(df=3; n=408) =13.857; p<,05]. This finding shows that the water literacy levels of the participants in different class level groups are different. Considering the mean rank of the class levels, a significant difference was found between class 5 students (mean rank=225.57), class 7 (mean rank=186.20) and class 8 students (mean rank=179.09) in favour of class 5 students. Similarly, in the same sub-dimension, a significant difference was found between class 6 students (mean rank=226.83) and class 7 (mean rank=186.20) and class 8 students (mean rank=179.09) in favour of class 6 students. This finding can be interpreted as secondary school students' water literacy levels in the water awareness sub-dimension of the scale are higher among class 5 and 6 students than that of class 7 and class 8 students.

According to the results of the analysis, a significant difference was found in the "water sensitivity" sub-dimension of the scale in the water literacy levels of secondary school students at different class levels [x^2(df=3; n=408) =12.349; p< ,05]. Considering the mean rank of the class levels, a significant difference was found between class 6 students (mean rank=236.58) and class 5 (mean rank=181.08) and class 7 students (mean rank=194.95) in favour of class 6 students. This finding can be interpreted as secondary school students' water sensitivity levels in the "water sensitivity" sub-dimension of the water literacy scale are higher among class 6 students than that of class 5 and class 7 students.

Table 4. *Kruskal-Wallis H test results of participants' water literacy levels by mother education variable*

	Mothers' educationalstatus	N	MeanRank	x^2	p	Difference U
Water Conservation	Illiterate	34	124.44	17.682	.001	2-1
	Primary&Lower-SecondaryEducation	246	211.45			3-1 4-1
	Upper-SecondaryEducation	73	206.38			
	University	55	220.43			
	Total	408				
Water Awareness	Illiterate	34	160.56	8.841	.031	2-1
	Primary&Lower-SecondaryEducation	246	216.16			
	Upper-SecondaryEducation	73	186.53			
	University	55	203.37			
	Total	408				
Water Sensitivity	Illiterate	34	208.93	1.709	.635	
	Primary&Lower-SecondaryEducation	246	209.02			
	Upper-SecondaryEducation	73	188.95			
	University	55	202.17			
	Total	408				

Table 4 demonstrates the results of the analysis of the Kruskal Wallis H test regarding the effect of secondary school students' whose mothers have different education levels on their water literacy levels.

According to the results of the analysis, a significant difference was found in the water literacy levels of the secondary school students with different maternal education levels in the "water conservation" sub-dimension of the scale [x^2(df=3; n=408) =17.682; p<,05]. Considering the mean rank of the participants' maternal education levels, those with illiterate maternal education (mean rank=124.44) and those with maternal education level at primary and lower-secondary school (mean rank=211.45), upper-secondary school (mean rank=206.38), and university (mean rank=220.43) were found to be significantly different from those with maternal education level as illiterate, and this significance is not in favour of the latter. This finding can be interpreted in the way that the level and awareness of "water conservation" increases as much as the education level of maternals increases.

According to the results of the analysis, a significant difference was found in the water literacy levels of the secondary school students with different maternal education levels in the "water awareness" sub-dimension of the scale [x^2(df=3; n=408) =8.841; p< ,05]. Considering the mean rank of the participants' maternal education levels, a significant difference was found between those whose mothers' education level was illiterate (mean rank=160.56) and those whose mothers' education level was primary school (mean rank=216.16) in favour of those whose mothers' education level was primary school. This finding is important in terms of showing the effect of maternal education level on "water awareness".

According to the results of the analysis, no significant difference was found in the water literacy levels of the secondary school students with different maternal education levels in the “water sensitivity” sub-dimension of the scale [x^2(df=3; n=408) =1.709; p>,05].

Table 5. *Kruskal-Wallis H test results of the participants’ water literacy levels by father education variable*

	Fathers’ educationalstatus	N	MeanRank	x^2	p	Different U
Water Conservation	Illiterate	10	51.40	20.532	.000	2-1
	Primary&Lower-SecondaryEducation	228	203.48			3-1 4-1
	Upper-SecondaryEducation	102	203.97			
	University	68	231.25			
	Total	408				
Water Awareness	Illiterate	10	117.85	6.558	.087	
	Primary&Lower-SecondaryEducation	228	205.95			
	Upper-SecondaryEducation	102	215.00			
	University	68	196.63			
	Total	408				
Water Sensitivity	Illiterate	10	175.50	1.035	.793	
	Primary&Lower-SecondaryEducation	228	207.94			
	Upper-SecondaryEducation	102	204.23			
	University	68	197.64			
	Total	408				

Table 5 demonstrates the results of the analysis of the Kruskal Wallis H test regarding the effect of secondaryschoolstudents’ havingdifferentfathereducationlevels on theirwaterliteracylevels.

According to the results of the analysis, a significant difference was found in the water literacy levels of secondary school students with different father education levels in the “water conservation” sub-dimension of the scale [x^2(df=3; n=408) =20.532; p<,05]. Considering the mean rank of the participants’ paternal education levels, those with illiterate paternal education (mean=51.40) and those with paternal education level at primary and lower-secondary school (meanrank=203.48), upper-secondary school (meanrank=203.97), and university (meanrankrank=231.25) were found to be significantly different from those with paternal education level as illiterate, and this significance is not in favour of the latter. This finding can be interpreted as thelevel of water literacy in the “water conservation” sub-dimension of the scale increases as much as the education level of father increases.

According to the results of the analysis, no significant difference was found in the “water awareness” sub-dimension of the scale in the water literacy levels of secondary school students with different paternal education levels [x^2(df=3; n=408) =6.558; p> ,05].

According to the results of the analysis, no significant difference was found in the water literacy levels of the secondary school students with different paternal education levels in the “water sensitivity” sub-dimension of the scale [x^2(df=3; n=408) =1.035; p> ,05].

Table 6. *Kruskal-Wallis H test results of the participants' water literacy levels by monthly family income level variable*

	Monthlyincome	N	MeanRank	x^2	p	Different U
Water Conservation	Lower	168	212.79	4.127	.127	
	Middle	188	205.25			
	Upper	52	174.99			
	Total	408				
Water Awareness	Lower	168	225.34	9.006	.011	1-2
	Middle	188	190.99			1-3
	Upper	52	186.03			
	Total	408				
Water Sensitivity	Lower	168	216.38	9.262	.010	1-2
	Middle	188	186.13			3-2
	Upper	52	232.55			
	Total	408				

Table 6 shows the results of the analysis of the Kruskal Wallis H test regarding the effect of secondary school students having different family income levels on their water literacy levels.

According to the results of the analysis, no significant difference was found in the water literacy levels of the secondary school students with different family income levels in the "water conservation" sub-dimension of the scale [x^2(df=2; n=408) =4.127; p>,05].

According to the results of the analysis, a significant difference was found in the "water awareness" sub-dimension of the scale in the water literacy levels of secondary school students with different family income levels [x^2(df=2; n=408) =9.006; p<,05]. Considering the mean rank of the participants' family income levels, a significant difference between secondary school students with lower family income (mean rank=225.34) and those with middle (mean rank=190.99) and high (mean rank=186.03) income levels was found in favour of students with lower family income status.

According to the results of the analysis, a significant difference was found in the water literacy levels of secondary school students with different family income levels in the "water sensitivity" sub-dimension of the scale [x^2(df=2; n=408) =9.262; p<,05]. Considering the mean rank of the participants' family income levels, a significant difference was found between the secondary school students with middle family income level (mean rank=186.13) and those with lower (mean rank=216.38) and high (mean rank=232.55) income levels were found, which was against students with middle income levels.

Table 7. *Kruskal-Wallis H test results of the participants' water literacy levels by daily internet usage level variable*

	Daily Internet Usage	N	MeanRank	x^2	p	Different U
Water Conservation	None	29	124.14	14.888	.005	2-1
	Lessthan1hour	77	212.16			3-1

	1-3hours	155	213.49			4-1
	4-6hours	83	208.09			5-1
	6+hours	64	205.27			
	Total	408				
Water Awareness	None	29	168.97	7.812	.099	
	Lessthan1hour	77	233.28			
	1-3hours	155	203.55			
	4-6hours	83	199.15			
	6+hours	64	195.21			
	Total	408				
Water Sensitivity	None	29	255.72	8.892	.064	
	Lessthan1hour	77	212.38			
	1-3hours	155	188.82			
	4-6hours	83	210.91			
	6+hours	64	201.47			
	Total	408				

Table 7 demonstrates the results of Kruskal Wallis H test regarding the effect of daily internet use of secondary school students on their water literacy levels.

According to the results of the analysis, a significant difference was found in the water conservation sub-dimension of the scale in the water literacy levels of secondary school students with different internet usage levels [x^2(df=4; n=408) =14.888; p<,05]. Considering the mean rank of the participants regarding their daily internet use, a significant difference was found between secondary students those who never used the internet (mean=124.14) and lessthan 1 hour a day (mean=212.16), 1-3 hours (meanrank=213.49), 4-6 hours (mean=208.09), and 6+ hours (mean=205.27), which was against those who did not use the internet. This finding can be interpreted as the use of the internet has a positive effect on raising awareness on water conservation.

According to the results of the analysis, no significant difference was found between the water literacy levels of secondary school students with different daily internet usage times in the “water awareness” sub-dimension of the scale [x^2(df=4; n=408) =7.812; p>,05].

According to the results of the analysis, no significant difference was found between the water literacy levels of secondary school students with different daily internet usage times in the “water sensitivity” sub-dimension of the scale [x^2(df=4; n=408) =8.892; p>,05].

Table 8. *Kruskal-Wallis H test results of theparticipants’ water literacy levels by residential area variable*

	ResidentialArea	N	MeanRank	RankSum	U	p
Water Conservation	Village	178	168.80	30047.00	14116.000	.000
	City	230	232.13	53389.00		
	Total	408				
Water Awareness	Village	178	195.53	34803.50	18872.500	.176
	City	230	211.45	48632.50		
	Total	408				
Water sensitivity	Village	178	222.27	39564.50	17306.500	.007
	City	230	190.75	43871.50		
	Total	408				

Table 8 presents the results of the analysis of the Kruskal Wallis H test regarding the effect of the areas, where the secondary school students reside, on their water literacy levels.

When the table is examined, the results of the U test regarding the “water conservation” sub-dimension of the water literacy scale scores of the secondary school students in relation to the residential units group variable are found. According to these results, secondary school students’ water literacy scores show a significant difference in the “water conservation” sub-dimension, in relation to the variable of residential areas [U=-5.400; p<.05]. While the mean rank of the people living in the village was 168.80, the mean rank of the people living in the city was 232.13. According to these findings, it can be said that the water conservation awareness level of secondary school students living in the city is higher than those living in the village.

There is no significant difference in the “water awareness” sub-dimension of the water literacy scale scores of secondary school students in relation to the variable of residential areas [U=-1.354; p>.05]. While the mean rank of those living in the village was 195.53, the mean rank of those living in the city was 211.45.

In relation to the residential units group variable of secondary school students’ water literacy scale scores, the U test results related to the “water sensitivity” sub-dimension are seen here. According to these results, the water literacy scores of secondary school students show a significant difference in the sub-dimension of water sensitivity in relation to the variable of residential areas [U=-2.685; p<.05]. While the mean rank of the people living in the village was 222.27, the mean rank of the people living in the city was 190.75. These findings suggest that the water sensitivity level of secondary school students living in the city is higher than those living in the village.

Table 9. *Kruskal-Wallis H test results of the participants’ water literacy levels by being in the natural environment variable*

	Being in thenaturalenvironment	**N**	**MeanRank**	**x^2**	**p**	**Different U**
Water Conservation	Rarely	96	194.22	2.570	.277	
	Sometimes	184	200.63			
	Often	128	217.78			
	Total	408				
Water Awareness	Rarely	96	206.29	1.753	.416	
	Sometimes	184	196.64			
	Often	128	214.45			
	Total	408				
Water Sensitivity	Rarely	96	232.14	7.018	.030	1-2
	Sometimes	184	197.63			1-3
	Often	128	193.65			
	Total	408				

Table 9 shows the results of the analysis of the Kruskal Wallis H test regarding the effect of secondary school students’ presence in the natural environment on their water literacy levels.

According to the results of the analysis, there was no significant difference in the water literacy levels of secondary school students in the “water conservation” sub-dimension of the scale [x^2(df=2; n=408) =2.570; p>,05].

According to the results of the analysis, no significant difference was found in the water literacy levels of secondary school students in the “water awareness” sub-dimension of the natural environment

[x^2(df=2; n=408) =1.753; p>,05].

The results of the analysis suggest that a significant difference was found in the “water sensitivity” sub-dimension of the scale in the water literacy levels of the secondary school students being in the natural environment [x^2(df=2; n=408) =7.018; p<,05]. Mann-Whitney U test was conducted to determine between which groups there were significant differences, and according to the results of its analysis, a significant difference was found between those who were rarely in the natural environment (mean rank=232.14) and those who were sometimes in the natural environment (mean rank=197.63), and those who were often in the natural environment (mean rank=193.65), in favour of those were rarely in the natural environment.

CONCLUSION AND DISCUSSION

The importance of protecting and using water maintains its importance in the past and present because water is one of the most vital elements necessary for life. Therefore, people’s attitudes on this subject and the level of their knowledge are always on the agenda and will continue to be on the agenda. In this study, water literacy levels of secondary school students were examined in relation to the variables of gender, class level, parental education status, daily internet use, residential area and frequency of being in the natural environment.

In the study, it was firstly examined whether the mean scores of secondary school students for the sub-dimensions of the water literacy scale differed significantly within the gender variable. As a result of the study, it was finalized that the mean scores of the students for the “water awareness”, “water conservation”, and “water sensitivity” dimensions in the water literacy scale did not differ within the gender variable. In parallel with this result, Wang, Chang and Liou (2019) and Tian, Wang and Wang (2021) also found in their multiple regression analysis that gender did not have a significant effect on water literacy. Küçük (2022), on the other hand, found in his study that the water literacy levels of lower- and upper-secondary students differed significantly in favour of girls in the “water conservation” dimension of the scale, but did not create a significant difference in other dimensions. Sözcü and Türker (2020b), Yentür, Sözcü and Aydınözü (2022), and Ekinci, Acıelma, Küçükseymen, Öztürk, Kubilay, Yelseli, and Toprak (2022) maintained different results from this study. In those studies, in which the water literacy levels of upper-secondary students were determined, they found a significant difference in all sub-dimensions of the scale according to the gender of the students and stated that this difference was in favour of female students. In the study, the researchers interpreted this difference as the fact that female students were more sensitive and conscious about water due to their personal characteristics brought about by gender difference. Febriani, (2017), on the other hand, found that women’s water literacy levels were lower than men’s. Given the result of this study, it can be stated that because water is one of the most important vital resources, this issue has reached a level that will affect people of all ages, all genders, and all segments of society, as is the case with many other issues today.

As a result of the research, while there was no significant difference in the water literacy levels of secondary school students at different class levels in the “water conservation” sub-dimension of the scale, a significant difference was found in the “water awareness” and “water sensitivity” sub-dimensions. While the mean scores of class 5 and 6 were higher in the “water awareness” dimension, it was concluded that class 6 students’ water sensitivity was higher in the “water sensitivity” sub-dimension. Yentür et al. (2022), in their study in which they determined the water literacy levels of upper-secondary students, defined differently from this study that there was a significant difference in the “water conservation” sub-dimension for the students in relation to the class level while a significant difference was not found among the students in the “water sensitivity” sub-dimension in relation to the class level. In the “water awareness” sub-dimension, a similar result was reached with this study, and the mean scores of students differed significantly based on the class level. Ekinci et al. (2022), in their studies with upper-secondary students, a significant difference was determined in all sub-dimensions of the water literacy scale in relation to the class level, and this difference was determined as a difference in favour of class 9 students. As in many subjects at each level of education, trainings on the importance of water use, water conservation, etc., which are either dependent or independent to environmental issues, are important in terms of raising awareness and generating consciousness on this issue. In this way, social awareness will also be ensured. When the results of the research are evaluated, it is seen that the average scores/levels of students in terms of water awareness and sensitivity are lower as the class level increases. This situation can be interpreted that the education provided in this regard remains insufficient once the level of education increases. Therefore, it can be stated that it is a necessity to include subjects related to water literacy in education programmes and textbooks to continue the development.

Among the other variables discussed in the study, there is the variable of parental education status, which may affect the water literacy levels of secondary school students. As a result of the research, it was concluded that as the mothers' education level increased, the "water conservation" level and awareness of the participants increased. In the "water awareness" sub-dimension of the water literacy level of those students in relation to maternal education status, a significant difference was found between those with maternal education status as illiterate and those with maternal education status as primary education, which was in favour of those with maternal primary education level. In the "water sensitivity" sub-dimension of the scale, there was no significant difference according to the education level of the mother. In parallel with this study, Yentür et al. (2022) found a significant difference in the "water awareness" dimension of the scale related to the educational status of the mother. However, unlike this study, they determined that there was no significant difference among students in the "water conservation" sub-dimension. Also, in the "water sensitivity" sub-dimension, there was a significant difference among them. Ekinci et al. (2022), on the other hand, showed a significant difference in the "water conservation" sub-dimension in their study, while no significant difference was found in the "water awareness" and "water sensitivity" dimensions in relation to the maternal education level. Sözcü and Türker (2020b), on the other hand, found a significant difference in all sub-dimensions of the scale between those whose mothers' education level is categorised as illiterate and whose mothers' education level is categorised as university.

According to the paternal education level of students, in the "water conservation" sub-dimension of the scale, a significant difference was found between those whose paternal education level was categorised as illiterate and those as primary and lower secondary school, upper-secondary school, and university. The significant difference is against the former category of paternal education level. Based on this finding, it can be stated that the level of water literacy in the "water conservation" sub-dimension of the scale increases as the education level of the father increases. There was no significant difference in the water literacy levels of students in the "water awareness" and "water sensitivity" sub-dimensions of the scale, based on the paternal educational status though. In the studies of Yentür et al. (2022), unlike this study, it was observed that there was a significant difference in the "water awareness" and "water sensitivity" dimensions of the water literacy scale, while there was no significant difference in the "water conservation" sub-dimension. In the study of Ekinci et al. (2022), in parallel with this study, they determined a significant difference related to students' paternal education level in the "water conservation" dimension, but they did not find a significant difference related to students' paternal education level in the "water sensitivity" sub-dimension. Unlike this study, they determined in their study that there was a significant difference in the dimension of "water awareness" and concluded that the water sensitivity of students increased as much as the paternal education level increased. Sözcü and Türker (2020) found significant differences in all sub-dimensions of the water literacy scale in their study. Significant difference was found in the "water conservation" and "water awareness" sub-dimensions of the scale, between those with paternal education level as primary school and those as university. In the "water sensitivity" sub-dimension, there were significant differences between those with paternal education level as primary school and those with paternal education level as upper-secondary school and university.

Considering the family income level variable, as a result of the research, there was a significant difference in the “water awareness” sub-dimension of the scale. However, there was no significant difference in the “water conservation” sub-dimension of the water literacy scale. Considering the mean rank of the participants’ family income levels, there is a significant difference between secondary school students with lower family income and those with middle- and upper-income levels, which is in favour of students with lower family income. On the other hand, the significant difference determined in the “water sensitivity” sub-dimension of the scale is against those with middle family income compared to those with lower- and upper-income levels. In their study that is parallel with this study, Yentür et al. (2022) concluded that family income status was not effective in the “water conservation” dimension of the water literacy scale, while it was concluded in both studies that the family income status was effective in the “water awareness” sub-dimension. In the sub-dimension of “water awareness” determined in both studies, it is remarkable that students with low family income are more conscious about water. Yentür et al. (2022) explained this situation in their study as the students living in low-income families were more interested in water-related research and they regarded the result of their research as an important data when the items forming water awareness were examined. Ekinci et al. (2022), on the other hand, concluded that students with lower- and upper-family income levels were more conscious about water conservation and water sensitivity than students with middle-income level, while water awareness is higher in students with middle-income level. Tian et al. (2021), in their multiple regression analysis, found that income had an effect on water literacy. Küçük (2022), on the other hand, found that family income had no effect on water literacy of lower-secondary and upper-secondary students.

In proportion to the results of the research, a significant difference was found in the “water conservation” sub-dimension of the water literacy levels of secondary school students with different internet usage times, which is in favour of students with more internet usage time. This result can be interpreted as the use of the internet has a positive effect on raising awareness on water conservation. There was no significant difference in the “water awareness” and “water sensitivity” sub-dimensions of the scale according to the internet usage time of students.

The water literacy scale scores of secondary school students showed significant differences in the sub-dimensions of “water conservation” and “water sensitivity” with regards to the residential area variable. As a result of the research, it was determined that secondary school students living in the city had higher awareness levels of water conservation and water sensitivities than those living in villages. It can be said that this situation stems from the fact that the problems related to water in cities are more than in villages. In the "water awareness" sub-dimension of the scale, it was determined that the residential area did not cause any difference among students.

In regard to the results of the research, a significant difference was found in favour of students living in the cities, for the “water conservation” dimension of the water literacy scale in relation to the residential area variable. This finding is in similar with the study of Küçük (2022) on lower- and upper-secondary students. In the “water awareness” dimension of the water literacy scale, there was no significant difference in favour of those living in any residential units. This finding is also in similar with the study of Küçük (2022). In the “water sensitivity” dimension of the water literacy scale, a significant difference was found in favour of students living in the villages. This finding differs with the study of Küçük (2022). Küçük (2022), in his study, concluded that the water literacy status of lower- and upper-secondary students in the “water awareness” sub-dimension of the water literacy scale did not differ in accordance with the residential area. Tian et al. (2021), as a result of the multiple regression analysis, conducted in their study that the residential area had an effect on water literacy. Sözcü and Türker (2020b) also tested whether the water literacy levels of upper-secondary students differed based on the region they live in. The results showed that water literacy levels in all sub-dimensions of the scale differed based on the geographical region in which upper-secondary students lived. This finding can be interpreted as the development or education level of the region where students live affects the water literacy levels of them.

The last variable discussed in the study was the situation of secondary school students being in the natural environment. No significant difference was found in the “water conservation” and “water awareness” sub-dimensions of the scale, related to students’ presence in the natural environment. Yet, in the “water sensitivity” sub-dimension, a significant difference was found in favour of those who were rarely in the natural environment in comparison to those who sometimes were in the natural environment and those who were often in the natural environment.

Water literacy can be added to environmental issues in order to make students gain water literacy in the primary education program.

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