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Examining the Water Literacy Levels of High School Students According to Some Variables

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Abstract

As the world population increases, the issue of using freshwater resources efficiently becomes more important. Using water, which is an indispensable resource for life, consciously and sustainably, to be sensitive, in short, to be water literate is a necessity for all citizens of the world. Turkey is a country living water scarcity. Therefore, it is a country where water literacy studies should conduct. As it is the first comprehensive study of water literacy in Turkey, the present study becomes significant in the field. This study aims to determine the water literacy levels of high school students in Turkey. In the present study, Data was gathered through the Water Literacy Questionnaire. The Water Literacy Questionnaire was designed by Sözcü and Türker (2020) and consists of three sections. The questionnaire was applied to 3202 high school students living in different regions. As a result of the study, the water literacy of high school students was at 'Good Level' in general. When the sub-dimensions of water literacy were analyzed, high school students were very good at water-saving and good at water sensitivity, but remain at medium level in terms of water consciousness. In light of the results, some recommendations have been made to increase water literacy.

Keywords: Water-saving, Water sensitivity, Water consciousness, Water literacy, High school students.

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Contribution of this paper to the literature
This study aims to determine the water literacy levels of high school students in Turkey.

1. Introduction

"What is the most important factor for the continuity of all living or inanimate beings on the planet we live in and to be passed on to future generations?" the vast majority of people will respond as "water". Water is of great importance for the continuation of life. As a result of the hydrological cycle, the water circulating between the lithosphere, atmosphere, hydrosphere, and biosphere. Although it is considered an infinite resource by most because it occupies two-thirds of the globe, this is not the case. The total amount of water on Earth is 1.2 billion km3. Salty waters in seas and oceans, which are not suitable for direct drinking and agricultural irrigation, constitute 97.5% of this amount. The distribution of water on the Earth's surface is extremely uneven. Only 3% of the water on the surface is fresh; the remaining 97% resides in the ocean. Of freshwater, 79% (2.39% of total water assets) reside in glaciers, 20% (0.6% of total water asset) underground, and less than 1% (0.03% of the total water asset) is on the surface and atmospheric waters.

Data prepared by the United Nations (2007) show that there is an imbalance in the availability of freshwater, which is already very limited. 36% of the available water resources in the world are distributed to Asia, 25% to South America, 15% to North America, 11% to Africa, 8% to Europe and 5% to Oceania. The fact that the highest proportion of the Asian continent accommodates 60% of the world population reveals the insufficiency of the water potential. If the total available water in the world is distributed equally to the world population, there will be 5000-6000 m^3 of water per person per year. Falkenmark, Lundqvist, and Widstrand (1989) introduced an indicator (The Falkenmark Water Stress Indicator) for water stress that expresses the level of water scarcity in a certain region as the amount of renewable freshwater that is available for each person each year. According to the Falkenmark Water Stress Indicator, if the amount of renewable water in a country is above 1,700 m^3 per person per year, water scarcity is rare or only in certain areas. If the amount of renewable water in a country is below 1,700 m^3 per person per year, that country is said to be experiencing water stress; below 1,000 m^3 it is said to be experiencing water scarcity; and below 500 m^3, absolute water scarcity. According to the UN (2012) report, while 1 billion people in the world live below the water stress limit, approximately one-fifth of the World population has difficulties to access healthy drinking water. It is estimated that by 2025, about 3 billion people will experience water scarcity.

Increasing global temperature averages along with the increase in the world population and the decrease of freshwater resources due to misuse of water, raise concerns that if future generations may reach clean water. In Turkey, where the population growth rate is still above the world average, the water amount per person per year is falling steadily. According to The General Directorate of State Hydraulic Works (*SHW*) (2020) data, the annual amount of water per person, which was 1652 m^3 in 2000, decreased to 1544 m^3 in 2009 and 1346 m^3 in 2020. Local sources and dense population qualify Turkey as a water-rich country. Hence, referring to official data, Turkey is a country suffering from water shortage. It is clear that it is in danger of being included among the countries considered as "water-poor (Aksay, Ketenoğlu, & Latif, 2005; Karadağ, 2008; Muluk et al., 2013). According to data from Turkey Statistical Institute (TSI), the amount of water available per person in Turkey expected to decrease 1120 m^3 / year in 2030. This expectation may be valid if available resources are not adversely affected by 2030. In other words, to leave clean and potable water to future generations, water resources must be well protected and rationally managed (Türkyılmaz, 2010). When the usable water potential per capita in Turkey evaluated according to 'The Falkenmark Water Stress Indicator', Turkey is among the countries of water stress/pressure. This situation reveals the importance of saving water and the conscious use of water.

The success of the work done in the conscious use of water and conservation by the government in Turkey is significant. Also, the approach of individuals and the steps is essential for sustainable water use. For this reason, building a society that has high water sensitivity, conscious about water, and supports the steps taken by the state in terms of water-saving will also provide significant advantages. In a society of individuals with a high level of water literacy, the steps that the state should take in terms of efficient use and savings of water resources will be much simpler.

Although the concept of literacy was previously used only for people who can read and write or included in the education system, today, its meaning broadened further. It was defined as the ability to perform various mental operations (understanding, explanation, description, interpretation, association, etc.) on a subject, event, or phenomenon using visual, literary materials. As stated in the study published by UNESCO (2006) the concept of literacy, which was expressed only as alphabet literacy before 1950, has reached its current definition after the UNESCO general conference in 1978. In the late 1980s, the definition of literacy developed in line with the developments in globalization and information-communication technologies. In the 1987 Toronto seminar, it was emphasized that the concept of literacy is more than literacy and computation. According to Ahmed (2011) literacy is a process that includes the continuous learning of individuals, enables them to reach their personal goals, increases their knowledge and potential, and takes an active place in society.

The importance of water for life is increasing day by day. Therefore, water literacy needs to take its place on the agenda for water use, protection, and sustainability to future generations. There is a need for individuals and society who have basic knowledge about water, have a positive attitude towards water, and transform it into a lifestyle. Topics such as having high knowledge and awareness of water, being a pioneer in water-saving and sustainable use of water, having a positive attitude and behavior towards water are also expressed as water literacy. Every year, TUBITAK (Scientific and Technical Research Council of Turkey) organizes research projects competition for high school and middle school students. Water literacy was included in the TUBITAK 2020 competition project guide. In the project guide prepared by the institution, water literacy and water literate individual was defined as follows.

"Water literacy is the ability of individuals to understand about water, water resources, and basic information on all topics covering water, sustainable use of water, water management, the importance and necessity of water for life. Also, ones' ability to find solutions to problems encountered by using scientific information about water and to clarify them is called water literacy.

Individuals who know how to distribute and treat daily water, as well as maintaining the quality and safety of the water, and knowing how much water is used and exactly what it is used for are called water literate (TÜBİTAK, 2020).

Dinç (2018) defines water literacy as an awareness and responsibility that allows individuals with general knowledge about water to know and predict in which situations water will *suffer*. Sammel and McMartin (2014) states that water literate individuals are calculating the individual water footprint, taking into account in daily life and operating on the sustainable use of water. According to Xu, Wang, Wang, and Zhang (2019) water knowledge and water attitude are the main factors affecting citizens' water behavior. Water attitude consists of three dimensions: the sense of water, water responsibility, and water ethics. It will be easier to increase the water literacy levels of individuals with a positive water attitude.

If water literacy is categorized, it is gathered under three titles, which are the continuation and development of each other: practical water literacy, live water literacy, and social water literacy. Having safe water that is vital for all beings on the planet, distinguishing unhealthy water, and understanding the importance of water in daily life can be considered as practical water literacy. Live water literacy is the ability to control water recycling processes by using necessary and sufficient amount of water at home and in social life. Social water literacy refers to the willingness to act responsibly and make reasonable decisions for society as a whole in terms of water usage (Otaki, Sakura, & Otaki, 2015). Some curriculum studies have been carried out by several researchers to increase the number of water literate individuals (Brody, 1995; Covitt, Gunckel, & Anderson, 2009). The first program framework for water educators, scientists, and resource managers was prepared by Brody (1995). Within the framework of water education carried out by Brody (1995) attention was drawn to the concept-skill-interaction relationship by drawing attention to the interdisciplinary quality of water. Covitt et al. (2009) based on Brody (1995) developed a framework based on establishing connections from different angles which will include natural and human engineering systems, to improve water literacy starting from atoms and molecules. With the "International Water Literacy Symposium (Wheeler, 2012) held at International Christian University in Tokyo in September 2012, studies on water literacy have increased and water literacy has begun to be handled from different perspectives. Wood (2014) conducted a comprehensive doctoral thesis study, including a questionnaire, focus group discussions and observations at schools, about reviewing current water education and water literacy in East Midlands, England. Hui-Shuang He (2018) was conducted a study with 303 people between the ages of 6-69 to determine the water literacy levels in four different regions of China. Wang, Chang, and Liou (2019) conducted a study that aims to determine the change in levels of water literacy before and after participation in water conservation activities of 620 participants over the age of 18. Moreno-Guerrero, Romero-Rodríguez, López-Belmonte, and Alonso-García (2020) applied ten sessions of 55 minutes each with four groups of 30 participants in the first year of middle-school to investigate the impact of flipped learning practices in the development of water literacy. Hui-Shuang He (2018) argues that water literacy level should be high for a society that saves water, concerned about the future of water, and participates in activities. Hui-Shuang He (2018) stated that water behavior is at the center of the water literacy scale he developed. In their study, Sherchan et al. (2016) stated that courses on water literacy are needed to compensate students' lack of basic knowledge about water. They planned the content of the course as in Figure 1 stating that water literacy courses may be organized with a multi-disciplinary approach to inform the public about water, which is indispensable for life today and the future, and to build a water literate society.

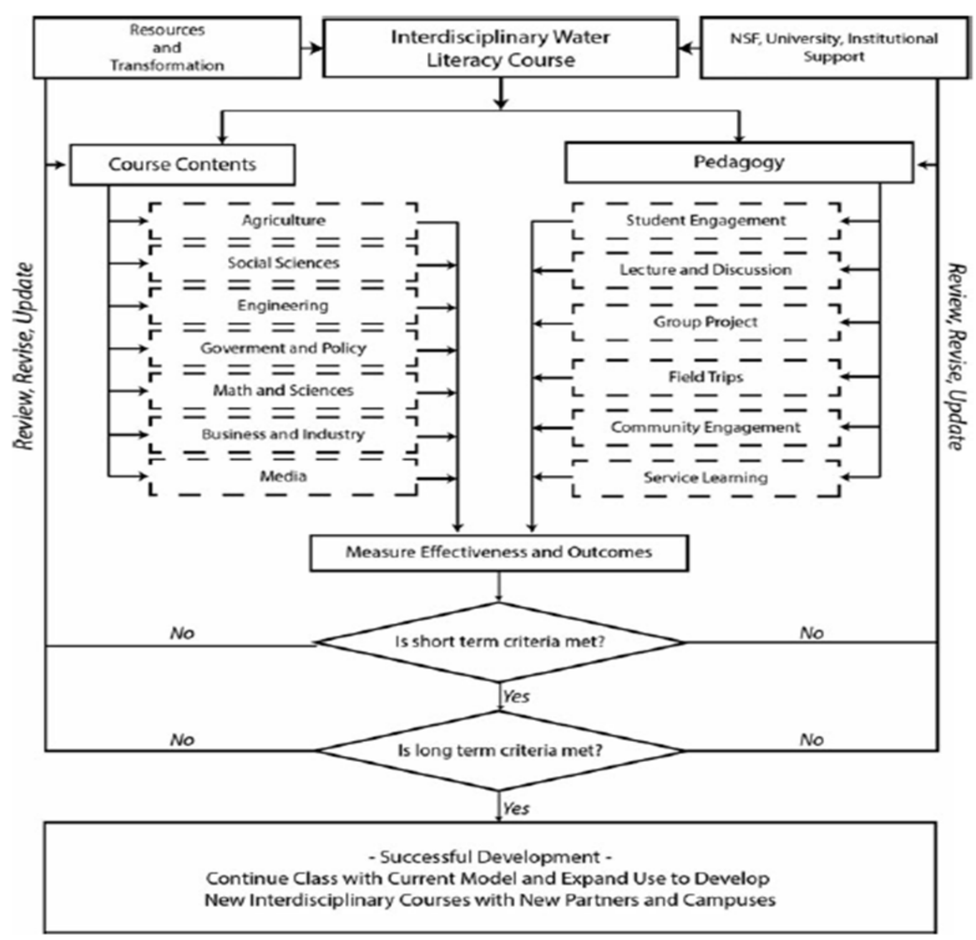

Figure 1. Learning components and performance evaluation in an interdisciplinary course implementation model on water literacy.
Source: Sherchan et al. (2016).

As can be seen in Figure 1, if a course or lesson will be organized for the development of water literacy, it is impossible to achieve this with a single discipline. A multi-disciplinary approach is required for an element that affects all life and activities, such as water. Forbes, Brozović, Franz, Lally, and Petitt (2018) determined that after the multidisciplinary courses, undergraduate students increased their knowledge about water. This result reveals the importance of the multidisciplinary approach. In this context, "Water Ambassadors Training and Awareness Raising Technical Support Project" has been prepared. Students, teachers, and mothers were determined as the target audience. The project carried out by the Ministry of Environment and Urbanization and funded by the European Union and the Republic of Turkey. To increase water awareness many activities were organized within the scope of the project. These activities include preparing cartoons, organizing stage shows with the participation of expert guests under the title of causes of water, and conducting teacher training. Also, by training the project partner institutions staff, Ministry of National Education (MNE), and State Hydraulic Works (SHW) activities were organized to raise awareness of more than 40,000 people in water and environment in pilot regions (URL-1, URL-2). Similarly, it is planned to reach pre-school, primary, and secondary school students in 19 pilot provinces between 2019-2021 with the 'Water Ambassadors in Education' project, which was carried out in partnership with MNE Directorate-General for Basic Education and SHW. Within the scope of the project, it is aimed to increase the sensitivity and awareness of students about the water crisis in the world and our country, the correct use of water, and savings in water consumption (URL-3).

All of the mentioned studies have great importance and value to reach a society where water literate individuals are the majority and to leave healthy and accessible water for future generations. Maclean and Bana (2015) emphasizes the need for regulations (policies, plans, appropriate stakeholder engagement approaches) that can integrate various information, values , and interests to decision making to ensure sustainable water management. Education should be at the center of these regulations. Starting from the fact that education starts in the family, parents also have a significant duty in reaching the water literate community goals. As the role model, the role of our parents, people who shape our many attitudes and behaviors in our lives is significant. Formal education institutions also have a great role in the education of parents. To reach a water literate society, it is essential to have a comprehensive water education from pre-school education, which is the first level of formal education, to high school education, which is the last level of compulsory education in Turkey, even in all departments in university education. In their study, Ursavaş and Aytar (2018) emphasized the importance of giving information about the basic concepts of water, especially in the pre-school period.

From the very beginning of the education and training processes, understanding the basic information about water and the qualities related to the structure of the water is essential to achieve the goal of reaching the society consisting of water literate individuals. In this process, as a role model, all branch teachers have an important duty in transferring knowledge. Among all branches, social studies and science courses at secondary school level and geography and biology courses at high school level are more significant due to their scope. In addition to the teachers, these objectives might also be considered in the preparation of the curriculums and textbooks of some courses.

In connection with all these, the high school period is seen as a period in which students make great progress in becoming a society-compatible individual and gaining their social sensitivity and clarifying their status. The effects of the education given until the end of the high school period on individuals and society will be more permanent in terms of habituation and being an example. For this reason, it is essential to determine the water consciousness, water-saving, and water sensitivity levels of students in the high school period. In this way, it will be possible to examine the results of the education that the students receive about water until high school education. The results are expected to guide the ministry in planning the curriculums and in the activities to be organized. In this regard, this study aims to determine the water literacy level of high school students from different regions of Turkey. Finally, the research questions that guided the study were:

RQ1: What are the water literacy levels of high school students?

RQ2: Do high school students' water consciousness, water-saving and water sensitivities significantly differ according to the; Gender, school type, region they live in, grade level, GPA, mother, and father education levels, knowing an institution related to water and participating in the water-related activity?

2. Material and Methods

2.1. Research Model

The research was designed in the screening model, which is the most used model in the social sciences. A screening model is a research approach that aims to describe either the past or the present situation as it exists. In the screening model, without changing the events, objects and individuals, and making an experimental intervention to them, individuals' beliefs, attitudes, opinions, behaviors, expectations, and characteristics of a particular phenomenon or event aimed to determine by asking questions such as what, where, how often, at what level, how, with the help of surveys (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2014; Gürbüz & Şahin, 2016; Karakaya, 2011; Karasar, 2012). As it aimed to describe the water literacy of high school students as they exist, the "instant screening" model was used among the screening models.

2.2. Study Group

High school students in Turkey were the universe of the study. The sample of the study was 3202 high school students (9th-10th-11th. and 12th grade) selected from within Turkey overall. The purposeful sampling method, is a form of non-probability sampling, was chosen as the sampling method. The purpose of purposeful sampling is to select information-rich cases whose study will illuminate the questions under study (Patton, 1990). Purposeful sampling requires access to key informants in the field who can help in identifying information-rich cases (Suri, 2011).

In the selection of 3202 high school students across Turkey, maximum variation sampling was preferred. Regarding the problem examined in maximum variation sampling, it is possible to determine the different situations in itself and to conduct the study on these situations (Büyüköztürk et al., 2014). A maximum variation sample is constructed by identifying key dimensions of variations and then finding cases that vary from each other as much as possible. This sampling yields: "(1) high quality, detailed descriptions of each case, which are useful for documenting uniqueness, and (2) important shared patterns that cut across cases and derive their significance from having emerged out of heterogeneity (Patton., 2002). The evaluator using a maximum variation sampling strategy would not be attempting to generalize findings to all people or all groups but would be looking for information that elucidates programmatic variation and significant common patterns within that variation (Patton, 1990).

Level 1 (NUTS 1 Nomenclature of Territorial Units for Statistics) regional classification determined by TSI (Turkey Statistical Institute) taken as a basis in determining the maximum variation sample. These regions determined in 2002 within the framework of European Union harmonization. Figure 2 shows this region classification.

Figure-2. TSI Turkey level-1 statistical area classification.

Source: The map was created according to the TSI classification.

As can be seen in Figure 2 Turkey divided into 12 regions according to Level-1. According to the population of these regions, the number of participants included in the study changes due to reasons such as accessibility and economy. In this context, personal information of high school students included in the study is given in Table 1.

Table-1. Information about participants.

Variables	n	%		n	%
Gender			Mother Education Level		
Female	2192	68.5	Illiterate	221	6.9
Male	1010	31.5	Primary School	1739	54.3
Grade Level			High School	753	23.5
9th grade	727	22.7	University	431	13.5
10th grade	1017	31.8	Postgraduate	58	1.8
11th grade	754	23.5	Father Education Level		
12th grade	704	22.0	Illiterate	41	1.3
School Type*			Primary School	1292	40.3
Project public school	1787	55.8	High School	1058	33.0
Public school without exam	1093	34.1	University	665	20.8
Private school	322	10.1	Postgraduate	146	4.6
Region**			Grade Average		
Istanbul	411	12.8	50-60	279	8.7
West Marmara	91	2.8	61-75	752	23.5
Aegean	260	8.1	76-90	1461	45.6
Mediterranean	269	8.4	91-100	710	22.2
West Anatolia	590	18.4	Knowing the institution name		
East Marmara	209	6.5	Yes	2338	73.0
West Black Sea	455	14.2	No	864	27.0
Central Anatolia	310	9.7	Participate in activities on water		
East Black Sea	153	4.8	Yes	488	15.2
Northeast Anatolia	90	2.8	No	2714	84.8
Middle East Anatolia	130	4.1			
Southeastern Anatolia	234	7.3			
Total	3202	100	Total	3202	100

Note: **Regulated to Level-1 in the regional classification created by TSI.
*Some high schools in Turkey accept students according to the high school entrance exam (project schools), while some are accepting students without examination.

As can be seen in Table 1 68.5% (n = 2192) of the students in the study group are female and 31.5% (n = 1010) are male. It is noteworthy that, according to the grade levels of the students, they were distributed close to each other, 55.8% of the participants' study in project schools, 34.1% in schools that take students without examination, 10.1% in private schools. When the distribution of students' cities according to their regions examined, Istanbul, West Anatolia, and West Black Sea regions have the highest rates while regions with a low population such as Northeast Anatolia and West Marmara have the lowest rates. Students' grade point averages were mostly within the range of 76-90 points (45.6%) and at least 51-60 (8.7%).

2.3. Data Gathering

"Water Literacy Survey" designed by Sözcü and Türker (2020) was used as a data collection tool in the study. The survey consists of two parts. The first part consists of questions that to be determinative on high school students' water literacy. In the second part, there was a water literacy scale. The scale consists of 3 sub-dimensions called water saving, water consciousness, and water sensitivity. Water-saving sub-dimension consists of 13 items, water consciousness sub-dimension consists of 12 items, and water sensitivity sub-dimension consists of 5 items. The scale consists of 30 items on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). In the scale, 25 items have positive expressions, and five items have negative expressions. The lowest score that can be obtained from the scale is '30' and the highest score is '150'. Cronbach Alpha reliability value of the scale was found to be .894. Data on the scale, which has reliable and good substance characteristics, were collected online from high school students voluntarily in May 2020. The online questionnaire was prepared on Google forms and delivered to the students by sharing the link address and through their teachers.

2.4. Data Analysis

The data were processed and analyzed using SPSS 20 software. Since the data was collected through an online questionnaire, no lost data occurred. Five items that have negative expressions were entered into the program by the reverse coding method. The normality of the processed 3202 data was analyzed graphically (Histogram and stem-leaf graph, normal Q-Q graph, box graph) and the coefficient of kurtosis and skewness. The normality of variables assessed by either statistical or graphical methods (Tabachnick & Fidell, 2013). The kurtosis and distortion values of the data, which are compatible with the graphical method, were also examined.

In a large sample, a variable with statistically significant skewness often does not deviate enough from normality to make a substantive difference in the analysis. In other words, with large samples, the significance level of skewness is not as important as its actual size (worse the farther from zero) and the visual appearance of the distribution. In a large sample, the impact of departure from zero kurtoses also diminishes. For example, underestimates of variance associated with positive kurtosis (distributions with short, thick tails) disappear with samples of 100 or more cases; with negative kurtosis, underestimation of variance disappears with samples of 200 or more (Waternaux, 1976, cite. Tabachnick and Fidell (2013)). In this context, the kurtosis and skewness coefficients of the data are in the reference range.

After providing normality conditions, scale averages, and the equivalence of these averages in the hundred point system were used to determine the water literacy level of high school students. As seen in Table 2 the scale average classified as; strongly disagree 1 point, strongly disagree – disagree 1-2 intervals, disagree – neutral 2-3 intervals, neutral – agree 3-4 intervals, agree – strongly agree 4-5 intervals, strongly agree 5 points. The rating used by the Ministry of Education was used as the equivalent of the scale averages in the hundred point system (Example: Water Awareness scale average: 3.32 * 100/5 = 66.2 points average). Accordingly, 0-49 points failed, 50-59 points pass, 60-69 points are moderate, 70-84 points are good, and 85-100 points are very good.

In the next step, the relationship between the independent variables and the water literacy sub-dimensions was determined with which tests to test. Independent sample t-test was used to find the differences between the variables such as gender status, participation in water activity, and the institution name knowing status variables and the sub-dimensions of the scale (when variances are not equal). A one-way analysis of variance (ANOVA) test was performed in cases where the independent variable consists of three or more categories (school type, class level, region, grade point average, mother, and father education level). In cases where the homogeneous distribution of variances provided, Scheffe, which is one of the multiple comparison tests (Post Hoc Test), and Tamhane's T2 test was applied when not provided.

3. Findings

This section presents the findings of the data obtained within the framework of the research problem and sub-problems. Findings for each sub-problem are presented in tables and explained. Table 2 shows the findings of the water literacy levels of high school students.

Table-2. Water literacy levels of high school students according to scale average and scores.

	Water-saving					Water consciousness					Water sensitivity				
Scale expressions	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	4,44					3,32					3,95				
	Agree-Strongly agree					Neutral-Agree					Neutral-Agree				
	Points Value: 88,8 (Very Good)					Points Value: 66,4 (Moderate)					Points Value: 79,0 (Good)				
	Scale average:3,91 (Neutral-Agree) Average score:78,2 (Good)														

The scale averages according to the 5-point Likert scale, and the equivalents of these averages in a hundred point system are given in Table 2. Accordingly, the scale average in the water-saving sub-dimension of the scale was at the level of agree-strongly agree, and its response in terms of points was 88.8. Scale averages of water consciousness and water sensitivity sub-dimensions were at the level of neutral - agree. However, while the average score of the water consciousness sub-dimension was 66.4, the average score of the water sensitivity sub-dimension was 79. While the overall average of the scale was in the neutral-agree range, the average score was 78.2. The findings of the t-test conducted to determine whether the water literacy of high school students make a significant difference for gender are given in Table 3.

Table-3. Analysis of high school students' water literacy according to gender variable.

Scale	Gender	N	$\bar{X}$	Ss	Sd	t	p
Water-saving	Female	2192	58.32	5.72	3200	8.06	.000*
	Male	1010	56.46	6.74			
Water consciousness	Female	2192	40.09	8.52	3200	1.85	.064
	Male	1010	39.46	9.80			
Water sensitivity	Female	2192	20.13	3.80	3200	7.62	.000*
	Male	1010	18.94	4.71			
General	Female	2192	118.5	13.59	3200	6.87	.000*
	Male	1010	114.8	15.04			

As can be seen in Table 3, there was a significant effect of gender on high school students' water literacy overall scores [$t_{(3200)}$= 6.82, p<0.05]. Likewise, the scores of high school students on the water-saving [$t_{(3200)}$= 8.06, p<0.05] and water sensitivity [$t_{(3200)}$=7.62, p<0.05] sub-dimensions were also differ significantly according to gender. However, water consciousness sub-dimension scores were not differ significantly by gender [$t_{(3200)}$=1.85, p<0.05]. In other words, while the gender of high school students caused a significant difference in their water savings, water consciousness, and general status of water literacy, they did not make a significant difference in their water sensitivity. One-Way ANOVA results of water literacy according to the grade levels of high school students are given in Table 4.

Table4. One-way ANOVA results of water literacy according to grade levels of high school students.

Scale	Grade Level	N	$\bar{X}$	S	F	p	Significant Difference (Scheffe Test)
Water-saving	1. Grade 9	727	57.46	6.07	6.52	.000*	1-4
	2. Grade 10	1017	57.64	6.38			2-4
	3. Grade 11	754	57.32	6.44			3-4
	4. Grade 12	704	58.61	5.30			
	Total	3202	57.74	6.12			
Water consciousness	1. Grade 9	727	40.45	9.08	1.28	.277	
	2. Grade 10	1017	39.82	8.81			
	3. Grade 11	754	39.67	9.09			
	4. Grade 12	704	39.65	8.83			
	Total	3202	39.89	8.94			
Water sensitivity	1. Grade 9	727	19.51	4.35	2,67	.051	
	2. Grade 10	1017	20.03	4.02			
	3. Grade 11	754	19.62	4.26			
	4. Grade 12	704	19.77	3.97			
	Toplam	3202	19.76	4.15			
General	1. Grade 9	727	117.4	14.38	1.26	.285	
	2. Grade 10	1017	117.5	14.47			
	3. Grade 11	754	116.6	14.43			
	4. Grade 12	704	118.0	13.16			
	Total	3202	117.3	14.17			

Note: *p<0.05.

As can be seen in Table 4, high school students' water literacy overall scores did not differ significantly according to the grade levels they are studying [$F_{(3,3198)}$=1,26, p>0,05]. Likewise, water consciousness [$F_{(3,3198)}$=1,28, p>0,05] and water sensitivity [$F_{(3,3198)}$ =2,67, p>0,05] scores were not differ significantly in terms of students' grade levels. However, there was a significant difference in students' water-saving scores according to their grade levels [$F_{(3,3198)}$ =6,52, p <0,05]. Post hoc analyses using the Scheffé post hoc criterion for significance indicated that the water-saving average score of students was significantly lower in the 12th-grade ($\bar{X}$= 5,30) than in the 9th-10th, and 11th grade respectively ($\bar{X}$= 6.07 / 6.38 / 6.44). Table 5 shows the results of the One-Way ANOVA test of water literacy according to the mother education levels of high school students.

As can be seen in Table 5, results indicated a non-significant relation between students' water literacy scores and students' mother's educational background [$F_{(4,3197)}$=1,03, p>0,05]. However, there was a significant effect of mother's educational background on water-saving [$F_{(4,3197)}$ =3,41, p<0,05], water consciousness [$F_{(4,3197)}$=4,64, p<0,05], and water sensitivity [$F_{(4,3197)}$=1,03, p<0,05] sub-dimensions of the scale. Post hoc analyses using the Scheffé post hoc criterion for significance indicated that the water-saving and water sensitivity average scores of students was significantly higher in the undergraduate level of mothers' education ($\bar{X}$=58,47/20,67) than in the illiterate level of mothers' education ($\bar{X}$=56,69/18,76).

Table-5. One-way ANOVA results of water literacy according to mother's education levels of high school students.

Scale	Mother's Educational Background	N	$\bar{X}$	S	F	p	Significant Difference (Scheffe Test)
Water-saving	1. Illiterate	221	56.69	6.89	3.41	.009*	1-4
	2. Primary School	1739	57.64	6.11			
	3. High School	753	57.88	5.87			
	4. Undergraduate	431	58.47	5.46			
	5. Postgraduate	58	57.43	9.65			
	Total	3202	57.74	6.12			
Water consciousness	1. Illiterate	221	40.96	9.48	4.64	.001*	1-4
	2. Primary School	1739	40.14	8.64			
	3. High School	753	39.51	9.33			
	4. Undergraduate	431	38.66	8.88			
	5. Postgraduate	58	42.39	9.97			
	Total	3202	40.96	8.94			
Water sensitivity	1. Illiterate	221	18.76	4.55	9,18	.000*	1-4
	2. Primary School	1739	19.66	4.10			
	3. High School	753	19.70	4.27			
	4. Undergraduate	431	20.67	3.60			
	5. Postgraduate	58	20.44	5.00			
	Total	3202	19.76	4.15			
General	1. Illiterate	221	116.4	14.82	1.03	.386	
	2. Primary School	1739	117.4	13.84			
	3. High School	753	117.1	14.47			
	4. Undergraduate	431	117.8	13.72			
	5. Postgraduate	58	120.2	19.50			
	Total	3202	117.3	14.17			

Note: *p<0.05.

On the other hand, in the water consciousness sub-dimension, the scores of high school students whose mother was illiterate ($\bar{X}$=40.96) were significantly higher than the scores of those whose mothers were university graduates ($\bar{X}$=38.66). One-Way ANOVA results of water literacy according to the father education levels of high school students are given in Table 6.

Table-6. One-way ANOVA results of water literacy according to father education levels of high school students.

Scale	Father's Educational Background	N	$\bar{X}$	S	F	p	Significant Difference (Scheffe Test)
Water-saving	1. Illiterate	41	56.26	7.29	3.07	.015*	2-4
	2. Primary School	1292	57.44	6.39			
	3. High School	1058	57.73	6.16			
	4. Undergraduate	665	58.28	5.07			
	5. Postgraduate	146	58.39	7.07			
	Total	3202	57.74	6.12			
Water consciousness	1. Illiterate	41	39.92	9.36	2.76	.026*	2-4
	2. Primary School	1292	40.33	8.99			
	3. High School	1058	39.91	8.73			
	4. Undergraduate	665	38.93	8.96			
	5. Postgraduate	146	40.15	9.65			
	Total	3202	39.89	8.94			
Water sensitivity	1. Illiterate	41	18.82	4.66	9.41	.000*	2-3 2-4
	2. Primary School	1292	19.32	4.25			
	3. High School	1058	19.83	4.10			
	4. Undergraduate	665	20.47	3.80			
	5. Postgraduate	146	20.11	4.43			
	Total	3202	19.76	4.15			
General	1. Illiterate	41	115.0	16.04	0.78	.533	
	2. Primary School	1292	117.1	14.28			
	3. High School	1058	117.4	13.99			
	4. Undergraduate	665	117.6	13.59			
	5. Postgraduate	146	118.6	16.38			
	Total	3202	117.3	14.17			

Note: *p<0.05.

As can be seen in Table 6 results indicated a non-significant relation between students' water literacy scores and students' father's educational background $[F_{(4,3197)}=0,78, p>0,05]$. However, there was a significant effect of father's educational background on water-saving $[F_{(4,3197)}=3,07, p<0,05]$, water consciousness $[F_{(4,3197)}=2,76, p<0,05]$, and water sensitivity $[F_{(4,3197)}=9,41, p<0,05]$ sub-dimensions of the scale. Post hoc analyses using the Scheffé post hoc criterion for significance indicated that the water-saving and water sensitivity average scores of students was significantly higher in the high school level of fathers' education ($\bar{X}$=58,28/20,47) than in the primary school level of fathers' education ($\bar{X}$=57,44/19,32). On the other hand, in the water consciousness sub-dimension, the scores of high school students whose father was primary school graduate ($\bar{X}$=40,33) were significantly higher than the scores of those whose fathers were university graduates ($\bar{X}$=38,93). One-Way ANOVA results of water literacy according to grade point averages (GPA) of high school students are given in Table 7.

Table-7. One-way ANOVA results of water literacy according to grade averages of high school students.

Scale	Grade Point Average	N	$\bar{X}$	S	F	p	Significant Difference (Scheffe Test)
Water-saving	1.50-60	279	55.84	6.70	29.44	.000*	1-3
	2.61-75	752	56.52	7.57			1-4
	3.76-90	1461	58.20	5.20			2-3
	4.91-100	710	58.80	5.36			2-4
	Total	3202	55.84	6.12			
Water consciousness	1.50-60	279	40.27	9.25	0.36	.782	
	2.61-75	752	39.66	9.14			
	3.76-90	1461	39.95	8.85			
	4.91-100	710	39.86	8.81			
	Total	3202	39.89	8.94			
Water sensitivity	1.50-60	279	17.37	4.80	74.77	.000*	1-2
	2.61-75	752	18.68	4.40			1-3
	3.76-90	1461	20.26	3.73			1-4
	4.91-100	710	20.81	3.81			2-3
	Total	3202	19.76	4.15			2-4 3-4
General	1.50-60	279	113.4	13.93	23.15	.000*	1-3
	2.61-75	752	114.8	15.24			1-4
	3.76-90	1461	118.4	13.80			2-3
	4.91-100	710	119.4	13.14			2-4
	Total	3202	117.3	14.17			

Note: *p<0.05.

As can be seen in Table 7, there was a significant effect of GPA on high school students' water literacy overall scores [$F_{(3,3198)}$=23,15, p<0,05] and water-saving scores [$F_{(3,3198)}$=29,44, p<0,05]. According to the Scheffe test for the direction of the significant difference; Water literacy general scores and water-saving scores respectively of high school students whose GPA were between 91-100 ($\bar{X}$=119,4/58,80) were higher than those whose GPA was between 50-60 ($\bar{X}$=113,4/55,84) and 61-75 ($\bar{X}$=114,8/56,52). Likewise, water literacy general scores and water-saving scores respectively of high school students whose GPA was between 76-90 ($\bar{X}$=118,4/58,20) were higher than those whose GPA was between 50-60 and 61-75.

There was a significant difference in high school students' water sensitivity scores according to their GPA [$F_{(3,3198)}$=74,77, p<0,05]. Water sensitivity scores of the students whose GPA was between 91-100 and 76-90 ($\bar{X}$=20,81/20,26), respectively, were higher than students whose GPA was between 50-60 and 61-75 ($\bar{X}$=17,37/18,68). On the other hand, water consciousness scores did not differ significantly according to the GPA of high school students [$F_{(3,3198)}$=0,36, p>0,05]. One-Way ANOVA results of water literacy according to the type of school high school students attend are given in Table 8.

Table-8. One-Way ANOVA results of water literacy according to the type of school high school students attend.

Scale	School Type	N	$\bar{X}$	S	F	p	Significant Difference (Scheffe Test)
Water-saving	1. Project public school	1787	57.85	6.38	5.23	.005*	2-3
	2. Public school without exam	1093	57.33	5.97			
	3. Private school	322	58.50	4.90			
	Total	3202	55.84	6.12			
Water consciousness	1. Project public school	1787	39.95	9.09	0.38	.679	
	2. Public school without exam	1093	39.91	8.76			
	3. Private school	322	39.48	8.79			
	Total	3202	39.95	8.94			
Water sensitivity	1. Project public school	1787	19.92	4.20	8.73	.000*	1-2
	2. Public school without exam	1093	19.35	4.13			2-3
	3. Private school	322	20.24	3.81			
	Total	3202	19.92	4.15			
General	1. Project public school	1787	117.7	14.57	2.76	.063	
	2. Public school without exam	1093	116.6	13.77			
	3. Private school	322	118.2	13.09			
	Total	3202	117.3	14.17			

Note: *p<0.05.

As can be seen in Table 8 there was a significant difference in high school students' water sensitivity [$F_{(2,3199)}$=8,73,p<0,05] and water-saving [$F_{(2,3199)}$=5,23, p<0,05] scores according to their school type. The significant difference was determined at students' water-saving and water sensitivity scores, respectively, students studying at the private school ($\bar{X}$=58,50/19,92) and students studying at the schools accepting students without an examination ($\bar{X}$=57,33/19,35). In addition, the average score of students studying in the project school in terms of water sensitivity was higher than the average scores of those studying in schools accepting students without an examination.

High school students' water literacy scores and water awareness scores do not make a significant difference according to the type of school they are studying [$F_{(2,3199)}$=0,38,p>0,05]. The results of the One-Way ANOVA test of water literacy according to the region where high school students live are given in Table 9.

Table-9. One-Way ANOVA results of water literacy according to the region where high school students live.

Scale	Regions	N	X̄	S	F	p	Significant Difference (Scheffe Test)
Water-saving	1.Istanbul	411	57.60	5.15	2.26	.010*	4-9
	2.West Marmara	91	57.96	4.82			
	3.Aegean	260	57.49	7.18			
	4.Mediterranean	269	56.60	8.86			
	5.West Anatolia	590	58.29	5.96			
	6.East Marmara	209	58.01	5.64			
	7.West Black Sea	455	57.70	5.38			
	8.Central Anatolia	310	58.00	5.66			
	9.East Black Sea	153	58.94	4.40			
	10.Northeast Anatolia	90	57.00	8.31			
	11.Middle East Anatolia	130	57.33	5.10			
	12.Southeastern Anatolia	234	57.14	6.06			
	Total	3202	57.74	6.12			
Water consciousness	1.Istanbul	411	38.52	8.66	2.05	.020*	1-11
	2.West Marmara	91	39.72	8.35			
	3.Aegean	260	40.10	8.58			
	4.Mediterranean	269	39.90	9.60			
	5.West Anatolia	590	40.12	9.12			
	6.East Marmara	209	39.63	8.24			
	7.West Black Sea	455	39.41	8.43			
	8.Central Anatolia	310	40.37	8.77			
	9.East Black Sea	153	40.48	10.2			
	10.Northeast Anatolia	90	39.18	8.79			
	11.Middle East Anatolia	130	41.83	9.44			
	12.Southeastern Anatolia	234	40.85	9.26			
	Total	3202	39.89	8.94			
Water sensitivity	1.Istanbul	411	19.67	3.97	3.20	.000*	7-12 8-12 9-11 9-12
	2.West Marmara	91	20.40	3.70			
	3.Aegean	260	20.05	3.89			
	4.Mediterranean	269	19.30	4.56			
	5.West Anatolia	590	19.74	4.37			
	6.East Marmara	209	20.11	3.65			
	7.West Black Sea	455	19.94	3.80			
	8.Central Anatolia	310	20.11	3.76			
	9.East Black Sea	153	20.37	4.29			
	10.Northeast Anatolia	90	20.06	3.23			
	11.Middle East Anatolia	130	18.73	4.84			
	12.Southeastern Anatolia	234	18.83	4.90			
	Total	3202	19.76	4.15			
WaterLiteracy (General)	1.Istanbul	411	115.8	13.2	1.62	.085	
	2.West Marmara	91	118.0	12.7			
	3.Aegean	260	117.6	15.1			
	4.Mediterranean	269	115.8	17.1			
	5.West Anatolia	590	118.1	13.9			
	6.East Marmara	209	117.7	13.0			
	7.West Black Sea	455	117.0	13.4			
	8.Central Anatolia	310	118.4	13.5			
	9.East Black Sea	153	119.7	14.4			
	10.Northeast Anatolia	90	116.2	16.2			
	11.Middle East Anatolia	130	117.9	13.7			
	12.Southeastern Anatolia	234	116.8	14.0			
	Total	3202	117.3	14.1			

Note: *p<0.05.

As can be seen in Table 9, high school students' water literacy scores did not differ significantly according to the region they live in [$F_{(11,3190)}$=1,62, p>0,05]. However, water-saving scores differ significantly according to the region where high school students live [$F_{(11,3190)}$=2,26, p<0,05]. Water-saving score of high school students living in the Eastern Black Sea ($\bar{X}$=58.94) was significantly higher than those living in the Mediterranean ($\bar{X}$=56.60). Water sensitivity scores differ significantly according to the region where high school students live [$F_{(11,3190)}$=3,20, p<0,05]. Accordingly, water sensitivity scores of high school students living in Southeastern Anatolia ($\bar{X}$=18.83) was significantly lower than the scores of students living in the Western Black Sea ($\bar{X}$=19.94), Central Anatolia ($\bar{X}$= 20.11) and Eastern Black Sea ($\bar{X}$=20.37). Also, the scores of students living in the Eastern Black Sea ($\bar{X}$=20.37) were significantly higher than those of students living in the Middle East Anatolia ($\bar{X}$=18.73). Finally, water consciousness scores differ significantly according to the region where high school students live [$F_{(11,3190)}$=3,20, p<0,05]. A significant difference emerged between students living in Central East Anatolia and students living in Istanbul, in favor of students who live in the Middle East Anatolia. The t-test results of the high school students' water literacy according to their knowledge about water-related institutions are given in Table 10.

Table-10. Analysis of high school students' water literacy according to their knowledge of institution about water

Scale	Knowledge of water-related institutions	N	$\bar{X}$	Ss	Sd	t	p
Water-saving	Yes	2338	58.03	6.04	3200	4.54	.000*
	No	834	56.93	6.24			
Water consciousness	Yes	2338	40.1	8.77	3200	4.36	.000*
	No	834	38.76	9.30			
Water sensitivity	Yes	2338	20.10	4.10	3200	7.68	.000*
	No	834	18.84	4.14			
General	Yes	2338	118.4	14.11	330	6.98	.000*
	No	834	114.5	13.92			

Note: *p<0.05.

As can be seen in Table 10, there was a significant effect of knowing any institution related to water, on high school students' water literacy overall scores [$t_{(3200)}$=6,82, p<0,05]. The scores of high school students regarding the water-saving [$t_{(3200)}$=4,54,p<0,05], water consciousness [$t_{(3200)}$=4,36,p<0,05], and water sensitivity [$t_{(3200)}$=7,68,p<0,05] sub-dimensions of the scale also differ significantly according to their knowledge of water-related institutions. The knowledge of high school students about water-related institutions causes a significant difference in favor of those who know the water-related institution in both their general literacy and sub-dimensions. The results of the t-test for high school students' water literacy scores and participation in water-related activities are given in Table 11.

Table-11. Analysis of high school students' water literacy according to their participation in water-related activities.

Scale	Participation in water-related activities	N	$\bar{X}$	Ss	Sd	t	p
Water-saving	Yes	488	58.61	6.64	3200	3.41	.001*
	No	2714	57.58	6.01			
Water consciousness	Yes	488	43.15	8.99	3200	8.84	.000*
	No	2714	39.30	8.81			
Water sensitivity	Yes	488	20.40	4.72	3200	3.73	.000*
	No	2714	19.64	4.03			
General	Yes	488	122.1	15.59	330	8.17	.000*
	No	2714	116.5	13.72			

Note: *p<0.05.

As can be seen in Table 11, there was a significant effect of participating in water-related activities, on high school students' water literacy overall scores [$t_{(3200)}$=8,17,p<0,05]. Likewise, the scores of high school students regarding the water-saving [$t_{(3200)}$=4,54,p<0,05], water consciousness [$t_{(3200)}$=4,36,p<0,05], and water sensitivity [$t_{(3200)}$=7,68,p<0,05] sub-dimensions of the scale show a significant difference according to their participation in the water-related activity. In other words, the scale scores of high school students who participated in the water-related activity were significantly higher than those who did not participate in the activities

4. Conclusion and Recommendations

With the rapid population growth in the world, studies on *'water'* have gained speed. This study revealed the water literacy levels of students at the high school level in Turkey, and factors affecting these levels. As a result of the study, the water literacy of high school students was generally at a 'good level'. As stated in UNESCO (2006) literacy should no longer be viewed individually but socially. Therefore, the high level of water literacy of students is an expected situation for all societies. In today's world, where the effects of global warming are increasing day by day, the importance of the subject is increasing. When the sub-dimensions of water literacy were analyzed, high school students were very good at water-saving and good at water sensitivity, but remain at medium level in terms of water consciousness. Results conclude that students assumed their responsibilities for saving water individually, but they were not willing to influence and direct the people around them and increase their knowledge. Turkey has a semi-arid climate and is a country facing water scarcity. Therefore, the situation of young people who are water-sensitive, and tend to save water, remained at an average level of awareness of water and awareness-raising should be considered as a deficiency. Moreover, local and regional development of the water struggle will make significant contributions on a global scale. The fact that the participants found to be at a medium level on water awareness may be interpreted as there is a lack of knowledge about basic concepts and the structure of water. Undoubtedly, knowing the general concepts about water and understanding the functioning of water is of great importance in ensuring water literacy. Necessary arrangements needed to be made in the education-training processes to overcome these information gaps. In his study with 5th-grade students, Wheeler (2012) determined that students had information deficiencies and misconceptions about water. To overcome these deficiencies and misconceptions, Wheeler (2012) recommended increasing training about water and developing the water literacy curriculum. Although the circulation of water in the earth is included more in the field of engineering and natural sciences, educational sciences and teachers have a significant role in providing water awareness and eliminating basic knowledge gaps. Similarly, Sammel and McMartin (2014) emphasizes that educators have a greater role in the development of water literacy than engineers. As in all teaching activities, to increase the water literacy level, the teachers are needed to be well trained and able to use new teaching techniques. Moreno-Guerrero et al. (2020) concluded that flipped learning practices are more effective in developing water literacy as it increases student motivation and participation compared to traditional teaching methods.

There was a significant effect for gender, with female students receiving higher scores than male students both in overall scale and in water-saving and water sensitivity sub-dimensions. In this case, the water literacy level of female students was higher. This result indicates that female students are more sensitive to water and attach importance to water saving. No proportional difference was found in the school types and the education levels of parents, in which female and male students. Therefore, the effects of personal and environmental factors may be mentioned in the occurrence of this situation.

The water literacy levels of high school students do not change according to the grade level. However, 12th-grade students in the water-saving sub-dimension of the scale got higher scores than those who studied in other grades. In other words, 12th-grade students are more successful in water-saving than lower grades. This result may arise from the increase in the knowledge acquired by students until the 12th grade.

Wang et al. (2019) were determined that the water literacy levels of the participants improved after the water-saving activities. There was no significant difference between water knowledge and attitude towards water and the level of water literacy. There was a significant difference between variables such as age, income level, and domestic water expenses of the participants and the levels of water literacy.

The education levels of high school students' mothers and fathers were not significant in general water literacy levels. However, the water-saving and water sensitivity of the students whose parents are university graduates were higher than the illiterate parents. This result indicates that students learn water-saving from their parents with high education levels and gain sensitivity towards the water. Contrary to this situation, students whose parents have low education levels had higher water consciousness than others. The items that constitute water consciousness are composed of mostly cognitive items that are difficult to transmit by parents with low education levels. In this context, the personal efforts of students whose parents have low education levels may have been effective in raising their water consciousness.

As the GPA of high school students increased, water literacy levels also increased. The same is true for other sub-dimensions, except for the water consciousness dimension. The fact that academically successful individuals are water literate individuals may be seen as a positive aspect of the education system. The type of school in which high school students attend did not significantly affect their overall water literacy levels. However, the students studying in schools that are accepting students with exams were at a higher level of water literacy. This situation is in parallel with the results of the GPA variable. The same result was achieved in terms of water-saving and water sensitivity sub-dimensions of the scale. Briefly, the water literacy level of the students whose GPA was high and studying in the schools that accept students by exam was higher. This situation may be considered as a reflection of academic success.

Xu et al. (2019) stated that water knowledge levels of citizens have a direct effect on water behavior and indirectly affect water sensitivity and water responsibility. There was no significant relationship between water ethics and water behavior. Based on these results, the importance of citizens' water feelings, and water responsibility was emphasized in the works to be carried out to protect water.

There was no significant impact of the region lived in, on the general water literacy of high school students. However, the highest point average in water-saving was found in the students living in the Eastern Black Sea, and the lowest in students living in the Mediterranean. When Turkey's climate is concerned, it is a remarkable result that the water-saving approach was high in the region with the most precipitation and water resources. Considering that the school types and GPA of the students were close to each other in these regions, the difference in culture between regions may be the reason for this situation. It can be mentioned the effect of the fact that the Eastern Black Sea region receives rain throughout the year, there are many rivers, and the sea has a very important place in daily life. The lowest region in terms of water awareness was Istanbul. It is noteworthy that this situation occurred in Istanbul, which is Turkey's largest but also one of the world's few large cities. In the emergence of this result, the fact that young people in high school age did not experience or feel water problems in Istanbul during their short lives may be significant. Hui-Shuang He (2018) has revealed that socioeconomic and geographical differences were significant in water literacy scores as a result of the water literacy scale applied in four different regions of China. The average score in Beijing, which is the center of politics, economy, and culture, was 74.29, while the water literacy score average was 69.55 in Qingtongxia in the Yellow River basin, where water scarcity occurred.

The least sensitivity was determined in the Southeastern Anatolia and Middle East Anatolia regions in terms of water sensitivity. The most sensitive region in terms of water sensitivity was the Eastern Black Sea region. The Southeastern Anatolia region is Turkey's most arid regions, and vice versa for the emergence of a result was expected. The low education level of parents in both Southeast Anatolia and Middle East Anatolia regions may have an impact on this situation. As mentioned in the mother and father education section, students with the low education level of parents have lower water sensitivity. Finally, the water literacy level of the students who participated in any water-related activity and who knew the name of the water institution was higher than the others. This result may be explained as that the activities that students participate contribute to being more conscious and sensitive about water. Students who know the water-related institution are cognitively and affectively careful about this topic. That allows them to become a high-level water literate.

Within the framework of the results; the number of students participating in the water-related activity was very low, but the water literacy of those students was high. Therefore, increasing water-related activities in schools may contribute to water literacy. In addition, nationwide activities that will raise water awareness and sensitivity through non-governmental organizations may be beneficial. Wood (2014) draws attention to the development of a sense of responsibility to take steps with local, national, and global impact, away from individual behavior to raise water literacy standards.

Special plans should be made for regions with low water literacy. Raising awareness of the new generation is important both for the coming years and for the country in general. Otaki et al. (2015) stated that the ultimate goal of the concept of water literacy is the construction of a water system diversified according to the local lifestyle and traditions to coexist as a society. Therefore, steps should be taken towards reaching a water literate society through educational activities which planned considering regional differences.

In order to increase the water literacy of high school students, giving practical training rather than academic knowledge may contribute more. Students who learn by doing and living are expected to have more permanent attitudes and behaviors. Ursavaş. and Aytar (2019) determined that after an action-oriented training, biology, and science teachers experienced a positive change in water literacy levels and gained a multi-faceted perspective on water-related subjects. As in all teaching activities, performing in-class or out-of-class practices that will provide an environment suitable for learning by doing-living may also play a significant role in increasing the number of water literate individuals. Maclean and Bana (2015) emphasizes the necessity of effective participation, especially local people, to ensure water governance in Australia and to achieve a sustainable environment and water management. The planning of the projects and activities in which the society is fully integrated may ensure effective water management and water literate society in Turkey.

Multidisciplinary approaches might be planned in Turkey to achieve a water literate community goal and to provide sustainable water for future generations. There is a need for courses to be taught at the educational levels and activities that will raise awareness in every segment of society. As highlighted as a result of the course model developed by Sherchan et al. (2016) a water literacy module or course, which can only be realized with a multidisciplinary approach, will also provide strong cooperation between students and faculty. This ability to collaborate is the critical learning component that society expects from citizens in the 21st century. Learning contents, projects, or activities planned with a multidisciplinary approach may provide a successful and permanent increase in citizens' water literacy levels. In their study, Forbes et al. (2018) found that, after participating in a course developed with a multi-disciplinary approach, there was an increase in the post-test scores of the students compared to the pre-test scores. This result supports the necessity of acting with a multidisciplinary approach in the development of water literacy. This study is a pioneering study in the field to reveal the water literacy level and the variables that affect this level in Turkey. New studies with different methods and techniques may contribute to the development of water literacy.

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