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Investigation of Turkish Middle and High School Students' Water Literacy as a Factor Predicting Targets for Sustainable Development Goals

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Abstract
This research was carried out to reveal the factors affecting the water literacy of middle and high school students in Turkey. In the study, in which a total of 155 children living in Rize of Turkey participated, the data were collected using the "Water Literacy Scale" developed by Sozcu and Turker (2020a). This measurement tool was implemented as online questionnaire. The scale consisted of three sub-dimensions, namely water saving, water consciousness, and water sensitivity, and a total of thirty items. Data analysis was performed in the SPSS program, using unrelated t and One-Way Anova tests. It was concluded that the water literacy of the children differed according to finding the news about the water crisis realistic, and having a concrete experience in reusing water in some dimensions. There was no difference between the water literacy of middle and high school students. Critical suggestions based on informal learning, including parents, were made to provide water literacy to children.

Keywords: Sustainable Development, Water Literacy, Children, Environmental Education

1. Introduction

Human beings find new ways to meet their current needs with each new century. They prepare new needs lists, probably as a result of their changing nature, not nature. It becomes clear that the recognition and resolution of existing needs is a dynamic and interactive process. The process starts again when a new cycle begins to be talked about. One of the best indicators of this situation is the differentiation of topics and concepts spoken in previous centuries and today. As an example, the subject of development, which started to be used with the industrial revolution, has now turned into sustainable development (SD). New topics have been started to talk about for a while that the old people had difficulty in understanding. Among these, the issue of literacy is very important. As a result of a small literature review, they are frequently seen even in reports and/or speeches of politicians or bureaucrats. These include science literacy, technology literacy, media literacy, global literacy, economic literacy, and many more. There are types of literacy belonging to different disciplines, especially education. In reviews conducted by Ates and Asci (2021) and Mete (2020) on this subject, many types of literacy were determined. As a result of the transformations in science and technology, the tendency to studies on literacy has increased (Kurt, 2010; Kurt et al., 2014). Some of these (for example, science, technology, and water literacy) are known as literacy

that is directly related to education. New knowledge and skills needed from individuals as a result of rapid changes in science and technology are identified, and new types for different fields will emerge. Here, it should be well known that new concepts are created by new needs, and therefore, new concepts may arise in the future. However, efforts should be made to explain the theoretical foundations of literacy concepts, which are on the agenda in today's conditions, and to bring related knowledge, attitudes, and behaviors to all stakeholders of the society, from 7 to 77.

One of them is “water literacy,” which is closely related to sustainable development (Kucuk & Burkaz Ekinci, 2021). In this, it has been effective that the bad prophecy about the end of life, which is thought to be unlimited and does not only end when consumed at high speed, is frequently spoken. Water is one of the best proofs of life in a celestial body. In this direction, human beings spend huge sums of money in the hope of encountering a drop of a water molecule in space. The studies carried out to date, unfortunately, have suggested that there may be water on another planet other than Earth, but they did not enable it to be discovered. Water, which is a combination of oxygen and two hydrogens, is known as the beginning of life. In all faiths and religions, water is known as the source of life, the basic substance of holiness, and physical and spiritual purification (Kiyak, 2013). Now, it is important to know how water is formed, as well as to learn how to save it and make it sustainable (Dinc, 2018). In science lessons, a simple experiment of water into its components is done. For this experiment, water is first electrolyzed, and oxygen and hydrogen gases are accumulated in two tubes. Finally, only a few drops of small water molecules are observed by holding a lit match inside the hydrogen collection tube. This experiment is necessary to learn how the water molecule is formed with concrete experience. It can be achieved that other members of the society, especially children, view water as a limited and valuable substance, not as an unlimited resource (Cooper & Cockerill, 2015). In this way, water knowledge, attitude, and behavior can be gained.

The subject of water literacy has been put forward as a means of trying to define and gain knowledge, attitudes, and behaviors about water (Otaki, Sakura, & Otaki, 2015). There are many definitions of this subject (Su, Chen, & Wang, 2011; Wang, Chang, & Liou, 2019; Sherchan et al., 2016). In addition, compilation and structure creation studies are also carried out to solve the confusion in the literature about the concept (McCarroll & Hamann, 2020). This concept is essential for achieving the water-related goals of sustainable development and for the sustainable use of water (UNESCO (United Nations Education, 2003). Otaki, Sakura, and Otaki (2015, p.36) defined water literacy as “water literacy as the ability to feel familiar with water, get actively involved in water, and face the issue of water as one's issue. Being water literate means understanding how the water we use daily is delivered and treated, as well as knowing the quality and safety of that water, how much water we use daily, and exactly what we use it for" Similarly, He (2018, p.486) explained that “water literacy is a composition of necessary water knowledge, scientific water attitude, and normative water behavior... Water literacy, composed of water knowledge, water attitude, and water behavior, is related to social economics, living habits, water ecological environment, water conservancy propaganda, and education.

With the sharing of this concept as an important dimension of sustainable development and its inclusion in curricula, research aimed at both teaching and measuring the impact of teaching have gained momentum (McCarroll & Hamann, 2020). In this process, the fact that the information obtained informally from family, friends, and other environments was not sufficient (Cappellaro et al., 2011). In support of this claim, studies conducted from preschool to university and even among adults have revealed that individuals experience significant problems in their knowledge, attitudes, and behaviors about water (Dean, Fielding, & Newton, 2016; McCarroll & Hamann, 2020). Although a partially acceptable proficiency is observed in some age groups in terms of attitude, it has been revealed that it does not trigger behavior towards water (McCarroll & Hamann, 2020). One of the possible reasons for this is the lack of water information (Xu, Wang, Wang, & Zhang, 2019; Wang, Chang, & Liou, 2019). Although attitude, which is an important quality for many subjects, including academic success, is considered valuable, more is needed in water literacy. It is believed that there is a hierarchical relationship between knowledge, attitude, and behavior that forms the center of the concept (McCarroll & Hamann, 2020). In short, attitude does not occur without knowledge about water, and behavior does not occur without attitude. In this context, measurement tools to measure water literacy consisted of three dimensions water saving, water consciousness, and water sensitivity. I think a sufficient and balanced development in these three dimensions indicates water literacy.

Water literacy of children or adults at certain educational levels (for example, secondary school, high school, university) was reported. The fact that the literacy measured in these reports were not frequently cited. In addition, gender, academic achievement, income status of the family, the profession of mother and father, etc. The effect of the usual variables was measured. And it has been reported that sometimes these variables have an impact on water literacy on a holistic or dimension basis, and sometimes they do not. As a criticism at this point, it is not clear how a possible difference reported in children's water literacy according to maternal education level, for example, can be used to predict the child's water literacy-based only on the mother's education level. A similar situation arises in the relationship established between the type of settlement where children live and water literacy. For example, it is not clear how information regarding a possible difference in water literacy according to residence will be used, other than only predicting the child's water literacy. For these reasons, instead of classifying children using their demographic information, it seems more pragmatic to examine the effects of life examples that will be employed in the immediate environment and that can bring water consciousness to children on their literacy. As an example of this, the situation of informing the children about the monthly water consumption of the home and making them conscious of water can provide pragmatic information. This can be produced simply by comparing the water literacy of children who know and do not know about water consumption at home.

This aim of providing useful information to the literature instead of producing information based on classification, which has been described as a problem situation up to this point, has made it necessary to conduct the current research about water literacy. For this purpose, gender, education level, place of residence, and others, which are independent variables that cannot be changed only by external intervention, were not studied on water literacy. Moreover, there is a rich literature on this subject, not only on water literacy but also on others. Instead of these, those that have the potential to affect it in dimensions such as water saving, water consciousness, and water sensitivity are written as independent variables, since they are included in the theoretical foundations of water literacy in the current study. A few of these are being aware of the average annual income of the family, knowing the average monthly water consumption, following the news in the media about water shortage and finding it realistic, having a concrete life for reusing water at home or outside, and similar variables. Suggestions for what can be done for water literacy in children can be developed by using the confirmatory evidence to be collected terms of these. In this way, instead of constantly moving in a loop for different literacies and eventually arriving at the same point each time, the starting point for another cycle can be reached.

This research was carried out to reveal the factors affecting the water literacy of middle and high school students in Turkey.

2. Method

In this study, survey research was used. In this way, the water literacy of the students between the 11-17 age group, known as children was measured.

The sample

The sample consisted of 155 children. 104 women (67,1%) and 51 men (32,9%), participated in this research. Of these, 53 (34.2%) stated that they knew about the water consumption at homes, and 102 (65.8%) did not. To date, 66 (42.6%) of them have stated that they have had a concrete experience regarding reusing water at home or outside, while 89 (57.4%) have stated that they have not. In addition, 131 (84.5%) of them stated that they found the news that there will be a water scarcity in Turkey and the world in the 2040s realistic, while 24 (15.5%) stated that they did not. In another question, 109 (70.3%) of them stated that they believed the news that technological tools such as dishwashers and washing machines consume less water, while 46 (29.7%) did not believe. The relationship between the participants' average annual income-education status (Table 1) and their knowledge of water consumption at home and the place of residence (Table 2) are in the next two tables.

Table 1: The relationship between the education status of children and the average income group

	Income Group				
	Low	Lower-Middle	Upper-Mid	High	Total
Middle School	61	38	21	-	120
High school	21	8	6	-	35
Total	82	46	27	-	155

Table 2: The relationship between children's knowledge of the water consumption of their homes and the type of settlement they live in

Residential Unit	Water consumption		Total
	No	Yes	
Village	24	1	35
Town	30	6	36
City	48	36	84
Total	102	53	155

Data Collection

The data were collected by a questionnaire that included two parts. One is the 'Water Literacy Scale,' which was developed by Sozcu and Turker (2020a) and used successfully in previous studies (Sozcu & Turker, 2020b; Turker, Yuksel, Tuna, & Sagir, 2022), the other part included introductory information about the sample. This measurement tool was implemented as online questionnaire. There were eight questions prepared to measure the variables that have the potential to affect the water literacy of the sample. The main part, there is a water literacy scale consisting of thirty items and three dimensions: water saving, water consciousness, and water sensitivity. The rating of this scale was made as a 5-point Likert type (totally agree, agree, partially agree, disagree, strongly disagree). The lowest score that can be obtained from this scale is '30' and the highest score is '150'. In this study, the Cronbach Alpha reliability coefficient of the water literacy scale was calculated as .91.

Data Analysis

Data were analyzed with SPSS 24.0. The skewness and kurtosis values of the scale dimensions were checked to prove whether the data were normally distributed. Tabachnick and Fidell (2013) explained that the skewness and kurtosis values of the normal distribution should be between -1.5 and +1.5. The skewness value of the total score was calculated as -,528, and the kurtosis value as 1,078. Based on these data, descriptive and exploratory statistical methods were applied sequentially according to the independent variables employed regarding the sub-dimensions of the scale and the total score. In descriptive statistics, the mean and standard deviation values of the answers given by the students to the scale items are given. In explanatory statistics, a t-test was used in pairwise comparisons of children's water literacy levels, and a one-way analysis of variance (ANOVA) was used in multi-way comparisons (Buyukozturk, 2012). Finally, for the relations between the groups, two comparison tests were made the Tukey test was applied in cases where the variances were homogeneous, and the Games Howell test was applied in cases where the variances were not. These tests have also been used successfully in previous studies examining water literacy scores (Sozcu & Turker, 2020b; Turker, Yuksel, Tuna, & Sagir, 2022).

3. Results

The results of the water literacy levels according to the gender of the participants are given in Table 3.

Table 3: Results of children's water literacy levels according to gender variable

Sub- dimensions	Gender	N	Mean	s	F	t	sd	p
Water-saving	Female	104	4,35	,60	1,56	1,87	153	,06
	Male	51	4,14	,72				
	Female	104	3,16	,89	1,40	2,61	153	,01

Water consciousness	Male	51	2,74	1,01				
Water sensitivity	Female	104	3,86	,88	,10	,58	153	,55
	Male	51	3,77	,88				
Total	Female	104	3,79	,57	1,20	2,62	153	,10
	Male	51	3,52	,67				

Table 3 indicates that there is a statistically significant difference in favor of female children in terms of gender, the two sub-dimensions of the water literacy scale, water-saving, and water consciousness.

The results regarding the water literacy levels of the children according to their knowledge of water consumption at home are given in Table 4.

Table 4: Results of children's water literacy levels according to their knowledge of water consumption at home

Sub-dimensions	Knowledge of water consumption	N	Ort	s	F	t	sd	p
Water-saving	Yes	53	4,28	,71	,21	-,07	153	,94
	No	102	4,28	,63				
Water consciousness	Yes	53	3,11	,91	,155	,81	153	,41
	No	102	2,98	,97				
Water sensitivity	Yes	53	3,92	,90	,04	,89	453	,37
	No	102	3,79	,87				
Total	Yes	53	3,75	,63	,41	,68	153	,49
	No	102	3,68	,61				

Table 4 indicates that there is not a statistically significant difference in favor of those who know the water consumption at home or not.

Table 5 shows the results of children's water literacy levels according to whether they find the news that there will be a water scarcity in Turkey and the world really in the 2040s.

Table 5: Results of water literacy levels according to the fact that children find the news that there will be a water scarcity in Turkey and the world really in the 2040s.

Sub- dimensions	Belief in the authenticity of the news	N	Mean	s	F	t	sd	p
Water-saving	Yes	131	4,34	,59	1,96	2,80	153	,00
	No	24	3,94	,89				
Water consciousness	Yes	131	3,09	,92	,24	2,20	153	,02
	No	24	2,63	1,01				
Water sensitivity	Yes	131	3,84	,84	2,94	,36	153	,71
	No	24	3,77	1,08				
Total	Yes	131	3,76	,58	,85	2,74	153	,00
	No	24	3,39	,70				

Table 5 indicates that there is a statistically significant difference in favor of those who find the news that there will be a water scarcity in Turkey and the world in the 2040s realistic, in terms of the first sub-dimensions of the water literacy scale and the total score.

Table 6 shows the results of the children's water literacy levels according to the fact that they find the news that technological tools such as dishwashers and washing machines consume less water realistically.

Table 6: Results of water literacy levels according to the fact that children find the news that technological devices such as dishwashers and washing machines consume less water realistically

Sub-dimensions	Belief in the authenticity of the news	N	Mean	s	F	t	sd	p
Water-saving	Yes	109	4,31	,68	1,09	,89	153	,37
	No	46	4,21	,58				
Water consciousness	Yes	109	3,94	,85	2,08	,75	153	,44
	No	46	2,93	1,05				
Water sensitivity	Yes	109	3,94	,85	,00	2,31	153	,02
	No	46	3,58	,91				
Total	Yes	109	3,75	,62	,25	1,42	153	,15
	No	46	3,59	,59				

Table 6 indicates that there is a statistically significant difference in favor of those who find the news that technological devices such as dishwashers and washing machines use less water realistic, and the third sub-dimensions of the water literacy scale.

Table 7 shows the results of the children's water literacy levels according to their experience of reusing the water they have used at home before pouring it into the sink.

Table 7: The results of the children's water literacy levels according to their experience of reusing the water they have used at home before emptying it into the sink.

Sub-dimensions	The life of reusing water	N	Mean	s	F	t	sd	p
Water-saving	Yes	89	4,30	,69	,13	,39	153	,69
	No	66	4,26	,62				
Water consciousness	Yes	89	3,16	,95	,04	2,04	153	,04
	No	66	2,84	,92				
Water sensitivity	Yes	89	3,96	,85	,15	2,19	153	,03
	No	66	3,65	,89				
Total	Yes	89	3,79	,63	,97	1,95	153	,05
	No	66	3,59	,58				

Table 7 indicates that there is a statistical difference in favor of those who have experience, in terms of the second and third sub-dimensions of the water literacy scale:

The results of the one-way analysis of variance (ANOVA) to determine the water literacy levels of children according to their annual average income for their families are given in Table 8.

Table 8: The results of the water literacy levels according to the annual average income of the children

Sub- dimensions		Sum of Squares	df	Mean Square	F	Sig.
Water-saving	Between Groups	,66	2	,33	,75	,47
	Within Groups	66,39	152	,43		
	Total	67,05	154			
Water consciousness	Between Groups	,03	2	,01	,01	,98
	Within Groups	140,37	152	,92		
	Total	140,41	154			
Water sensitivity	Between Groups	,33	2	,16	,21	,80
	Within Groups	120,02	152	,79		
	Total	120,35	154			
Total	Between Groups	,23	2	,11	,29	,74
	Within Groups	59,25	152	,39		
	Total	59,49	154			

Table 8 indicates that there is not a statistically significant difference among the groups in terms of all sub-dimensions of the water literacy scale and the total score according to their annual average income.

The results of the one-way analysis of variance (ANOVA) performed to determine the water literacy level of children according to their educational status are given in Table 9.

Table 9: Results of children's water literacy levels according to their educational status

Sub- dimensions	Levels	N	Mean	s	F	t	sd	p
Water-saving	Middle School	120	4,32	,57	9,78	,26	152	,20
	High School	34	4,16	,91				
Water consciousness	Middle School	120	3,01	,95	,12	-,44		,65
	High School	34	3,09	,97				
Water sensitivity	Middle School	120	3,83	,83	3,32	-,21		,82
	High School	34	3,87	1,04				
Total	Middle School	120	3,71	,61	,00	,25		,79
	High School	34	3,68	,65				

Table 9 indicates that there is not a statistically significant difference between the groups in terms of all sub-dimensions of the water literacy scale according to the educational status of the children.

The results of the one-way analysis of variance (ANOVA) performed to determine the water literacy level of children according to the type of settlement they live in are given in Table 10.

Table 10: Results of children's water literacy levels by type of settlement

Sub- dimensions		N	Mean	s	df	F	p	Sig
Water-saving	Village (1)	35	3,92	,98	2	7,76	,00	1-2;1-3
	Town (2)	36	4,48	,41				
	City (3)	84	4,35	,51				
Water consciousness	Village (1)	35	2,75	,97		2,32	,10	
	Town (2)	36	3,22	,83				
	City (3)	84	3,05	,97				
Water sensitivity	Village (1)	35	3,70	,90		1,46	,23	
	Town (2)	36	4,04	,89				
	City (3)	84	3,80	,86				
Total	Village (1)	35	3,41	,73		6,10	,00	1-2;1-3
	Town (2)	36	3,90	,46				
	City (3)	84	3,74	,59				

Table 10 indicates that there is a statistically significant difference between the groups in terms of the first dimension of the water literacy scale according to the type of settlement where the children live. When compared to those living in villages water literacy for water saving was found to be high among those living in the town and/or city in only the first dimension of the water literacy scale.

5. Discussion

While numerous studies have addressed student conceptions of the water cycle and scientific knowledge, less is known about their attitudes and values regarding water. Water is a particularly challenging topic due to its systems complexity as well as its interdisciplinary nature (Xiong, Hao, Liao, & Zeng, 2016; McCarroll & Hamann, 2020). It has been determined that the water knowledge level of the children has a direct effect on the water behavior, and indirectly affects the water feeling and water responsibility (Xu, Wang, Wang, & Zhang, 2019). This research was carried out to reveal the factors affecting the water literacy of middle and high school students in Turkey. It is known that many studies have been carried out on water literacy both in Turkey and in other countries for students (Ates, 2019; Boon, 2011; Cobanoglu & Turer, 2015; Er-Nas & Senel-Coruhlu, 2017; Sagdic & Sahin, 2016; Teksoz, Sahin, & Ertepinar, 2010). However, in the current study, a study was conducted that revealed pragmatic knowledge in terms of water literacy. In this way, instead of hard-to-change factors such as gender, class level, educational status of parents, and place of residence, which are frequently researched in others (Hui-Shuang, 2018; Sozcu, Yuksel, Tuna, & Sagir, 2022; Sozcu & Turker, 2020b; Moreno-Guerrero et al., 2020), some variables were

determined based on the experiences offered to children. For this purpose, a possible difference that may arise at the point of water literacy can be used directly to strengthen water literacy in the field.

For this purpose, firstly, gender, grade level, and place of residence were discussed as independent variables. There are many studies in which these variables are discussed and their effect on water literacy were examined (Moreno-Guerrero et al., 2020; Wang, Chang, & Liou, 2019). In this study, there was a difference in the water literacy of middle and high school students, although not on the whole scale, in the dimensions of water-saving and water consciousness, in favor of girls. However, there is no difference in water sensitivity. Some studies supported these results, that is, the water literacy of girls is higher than that of boys (Cakir, 2016; Sozcu & Turker, 2020b; Sozcu, Yuksel, Tuna, & Sagir, 2022). However, unlike the current study, there was no difference in water sensitivity. There was no statistical difference between the annual average income of the families of the children on water literacy as supported (Sozcu & Turker, 2020b). Wang, Chang, and Liou (2019) determined that there was a significant difference between the variables such as age, income level, and domestic water expenses of the participants and their water literacy levels. In terms of where children live, there is only a difference in the first dimension of the scale, water-saving. As expected, this difference is in favor of those living in the city rather than those living in the village. This was probably because the water in the villages was free and plentiful in Turkey. On the other hand, the high water prices in cities automatically lead children to save water. At this point, it comes to mind that sharing the water consumption at home and even the price paid for it may affect the water literacy of children. At this point, when the effect of grade levels on water literacy was compared as usual variables, there was no difference. In short, the water literacy of middle and high school children is quite similar. This result is different from studies that argue that children gain more water consciousness as they get older (McCarroll & Hamann, 2020).

In the second part of this research, factors that were rarely studied in previous studies were used as independent variables to produce pragmatic information that would contribute to the field, namely the promotion of water literacy. Although the average scores of those who know the amount of water consumed at home, which is among them, are high in all three sub-dimensions, no difference was found in the pairwise comparison. If they know not only the amount of water consumption but also the price paid for it, which will deepen the discussion in the previous paragraph, their water literacy will likely change. For this purpose, when the children were asked whether they followed the news about the drought risk, which is predicted to be experienced in the 2040s and which is frequently shared in the media, the majority of the children answered yes. In this way, there was a difference between the water literacy scores of the children who follow and believe to be realistic in terms of the first two dimensions of water conservation and water consciousness. This difference is in favor of those who follow and find it realistic. Meanwhile, it was noted that the mean scores of both groups were close to each other in terms of water sensitivity, where there was no difference. Again, the vast majority follow the news in the media about devices such as washing machines and dishwashers, which are among the technological tools used at home, that they consume less water and find it realistic. In the comparison made at this point, the difference in water sensitivity has emerged. The first dimension scores were again both high and close to each other. In the comparison made according to whether they have had a concrete experience of reusing water at home, there is a difference between water consciousness and sensitivity scores. The value of direct experiences offered to children at home towards sustainable development and water literacy is revealed (Kucuk & Burkaz Ekinci, 2021). As expected, this difference is in favor of those who have experienced it. A comparison could not be made because there was no other study in which these variables were studied in the literature. However, important results can be shared based on the new and pragmatic information produced in the study.

6. Conclusion

Brody (1995) explained that water concepts were abstract and disconnected from everyday life and experience. Based on the literature, attention needs to be paid to helping students to better understand and conceptualize some unseen elements of hydrologic and hydrological systems (Benninghaus, Kremer, & Sprenger, 2018). The variables produced and frequently examined in this study were used to confirm the validity of the study. However, concrete inferences can be made for the development of water literacy in children over the newly determined variables. In this context, there is a need to adopt a movement style from near to far to develop water literacy in children. The

closest place is the house where they live. At this point, it is useful to share the amount of water consumption in the house as well as the price for it. Creating an environment for the families to follow the news about water and evaluating the news within the family will contribute to the water literacy of children (Cappellaro et al., 2011). In this process, in addition to the news, conversations with them about the water consumption of the machines have the potential to be useful so that children can gain concrete experiences. Experiences in reusing water at home and outdoors are also very valuable.

When these results are taken together, although the value of instructional designs based on an interdisciplinary approach to water literacy is known, the training of parents can be given as an alternative to this. In this way, the informal experiences that the parents, who are models for water literacy, will offer to their children will probably be more valuable than the formal experiences offered in educational institutions (Kucuk & Yildirim, 2020). It is also advocated by other researchers that informal experiences can be used successfully in helping children acquire water literacy. Dean, Fielding, and Newton (2016) put forward that higher levels of water-related knowledge among the public lead to more numerous and productive discussions and also public engagement in both informal and formal processes. In this context, as a final word, it is clear that there is a need for training on the physical and chemical nature of water so that children can acquire water knowledge and therefore water literacy and water consciousness.

References

Ates, H. (2019). Fen bilimleri dersi öğretim programı'nın sürdürülebilir kalkınma eğitimi açısından analizi [Analysis of the Science Curriculum in terms of Education for Sustainable Development]. *YYU Journal of Education Faculty, 16*(1), 101-127. http://dx.doi.org/10.23891/efdyyu.2019.120

Ates, M., & Asci, A. U. (2021). Okuryazarlık kavramı ve eğitimle ilişkili okuryazarlık türleri [The concept of literacy and types of educational literacy]. VII. TURKCESS-Intentaional Education and Social Sciences Congress Procedings Book. Ankara: Vizetek Publishing.

Benninghaus, J. C., Kremer, K., & Sprenger, S. (2018). Assessing high-school students' conceptions of global water consumption and sustainability. *Int. Res. Geogr. Environ. Educ,* 27, 250–266.

Boon, H. (2011). Beliefs and education for sustainability in rural and regional Australia. *Education in Rural Australia, 21*(2), 37-51.

Cappellaro, E., Unal-Coban, G., Akpinar, E., Yildiz, E., & Ergin, O. (2011). Yetişkinler İçin yapılan uygulamalı çevre eğitimine bir örnek: Su farkındalığı eğitimi. *Journal of Turkish Science Education, 8*(2), 157-173.

Cobanoglu, O., & Turer, B. (2015). Fen bilgisi ve sosyal bilgiler öğretmenlerinin sürdürülebilir kalkınma farkındalıklarının belirlenmesi[The awareness of science and social science prospective teachers regarding to sustainable environment]. *International Journal of Turkish Educational Sciences,* 5, 235-247.

Cooper, C., & Cockerill, K. (2015). Water Quantity perceptions in Northwestern North Carolina: Comparing college student and public survey responses. *Southwest. Geogr,* 55, 386–399.

Cakir, A. (2016). *Ortaokul öğrencilerinin su kullanımına yönelik tutumlarının ve farkındalıklarının incelenmesi [An investigation of middle school students' attitudes and awareness of water use] (Unpublished Master Thesis).* Afyon Kocatepe University, Afyonkarahisar. https://tez.yok.gov.tr/UlusalTezMerkezi

Dean, A. J., Fielding, K. S., & Newton, F. J. (2016). Community knowledge about Water: Who has better knowledge and is this associated with water-related behaviors and support for water-related policies? PLoS ONE, 11(7) e0159063. https://dx.doi.org/10.1371%2Fjournal.pone.0159063

Dinc, H. (2018). Su okuryazarlığı eğitiminin gerekliliği ve etki gücü üzerine bir deneme[A requirements on the effectiveness of water literacy education]. *Anatolian Journal of Teacher, 2*(2), 169-176. https://dergipark.org.tr/tr/pub/aod

Er-Nas, S., & Senel-Coruhlu, T. (2017). Fen Bilgisi öğretmen adaylarının perspektifinden sürdürülebilir kalkınma kavramı[The Concept of sustainable development from the perspective of preservice science teachers] *YYU Journal Of Education Faculty, 14*(1), 562-580. http://dx.doi.org/10.23891/efdyyu.2017.22

He, H. S. (2018). Construction of the index system of water literacy and application in a case study of four Chinese communities. *J. Discret. Math. Sci. Cryptogr,* 21, 485-491.

Hui-Shuang, H. (2018). Construction of the index system of water literacy and application in a case study of four Chinese communities. *Journal of Discrete Mathematical Sciences and Cryptography, 21*(2), 485-491. https://doi.org/10.1080/09720529.2018.1449330

Kiyak, A. (2013). Geleneksel Türk inanışlarındaki su kültü ve Elazığ'daki izleri[Aquatic cult in traditional Turkish beliefs and theır marks in Elazig]. *The Journal of Gumushane University Faculty of Divinity, 2*(4), 22-39. https://dergipark.org.tr/en/pub/gifad

Kucuk, M., & Burkaz Ekinci, S. (2021). What do Turkish Experts say about sustainable development goals and teaching about achieving these goals? *Education Quarterly Reviews, 4*(3), 290-303. https://doi.org/10.31014/aior.1993.04.03.339

Kurt, A. A. (2010). Okuryazarlıkta dönüşümler. In H. F. Odabasi (Ed.), *Bilgi ve iletişim teknolojileri ışığında dönüşümler* (p. 81-118). Ankara: Nobel Publishing.

Kurt, A. A., Orhan Goksun, D., Yaman, F., Solak, M. S., & Turkan, F. (2014). Bilgi ve iletişim teknolojileri ışığında Türkiye'de yapılan okuryazarlık çalışmalarındaki eğilim [Literacy studies' trends in Turkey in the light of information and communication technologıes]. *Eğitim Teknolojileri Araştırmaları Dergisi, 5*(2).

Kucuk, A., & Yildirim, N. (2020). The Effect of out-of-school learning activities on 5th-grade students' science, technology, society, and environment views. *Turkish Journal of Teacher Education, 9*(1), 37-63. http://tujted.com/

McCarroll, M., & Hamann, H. (2020). What we know about water: A water literacy review. *Water, 12*(2803). https://doi.org/10.3390/w12102803

Mete, G. (2020). Okuryazarlık türleri ve 2023 Eğitim Vizyonu Belgesi. *Kesit Akademi, 6*(22), 109-120.

Moreno-Guerrero, A.-J., Romero-Rodríguez, J.-M., L.-B. J., & Alonso-García, S. (2020). Flipped learning approach as educational innovation in water literacy. *Water, 12*(2), 574.

Otaki, Y., Sakura, O., & Otaki, M. (2015). Advocating water literacy. *J. Eng. Technol,* 1, 36–40.

Sagdic, A., & Sahin, E. (2016). An assessment of Turkish elementary teachers in the context of education for sustainable development. *International Electronic Journal of Environmental Education, 6*(2), 141-155.

Sherchan, S., Pasha, F., Weinman, B., Nelson, F. L., Sharma, F. C., Therkelsen, J., & Drexler, D. (2016). Seven faculties in search of a mission: A proposed interdisciplinary course on water literacy. *Appl. Environ. Educ. Commun,* 16, 171-183.

Sozcu, A., Yuksel, H. K., Tuna, E., & Sagir, A. (2022). Bilim ve sanat merkezlerindeki lise öğrencilerinin su okuryazarlık düzeyleri (İstanbul örneği) [Water literacy levels of high school students in science and art centers (Istanbul example)]. *Socıal Scıence Development Journal, 7*(30), 107-120. http://dx.doi.org/10.31567/ssd.606

Sozcu, U., & Turker, A. (2020a). Development of water literacy scale. *Third Sector Journal of Social Economy, 55*(2), 1155-1168.

Sozcu, U., & Turker, A. (2020b). Examining the Water literacy levels of high school students according to some variables. *Asian Journal of Education and Training, 6*(3), 569-582. https://doi.org/0.20448/journal.522.2020.63.569.582

Su, H. J., Chen, M. J., & Wang, J. T. (2011). Developing a water literacy. *Curr. Opin. Environ. Sustain,* 3, 517–519.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics, new international edition* (6th ed.). Harlow: Pearson Education Limited.

Teksoz, G., Sahin, E., & Ertepinar, H. (2010). Çevre okuryazarlığı, öğretmen adayları ve sürdürülebilir bir gelecek[Environmental literacy, pre-service teachers, and a sustainable future]. *H. U. Journal of Education,* 39, 307-320. https://dergipark.org.tr/tr/pub/hunefd

UNESCO (United Nations Education, S. C. (2003). *World Water Assessment Programme. The United Nations World Water Development Report: Water for People, Water for Life.* Paris, and Earthscan, London: UNESCO. https://sustainabledevelopment.un.org/content/documents/WWDR_english_129556e.pdf

Wang, Y. H., Chang, M. C., & Liou, J. R. (2019). Effects of water-saving education in Taiwan on public water knowledge, attitude, and behavior intention change. *Water Policy*(21), 964–979. https://doi.org/10.2166/wp.2019.173

Wang, Y. H., Chang, M. C., & Liou, J. R. (2019). Effects of water-saving education in Taiwan on public water knowledge, attitude, and behavior intention change. *Water Policy,* 21, 964–979.

Xiong, Y. J., Hao, X. R., Liao, C., & Zeng, Z. N. (2016). Relationship between water-conservation behavior and water education in Guangzhou, China. *Environ. Earth Sci,* 75, 1-9.

Xu, R., Wang, W., Wang, Y., & Zhang, B. (2019). Can water knowledge change citizens' water behavior? A case study in Zhengzhou, China. *Ekoloji, 28*(107), 1019-2027.