The Sustainability Literacy of Students: A Comparative Study between Turkey and the UK

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Abstract: *In recent years, the sustainability literacy has become crucial for building more sustainable future. In this regard, a shift toward sustainability requires literate society on sustainability issues at global scale. Thus, the current study aims to detect the status of sustainability literacy of British and Turkish students. The study was conducted as a survey research with university students in the UK and Turkey within the context of a project that was supported by TUBITAK (Turkish Scientific and Technological Research Organization) and entitled "Ecological literacy education". The participants (n: 1023) of the study are students attending several departments of Plymouth University in the UK and Mugla Sitki Kocman University in Turkey. The data were collected by using the Scala of Sustainability Literacy and analyzed using appropriate statistical tests at SPSS 22. The findings show that the participants' sustainability literacy varies significantly depending on their sustainability attitude (SA), sustainability behavior (SB), sustainability knowledge (SK). Besides, the results of t- test analysis indicate that the participants exhibit different tendencies depending on the variables nationality, gender and place. On the other hand, the results of One-way ANOVA-Test revealed that the participants' sustainability literacy varies depending on the department attended.*

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Introduction

THE transition toward sustainability requires effective sustainability education especially. However, sustainability as a subject has been thought of in terms of environmental education. Also, various tools of environmental literacy rather than sustainability literacy were used to assess learning outcomes. On the other hand, the research on sustainability literacy is limited locally. Therefore, there is a need to investigate the status of sustainability literacy of people using a sustainability literacy scale within a comparative study between different nations. Thus, the current study aimed to detect the sustainability literacy of British and Turkish university students.

The Education for Sustainability and Sustainability Literacy

Sustainability as a future vision refers to a cross-disciplinary transformation of whole human life in which everyone is environmentally, economically and socially interconnected with each other (Sterling, 2004, p.6). In this regard, sustainable development goals (SDGs) declared by UN as future vision focus on mental shifting for achieving more sustainable world (UNESCO, 2017). There is no doubt that achieving the sustainable development goals (SDGs) requires that each person should be sustainability literate.

The basic framework of environmental literacy was stated by Roth (1992, p.17). According to him, environmentally literate citizens are able to recognize environmental problems, to evaluate environmental issues before acting, to take action for solving environmental problems and to take care of needs of future generations. Orr (1992: 92) describes environmental literacy as follows: "*Environmental literacy, further, implies a broad understanding of how people and societies relate to each other and to natural systems, and how they might do so sustainability*". On the other hand, Capra (2003, p.201) defines ecological literacy as our ability to understand the basic principles of ecosphere and to live accordingly.

The attributes framing environmental literacy are associated with four main components defined as knowledge, sensitivity, action and active involvement (Marcinkowski, 1991; Volk & Mc. Beth, 1997; Simsons, 2001). In this regard, Hollweg et al. (2011) conceptualized the components of environmental literacy as knowledge (e.g. knowledge of physical and ecological systems; knowledge of social, cultural, and political systems), dispositions (e.g. sensitivity, locus of control/self-efficacy), competencies (e.g. can identity and analyse environmental issues) and environmentally responsible behaviour.

Moreover, the scope and meaning of environmental literacy was extended to sustainability literacy due to transition from environmental education to sustainability education recently (Sterling, 2004, p.50; Brando et al., 2022). In this connection, sustainability literacy has become a major outcome of sustainability education (Sandri, 2014). *Seen from this perspective, sustainability literacy also implies the ability for a sustainable future rather than environmental literacy*. In this sense, sustainability literacy was defined as a competency for transition toward sustainability (Winter & Cotton, 2012). Stibbe and Launa (2014, p.11) describe sustainability literacy as a collection of skills that can contribute to transition toward more sustainable society. Also, according to Parkin et al. (2004, p.9), sustainability literacy addresses as an "umbrella term" to understand the symbiotic relations among environmental, social and economic dimensions of sustainable development. Also, a sustainability literate person is able to combine appropriate knowledge with skills and furthermore recognize and appreciate sustainable actions of others.

Literature Review

Today, in line with the sustainable future vision, for environmental education to be extended towards sustainability education, environmental literacy should be updated as sustainability literacy (Sterling, 2012). Thus, in the current study, the literature on environmental literacy is presented as sustainability literacy

The Status of Environmental (Sustainability) Literacy

When the literature is reviewed, it is seen that the environmental literacy (sustainability literacy) of different participants varies depending on their knowledge level, attitude and behaviour in general. Previous studies reported the results on various aspects regarding the level of participants' environmental (sustainability) literacy. High scores on knowledge were reported by Kaplowitz and Levine (2005), McBeth and Volk (2009), Erdoğan and Ok (2011), Al-Naqbi and Alshannag (2018), Sousa et al., (2021), low scores on knowledge were reported by Esa (2010), Veisi et al., (2019), high scores on attitude were reported by Erdogan and Ok (2011), He et al., (2011), Balcı (2012), Esa (2010), Veisi et al., (2019), Sousa et al., (2021), low scores on attitude and behavior were reported by McBeth and Volk (2009) and low scores on behavior were reported by Erdoğan and Ok (2011), and Esa (2010).

Participants' sustainability literacy may also vary across the sub-dimensions of this literacy. Indeed, Tekgoz et al. (2014) reported that while participants can easily answer questions about biodiversity and pollution, they have difficulty in answering questions about interrelationships in nature and atmospheric emission. In addition, the participants approve of the eco-

centric statements more than the anthropocentric ones. On the other hand, the tendency to use energy and paper sparingly in daily life is common (Ozdemir, 2019; Janmaimool and Khajohnmanee, 2019). In contrast, environmentally friendly ventilation (Sousa et al., 2021), recycling, individual sacrifice and active participation type sustainable practices (Ozdemir, 2019) are less exhibited.

The Demographic Variables (Nation, Gender, Place, Department)

Many studies have been conducted to measure and monitor nations' awareness of and attitudes and behaviours towards the issues of environment and sustainability (Korfiatis et al., 2004; Shulz & Zelenny, 1999; Lin & Shi, 2006; Pisano & Lubell, 2017; Frank et al., 2020; Brando et al., 2022).

In this regard, Shulz and Zelenny (1999) and Nawrotzki (2012) indicated that the citizens of the less developed countries exhibited highest concern for the environmental issues. However, as Frey Meyer and Johnson (2010), Oreg and Katz-Gerro (2006), Pirani and Secondi (2011) showed that the people in developed countries appear to exhibit more positive behaviors than others. On the other hand, Liu and Sibley (2012) and Pisano and Lubell (2017) found that there is a stronger positive correlation between the environmental attitude and behavior in developed countries.

Numerous studies consider the role of gender on sustainability literacy. In this regard, a lower level of knowledge among females than males was reported by various studies such as the ones conducted by Al-Naqbi and Alshannag (2018), Choe et al. (2020), Sousa et al. (2021). However, Dogan and Purutcuoglu (2017) and Sousa et al. (2021) have stated that the knowledge of participants don't differ by gender. On the other hand, many studies reported higher attitude related to sustainability literacy among females than males such as the ones conducted by Cho (2007), Erdogan (2013), Ozturk and Tokgoz (2016), Cimen and Benzer (2019), Aytekin at al. (2021). Similarly, the female participants were found to be exhibiting more sustainable styles than males in daily life (Choe, 2007; Teksoz, Sahin & Ertapinar, 2010; Erdogan, 2013; Cotton et al., 2018).

The place where the participants spent the longest time in their childhood was also found to be a predictor of sustainability literacy. As Louv (2012, p.43) emphasised, the nature experiences during childhood could play main role to form human-nature relationship. He described the side effect of a childhood spent in isolation from nature as "nature -deficit disorder". Numerous researchers such as Wells and Lekies (2006), Strife and Downey (2009), Wells (2000), Chawla (2006), Ewert et al., (2005) reported the cru-

cial role of nature experiences in childhood in the development of adults' proenvironmental attitudes and behaviors.

In fact, the vision of sustainability is based on the conflict and reconciliation of different perspectives: ecological, economic and socio-cultural. That's why, the meaning and priority regarding to sustainability vary depending on the perspective adopted.

In this regard, a few descriptive studies focused on the effect of education programs on students' sustainability literacy. For instance, Cotton, Miller and Valle (2018) reported that the students from health-medicine seem to ready to accept ecological worldview more than the students from social sciences, while students from science-technology departments seem to behave more sustainably than the students from health and social sciences departments regarding energy literacy. On the other hand, the level of knowledge of the participants from science-technology departments appears to be higher than the participants from health and social sciences departments. However, Goulgouti et al. (2019) stated that the knowledge and attitude scores of science-technology students seem to be higher than humanity sciences students while behavior scores don't differ. Tiftikci (2014) noted that the awareness on renewable energy sources of students in education faculties is higher than others.

Rationale, Purpose and Research Questions

Several studies have been conducted for the assessment of the status of sustainability literacy of various participants globally. However, studies in this area are limited to local evaluations rather than international comparisons. However, the transition to sustainability depends on the comparative determination of the difficulties or orientations of different participating groups in establishing a sustainable future. On the other hand, the relevant literature is dominated by environmental education and environmental literacy terminology. For this reason, international studies with appropriate terminology and unity are needed for the integration of ecological, economic and socio-cultural perspectives of sustainability. Thus, the current study investigated the sustainability literacy of the UK and Turkish students in terms of sustainability knowledge, sustainability attitude and sustainability behavior dimensions, taking into account the variables of nationality, gender, the place where the longest time is spent during childhood and department.

Through assessing the sustainability literacy efficiency globally, the findings of the study could contribute to the monitoring and enhancement of sustainability education practices.

The following research questions were investigated in this study:

- *What is the level of participants' sustainability knowledge (SK), sustainability attitude (SA) and sustainability behavior (SB)?*

Table 1. Participants' Demographic Features.			
		f	**%**
Nation	British	522	51.0
	Turkish	498	48.6
Gender	Female	665	64.8
	Male	351	34.2
Place	Urban	629	61.4
	Rural	392	38.3
Department	Health and Medicine	218	21.3
	Social Sciences	235	22.9
	Environmental Sciences	186	18.1
	Education	222.	21.7
	Sciences	81	7.9
	Engineering and Computer	81	7.9
Total		1023	100

- *How do participants' SA, SB and SK scores vary depending on nationality, gender, the place where the longest time spent during child*hood and department?

Method

The study was designed as a descriptive research to investigate and compare the sustainability literacy in Britain and Turkey.

Participants

The participants are British and Turkish students (n: 1023) who were studying in different departments at University of Plymouth in the UK and Mugla Sitki Kocman University in Turkey. The demographic features of the participants are presented in **Table 1**.

Instrument

The sustainability literacy scale developed in English as a part of TUBITAK project (Ozdemir, 2021) was used for data collection. The scale consists of four dimensions; "sustainable attitude (SA)", "sustainable behavior (SB)", "sustainable knowledge (SK)" and "sustainable perception (SK)". The study was conducted considering the first three dimensions in the scale; SA, SB and SK.

The part of the scale limited to the dimensions of SA and SB has a Cronbach's alpha reliability coefficient of 0.839. The validity of the dimensions of sustainability knowledge (SK) and sustainability perception (SP) were checked through taking the experts' recommendations into consideration. As a result, it was confirmed that the content of the items in the sub-dimensions of knowledge and perception concurs with the relevant literature.

Sustainability Attitude (SA)

The dimension of sustainability attitude (SA) consists of a Likert-type scale items (n: 14) addressing the sub- dimensions that are entitled as "concern/worried", "social responsibility "and "locus of control". The items in the SA dimension assess the extent to which participants agree with the statements by using five possible response options (1 = strongly disagree, 2 = disagree, 3 = have no opinion, 4 = agree, 5 = strongly agree).

Sustainability Behavior (SB)

The dimension of sustainability behavior (SB) includes Likert type items (n: 16) responded with one of the following response options (1= never, 2 = very seldom, 3 = sometimes, 4 = often, 5 = almost always). The SB was designed to have the sub-dimensions of "consumption pattern", "household use" and "participation".

Sustainability Knowledge (SK)

The dimension of sustainability knowledge (SK) consists of multiple-choice and close- ended questions (n: 11), which address fundamental ecological processes and principles (SK1, SK2, SK3, SK4, SK5), natural sources- human use (SK6, SK7, SK8) and environmental problems/issues (SK9, SK10). A correct response for each item is scored as "1" and an incorrect response is scored as "0".

Analyses

The data obtained in this study were analysed with descriptive analysis techniques in SPSS program. First of all, it was tested whether the normal distribution assumption was met using the Shapiro-Wilk test and it was found that the normal distribution assumption was met (Skewness: 0.077). The sustainability literacy status of the participants was presented descriptively, taking into account the mean score, the scores taken from the dimensions of the scale and the scores taken from each item. Then, the status of the participants'

Table 2. Mean and Standard Deviation of the related Dimension of Participants' Sustainability Literacy.

Dimension	N	X	Range (Min-Max.)	SD
Sustainability Attitude (SA)	1,020	35.46/3.54	19-50	6.98
Concern/worried (1-4)	1,020	13.47/3.36	4-20	4.00
Social responsibility (5-7)	1,020	11.88/3.96	4-15	1.98
Locus of control (8-10)	1,020	10.90/3.63	3-15	3.18
Sustainability Behaviour (SB)	1,020	48.12/3.43	23-70	8.90
Consumption Pattern (1-5)	1,020	18.05/3.61	5-25	3.77
Household Use (6-8	1,020	13.01/4.33	3-15	1.99
Participation (9-14)	1,020	17.05/2.84	6-30	5.32

Table 3. Participants' Responses on the Sustainability Attitude Items (%).

	Strongly Disagree	Disagree	Have No Idea	Agree	Strongly Agree
Concern/worried (1-4)					
1) The environmental issues are over exaggerated.	23.3	21.6	7.2	27.6	20.1
2) Human beings have the right to exploit nature`s resources according to our needs.	16.9	22.7	14.5	30.9	14.7
3) I am concerned about the extinction of some living species.	2.4	2.7	2.6	31.2	60.8
4) It is not important if some species which are not useful for human needs become extinct.	36.9	9.7	5.1	16.7	31.0
Social responsibility (5-7)					
5) I am concerned about the unequal use of resources in the World.	1.5	3.1	7.4	38.8	49.0
6) I would like to participate in local environmental events voluntarily.	0.8	7.2	12.0	45.5	34.0
7) I am willing to make sacrifices for sustainability (such as paying more tax etc.).	8.0	11.5	21.3	36.5	22.4
Locus of control (8-10)					
8) I believe I can contribute to the quality of the environment through my personal behavior.	2.1	9.9	17.8	39.4	30.6
9) The individual's intention does not impact environmental issues.	24.2	21.8	13.7	28.7	11.3
10) Individual sacrifices have no effect on sustainability.	25.4	18.6	9.1	27.1	19.4

Table 4. Participants' Responses on the Sustainability Behavior Items (%).

	Never	Very Seldom	Sometimes	Very Often	Almost Always
Consumption Pattern (1-5)					
1) Separate out waste for recycling (e.g. organic waste, plastic etc.)	2.7	5.1	22.5	29.5	39.9
2) Re- use of writing paper as scrap paper.	6.0	12.8	27.1	27.9	26.0
3) Purchase "environmentally friendly" products such as recyclable packaging.	2.2	10.8	32.9	34.1	19.7
4) Choose sustainable food such as local, seasonal and fair trade.	3.6	12.4	34.5	31.1	18.2
5) Consider label information in my shopping choices.	6.9	15.9	25.3	28.0	23.7
Household Use (6-8)					
6) Turn off lights and electric appliances when not in use.	0.2	2.7	8.2	30.7	57.9
7) Adopt water saving at home (turn off when brushing teeth, washing dishes etc.).	0.8	3.5	10.8	32.9	51.7
8) Do not use the washing machine until I have a full load of dirty laundry.	1.9	4.7	11.9	27.1	54.2
Participation (9-14)					
9) Donate used items to charity for re-use.	6.2	10.2	22.7	30.2	30.4
10) Volunteer at local environmental events such as Nature Trust, environmental training etc.	26.8	29.4	23.0	11.5	9.0
11) Read articles and watch TV programs on environmental issues.	4.3	11.6	31.1	32.6	20.2
12) Participate in climate-awareness campaigns.	41.9	23.9	19.6	8.6	5.8
13) Protest against damaging environmental government policy.	44.1	20.0	19.6	9.0	7.0
14) Confront people who litter in public spaces or damage the environment in any manner.	18.1	14.7	24.1	23.1	19.7

Table 5. Mean and Standard Deviation of Sustainability Knowledge Dimension.

Dimension	N	X	Range (Min-Max.)	SD
Sustainability Knowledge (SK)	1,023	5.71	0-10	1.81
Environmental Processes (1-4)	1,023	2.73	0-4	1.06
Natural sources and human use (5-8)	1,023	2.08	0-4	0.99
Environmental degeneration (9-10)	1,023	8.922	0-2	0.70

sustainability literacy scores according to gender, nationality, place and department were analysed by using t-test and ANVO test.

Results

In this study, the findings are presented in the following order; firstly, the means and standard deviations of the dimensions and their sub-dimension.

In the **Table 2**, the mean score for the participants' responses to a 10 five- point Likert type items was transformed to five-point Likert scale. Accordingly, the mean of SA was found as 3.54 that means nearly "agree". The means scores calculated for the sub-dimensions of SA such as concern-worried, social responsibility and locus of control are 3.36, 3.96 and 3.33, respectively. The mean score of SB was found to be 3.43 while the mean scores for its sub-dimensions were found to be 3.61, 4.33, and 2.84. Lastly, the mean score of the participants for SK was found to be 5.93.

Findings related to the extent of the agreement with the statements regarding each item of sustainability attitude are presented in **Table 3**.

Using data from **Table 3**, the following evaluations can be made based on items representing different dimensions of SA:

While statements such as "The environmental issues are over exaggerated", "Human beings have the right to exploit nature`s resources according to our needs" and "It is not important if some species which are not useful for human needs, become extinct" are strongly refuted by the majority. The statements such as "I am concerned about the extinction of some living species" are strongly approved by the majority.

The statements related to social responsibility sub-dimension such as "I am concerned about the unequal use of resources in the World", "I would like to participate in local environmental events voluntarily" and "I am willing to make sacrifices for sustainability (such as paying more tax etc.)" are strongly agreed by the majority of the participants. This trend indicates that majority of the participants seems to be concerned about social issues related to sustainability.

The responses to the negative statements of the locus of control sub-dimension such as "The individual's intention does not impact environmental issues" and "Individual sacrifices have no effect on sustainability" were divided almost equally into agreement and disagreement groups. In contrast, the statement namely "I believe I can contribute to the quality of the environment through my personal behaviour" is agreed by majority of participants.

The following table presents the scores for the participants on the sustainability behaviour items.

As can be seen from **Table 4**, the majority of participants seem to display sustainable daily life practises in terms of consumption pattern in a

frequency ranging from "sometimes" to "almost always". It indicates that majority of the participants are concerned about sustainable consumption patterns in their daily life. Likewise, the participants tend to consider sustainable household use practises such as "turn off lights and electric appliances when not in use", "adopt water saving at home (turn off when brushing teeth, washing dishes etc.)", "do not use the washing machine until I have a full load of dirty laundry" in a frequency ranging from "very often" to" almost always". On the other hand, the participants seem to participate in events such as "donate used items to charity for re-use read articles" and "watch TV programs on environmental issues". However, they don't much engage with voluntary activities such as "volunteer at local environmental events such as Nature Trust, environmental training etc." and "protest against damaging environmental government policy".

Lastly, the mean and standard deviation scores about sustainability knowledge and its sub-dimensions are presented below:

As can be seen from **Table 5**, the mean score of participants taken from SK is 5.71. Also, the participants correctly answered nearly half of the questions. Indeed, almost three of the four questions related to environmental processes were answered correctly. On the other hand, nearly half of the questions regarding natural sources and human use and environmental degeneration were answered correctly.

To understand more clearly the participants' level of SK, their answers are presented as incorrect and correct in the following table.

As can be seen in **Table 6**, the majority of the participants (between 60% and 88%) correctly answered the questions related to basic ecological processes such as "Which of the following is not true about ecosystems?" and "Which of the following living creatures transform organic waste to inorganic compounds in nature?" Indeed, the fourth question was answered by more participants than the others. However, almost half of the participants couldn't give correct answer to the question regarding the relationship between all living systems in the nature.

The majority of the participants (between 63% and 69%) answered correctly the questions regarding the environmental sources and human use. But, the questions related to "the population theory and bio capacity - footprint" were not answered correctly by the majority of the participants (between 59.7% and 64.6%). Especially, the participants couldn't comprehend subjects regarding to bio capacity and human footprint.

Lastly, the questions regarding to environmental degeneration weren t answered correctly by the majority of the participants (between 50.7% and 60%. Especially, the great majority of the participants expressed a misconception about the reason of climate change because the majority suggest that the climate change is caused by depletion of stratospheric ozone.

Table 6. Participants' Responses on the Sustainability Knowledge (SK) Items.		
Items	Incorrect (%)	Correct (%)
Ecological Processes (1-4)		
1) Which of the following is not true about ecosystems? (a) In an ecosystem energy is recycled (b) In an ecosystem materials are recycled (c) The size of populations in nature is limited by the amount of food (d) The base of the food web is consumers	39.4	60.0
2) Which of the following living creatures transform organic waste to inorganic compounds in nature? (a) Plants (b) Animals (c) Microbe (d) Mushroom	35.1	64.8
3) Which of the followings best define the relationship between all living systems? (a) inter-connection (b) competition (c) fitness (d) cooperation	41.9	57.9
4) Which of the following does not break down in nature? (a) organic waste (b) cotton clothes (c) plastic (d) paper products	9.8	88.8
Natural Resources and Human Use (5-8)		
5) Which of the following energy sources are used most? (a) fossil fuels (b) Natural gas (c) Solar energy (d) Nuclear energy	30.9	69.0
6) Which of the following resources used least frequently? (a) Soil for food (b) minerals for technology products (c) water for industrial production (d) animals for transportation	35.8	63.8
7) Who developed the "theory of human population", which stated that at some point there would be too many people alive? (a). C. Darwin (b) T.R. Malthus (c) H. Spencer (d) A. Smith	59.7	40.0
8) Please answer the following questions according to the following formula. Field (F) x biological productivity (BP) = Biocapacity (A) Population (P) x Consumption per capita (C) x Concentration of waste (W) = Ecological footprint Which of the following is least accurate, given the above statement? (a) Biocapacity means productive area size, which sustains life on the planet. (b) Ecological footprint means total human effect on nature (c) difference between B and A defines ecological deficit d) the area of (A) is bigger than of (B)	64.6	34.7
Ecological Degeneration (9-10)		
9) Which of the following statements is not true? (a) depletion of stratospheric ozone causes climate change (b) use of pesticides causes water pollution (c) burning of fossil fuels causes air pollution (d) destroying of habitats causes loss of biodiversity	60.0	39.1
10) Which pollution is the most difficult to perceive? (a) physical p. (b) biological p. such as contamination of microbe (c) chemical p. such as contamination of some chemicals (d) visual p.	50.7	49.3

The results of the independent samples t-test conducted to determine whether the sustainability scores of the participants vary significantly depending on the variables of gender, nationality and place are presented in **Table 7**.

As seen in **Table 7**, the mean values regarding to SA vary significantly depending on gender, nationality and place in favour of the female and British students and the students having spent the longest time in urban during their childhood. The mean scores taken from SB are significantly higher for the female and British students. The mean scores taken from SK are higher for the Female and British students.

Table 7. Results of the t-Test Conducted to Determine Whether Sustainability Scores Vary Significantly depending on Nationality, Gender and Place.

Dimension	Variable	n	X	SD	p
Sustainability Attitude	Female	660	35.59	6.69	0.000
	Male	348	33.65	6.16	
	British	516	39.73	5.22	0.000
	Turkish	496	29.98	3.38	
	Urban	626	33.84	6.30	0.000
	Rural	387	36.72	6.61	
Sustainability Behavior	Female	660	48.71	8.31	0.003
	Male	348	46.98	9.84	
	British	517	45.97	7.89	0.000
	Turkish	495	50.28	9.32	
	Urban	624	48.55	8.91	0.049
	Rural	389	47.42	8.87	
Sustainability Knowledge	Female	663	5.82	2.29	0.044
	Male	346	6.13	2.26	
	British	515	5.29	1.95	0.000
	Turkish	498	6.59	2.37	
	Urban	628	5.92	2.29	0.907
	Rural	386	5.94	2.27	

Table 8. Results of the ANOVA-Test Conducted to Determine Whether Sustainability Scores Vary Significantly depending on Department.

Department	1:218(n)	2: 235(n)	3:186(n)	4:222(n)	5:81(n)	6:81(n)
SA Mean	34.53	35.75	38.02	32.57	33.91	34.17
SA Mean Difference	3.51*(1-3) 2.00* (1-4)	-2.36*(2-3) 3.15* (2-4)	5.52* (3-4) 4.13* (3-5) 3.88* (3-6)			F: 0.000
SB Mean	46.73	47.47	48.36	49.60	49.41	47.80
SB Mean Difference	-2.95*(1-4)					F: 0.012
SK Mean	6.06	5.46	6.11	6.04	5.88	6.28
SK Mean Difference	0.775* (1-5)	-0.784*(2-3) -0.804*(2-4) -0.720*(2-5 -0.670* (2-6)		.		F: 0.013

Note
Department: 1: Health, 2: Social Sciences, 3: Environmental Sciences, 4: Education, 5: Positive Sciences, 6: Computer and Engineering

The results of the ANOVA-Test conducted to determine whether the sustainability scores of the participants vary significantly depending on the variable of department are presented in **Table 8**.

As can be seen in **Table 8**, the sustainability attitude means scores of the students attending the Departments of Health Sciences, Educational Sciences and Environmental Sciences vary significantly in favour of the students attending the Department of Health Sciences. On the other hand, the mean scores of the students attending the Departments of Social Sciences and Environmental Sciences were found to be significantly different in favour of the students attending the Department of Environmental Sciences and the mean scores of the students attending the Departments of Educational Sciences and Social Sciences were found to be significantly different in favour of the students attending the Department of Social Sciences. The sustainability attitude means scores of the students attending the Departments of Environmental Sciences, Educational Sciences, Positive Sciences and Computer/Engineering were found to be significantly different in favour of the students attending the Department of Environmental Sciences.

The sustainability behaviour means scores of the students attending the Departments of Health Sciences and Educational Sciences were found to be significantly different in favour of the students attending the Department of Health Sciences.

The sustainability knowledge means scores of the students attending the Departments of Health Sciences and Positive Sciences were found to be significantly different in favour of the students attending the Department of Health Sciences. On the other hand, the sustainability knowledge mean scores of the students attending the Department of Social Sciences and the other departments were found to be significantly different in favour of the students attending the other departments.

Discussion

The mean scores taken from the dimension of sustainable attitude (SA) show that the participants have a positive attitude towards the situations related to sustainability issues. In particular, the situations corresponding to the "concern-worried, social response ad locus of control" sub-dimensions SA dimension are generally adapted to a large extent. However, it is seen that the participants are more engaged in situations related to social response than concern-worried and locus of control. These findings are generally parallel to the related literature (Erdogan and Ok, 2011; He et al., 2011, Balcı, 2012; Esa, 2010; Veisi et al., 2019, Sousa et al., 2021). However, it is contradictory that while the positive items related SA were largely approved, the participants remained hesitant about the negative items. This may be due to the distracting feature of the negative items.

Participants declared that they exhibited behaviours related to the sustainable behaviour (SB) dimension "very often". However, it is noted that the participants are not so willing to participate in sustainability processes.

For example, it was stated that sustainable domestic behaviours such as "turn off lights and electric appliances when not in use", "do not use the washing machine until I have a full load of dirty laundry" are frequently exhibited. In contrast, it was seen that social responses related to sustainability situations such as "volunteer at local environmental events such as Nature Trust, environmental training etc.", "protest against damaging environmental government policy" are rarely demonstrated. Similarly, Janmaimool and Khajohnmanee (2019) stated that students often behave more environmental friendly in their daily life activities, house hold use etc. In contrast, they don't engage in participating in campaigns and demonstration for sustainability issues willing (Goulgouti et al., 2019).

Lastly, the participants' responses to the questions regarding sustainability knowledge (SK) indicate that the half of them own insufficient knowledge or some misconceptions about environmental processes, natural sources-human use and environmental degeneration. In this regard, the majority of the participants answered correctly the questions about the energy flow, food chain, matter cycle, recycling etc., while almost half of them didn t answer correctly the question about the relationships between all matters in the nature such as inter-connection, competition, fitness, cooperation etc. Similarly, the majority of the participants answered correctly the questions related to environmental sources and human use however they couldn't answer the questions about population's theory and bio capacity-human footprint relationship. As expected, the majority of the participants have misconception about the reason of climate change because they suppose climate change is caused by depletion of stratospheric ozone. Likewise, numerous studies such as the ones by Esa (2010), Teksoz et al. (2014), Veisi et al. (2019), Esa (2010), Teksoz et al. (2014) and Veisi et al. (2019) pointed out that participants could answer the easiest basic questions related to ecosystem while they have difficulty understanding the relationships in the nature and human affects.

There is a gap of cross-nation studies investigating the status of sustainability literacy of students specially. Thus, shifting toward sustainability depends on the explorations and enhancements of sustainability literacy globally. In this study, it was found, that the British participants seemed exhibiting more positive attitudes and less positive behaviours while the Turkish participants have fewer positive attitudes and more positive behaviours. This finding wasn't not totally confirmed by related literature such as Freymeyer and Johnson (2010), Oreg & Katz-Gerro (2006), Pirani & Secondi (2011). This unexpected finding in the study can be explained by the behavioural patterns of industrial societies such as the United Kingdom because the attributes of a society such as development, welfare level etc. could predict the attitude, behavior and knowledge regarding to sustainability issues (Pisano & Lubell, 2017). Compared to the United Kingdom, Turkey indus-

trialized and urbanized later. The fact that the UK students tend to exhibit fewer examples of SB can therefore be seen as one of the consequences of being a long-term industrial society.

On the other hand, the fact that Turkish students respond to SK questions more easily than the British students can be attributed to the fact that the education system in Turkey is carried out on the basis of a more intensive curriculum.

When the findings are evaluated in terms of gender, place where the longest part of childhood is spent and department attended, the following comes to the fore.

The studies conducted by Cho (2007), Erdogan (2013), Ozturk and Tokgoz (2016), Teksoz, Sahin, and Ertapinar (2010), Cotton, Miller and Valle (2018), similarly the findings in the current study, show that the female participants appear to reflect more positive attitude and sustainable behavior than male participants regarding to environmental; that is, sustainability literacy. However, female participants have a greater difficulty understanding than male participants as Al-Naqbi and Alshannag (2018), Choe et al. (2020) and Sousa et al. (2021) pointed out. This finding could be explained in terms of both socialization-based theory and structural theory (Zellezny et al., 2000) that emphasized the different role of gender in society generally.

The place where the adults lived for the longest period during childhood could be a determinant of their relationships with and behaviours towards nature. In the current study, the participants spent longer time in rural areas during their childhood seem to have more positive attitudes to sustainability issues than the ones spent longer time in urban areas during their childhood. This finding is also supported by place-based approaches such as Smith and Sobel (2010) and Love (2010). The deficit between attitude and behaviour could be explained in terms of various obstacles for SB in daily live. This finding indicated the importance of nature experience based environmental education for improving sustainability literacy.

Firstly, the transition toward sustainability requires an interdisciplinary approach interlinking different aspects such as economical, ecological, social and cultural. From this perspective, this study investigated in Britain and Turkey whether the sustainability literacies of the university students enrolled in different departments such as health, social sciences, environmental sciences, education, positive sciences, computer and engineering differ. Accordingly, health students seem to have more positive attitude than environmental sciences and education students. In contrast, student teachers like be behave more sustainable than health students. This discrepancy might be caused by the deficit between attitude and behaviour. On the other hand, the students in environmental sciences reflect higher and positive attitude than social sciences compared with education students as well as they have more positive attitude than computer/engineering sciences. As expected, this

finding show that environmental science students appear more concerned with sustainability issues than others in general. On the other hand, as Cotton, Miller and Valle (2018) stated, the SK level of social sciences students seems to lower than others in general.

Conclusion and Recommendations

The differences of participants' sustainability literacy in the dimensions of SA, SB, and SK with respect to nation, gender, place and department guide showed how sustainability literacy could be improved globally. On the other hand, the higher level of female participants in terms of SA and SB confirm the power of female for transition toward sustainability. The result that the participants who lived in rural for the longest period during childhood have more positive attitude than others underlines the important of nature experience for improving sustainability literacy. In contrast, the finding that more sustainable behaviors among the participants with the longest periods of urban experiences explains urgency of the emergence of sustainability in urban life. Another remarkable finding is to consider the deficit between attitude and behavior, as several studies stated. Future studies could make the interaction between both dimensions more obvious.

Summarily, in this study, the redefining the terminology related environmental education and environmental literacy as sustainability education along with sustainability literacy may contribute to transform related literature and education practice toward the direction of sustainability future vision. The results herein obtained, set a starting point to evaluate and enhance of sustainability literacy in light of SDG goals at cross-nation level.

The following suggestions can be made in order to increase the sustainability literacy of students with sustainability education globally:

- *There is a need to develop a sustainability education curriculum based on cross-disciplinary and cross-cultural content in light of SDG goals.*
- *There is a remarkable uncertainty about how sustainability education can be implemented. For this, best models/materials that could guide sustainability education should be designed and implemented within international collaboration.*
- *The permanence of learning outcomes as sustainability literacy should be monitored and evaluated within alternative tools.*

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