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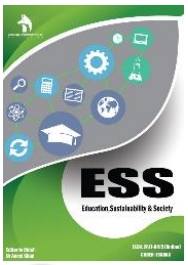

RESEARCH ARTICLE

A SCALE DEVELOPMENT OF THE SUSTAINABILITY LITERACY

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ABSTRACT

The transition toward sustainable society requires effective sustainability education broadly. In this regard, the studies for assessment and observation of sustainability literacy have become important specially. From this point, the study aims to develop a scale for sustainability literacy. The study was conducted with university students in the UK within the context of a project that has been supported by TUBITAK (Turkish Scientific and Technological Research Organization) and entitled "Ecological literacy education". The participants (n: 523) of the study consist of students studying on several departments of Plymouth University in the UK. The data was tested by using the appropriate statistical tests at SPSS 22. The structure validity of the scale was investigated using Explanatory Factor Analysis (EFA) and according to factor loading value of any items. The reliability of the scale was tested according to Cronbach's alpha score limited to the dimensions of sustainability attitude (SA) and sustainability behaviour (SB) particularly. The findings show that the scale is suitable for measuring of participants' sustainability literacy within the factors of "sustainability attitude (SA)", "sustainability behaviour (SB)", "sustainability knowledge (SK)" and "sustainability perception (SP)". The results suggest that the scale can be used to assess sustainability literacy reliable.

KEYWORDS

Sustainability education, sustainability literacy, scale development.

1. INTRODUCTION

The increasing number of threats because of environmental problems on the nature and the existence of human on the earth requires the transition toward sustainable life styles without delay. There is no doubt that the transition to sustainability can be achieved through sustainability education which is expected to make students sustainability literate. The sustainability as a subject has been handled in terms of environmental education. In this connection, learning outcomes have been assessed using various tools of environmental literacy rather than those of sustainability literacy. That's why, there is a need to develop a scale of sustainability literacy. Thus, the current study aimed to introduce a scale to assess sustainability literacy of university students in the UK. The scale of sustainability literacy that has been developed within the study can be used to assess the learning outcomes of sustainability education given to students in general.

1.1 The Sustainability from Past to Future

The unsustainability of anthropocentric lifestyle was declared clearly during the 1950s by Roma Club. At that time, famous scientists and philosophers in Roma Club recognised the hazards of the economic development-based lifestyle on the nature and human wellbeing. As a result, they aimed an alternative development model, which wouldn't damage natural life. In this process, the book of D. Meadows entitled "Limits of Growth" (Meadows et al., 1972) became a milestone. Meadows clearly declared the urgency of limiting the economic development which threatens human wellbeing and natural life. Finally, "the sustainability" as a global future vision was declared in 1987 by the former Norwegian Prime Minister in a report issued in the "Our Common Future Meeting of the UN".

What does the sustainability mean in reality? In short, 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: 6). Here, firstly ecological dimension refers to the protection of natural structure and healthy functioning of ecosphere, then economic dimension implies the consideration of the capacity of the nature, and finally socio-cultural dimension underlines the fair distribution of the resources in the world both intra-nationally and internationally and even among future generations. In this regard, shifting toward sustainability requires long-term transformation in ecological-economic and social-cultural areas (Ozdemir, 2007).

1.2 The Education for Sustainability and Sustainability Literacy

The transition toward sustainability depends on the mental transformation of society at first via education, which can enhance ecological, economic and social sustainability (Sterling, 2004:6). On the other hand, the transformation toward sustainability should be an essential outcome of education. In this regard, sustainable development goals (SDGs) declared by UN as future vision focuses on mental shifting for achieving more sustainable world (UNESCO, 2017). There is no doubt achieving sustainable development goals (SDGs) requires that each person will be a sustainability literate.

The literacy as a terminology highlights abilities in broad areas such as science, technology, computer, communication and environmental

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sciences (Stables and Bishop, 2001). The basic framework of environmental literacy was stated by Roth (1992:17), who defines environmental literacy as follows: "*Environmental literacy is the capacity to perceive and interpret relative health of environmental systems and to take appropriate action to maintain, restore and improve the health of systems".* According to him, environmentally literate citizens are able to recognise environmental problems, to evaluate environmental issues before acting, to take action for solving environmental problems, 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: 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 and Mc. Beth, 1997, Simsons, 2001). In this regard, Hollweg et al. (2011) conceptualised 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: 50). 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 and Cotton, 2012). Stibbe and Launa (2014:11*)* describe sustainability literacy as a collection of skills that can contribute to transition toward more sustainable society. From this point of view, Parkin et al. (2004:9) define sustainability literacy 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 recognise and appreciate sustainable actions of others. Moreover, the sustainability literacy implies the attributes and dispositions required to develop decision-making strategies (Sterling, 2012). In this regard, sustainability literacy addresses several competences such as knowing, caring, attitude, behaviour and worldview related to natural life and human-nature relationship.

1.3 Literature Review

Various scales have been used to asses environmental literacy on numerous groups of participants such as secondary school teachers in Taiwan (Hsu and Roth, 1998), participants in Korea (Chu et al. 2007), elementary school students in Turkey (Erdogan and Ok, 2011), university students in Turkey (Teksoz , Şahin and Tekkaya, 2012), junior high school students in Israel (Goldman, Assaraf and Shaharabani, 2013), university students in Israel (Alkaher and Goldman, 2018), students in the USA (Szczytko et al. 2019), university students in Iran (Veisi et al. 2019). These studies generally focused on representation of main dimension related to environmental literacy such as knowledge, sensibility, attitude and responsible behaviour and the relationships between them. In this regard, positive relationships have been found between related dimensions in general (Chu et al. 2007; Teksoz, Şahin and Tekkaya, 2012; Goldman, Assaraf and Shaharabani , 2013; Genc and Akilli, 2016, Szczytko et al., 2019; Veise et al. 2019). Furthermore, the relationships between the components of environmental literacy were modelled by Teksoz, Şahin and Tekkaya (2012) and Szczytko et al. (2019). Teksoz, Şahin and Tekkaya (2012) reported that environmental knowledge predicts environmental attitude, concern and responsibility which together accounts for environmental activity. According to Szczytko et al. (2019), there is an interaction between knowledge and hope which together predict cognitive skills and cognitive skills weakly predict environmental behaviour.

On the other hand, numerous studies have been conducted to assess limited and reduced dimensions of sustainability literacy using different scales (Stephard et al. 2011; Winter and Cotton, 2012; Biasutti and Frate, 2017; Cotton, Winter and Valle, 2018; Yamashita, Hayes and Trexler, 2017; Opoku and Egbu, 2018). Mostly, the studies related to the development of a scale for sustainability literacy have focused on the dimensions such as knowledge, attitude and behaviour (Harmon, 2017). In this regard, several specific kinds of literacy such as energy literacy (Cotton et al. 2018), climate literacy (Ledley et al. 2014) etc. were studied in terms of sustainability. Furthermore, some studies were conducted to create a scale such as sustainable intelligence literacy (Okur-Berberoglu, 2020), consumer literacy (Akkuzu, 2016) and interlinked sustainability. However, there is lack of a compact scale of sustainability literacy that addresses the dimensions of sustainability holistically covering attitude, behaviour, knowledge and perception.

1.4. Rationale, Purpose and Research Questions

There is no doubt that the major outcome of sustainability education must be students literate in sustainability, which represent competences and skills for sustainable future. The development and monitoring of sustainability literacy level have become of a special importance. For this reason, several studies were conducted by using different scales for environmental and sustainability literacy. However, there is a need for a compact scale that might represent any dimension of sustainability literacy in an integrated manner. Thus, the current study aims to develop and introduce a scale to measure sustainability literacy of students. Therefore, it can contribute to improvement of sustainability education that assess and monitor sustainability literacy efficiency.

The following research questions were investigated in this study:

- Which components (dimensions) and sub-components (subdimensions) are represented by the sustainability literacy scale?
- What relationships are there between the components?

2. Materials and Methods

The study was designed as a descriptive research that aims to investigate whether the scale represents the sustainability literacy of participants.

2.1. Participants

The study was conducted with a sample of students (n:523) who were studying in different fields at University of Plymouth in the UK. The distribution of participants is presented in the following table:

Table 1: Participants

Variable		n	f(%)
Gender	Female	359	68.6
	Male	157	30.0
Nation	British	456	87.2
	Others	67	12.8
Place	Urban	259	49.6
	Rural	261	50.0
Department	Health and medical sciences	117	22.4
	Social sciences	86	16.4
	Earth and Environmental Sciences	159	30.0
	Education	79	15.1
	Economical Sciences	55	10.5
	Technical Sciences	28	5.4
	TOTAL	523	100

2.2 Instrumentation

The scale of sustainability literacy was developed by the researcher in the light of literature review and expert's recommendations. The related scale was designed in following stages:

Firstly, a draft was developed in the light of the relevant literature such as Shih and Roth (1998), Yavetz, Goldman and Pe`er (2009), Kollmuss and Agyeman (2002), Hollweg et al. (2011), Tekgoz, Sahin and Tekkaya (2012), Szczytko et al. (2019). According to related literature, the content of the scale of sustainability literacy generally represent the main dimensions such as "knowledge", "sensitivity", "skills" and "behaviour". The sensitivity dimension consists of various sub-dimensions such as "concern/worried", "social responsibility" and "locus of control" (Chu et al. 2007; Yavetz, Goldman and Pe'er, 2009). On the other hand, the behavioural dimension addresses the sub-dimensions such as "consumption pattern", "household use" and "participation" (Hungerford and Volk, 1990; Chu et al. 2007; Yavetz, Goldman and Pe'er, 2009).

In this respect, the draft instrument addressed the related dimensions of "sustainable attitude", "sustainable behaviour", "sustainable knowledge" and "sustainable perception". The dimension of sustainability attitude (SA) consists of a Likert-type scale items (n: 14) addresses the sub-dimensions that are entitled as "concern/worried", "social responsibility "and "locus of control". The items of SA in the scale assess the responses via self-report of participants to what extent they agree with the related statements having five possible response options ('1' = strongly disagree,

'2' = disagree, '3' = have no opinion, '4' = agree, '5' = strongly agree). The dimension of sustainability behaviour (SB) includes items (n: 16) each with a Likert-type scale were stated according to frequency in daily life ('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". 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). The sustainability perception (SP) consists of three multiple-choice questions and two open statements. The multiple -choice questions concern the hazard perception (SP1), the meaning of sustainability (SP2), participant's assumption about the most effective way for transition toward sustainability (SP3). With the open-ended questions, the participants were asked to give an example of sustainability and unsustainability in their local area (SP4) and their suggestions for encouraging towards sustainability (SP5).

Secondly, the draft instrument was revived by the three researchers who are experts in the field of sustainability education. The draft scale was revised based on experts' feedback regarding the structure, content and comprehensibility. Thirdly, the draft instrument was piloted with a sample of students at Plymouth University (n: 50). The content validity of the scale was checked in the light of the pilot study. Finally, the items in each dimension were edited according to feedback of participants and experts.

2.3. Analyses

The structure validity of the draft scale that includes the dimensions "sustainability attitude (SA)" and "sustainability behaviour (SB)" was tested using Explanatory Factor Analysis (EFA) at SPSS 22. To do so, principle component analysis as a factoring method and varimax rotation as a rotation method were used for factoring regarding the EFA. The coefficient of data set was tested using Kaiser -Meyer-Olkin (KMO) and Barlett -Test. The KMO value for SA and SB factors were found to be 0.80 and 0.82. In this regard, it was found that the sample size of both groups for factor analysis are suitable (Hutcheson and Sofroniou, 1999). Moreover, the result of SA Barlett test was found to be ($\chi 2$ (45)= 798,355; p<.01) and the result of SB Barlett test was found to be ($\chi 2$ (78)= 1776;213 p<.01), confirming the assumption for multiple variable normalisation (Şencan, 2005; Büyüköztürk, 2018;). Hence, the coefficient of any factor was decided according to factor value over .40 and the items with a factor loading lower than 0.40 were discarded from the scale.

The reliability of the scale was tested according to Cronbach's alpha score. The scale of sustainability literacy 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.

3. Results

The items with factor loading values less than 0.40 were discarded from the scale. In this connection, the items A1, A3, A7, A12 in the SA and B6, B9, B10 in the SB were discarded from the scale. The sub-dimensions of SA (n: 10) were defined as "concern/worried (A1-A4)", "social responsibility (A5-A7)" and "locus of control (A8-A10) according to factor loading values. These three factors explain 53.186% of the total variance. The variances explained by each sub-dimension are as follows: first sub-dimension explains 18.853%, second sub-dimension explains 17.711% and third sub-dimension explains 16.621%. The sub-dimensions of the SB (n:14) were defined as "consumption pattern (B1-B5)", "household use (B6-B8)" and "participation (B9-B13)". These three factors explain 52.88% of the total variance. The variances explained by each sub-dimension are as follows: first sub-dimension explains 22.43%, second sub-dimension explains 16.52% and third sub-dimension explains 13.93%.

The factor values and Cronbach alpha scores related to dimension of the sustainability attitude (SA) in the scale are shown in Table 2.

Table 2: Description of the factor "sustainability attitude" and it's subdimensions

Factor	Subdimensions	Items	The Loading of Item	Total Explained Variance	Cronbach alpha value
Sustainable Attitude (SA) (10 items)	Concern /Worried	1.The environmental issues are over exaggerated.	0.610-0.725	53.186 %	0,737
		2.Human beings have the right to exploit nature`s resources according to our needs.			
		3.I am concerned about the extinction of some living species			
		4.It is not important if some species which are not useful for human needs, become extinct.			
	Social Responsibility	5.I am concerned about the inequal use of resources in the World	0.657-0.713		
		6.I would like to participate in local environmental events voluntarily.			
		7.I am willing to make sacrifices for sustainability (such as to pay more tax etc.).			
	Locus of Control	8.I believe I can contribute to the quality of the environment through my personal behaviour	0.683-0.800		
		9.The individual's intention does not impact environmental issues.			
		10.Individual sacrifices have no effect on sustainability.			

According to table 2, the dimension SA consists of three sub-dimensions called "concern/worried (SA1-SA4)", "social responsibility (SA5-SA7)" and "locus of control (SA8-SA10). The factor loading values were found to be ranging from .61 to .80. In the current study, the sub-dimension of "concern/worried" was represented with the items SA1, SA2, SA3, and SA4 that address emotional and ethical dispositions on environmental issues. The findings obtained for the sub-dimension of concern/worried concur with the findings reported by Chu et al. (2007). The sub-dimension of "social responsibility" has not been directly addressed in the relevant literature. However, Chu et al (2007) define it as "personal involvement", Kollmuss and Agyeman (2002) titled it as "personal responsibility"; Yavetz, Goldman and Pe`er (2009)) conceptualise it as "value of natural law". In the current study, the sub-dimension of "responsibility" was represented with the items SA5, SA6, SA7 that emphasise reaction to unequal use of resources and individual sacrifice for sustainability. The sub-dimension of locus of control was represented with the items SA8, SA9 and SA10 that highlight the power of personal choice on sustainability. The findings obtained for this sub-dimension concur with the findings reported by Yavetz, Goldman and Pe'er (2009).

The factor values and Cronbach alpha scores related to dimension of the sustainability behaviour (SB) in the scale are shown in Table 3.

Table 3: Description of the factor "sustainability behaviour" and it's subdimensions

Factor	Subdimension	Items	The Loading of Items	Total Explained Variance	Cronbach alpha value
Sustainable Behaviour (SB) (14 Items)	Consume pattern	1.Separate out waste for recycling (e.g. organic waste, plastic etc.)	0.494-0.660	52.88%	0,811
		2.Re- use of writing paper as scrap paper.			
		3.Purchase "environmentally friendly" products such as recyclable packaging.			
		4.Choose sustainable food such as local, seasonal and fair trade.			
		5.Consider label information in my shopping choices.			
	Household house	6.Turn off lights and electric appliances when not in use.	0.686-0.769		
		7.Adopt water saving at home (turn off when brushing teeth, washing dishes etc.).			
		8.Do not use the washing machine until I have a full load of dirty laundry.			
	Participation	9. Donate used items to charity for re-use.	0.537-0.865		
		10.Volunteer at local environmental events such as Nature Trust, environmental training etc			
		11. Read articles and watch tv programs on environmental issues.			
		12.Participate in climate-aware campaigns.			
		13. Protest against damaging environmental government policy.			
		14.Confront people who litter in public spaces or damage the environment in any manner			

According to table 3, the dimension of SB consists of three sub-dimensions called "consumption pattern (SB1-SB5)", "household use (SB6-SB8)" and "participation (SB9-SB13)".

There is no doubt that the consumption pattern plays a very crucial role in the current unsustainable situation and also could be effective to shift toward a sustainable future (Gardner, Assadourian and Sarin, 2004: 5). This sub-dimension is represented by the items SB1, SB2, SB3, SB4, SB5 that address consumer choice in daily life such as the use of resources, sorting out wastes for recycling, re-using, purchasing environmentally friendly products, choosing sustainable foods, paying attention to label information. However, in the relevant literature, consumption pattern is not addressed as the component of sustainability literacy. In this regard, Yavetz, Goldman and Pe`er (2009) imply "environment friendly consumerism". The household use occupies an important place on environmental problems and might play a crucial role to shift toward sustainability. In the study, the household use as a sub-dimension is represented by the items SB6, SB7, SB8, which indicate the household use including electricity, water etc. Yavetz, Goldman and Pe`er (2009) and Szcytko et al. (2019) found that the household use is a basic component of sustainability literacy.

The participation sub-dimension is represented by the items SB9, SB10, SB11, SM12, SB13, SB14 that emphasise effective citizenship on sustainability and active participation on sustainable issues. It addresses personal and social intention towards sustainable life. In this regard, the study shows that voluntarily participating in environmental activities, following environmental issues, participating in demonstration and taking initiatives in social life for sustainability etc. represent an important component of sustainability literacy. Also, the participation regarding sustainability literacy has been defined as "citizenship action" by Yavetz, Goldman and Pe`er (2009).

Sustainability literacy requires broad knowledge on both animate and inanimate entities in the earth, an awareness regarding the use of natural resources and multidimensional hazards of human. The knowledge was dealt by several studies as a basic dimension of environmental or sustainability literacy. In this regard, Szczytko et al. (2019) define ecological knowledge as dimension of sustainable literacy as well as knowledge on physical and ecological world; Chu et al (2007) conceptualise it as ecological knowledge and knowledge of environmental issues. There is no doubt that it is not easy to collect this whole knowledge in a scale. However, in the current study, the knowledge as a component of sustainability literacy was condensed as knowledge on ecological process (SK1, SK2, SK3, SK4, SK5), natural resources-human use and environmental deterioration (, SK6, SK7, SK8, SK9, SK10).

The sub-dimensions related to dimension of sustainability knowledge (SK) in the scale are shown in the Table 4.

Table 4: Description of the factor "sustainability knowledge" (SK) and it's subdimensions		
Factor	**Subdimensions**	**Sample Items**
Sustainable Knowledge (SK) (10 items)	Ecological principles and process (5 items)	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 (1)
		Which of the followings best define the relationship between all living systems? (a) inter-connection (b) competition (c) fitness (d) cooperation (3)
		Which of the following does not break down in nature? (a) organic waste (b) cotton clothes (c) plastic (d) paper products (4)
	Natural resources, human use and environmental deterioration (5 items)	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 (6)
		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 (7)
		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 (9)

As Table 4 shows, the dimension of sustainability knowledge addresses knowledge level related to sustainability in broad area involving ecological principles and process, natural resources- human use and environmental deterioration due multiple-choice close-ended questions.

Finally, the dimension of sustainability perception (SP) with its items is described as followed:

The term of sustainability was used very widely and loosely. But it needs to be determined what sustainability means and how could be shifted to sustainability in the future clearly. Also, the perception of sustainability was not considered in the relevant literature. For this reason, through four items (SP1, SP2, SP3, SP4) were reflected sustainability perception. Firstly, it was stated what sustainability means and which role it can play in shifting to sustainability via multi-choice items SP1, SP2. Secondly, the participants could provide an example of sustainability and unsustainability in their local area and state their suggestions toward sustainability via open-ended items SP3 and SP4.

Table 5: Description of the dimension of "sustainability perception" (SP) of the scale	
Factor	Items
Sustainability perception	**1.** Which of the following threatens nature the most? (a) growth of human population (b) over-consumption (c) accumulation of waste (d) inequal use of resources
	2. What is sustainability to you? (a) sustainability of human life at first (b) sustainability of all non-living and living matter on the planet (c) continuity of trade (d) provide social equity and cultural diversity (2)
	3. Which would play the most important role for a societal shift towards sustainability? (a) transformation of trade (b) changing human mentality (c) institutional measures (d) consumer choice (3)
	4.Please provide an example of sustainability and unsustainability in your local area: Sustainability: …… Unsustainability: …… ….
	5. What are your suggestions for encouraging a shift towards sustainability? Please provide an example: …… ……

As shown in Table 5, the dimension of sustainability perception consists of five items which stress different aspects regarding to sustainability perception. The items 1, 2 and 3 address the perceptions of participants related to threats on the nature, the meaning of sustainability and the role of some challenges to shift toward sustainability. It was expected to get participants 'ideas related to shift toward sustainability instead of their responses as well "true" or "false". The item 4 stresses the awareness related to sustainable and unsustainable issues in local area. Finally, item 5 extend to participant's suggestions for encouraging to shift toward sustainability.

Additionally, the correlation between sustainable attitude and sustainable behaviour is shown in table 6.

Table 7: The Scores of the Pearson Correlation Test					
Variables			**SB**	**SK**	
SA	Pearson Correlation Sig (2-tailed) N		435** .000 522	.064 .094 407	
SB	Pearson Correlation Sig (2-tailed) N			.024 .625 406	

** Correlation is significant et the level 0,01 (2 –tailed).

According to table 6, there is a positive and significant correlation between the SA and SB. These results are in compliance with the relevant literature (Chu at al., 2007; Teksoz, Şahin and Tekkaya, 2012; Goldman, Assaraf and Shaharabani, 2013; Genc and Akilli, 2016; Szczytko et al. 2019; Veisi et al., 2019). However, there is not any significant correlation between SA and SK and between SB and SK.

4. Discussion

A shift toward a sustainable future requires a mental and emotional transition that relies on sustainability literacy of people. As Capra (2003: 201) states sustainability literacy means the ability to understand the basic principles of ecosystem and to live accordingly. According to them, sustainability literacy addresses very broad attributes related to basic principles of nature and to live accordingly from understanding to responding. However, increasing unsustainable state of human life on the earth shows that environmental education practises are not effective enough to achieve sustainability literacy (Sayan and Blumstein, 2011).

For this reason, assessing the state of sustainability literacy of society can be a turning point for redesigning the curriculum related to sustainability education and overcoming obstacles to more effective education. However, there is a gap in the relevant literature due to the lack of a scale for assessing sustainability literacy holistically. Thus, in this study, it was aimed to develop a compact scale which includes different dimensions of sustainability literacy such as sustainability attitude (SA), sustainability behaviour (SB), sustainability knowledge (SK) and sustainability perception (SP).

In the study, it was found that the scale of sustainability literacy may be used to assess the sustainable literacy of university students with its dimensions and sub-dimensions. The findings of the study were confirmed

by other studies such as Chu et al. (2007), Yavetz, Goldman and Pe'e (2009), Szcytko et al. (2019). Unlike the related studies, the current study involves the dimension of "sustainability perception" as well, aiming to understand the participant's perception of sustainability and elicit their suggestions for a shift toward sustainability.

Moreover, a significant correlation found between sustainability attitude (SA) and sustainability behaviour (SB) is also confirmed by Chu et al. (2007), Teksoz et al. (2012), Goldman, Assaraf and Shaharabani (2013), Genc and Akilli, (2016), Szczytko et al. (2019), Veise et al. (2019), showing that the dimensions of SA and SB interact with each other. However, absence of significant correlation between the dimensions of SA and SK and between SB and SK shows that having sustainable knowledge is not enough to develop positive attitudes and act in this direction. In contrast, according to Teksoz, Şahin and Tekkaya (2012), the dimension of knowledge related to sustainability literacy predicts the other dimensions of attitude, concern and responsibility. However, Szcytko et al. (2019) emphasises that there is a weak correlation between cognition and behaviour. The further study is needed to investigate the correlation between the dimensions of sustainability literacy scale.

5. Conclusion

The study in which a compact scale of sustainability literacy was developed could contribute to improve teaching practices and further studies related to sustainability education generally. Firstly, the scale of sustainability literacy can be used to assess and monitor the state of sustainability literacy of university students globally. The use of related scale in education process could not only to asses and monitor of sustainability literacy of students but also it could help for active participation of students with their reflections. Also, it can reveal participants' perceptions and suggestions on possible implementations of sustainability vision in their local areas especially. Secondly, the results of this study could contribute as guide for further studies that focus on investigating sustainability literacy of numerous participants. Finally, the study could be helpful for refinement of sustainability literacy and progress of environmental education toward sustainability vision. However, the results of study are limited within related participants. There is a need for adaptation of the scale in different age groups. In this way, sustainability literacy of participants could be assessed and enhanced broadly.

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