Article

Sustainable Development in Teacher Education in Terms of Being Solution Oriented and Self-Efficacy

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Abstract: In this study, the correlation between 526 prospective teachers' beliefs about education for sustainable development (ESD) and their perceptions of self-efficacy and abilities to focus on solutions was addressed. This descriptive study found that prospective teachers had strong beliefs about ESD. In terms of the "beliefs about the implementation of sustainable development" and "beliefs about the limitation of sustainable development", the prospective teachers who are studying at the faculty of education had stronger beliefs than those enrolled in the Pedagogical Formation Certificate Program. In addition, fourth-year prospective teachers and those perceiving themselves as showing good academic performance had stronger beliefs about ESD. Also, participants' beliefs about ESD were found to be related to their abilities to focus on solutions and their perceptions of self-efficacy. Additionally, our study found that perceptions of self-efficacy significantly predicts the ability to focus on solutions and beliefs about ESD (29%). One of the limitations of our study is that our findings can be generalized only to a limited extent. Furthermore, further research is needed to validate the predictive variables that have arisen. Finally, longitudinal and experimental research that use qualitative analysis techniques is needed to investigate the implications of the results for professional improvement and to find out what sort of sustainable education practices there are in different education levels.

Keywords: education for sustainable development; prospective teachers; perceptions of self-efficacy; ability to focus on solutions

1. Introduction

In 2002, the United Nations initiated the Education for Sustainable Development (ESD) initiative that would cover a decade from 2005 to 2014. ESD seeks to raise awareness in individuals about how to develop a sustainable lifestyle and thus achieve positive transformations in societies in the long term [1]. The UN's 2030 Agenda for Sustainable Development and its 17 sustainable development goals aimed both to improve the environment and to provide a way of achieving a better future. Goal number 4 promotes quality education while target number 7 of this goal specifically addresses education for sustainable development [2]. In fact, successful globalization is linked with sustainable development and education for sustainable development [3,4].

ESD is defined as an uninterrupted education that enables individuals to perform actions for sustainability with systematic and innovative thinking abilities and provides them with the necessary cognitive, affective, and psychomotor equipment (*such as knowledge, skills, attitudes, values*) for them to meet their needs [5]. ESD has seven key characteristics: interdisciplinary and holistic, values-driven, critical thinking and problem-solving, multi-method, participatory decision-making, applicability, and locally relevant [6]. In addition, ESD requires self-confidence, emotional intelligence, responsibility, and systemic thinking [7].

The key role that education can play in enabling people to adopt this new perspective and organize their lifestyles accordingly is highlighted in several international reports, such as Agenda 21 (UNCED, 1992) and the Johannesburg Declaration (WSSD, 2002) [7]. In particular, the role of universities in ESD is manifested in action research carried out [8]. It is important that students develop new attitudes towards and perceptions of the environment and sustainability problems [9]. The development of key competencies related to ESD is based on both cognitive and non-cognitive tendencies and is questioned in more than one context; it is also multidisciplinary [2,10]. It is concluded that ESD should provide individuals with general competencies as well as "basic competencies" in line with transformational learning concepts. With the integration of formal and non-formal learning environments in higher education, sustainability has become a collective element of the new curriculum [11].

ESD does not require a single learning domain; it requires the integration of multiple learning domains and the interdisciplinary work of individuals. It is thought that the desired change in the values of individuals in terms of sustainable development will lead to a positive change in their behaviors, as well [12,13]. Many studies have emphasized that teaching/learning methods such as research-based learning, discussion, field studies, case studies, and experimental activities are more suitable for ESD than traditional teaching/learning methods [14,15]. Students' active participation in these processes and their preferences according to their wishes and needs will provide the most appropriate learning environment. Therefore, especially teachers should have sufficient knowledge [16] and positive attitudes [17] for sustainable development.

Beliefs about ESD generally have cognitive, affective, and behavioral components and naturally affect knowledge, actions, and emotions [18]. After three years of interviews with more than 500 people using the Delphi approach, Vare et al. [19] developed a robust list of the components of sustainable education: empathy, innovation, responsibility, participation, futures, criticality, transdisciplinarity, attentiveness, systems, engagement, action, and decisiveness. Education plays a key role in promoting sustainable development and developing people's capacity to address environmental and developmental problems. Sustainable development will become more qualified if it can be implemented as a behavioral pattern including environmental and ethical values.

Student-centered teaching methods, future-oriented thinking skills, high-level thinking skills, interdisciplinarity, linking local and global problems demonstrated the relationship of teacher competencies with the teaching-learning process and, therefore, with the promotion of education for sustainability in a study with teachers in Spain [20]. In another study, it was determined that the perspectives of faculty members played a decisive role in education for sustainability. The results of the study showed that participation, personal motivation, and competent leadership of the faculty members were necessary for the success of the program with the support of the school administrators. The determination of faculty members and a sense of belongingness to the project are the determining factors. In this sense, the following differences in favor of private schools between public and private schools were noted: practical activities, activities outside the classroom, and a positive perspective on ESD [21]. Cotton et al. [22], in addition to some previous research, has mentioned indications that many faculty members find the language of ESD inaccessible. Mogren and Gericke [23] highlighted the ways to contribute to the long-term transformative characteristics of schools with high levels of ESD. The researchers also focused on how the methods identified by the administrators of schools applying ESD can be used to overcome the barriers to ESD.

A scale for sustainability in educational settings has been developed for primary and secondary school students aged 9–16. In addition to the general socio-demographic characteristics, the scale includes the association of cognitive, affective, behavioral, application, and sustainability competencies with psychological elements [24]. Another study addressed the appropriateness, complex, and controversial meanings and challenges of sustainable development for school students [25]. Based on these findings, it is clear that ESD carries psychosocial elements not only for teachers but also for students, and its complex structure is tried to be revealed.

Self-efficacy can be defined as a perceived capability to perform a target behavior. Boon [26] used a seven-item scale to investigate prospective teachers' self-efficacy beliefs about ESD. It was determined that 97 prospective teachers supported the value and mediating role of education for environmental sustainability and believed that they could incorporate education for sustainability into their teaching methods. The participants stated that their confidence and self-efficacy increased when they aimed to be engaged in sustainability activities.

In one study, awareness training programs were organized to increase self-efficacy perception levels of new employees regarding sustainable education. The results showed that after the training programs there were significant increases in the work performance of the employees and the productivity of the organization [27]. There are also research findings showing that entrepreneurship education increases entrepreneurship self-efficacy and intention for ESD [28].

Solution-oriented individuals are also individuals who can make effective plans for the future and make accurate judgments. The solution-oriented approach emphasizes people should use their internal resources to achieve a positive change [29]. Goals are at the heart of solution-oriented practice as an internal representation of desired situations or outcomes [30]. There is increasing interest in this approach in the literature, but the mechanism of this approach continues to be investigated.

One study aimed to provide experience-based guidance for similar initiatives in sustainability programs worldwide. This guidance aims to define the problem and project-based learning program and the institutional context at the Arizona State University School of Sustainability [31]. Tilbury [32] conducted an extensive study on education and sustainability in the context of globalization. The study shared recommendations and solutions on education for sustainability in 4 continents and 17 countries.

In traditional education settings where students' attitudes towards sustainable education cannot be addressed effectively, the issue of sustainability is dealt with from a very general point of view. Such competence can be best achieved when it can be transferred to real-life learning settings. Solution-oriented sustainability learning programs create and use such settings [33]. The problem-solving skills of the students towards sustainable education can lead to positive changes not only at the school level but also at the macro level, i.e., in the city, enterprises or public institutions. The modules in the Teaching for a Sustainable World project handbook illustrate how environmental education and development education are related and provide practical assistance to teacher educators who wish to incorporate these key areas into their programs. An intensive expansion program from 1993 to 1994 included workshops at all faculties of education in Australia [34,35]. Numerous studies have been conducted to highlight the importance of ESD and seek educational solutions to environmental problems [1,15,36–41].

A sustainable development-oriented education approach, which is an important tool in the transition to a sustainable society structure for the future, has been accepted all over the world, has been reflected in education policies as an action plan, and has been applied directly in many cultures [1]. Within this framework, the three main functions expected from education for sustainable development are to inform, raise awareness, and create behavioral change. Hope and optimism are closely linked to physical and psychological health and have been widely researched in the field of positive psychology. Research has shown that hope is linked to pro-environmental behavior and plays an important role in ESD [42].

Education for sustainable development aims not only to provide individuals with specific knowledge but also to provide them with the necessary skills, values, and a proper perspective [43]. However, decisions need to be made on some issues, such as topics to be covered and materials to be used. Education for sustainable development promotes the active involvement of students in such decision-making processes. The studies conducted to determine teachers' beliefs about education for sustainable development are generally qualitative studies conducted with a small number of participants. Also the literature review showed that there is no study examining the association of beliefs about education for sustainable development with the ability to focus on solutions and perceptions of self-efficacy. Hence, studying the relationship between prospective teachers' beliefs about education for sustainable development and their perceptions of self-efficacy and abilities to

focus on solutions will surely guide us in developing teacher training curricula. It is thought that the results of our study will reveal the attitudes of prospective teachers who will educate future generations towards education for sustainable development and thus will be important in terms of teacher training policies [44].

In light of the above information and opinions, answers to the following research questions were sought:

1. Do prospective teachers' beliefs about education for sustainable development differ in terms of the sex variable?
2. Do prospective teachers' beliefs about education for sustainable development differ in terms of the education type variable?
3. Do prospective teachers' beliefs about education for sustainable development differ in terms of the years at university variable?
4. Do prospective teachers' beliefs about education for sustainable development differ in terms of their perceptions of academic achievement?
5. What are the correlations between prospective teachers' beliefs about education for sustainable development, their ability to focus on solutions, and their perceptions of self-efficacy?
6. Do prospective teachers' perceptions of self-efficacy predict their ability to focus on solutions and their beliefs about education for sustainable development?

2. Materials and Methods

In the study, the screening model, which is one of the quantitative research methods, was used to determine the attitudes of prospective teachers towards a sustainable environment. This model aims to collect data about the specific characteristics of a group [45]. Necessary permissions were obtained for the application of the scales, and the scale was applied to voluntary prospective teachers. Before the implementation, prospective teachers were briefly informed about ESD since they had not come across the subject throughout their educational life. The scales were applied to the students at the beginning or end of the classes. Some (58) of the initial 584 scales were ignored as they were filled out wrongly, incompletely, or randomly.

2.1. Population

Since 2010, teacher training in Turkey has been offered by faculties of education according to two different programs: undergraduate programs and the pedagogical formation program. Undergraduate programs enroll students who start university after completing their high school education while the pedagogical formation program enrolls those who have completed or are in the fourth year of their undergraduate education. The reason why the prospective teachers attending the pedagogical formation program were also included in our study is that they become high school teachers once they graduate. Having a perspective on ESD is important at the high school stage since high school can be considered as one of the crucial stages in which high school students, who will soon become adults and assume important roles in social life, develop a perspective on sustainable development.

The population of the study consists of prospective teachers who are enrolled in undergraduate programs and the pedagogical formation program at Bursa Uludağ University in the 2018–2019 academic year. The random sampling method was applied, and all prospective teachers were tried to be reached. Thus, the study was conducted with 526 (342 females, 184 males) prospective teachers. Four hundred and thirty-seven undergraduate students and 89 formation program students participated in the study. Of the participants, 76 were in the first year, 45 in the second year, 91 in the third year, 258 in the fourth year, and 56 were graduates.

2.2. Data Collection Tools

In our study, we utilized three scales and one personal information form. The personal information form contained questions about sex, years at university, and education type. It also contained 4-point Likert type items (bad, moderate, good, very good) to evaluate the participants' perceptions of their academic achievement.

2.2.1. Beliefs about Education for Sustainable Development Scale

Developed by Sağdıç and İnanç [46], the scale consists of 32 5-point Likert-type items (1 = strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, 5 = strongly agree). The scale also includes three factors: "beliefs about the implementation of sustainable development", "beliefs about the limitation of sustainable development", and "beliefs about the adequacy of education for sustainable development". Confirmatory factor analysis (X = 937,85, df = 457, p = 0; CFI = 0.92, RMSEA = 0.71), discriminant and convergent validity analysis conducted by researchers indicate that the beliefs about education for sustainable development scale is a valid scale to assess teachers' beliefs. The scale also has sufficient power to reveal possible differences or similarities in the beliefs of teachers and prospective teachers of different branches about education for sustainable development [46]. In this study, as a result of the reliability analysis of the beliefs about education for sustainable development scale and its subscales, Cronbach's alpha values were found to be 0.91, 0.95, 0.82 and 0.85, respectively.

2.2.2. Academic Self-Efficacy Scale

Developed by Jerusalem and Schwarzer in 1981, the scale was adapted into Turkish Yılmaz, Gürçay, and Ekici [47,48]. The scale consists of one subscale and seven 4-point Likert type items (1 = completely describes me, 4 = describes me not at all). The lowest score that can be obtained from the scale is 7 and the highest score is 28. A high score indicates high self-efficacy. Jerusalem and Schwarzer [48] calculated the Cronbach alpha reliability coefficient of the original scale as 0.87, and Yılmaz, Gürçay, and Ekici [47] calculated the internal consistency coefficient of the scale as 0.79. In this study, Cronbach's alpha (n = 527) reliability coefficient of the scale was found to be 0.87.

2.2.3. Solution Focused Inventory

The scale was developed by Grant, Cavanagh, Kleitman, Spence, Lakota, and Yu [29]. Validity and reliability studies of the Turkish version of the scale were conducted by Karahan and Hamarta [49]. The inventory consists of twelve 6-point Likert type items. Correlations between the original and Turkish version scores were calculated to determine the linguistic equivalence of the inventory, and correlations were found as 0.92 for the problem disengagement subscale, 0.94 for the goal orientation subscale, and 0.91 for the resource activation subscale. As a result of the exploratory factor analysis conducted to examine the construct validity of the scale, a three-factor construct consisting of 12 items was obtained. The results of the confirmatory factor analysis performed to determine whether this construct fits the sample data showed that the scale had strong goodness of fit. Goodness of fit index values were found to be RMSEA = 0.072 CFI = 0.94, IFI = 0.94, TLI = 0.91, GFI = 0.93, AGFI = 0.87. The 16-week test-retest reliability was 0.84. As a result of the Cronbach's Alpha test for this study, the reliability coefficient was found to be 0.80 for the overall solution-focused inventory.

2.3. Analyzing the Data

The normality values of the data were examined, and it was concluded that the data showed a normal distribution (Table 1). Therefore, parametric t and Anova tests were used in comparative analyses, and multiple linear correlations and regression methods were employed for relational analyses. The differences between the groups in the Anova tests were determined based on the Scheffe test because the number of groups was more than 3 [50].

Table 1. Mean, standard deviation, normality and cronbach alpha results of variables.

Scales	The Education of Sustainable Development	Beliefs Regarding Implementations	Beliefs Regarding Limitations	Beliefs Regarding Adequacy	Solution Focused	Self-Efficacy Perception
M	3.28	4.07	3.50	2.56	4.22	2.36
Std. deviation	0.51	0.82	0.78	1.06	0.77	0.55
Skewness	0.125	−0.868	−0.289	0.292	−0.418	0.160
Kurtosis	−0.095	0.822	−0.133	−0.590	−0.034	−0.331
Cronbach's α	0.91	0.95	0.82	0.85	0.80	0.87

3. Results

3.1. The Evaluation of the Beliefs of the Teacher Candidates Regarding the Education of Sustainable Development in Terms of a Gender Variable

According to the findings in Table 2, there is a significant difference in favor of female prospective teachers in the subscales of "beliefs about the implementation of sustainable development" [t (524) = 3.580; $p < 0.01$] and "beliefs about the limitation of sustainable development" [t (524) = 3.105; $p < 0.01$]. On the other hand, there is a significant difference in favor of male prospective teachers in the subscale of "beliefs about the adequacy of education for sustainable development" [t (524) = −2.793; $p < 0.01$]. When the scale was evaluated in general, there was no significant difference between prospective teachers' beliefs about sustainable development in terms of the sex variable [t (524) = 0.350; $p > 0.05$]. The sex variable has a little effect on the "beliefs about the implementation of sustainable development" ($\eta^2 = 0.024$), "beliefs about the limitation of sustainable development" ($\eta^2 = 0.018$), and "beliefs about the adequacy of education for sustainable development" ($\eta^2 = 0.015$) subscales.

Table 2. T-test results of the belief scale on the education of sustainable development regarding a gender variable.

The Scale and Sub-Dimension	Gender	n	M	SD	df	t	p	η^2
The Education of Sustainable Development	Female	342	3.29	0.49926	524	0.350	726	
	Male	184	3.27	0.52525				
Beliefs regarding implementations	Female	342	4.16	0.79336	524	3.580	0 **	0.024
	Male	184	3.90	0.83885				
Beliefs regarding limitations	Female	342	3.58	0.76978	524	3.105	0.002 **	0.018
	Male	184	3.36	0.78701				
Beliefs regarding adequacy	Female	342	2.47	1.03819	524	−2.793	0.005 **	0.015
	Male	184	2.74	1.08815				

* $p < 0.05$, ** $p < 0.01$ means (*M*), standard deviations (SD), degree of freedom (df).

3.2. Evaluation of Prospective Teachers' Beliefs about Education for Sustainable Development in Terms of the Education Type Variable

We examined whether prospective teachers' beliefs about education for sustainable development differed in terms of studying at the faculty of education or being enrolled in a pedagogical formation program. The results are presented in Table 3.

Table 3. T-test results of the beliefs scale regarding the education of sustainable development in terms of teaching type.

The Scale and Sub-Dimensions	Department	n	M	SD	df	t	p	η^2
The Education of Sustainable Development	Undergraduate	437	3.28	0.51	524	−0.540	0.589	
	Formation	89	3.31	0.51				
Beliefs regarding implementations	Undergraduate	437	4.15	0.78	524	5.391	0 **	0.052
	Formation	89	3.65	0.89				
Beliefs regarding limitations	Undergraduate	437	3.55	0.77	524	3.207	0.001 **	0.019
	Formation	89	3.26	0.78				
Beliefs regarding adequacy	Undergraduate	437	2.48	1.05	524	−3.859	0 **	0.027
	Formation	89	2.95	1.03				

* $p < 0.05$, ** $p < 0.01$ means (M), standard deviations (SD), degree of freedom (df).

Table 3 presents the differences between participants' beliefs in terms of the education type variable. There is a significant difference in favor of participants studying at the faculty of education in the subscales of "beliefs about the implementation of sustainable development" [t (524) = 3.207; $p < 0.01$] and "beliefs about the limitation of sustainable development" [t (524) = 5.391; $p < 0.01$] while there is a significant difference in favor of participants enrolled in a pedagogical formation program in the subscale of "beliefs about the adequacy of education for sustainable development" [t (524) = −3.859, $p < 0.01$]. There was no significant difference in the overall scale [t (524) = −0.540, $p > 0.05$]. The education type variable has little effect on "beliefs about the implementation of sustainable development" ($\eta^2 = 0.052$), "beliefs about the limitation of sustainable development" ($\eta^2 = 0.019$), and "beliefs about the adequacy of education for sustainable development" ($\eta^2 = 0.027$) subscales.

3.3. Evaluation of Prospective Teachers' Beliefs about Education for Sustainable Development in Terms of the Year at University Variable

The results of ANOVA performed to find out whether prospective teachers' beliefs about sustainable development differ according to their years at university are given below.

It can be inferred from Table 4 that in the subscale of "beliefs about the implementation of sustainable development" [F (4-521) = 12.876, ** $p < 0.05$], there is a significant difference between 1st ($M = 3.58$) and 2nd ($M = 4.12$), 3rd ($M = 3.98$), and 4th-year students ($M = 4.28$) in favor of 2nd, 3rd, and 4th-year students and between 4th-year and 3rd-year students and graduates ($M = 3.89$) in favor of 4th-year students. Also, in the subscale of "beliefs about the limitation of sustainable development" [F (4-521) = 3.494, ** $p < 0.01$], there is a significant difference between 1st and 4th-year students in favor of 4th-year students while in the subscale of "beliefs about the adequacy of education for sustainable development" [F (4-521) = 4.821, ** $p < 0.01$], there is a significant difference in favor of 1st-year students. There was no significant difference in the overall scale [F (4-521) = 0.620, $p > 0.05$]. The year at university variable has little effect on "beliefs about the implementation of sustainable development" ($\eta^2 = 0.090$), "beliefs about the limitation of sustainable development" ($\eta^2 = 0.026$), "beliefs about the adequacy of education for sustainable development" ($\eta^2 = 0.035$).

Table 4. The Anova results of the beliefs scale regarding the education of sustainable development in terms of grade variable.

The Scale and Sub-Dimensions	Grade	n	*M*	SD	SV	SS	df	MS	*f*	*p*	Difference	η²
The Education of Sustainable Development	1. Grade	76	3.22	0.44	BG	0.642	4	0.161				
	2. Grade	45	3.26	0.44	WG	134.876	521	0.259				
	3. Grade	91	3.26	0.56					0.620	0.468		
	4. Grade	258	3.31	0.52	TS	135.518	525					
	Graduate	56	3.33	0.49								
Beliefs regarding implementations	1. Grade	76	3.58	0.83	BG	31.649	4	7.912			1-2	
	2. Grade	45	4.12	0.70	WG	320.154	521	.614			1-3	
	3. Grade	91	3.98	0.86					12.876 **	0	1-4	0.090
	4. Grade	258	4.28	0.74	TS	351.802	525				3-4	
	Graduate	56	3.89	0.87							4-M	
Beliefs regarding limitations	1. Grade	76	3.34	0.72	BG	8.391	4	2.098				
	2. Grade	45	3.30	0.78	WG	312.822	521	0.600				
	3. Grade	91	3.46	0.82					3.494 **	0.008	1-4	0.026
	4. Grade	258	3.62	0.77	TS	321.212	525					
	Graduate	56	3.38	0.78								
Beliefs regarding adequacy	1. Grade	76	2.91	0.81	BG	21.164	4	5.291				
	2. Grade	45	2.59	0.98	WG	571.763	521	1.097				
	3. Grade	91	2.58	1.05					4.821 **	0.001	1-4	0.035
	4. Grade	258	2.39	1.12	TS	592.927	525					
	Graduate	56	2.83	1.05								

means (*M*), standard deviations (SD), source of variance (SV), sum of square (SS), degree of freedom (df), mean square (MS), * $p < 0.05$, ** $p < 0.01$, between-groups (BG), within-groups (WG), totally (T).

3.4. Evaluation of Prospective Teachers' Beliefs about Education for Sustainable Development in Terms of Their Perceptions of Their Academic Achievement

The table below presents whether prospective teachers' beliefs about education for sustainable development differ in terms of their perceptions of their academic achievement.

Table 5 presents the analysis of teachers' beliefs about education for sustainable development in terms of their perceptions of their academic achievement. In the subscale of "beliefs about the limitation of sustainable development" [F (4-521) = 7.550, ** $p < 0.05$], there is a significant difference between those perceiving themselves as showing bad academic performance (*M* = 3.28) and those perceiving themselves as showing very good academic performance (*M* = 3.84) in favor of those perceiving themselves as showing very good academic performance and there is a significant difference between those perceiving themselves as showing moderate academic performance (*M* = 3.38) and good (*M* = 3.63) and very good academic performance (*M* = 3.84) in terms of those perceiving themselves as showing good and very good academic performance. In the subscale of "beliefs about the implementation of sustainable development" [F (4-521) = 3.494, ** $p < 0.01$] and in the overall scale [F (4-521) = 3.536, * $p < 0.05$], there is a significant difference between those perceiving themselves as showing bad academic performance and those perceiving themselves as showing good academic performance in favor of the latter while in the subscale of "beliefs about the adequacy of education for sustainable development" [F (4-521) = 4.821, ** $p < 0.01$], there is a significant difference in favor of those perceiving themselves as showing bad academic performance. The variable has little effect on "beliefs about the adequacy of education for sustainable development" (η² = 0.020), "beliefs about the implementation of sustainable development" (η² = 0.026), and "beliefs about the limitation of sustainable development" (η² = 0.042).

Table 5. Anova results of the beliefs scale regarding the education of sustainable developments in terms of success perception variable.

The Scale and Sub-Dimensions	Degree	n	*M*	SD	SV	SS	df	MS	*f*	*p*	Difference	η²
The Education Sustainable Development	A. Bad	35	3.06	0.54	BG	2.699	3	0.900				
	B. Medium	261	3.27	0.52	WG	132.819	522	0.254	3.536 *	0.015	A-C	0.020
	C. Good	195	3.35	0.46	T	135.518	525					
	D. Very Good	35	3.28	0.57								
Beliefs regarding implementations	A. Bad	35	3.75	0.86	BG	9.124	3	3.041				
	B. Medium	261	4.00	0.79	WG	342.679	522	0.656	4.633 **	0.003	A-C	0.026
	C. Good	195	4.20	0.82	T	351.802	525					
	D. Very Good	35	4.22	0.83								
Beliefs regarding limitations	A. Bad	35	3.28	0.78	BG	13.359	3	4.453			A-D	
	B. Medium	261	3.38	0.78	WG	307.853	522	0.590	7.550 **	0	B-C	0.042
	C. Good	195	3.64	0.76	T	321.212	525				B-D	
	D. Very Good	35	3.85	0.78								
Beliefs regarding adequacy	A. Bad	35	2.62	1.02	BG	7.016	3	2.339				
	B. Medium	261	2.62	1.08	WG	585.911	522	1.122	2.084	0.101	-	-
	C. Good	195	2.54	1.05	T	592.927	525					
	D. Very Good	35	2.15	0.99								

means (*M*), standard deviations (SD), source of variance (SV), sum of square (SS), degree of freedom (df), mean square (MS), * $p < 0.05$, ** $p < 0.01$, between-groups (BG), within-groups (WG), Totally (T).

3.5. The Correlations between Prospective Teachers' Beliefs about Sustainable Development, Their Ability to Focus on Solution, and Perceptions of Self-Efficacy

A multiple correlations was performed to determine if there is a correlation between prospective teachers' beliefs about sustainable development, their ability to focus on solutions, and perceptions of self-efficacy.

It can be inferred from Table 6 that there is a strong negative correlation between the ability to focus on solutions and perceptions of self-efficacy (r = −0.53, $p < 0.01$). A moderately positive correlation was found between the ability to focus on solutions (r = 0.35, $p < 0.01$) and "beliefs about the limitation of sustainable development" (r = 0.37, $p < 0.01$). Also, a low positive correlation was found between "beliefs about education for sustainable development and the ability to focus on solutions (r = 0.26, $p < 0.01$) while a low negative correlation was found between "beliefs about education for sustainable development" and perceptions of self-efficacy (r = −0.22, $p < 0.01$). In addition, a low negative correlation was found between perceptions of self-efficacy and "beliefs about the implementation of sustainable development" (r = −0.19, $p < 0.01$) and beliefs about the limitation of sustainable development" (r = −0.24, $p < 0.01$). Besides, a negative negligible significant correlation was found between the ability to focus on solutions and "beliefs about the adequacy of education for sustainable development" (r = −0.09, $p < 0.05$). Finally, no significant correlation was found between "beliefs about the adequacy of education for sustainable development" and perceptions of self-efficacy (r = −0.02, $p > 0.05$).

Table 6. Multilinear correlation results of the solution-focused, self-efficacy perception and sustainable development education beliefs and sub-dimensions.

Scales	1.	1.1.	1.2.	1.3.	2	3.
1.The Education of sustainable development		0.42 **	0.23 **	0.53 **	0.26 **	−0.22 **
1.1. Beliefs regarding implementations			0.37 **	−0.27	0.35 **	−0.19 **
1.2.Beliefs regarding limitations				−0.41 *	0.30 *	−0.24 **
1.3.Beliefs regarding adequacy					−0.09 *	−0.02
2.Solution Focused						−0.53 **
3.Self-efficacy perception						

* $p < 0.05$, ** $p < 0.01$.

3.6. Predictive Power of Prospective teachers' Perceptions of Self-Efficacy on Their Ability to Focus on Solutions and "Beliefs about Education for Sustainable Development"

In this part of our study, a regression analysis was performed on two variables, which, as indicated in the literature review section, may predict the attitudes towards sustainable development.

It can be inferred from Table 7 that perceptions of self-efficacy significantly predicts the ability to focus on solutions and "beliefs about education for sustainable development" (F(523-2) = 104.409, $p < 0.01$, R = 0.53, R^2 = 0.29, Adjusted R^2 = 0.283). Therefore, perceptions of self-efficacy account for 29% of "beliefs about education for sustainable development" and the ability to focus on solutions. Seventy-one percent of "beliefs about education for sustainable development" and the ability to focus on solutions is explained by other factors. According to standardized regression coefficients, the order of significance of perceptions of self-efficacy on predicted variables is as follows: the ability to focus on solutions ($\beta = -0.503$) and education for sustainable development ($\beta = -0.092$). Perceptions of self-efficacy perception are negatively correlated with "beliefs about education for sustainable development" and the ability to focus on solutions. According to the results of the regression analysis, the regression equation that predicts "beliefs about education for sustainable development" and the ability to focus on solutions is as follows: "perception of self-efficacy ($-.359$x solution-focused inventory score) + (.099 x beliefs about education for sustainable development scale score) + (4.204)."

Table 7. Self-Efficacy perception predicting being solution-focused and the education of sustainable development.

Self-Efficacy	n	B	SHB	β	t	p
Stable		4.204	0.154		27.224	0
Solution Focused Inventory	525	−0.359	0.027	−0.503	−13.115	0
Sustainable Development E.	525	−0.099	0.041	−0.092	−2.390	0.017

n = 525, R = 0.53, R^2 = 0.29, Adjusted R^2 = 0.283, F = 104.409, $p < 0.01$.

4. Discussion

In our study, prospective teachers' scores from the beliefs about education for sustainable development scale are above the average. We can infer from this finding that the prospective teachers who participated in our study have very positive attitudes about raising environmental awareness, equipping individuals with positive attitudes and values, and developing their skills to ensure that appropriate behaviors emerge. This finding indicates that although there is no systematic education for sustainable development in our country, prospective teachers are quite aware of the concept of sustainability. It can be said that this finding is a result of the cultural norm of "being clean and moral" taught through our cultural and religious values.

We also found that female prospective teachers had stronger beliefs about the implementation and limitation of sustainable development. Similarly, in a study conducted by Çimen [51], it was reported that prospective teachers generally had positive attitudes towards the sustainable environment, and female prospective teachers obtained higher scores from the scale. Based on these results, we can argue that female prospective teachers are more hopeful in terms of education for sustainable development and can better foresee the limitations that might arise. On the other hand, some studies did not report any differences between sexes, while some reported differences in favor of male prospective teachers. For example, in their studies, Ilgaz and Eskici [52] found that male prospective teachers scored higher in terms of basic competencies for lifelong learning and beliefs about education for sustainable development.

Another finding that we obtained in the present study is that, when compared to the prospective teachers enrolled in the pedagogical formation program, prospective teachers studying at the faculty of education obtained higher scores from "beliefs about the adequacy of education for sustainable development" and "beliefs about the limitation of sustainable development". On the other hand, in the subscale of "beliefs about the adequacy of education for sustainable development," those enrolled in

the pedagogical formation program obtained higher scores. As is known, prospective teachers who receive undergraduate education at faculties of education are taught by faculty members who are more familiar with teaching practices in schools. It is, therefore, an expected result that they are more aware of the implementation and limitations of education for sustainable development. Bulut and Çakmak [53] underlined teacher competencies and the effectiveness of social studies programs as the two most important criteria for the formation of a sustainable environment. In another study [54], it was shown how the identified initiatives relate to the development of basic ESD competencies for educators identified by UNECE (United Nations Economic Commission for Europe) [55]. The findings of the same study showed that experience-based and interdisciplinary learning had a positive effect on learning based on real-life problems related to society and the natural environment. Also the importance of cooperation with colleagues and students was demonstrated in the same study. Another study compared the attitudes of the students of the Faculty of Agriculture and the students of the Department of Psychology towards ESD. The results showed that the students of the Faculty of Agriculture gave more importance to the environment factor, while the students of the Department of Psychology gave more importance to the social aspect of the subject. These findings indicate that students who study agriculture have a pro-environmental attitude while psychology students are more aware of social issues [56]. Based on these findings, a difference can also be expected among prospective teachers of different branches (such as science teacher, social studies teacher) in our country.

In our study, we found a significant difference between the 1st and 4th-year students in favor of the 4th-year students with regards to "beliefs about the implementation of sustainable development" and "beliefs about the limitation of sustainable development." This finding is promising in that the curricula of faculties of education are successful at providing the students with positive attitudes towards ESD. In one study, there was no significant difference between the beliefs of prospective science teachers in different years at university about education for sustainable development while there was a significant difference between the 1st-year and 4th-year prospective classroom teachers [51].

According to another finding from our study, the perception of academic achievement is important in evaluating the adequacy of education for sustainable. Summers et al. [17] asked teachers about their views on sustainable development. The teachers stated that they found their schools inadequate in terms of the implementation of sustainable development policies but found themselves sufficient and competent to mentor their students in this regard.

A strong negative correlation was found between the ability to focus on solutions and perceptions of self-efficacy, which are two intermediate variables of our study. In other words, as an individual's ability to focus on solutions increases, his/her perception of self-efficacy decreases. Self-efficacy is not related to the competencies of an individual, but to his/her belief in his/her skills [57]. The relationship between self-efficacy and the ability to focus on solutions are two important factors that support each other. In other words, even if the self-efficacy of the individual is high, the individual may not see his/her ability to focus on solutions adequate. The studies examining the correlation between these two variables are quite recent and very few [58].

In our study, negative low-level significant correlations were found between perceptions of self-efficacy and "beliefs about the implementation of sustainable development" and "beliefs about the limitation of sustainable development". A negative negligible significant correlation was found between the ability to focus on solutions and beliefs about the adequacy of education for sustainable development. Our perception of self-efficacy is not only related to our confidence in our own internal resources and but also gives us the necessary information for a realistic assessment of the situation. This is an expected result in our country where the quality of education is often discussed and there is widespread hopelessness about the adequacy of the education system. Because, even if a teacher, who thinks that sustainable education cannot be implemented positively because of the important deficiencies in education in our country, has high self-efficacy, he/she will not believe that he/she has the power to control the result. The results of a study of a moderated mediation model where self-efficacy in classroom management predicts emotional exhaustion [59] gives us an idea of teachers'

beliefs in the sustainability of activities. In another study, it was reported that prospective teachers are pessimistic, that they should be exposed to various school environments during the practice and that they should get context-related support from the stakeholders to improve their professional skills and to act in line with the ESD principles [60].

In our study, a significant positive correlation was found between beliefs about ESD and the ability to focus on solutions. In other words, solution-focused prospective teachers also had strong beliefs about education for sustainable development. Indeed, as stated in the research on twelve key competencies, which are crucial for sustainable development [61], the most important of these are systematic thinking, predictive thinking, and critical thinking. This finding is consistent with the findings in our study. Likewise, a solution-oriented teacher will be able to see the problems of the education system and be able to focus on their solution. Also, a teacher who is aware of the limitations makes the best use of resources in the school environment. This indicates that the teacher also has a positive personality trait for education for sustainable development.

Another finding consistent with the above finding is that there is a moderate positive correlation between the ability to focus on solutions and beliefs about the implementation and limitation of ESD. This result is quite significant in that the increase in the quality of education through effective use of resources will only be possible with a solution-oriented perspective. If prospective teachers believe that sustainable education practices will be implemented in the school environment, they will be able to instill this idea into their students. This finding of our study is consistent with the findings of Mogren and Gericke [23]. The researchers showed that hope is linked to pro-environmental behaviors and plays an important role in ESD. Teachers and young people are the most powerful representatives of a positive socio-ecological future. They report the strongest feelings about ESD and want to assume responsibilities for ESD [42].

Perceptions of self-efficacy have been found to significantly predict the ability to focus on solutions and beliefs about EDS. Therefore, perceptions of self-efficacy account for 29% of "beliefs about education for sustainable development" and the ability to focus on solutions. According to standardized regression coefficients, the order of significance of perceptions of self-efficacy on predicted variables is the ability to focus on solutions and perceptions of self-efficacy. Perceptions of self-efficacy are negatively correlated with beliefs about education for sustainable development and the ability to focus on solutions. This negative correlation between perceptions of self-efficacy and beliefs about education for sustainable development is also consistent with one study where teachers perceived curriculum, class size, and lack of teaching material as a barrier to education for sustainable development [7]. In other words, these barriers mean a lack of external factors that determine self-efficacy. Since teachers think that they lack the conditions that support their self-efficacy despite their positive beliefs about education for sustainable development, a result that supports the findings of our research emerges. The applicability of education for sustainable development, especially in educational settings, is based on three conditions: that educational settings must contain certain pedagogical characteristics, that ESD must be developed to be implemented in educational settings, and that institutions must adopt positive attitudes towards ESD [62]. In this case, it can be said that prospective teachers do not expect ESD to take place without these elements that will determine their self-efficacy, and they do not find themselves sufficient about ESD. Dai and Hwang [63] examined the participants of the bamboo craft course according to the ESD assessment criteria. It has been determined that students with self-learning skills were more confident in their craft and in responding to cultural sustainability challenges. This study addresses three types of factors that influence whether intentions can be turned into action: intentions themselves (i.e., authenticity and perceived control), contextual barriers and supports (i.e., task difficulty, regulations, and incentives), and personal characteristics (such as habits). Education is likely to affect each of these factors [64]. The more pedagogical variables a teacher has (for example, inclusive students, lesson planning, linking with previous learning, school culture, etc.), the more positive his/her educational environment will be [14,65].

One of the important limitations of our study was that since ESD is little known in our country, respondents had difficulties in understanding the questions in the scales. Before the scales were administered, a pilot implementation was conducted to assess the intelligibility of the questions. Before the application, brief information about ESD was given, and the respondents' questions were answered. Also, it can be said that the findings obtained in our study are limited to prospective teachers studying in Bursa/Turkey.

Based on all these results, we can say that the prospective teachers, who we see as the future teachers, have strong beliefs about education for sustainable development, and this is affected by their self-efficacy levels and ability to focus on solutions. For this reason, providing the students of especially faculties of education with the ability to focus on solutions during their university education and emphasizing the importance of lifelong learning [66] are likely to generate positive results [67,68]. Karahan [69] underlines the importance of increasing the quality of higher education for sustainable development. Also, to strengthen the self-efficacy perceptions of prospective teachers, it would be appropriate to take measures to increase their awareness. An important aspect of sustainability science is the involvement of external actors in the research process to combine the best available information, reconcile values and preferences, and thus generate solutions to problems. Therefore, interdisciplinary, community-based, and interactive research approaches are proposed as appropriate instruments both for identifying the solutions to real-world problems and fulfilling the goals of sustainability science [70].

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