Factor Structure, Reliability and Measurement Invariance of the Attitude Scale towards Sustainable Development for Prospective Teachers: Comparison of Their Attitudes Before and During the Covid-19 Pandemic

Öğretmen Adayları İçin Sürdürülebilir Kalkınmaya Yönelik Tutum Ölçeğinin Faktör Yapısı, Güvenirliği ve Ölçüm Değişmezliği: Covid-19 Pandemisi Öncesi ve Sırasındaki Tutumlarının Karşılaştırılması

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ABSTRACT

This study has two purposes. The first of these is the adaptation of the Attitudes towards Sustainable Development (ASD) scale developed by Biasutti and Frate into Turkish and finding evidence of its factor structure, reliability and measurement invariance by gender. The second one is to examine prospective teachers' attitudes towards sustainable development before and during Covid-19. For this purpose, two applications were conducted. The first application was conducted on 412 participants in the 2018-2019 spring semester (before Covid-19), 291 of whom were female (70%) and 121 male (30%). The findings of the adaptation study have indicated that ASD is suitable to collect Turkish pre-service students' attitudes towards sustainable development. The second application was conducted on 628 participants in the 2021-2022 spring semester (during Covid-19), of whom 421 were female (67%) and 207 were male (33%). As a result, before Covid-19, the environment and economy sub-scale means of males were higher than females. Total ASD, economy, society and education sub-scale mean of the females were higher than males during Covid-19. Finally, females' total ASD, economy, society and education sub-scale mean during Covid-19 were higher than their pre-Covid-19 means. In all comparisons, no significant differences were found between the environmental sub-scale means of ASD.

Keywords: Sustainable development, attitude, prospective teacher, Covid-19.

ÖZET

Bu çalışmanın iki amacı vardır. İlki, Biasutti ve Frate tarafından geliştirilen Sürdürülebilir Kalkınmaya Yönelik Tutum (SKT) ölçeğinin Türkçe'ye uyarlanması ve faktör yapısı, güvenirliği ve cinsiyete göre ölçme değişmezliğine dair kanıtlar bulunmasıdır. İkincisi ise öğretmen adaylarının Covid-19 öncesi ve sırasında sürdürülebilir kalkınmaya yönelik tutumlarını incelemektir. Bu amaçla iki uygulama yapılmıştır. İlk uygulama 2018-2019 bahar döneminde (Covid-19 öncesi) 291'i kadın (%70), 121'i erkek (%30) olmak üzere toplam 412 katılımcı üzerinde gerçekleştirilmiştir. Uyarlama çalışmasının bulguları, OSB'nin Türk öğretmen adaylarının sürdürülebilir kalkınmaya yönelik tutumlarını toplamak için uygun olduğunu göstermiştir. İkinci uygulama ise 2021-2022 bahar döneminde (Covid-19 döneminde) 421'i kadın (%67), 207'si erkek (%33) olmak üzere toplam 628 katılımcı üzerinde gerçekleştirilmiştir. Sonuç olarak, Covid-19 öncesinde erkeklerin çevre ve ekonomi alt ölçek araçları kadınlara göre daha yüksekti. Covid-19 döneminde kadınların toplam OSB, ekonomi, toplum ve eğitim alt ölçek ortalaması erkeklere göre daha yüksekti. Son

olarak, kadınların Covid-19 sırasındaki toplam OSB, ekonomi, toplum ve eğitim alt ölçek ortalamaları, Covid-19 öncesi ortalamalarından daha yüksekti. Yapılan tüm karşılaştırmalarda OSB'nin çevresel alt ölçek ortalamaları arasında anlamlı bir fark bulunmamıştır.

Anahtar kelimeler: Sürdürülebilir kalkınma, tutum, öğretmen adayı, Covid-19.

INTRODUCTION

Although the concept of sustainable development may be accepted as a simple concept, it can be said that it has a very deep meaning when it is examined together with its dimensions that have been articulated over the years. Between the 1950s and 1960s, countries focused more on production rather than consumption. Systems in which economic activity was prioritized and focused on continuous growth were quite common among the countries of the world (Teksöz, 2016). However, the increasing poverty in the 1970s, especially in developing countries, led the world's countries to produce policies that take into account income distribution. In other words, a more balanced development model that includes social objectives such as income distribution and poverty reduction has replaced the development efforts focused on production and economic efficiency, which were targeted in previous years. Again, the environmental disasters that started to be felt after the 1970s brought the view that protecting the environment is an important development tool on the world agenda. To put it briefly, the concept of sustainable development has emerged as an expression of the balance desired to be established between the economy, society and the environment since the 1970s and is a concept that has started to gain importance (Gürlük, 2010). Sustainable development as a concept is the protection of the interests of future generations and the balancing of the satisfaction of the present interests of people (Collin, 2004). More broadly, it means meeting the needs of the present without hindering the ability of future generations to meet their own needs (WCED, 1987).

When the definitions of the concept of sustainable development are examined, it is seen that the points emphasized in the definitions vary according to the fields of study. (Demirbaş, 2015). However, as it is generally expressed, sustainable development is considered as a concept that defines the economic, social and environmental balance of the society (Collin, 2004; Kaya, 2013). In summary, in this definition, Economics focuses on efficient use of limited resources, fair sharing, and fair trade (protection of small producers against large ones). Society focuses on environmentally conscious and conscious consumption, taking responsibility, equal opportunity and fair sharing. The environment means keeping the environment in its most natural state in interaction and reclaiming the deteriorated ecological environment (Biasutti & Frate, 2017). The individual, society and nature are ecologically interconnected. The ability of individuals to lead an ecological life depends on not consuming more than can be reproduced. Individuals with this consciousness can be defined as the ones who feel responsibility towards future generations. Developing this responsibility can be possible with the help of an education model (Demirbaş, 2015). In recent years, education has been recognized as a disciplinary field for the dissemination of the basic principles of sustainable development. Many researchers have increasingly begun to pay attention to Education for Sustainable Development (ESD) (Cotton et al. 2007; Michalos et al. 2012; Olsson, Gericke & Chang Rundgren 2015; Tilbury 2012). Therefore, UNESCO has declared the period between 2005 and 2014 as the Education Period focused on Sustainable Development (Öztürk, 2017). ESD refers to educational programs designed to include the knowledge and skills necessary to shape a sustainable future. UNESCO published one of the first calls to action on education for sustainable in 1992. This call had three main objectives. To redevelop educational practices towards Sustainable Development, to promote education and thus to raise public awareness. UNESCO repeated similar initiatives in 2005 and 2014 to integrate ESD into the educational practices of its member countries and to support such practices. Several other initiatives were implemented by UNESCO, such as the United Nations' decade of education for SD (UNESCO 2005). UNESCO's decade of education for SD initiatives has the following

objectives (2014): (1) Monitoring and evaluation of education within the framework of ESD indicators and inclusion of the United Nations decade of literacy. (2) Monitoring the progress of activities carried out by United Nations organizations, governments and NGOs in line with the requirements of the decade and facilitate their implementation and follow-up. (3) Evaluating the attainment of measurable outcomes in achieving the goals of the decade, particularly in terms of the integration of ESD into national education policies. (4) Making recommendations to further promote ESD based on the results and lessons learned from the decade (Biasutti & Frate, 2017).

These objectives indicate the need for tools and measures to assess ESD. Due to these requirements, various initiatives and projects have been implemented, such as RUCAS and EU-Tempus for Higher Education Institutions (Biasutti & Frate, 2017). The main aim of the RUCAS project was to guide the curricula of various courses of 11 European and Middle Eastern universities, providing knowledge, skills, perspectives and values on sustainability. The following key actions were undertaken within the RUCAS project: An ESD student qualification framework was developed, validated and implemented, and a curriculum revision process was carried out to instil sustainable development principles in university courses in economics, education, and engineering schools. Professors attending RUCAS revised their courses to address sustainability and implemented the revised courses in their classrooms (UNESCO, 2014).

To assess the impact of the RUCAS project on Italian University students in terms of ESD, the Attitudes towards Sustainable Development Scale (ASD) was developed by Biasutti and Frate (2017). The theoretical framework of ASD was created by adding the educational dimension to the previously discussed environmental, economic and society dimensions. The Environment dimension of ASD includes natural resources, climate change, rural development, sustainable urbanization, disaster prevention and mitigation. The economy dimension covers issues such as poverty reduction, corporate responsibility, and market economy. The society dimension includes topics such as human rights, gender equality, peace and human security, health, HIV/AIDS, governance, cultural diversity and intercultural understanding (Biasutti & Frate, 2017). On the other hand, Education for Sustainable Development supports active learning that is student-centered, participatory, and experiential. Traditional courses offer limited opportunities to engage students in such pedagogies (Evans, Tomas, & Woods, 2016). Nolet (2009) defines sustainability as a preparation paradigm that emerges in prospective teacher education. To integrate sustainability education into teacher preparation, specific strategies must be linked to a framework that is related to the curriculum vision for teacher education, teachers' understanding of learning, dispositions, and professional practices. (Keleş, 2017). For these reasons, the education dimension was added to the ASD as the fourth dimension. The education dimension of the ASD covers subjects such as student-centred teaching methods, future-oriented thinking skills, and high-level thinking skills, interdisciplinary, and local and global problems.

This study has two aims. The first aim of the study is to adapt the Attitude Scale towards Sustainable Development (ADS) developed by Biasutti and Frate (2017) for Turkish prospective teachers. For this purpose, it was aimed to examine the factor structure of ASD with CFA, to analyses its reliability with Cronbach's Alpha (α) and McDonald's Omega (ω), and to obtain evidence for measurement invariance according to gender.

The second aim of this study is to describe the attitudes of prospective teachers in Turkey towards sustainable development and to analyze their attitudes before and during Covid-19 according to their gender. In addition, it is aimed to understand the impact of the Covid-19 pandemic on their attitudes through comparisons.

The questions sought to be answered in this research for the purposes mentioned above are as follows:

RQ1. What is the factor structure and reliability coefficients of the ASD scale for Turkish prospective teachers?

RQ2. How is the measurement invariance of ASD according to the gender of prospective teachers?

RQ3. What are the attitudes of Turkish prospective teachers before/during Covid-19?

METHODS

2.1. Turkish Translation of ASD Scale

After receiving the approval of one of the authors (Michele Biasutti), four linguists with good knowledge of Turkish and English languages and cultures and one measurement and evaluation expert worked on the Turkish translation of the scale. First, two linguists translated the scale into Turkish. Then, two other linguists translated the Turkish scale back into English. These linguists met with the measurement and evaluation expert to review the translations and decide on the final Turkish version of the scale, and created the Turkish version of the scale. A pilot study was conducted for the Turkish version of this scale and the data were examined with EFA. The results showed that the Turkish version of the ASD scale and the original version gave similar values (Yurdabakan, 2018).

2.2. Participants and Data Collection

The first aim of this study was to examine the factor structure of Turkish ASD with CFA and analyse its reliability. Data for this examine were collected in 2018-2019 spring semester (before Covid-19). Covid-19 cases began to spread around the world after starting in China towards the end of 2019. Lockdown was declared in many countries, including Turkey, and all schools started online education. Due to the lockdown in Turkey, online education continued from March 2020 to summer 2022. ASD was applied again in 2021-2022 spring semester in order to examine the attitudes of Turkish teacher candidates towards sustainable development during the Covid_19 epidemic and to compare it with the 2018-2019 data. The participants of the research consist of students who continue their education in various departments (mathematics, science, social sciences, Turkish lenguage, English Language, pre-school and class theacher education) of İzmir Dokuz Eylul University Faculty of Education.

After consent was granted by the Education Faculty administration, the researcher performed the scale application. The first applications (before Covid-19) were completed in the spring semester of the 2018-2019 academic year. This application was organised face-to-face. Before the ASD applications, teacher trainees were informed that the purpose of the study was to understand their attitudes on sustainable development through their viewpoints. It was announced to the prospective teachers that their answers would be kept confidential and that no sanctions would be imposed in case of non-participation. In addition, prospective teachers were encouraged to ask questions whenever they needed to avoid any misunderstandings. 412 prospective teachers, whose grades ranged from 2nd to 4th, participated in the applications. Of the participants, 291 (70%) were female and 121 (30%) were male.

Applications for the second aim of this study (during Covid-19) were completed in the spring semester of the 2021-2022 academic year. This application was conducted online through the university's exam and survey application platform. During the online applications of the ASD, teacher trainees were told that the purpose of the study was to better understand their attitudes on sustainable development through their viewpoints. Teacher trainees were announced that their responses would be kept confidential and that there were no consequences for non-participation. Teacher trainees were encouraged to ask questions when they needed to avoid any misunderstanding. A total of 628 students from the 2nd to the 4th grades participated in the applications. Of the participants, 421 (67%) were female and 207 (33%) were male.

2.3. Measure

Attitudes toward Sustainable Development Scale (ASD): The original ASD is a 20-item scale developed by Biasutti and Frate for university students. Researchers applied this scale to 484 (N = 128 male, N = 356 female) students. The participants of the study were undergraduate students at a university located in the north-east of Italy. They were students of agriculture (N = 67), engineering (N = 34), primary education (N = 30), and psychology (N = 353). The Data were collected over five months and randomly divided into two subsamples so that one subsample could be assigned to the EFA group and the other subsample could be assigned to the CFA group.

The EFA results gave the following values: KMO = .830; Bartlett test: χ^2 = 1338.83, df = 190 (p = .000). These results indicate that a factor analysis can be performed on ASD. The second step was to conduct an exploratory factor analysis using the varimax rotation method to identify connections between the observed variables and the underlying factors. A four-factor structure with five items for each factor was found. The names and item numbers of the factors were Environment (items 1-5), Economy (items 6-10), Society (items 11-15), and Education (items 16-20). Factor loadings of ASD ranged from .33 to .78, Cronbach Alpha reliability was found to be .74 for Environment, .74 for Economy, .66 for Society, .76 for Education and .85 for total ASD. The lowest and highest scores that can be obtained from the total ASD are between 20-100. The scores that can be obtained from the sub-scales of environment, economy, society and education vary between 5-25. Scores from the total ASD and its sub-scales indicate that high scores are positive and low scores are negative attitudes.

The four-factor scale obtained from the exploratory factor analysis was re-administered to a second study group of 268 participants so that CFA analyses could be performed. DFA results of ASD showed that the fit indices were good and acceptable. The Fit indices of the original ASD were RMSEA= .04, SRMR= .05, GFI= .92, AGFI= .89, CFI= .97, NNFI= .97, IFI= .97 (Biasutti and Frate, 2017).

2.4. Data Analysis

Data were analysed with IBM SPSS Statistics 29, LISREL 8.71 (Jöreskog, & Sörbom, 2004) and JASP (0.19.3) to statistically test the factor structure, reliability and measurement invariance (by gender) of the ASD in this study. CFA was used to confirm the factor structure of the ASD scale; McDonald's Omega (ω) was also used together with Cronbach's Alpha (α) for internal consistency reliability. Because, the tau-equivalence assumption is a requirement for Cronbach's Alpha reliability (Cronbach, 1951). When the tau-equivalence assumption is violated, the Cronbach's Alpha reliability coefficient of the scale may be underestimated. In this case, McDonald's Omega (ω) corrects the underestimation tendency of Cronbach's Alpha (α) (Dunn et al., 2014). Besides, different studies show that McDonald's Omega (ω) one of the best alternatives for estimating reliability when the assumption of tau-equivalence is violated (Zinbarg et al., 2005, 2006; Revelle & Zinbarg, 2009). On the other hand, McDonald's Omega (ω) can be estimated with the calculation of unstandardized factor loadings obtained from CFA (Yurdabakan & Çüm, 2017).

RESULTS

3.1. Answer 1. Confirmatory Factor and Reliability Analysis of the Turkish ASD Scale

Confirmatory Factor Analysis: In the study, covariance matrix and Maximum Likelihood estimation were used for DFA. Univariate normality of the 20-item ASD scale was examined for skewness (.043 to -2.08, |M| = .68) and kurtosis (-.006 to -7.82, |M| = 2.66) and were found to be

-.62 and .28, respectively. These values were within the recommended limits for CFA with maximum likelihood (skewness < 2 and kurtosis < 7) (West, Finch, & Curran, 1995).

Model fit for the four-dimensional structure of the Turkish ASD scale was examined with multiple fit indices (Jackson, Gillaspy, & Purc-Stephenson, 2009). The fit indices used to test the model were goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), Tucker-Lewis index (TLI), comparative fit index (CFI), standardized root mean-square residual (SRMR), and root mean square error of approximation (RMSEA)—and relative chi-square/degree of freedom ($\chi 2/df$). According to cut off guidelines suggested by Hu and Bentler (1999), values > .95 for the GFI, AGFI, TLI and CFI; values < .06 for the RMSEA; and values ≤ .08 for the SRMR suggest a good fit. On the other hand, values of $\chi 2/df$ less than 3 to 4 are considered to reflect a good fit of the model (Haigh, Moore, Kashdan, & Fresco, 2011). A summary of fit indices, standardized item loadings and the path diagram for the four-dimensional model are given in Table 1, 2 and Figure 1.

Tablo 1

Summary of Confirmatory Factor Analysis Results of the ASD Scale

Model	X^2	Df	X^2/df	GFI	AGFI	CFI	TLI	SRMR	RMSEA	90% CI
4-factor	334.78	164	2.04	.96	.95	.97	.97	.025	.041	.033-.049

Note. GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; CFI = comparative fit index; TLI = Tucker–Lewis index; SRMR = standardized root mean-square residual; RMSEA = root mean-square error of approximation; AIC = Akaike information criterion. CAIC = Consistent Akaike information criterion.

Table 2

Factor Loadings of the Items of the ASD Scale

Items	Factor 1	Items	Factor 2	Items	Factor 3	Items	Factor 4
1	.44	6	.40	11	.75	16	.53
2	.67	7	.50	12	.72	17	.72
3	.46	8	.59	13	.68	18	.67
4	.33	9	.64	14	.63	19	.72
5	.53	10	.70	15	.76	20	.66

The results showed that all fit indices were good for the four-dimensional model of the Turkish ASD. The model provided satisfactory fit indices: GFI = .96, AGFI = .95, CFI = .97, TLI = .99, SRMR = .025, RMSEA = .041 and $\chi 2/df$ = 2.04, p = .00. All the paths from the constructs to the item t values were statistically significant at 5% level. The standardized path coefficients ranged from .33 to .76, and t values ranged from 5.66 (p<.01) to 17.18 (p<.01) suggesting that the items were good indicators of the four-dimensional construct.

Figure 1

Standardized Item Loadings Related to Four-dimensional Structure of ASD Scale
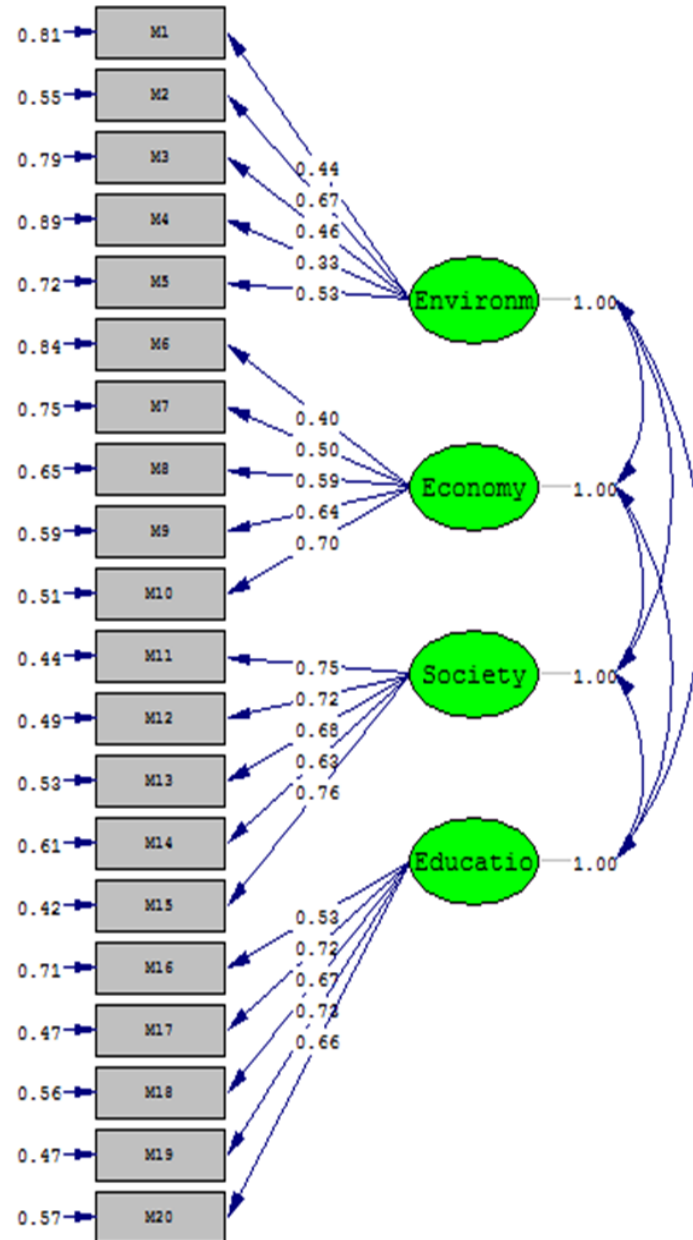
Reliability Analyses: In this study, Cronbach's Alpha and McDonald's Omega were utilized to test the reliability of the Turkish ASD. Since McDonald's Omega is calculated based on non-standardized item loadings, it gives higher and more realistic results from the Cronbach's Alpha (Zinbarg et al., 2005). While the Cronbach Alpha reliability of ASD is calculated as .88 for total scale, .68 for environment, .71 for economy, .85 for society and .81 for education, McDonald's Omegas are calculated as .94 for total scale, .76 for environment, .91 for economy.

.82 for society and .84 for education. Cronbach's Alpha and McDonald Omega reliability coefficients for ASD are quite good (Yurdabakan, 2008). The Turkish version of the ASD scale is given in the Appendix.

3.2. Answer 2. Measurement Invariance of the Turkish ASD Scale According to the Gender

Measurement Invariance by Gender: Since comparisons were made between groups in terms of gender in this study, the measurement invariance of ASD according to gender was examined. After confirming the four-dimensional structure of ASD for the total sample, a four-stage multi-group CFA was performed as suggested by Meredith (1993) to determine whether the four-dimensional model was invariant across gender groups. These stages are configural, metric, scalar and strict invariance stages. The results regarding the measurement invariance of the four-dimensional ASD according to gender are given in Table 3.

Table 3

Statistics on the Measurement Invariance Stages of ASD Across Gender

Invariance	χ^2	df	$\Delta\chi^2$	p	CFI	ΔCFI	RMSEA
Configural	681.663	328			0.925		0.047
Metric	702.27	344	20.607	0.194	0.924	0.001	0.046
Scalar	747.479	360	45.209	0.000	0.918	0.006	0.047
Strict	1012.846	380	265.367	0.000	0.866	0.052	0.058

The results regarding the configural model in Table 3 show that the factor structure obtained with the observed data is the same between men and women and provides good results in terms of data-model fit (CFI=0. 925 > 0.90; RMSEA=0.047 <0.05). When the findings regarding metric invariance are examined (CFI=0.924 > 0.90; RMSEA = 0.046 <0.05), it is determined that the model between the groups provides a good fit to the data. In addition, it is determined that the difference between the CFI value of the metric model and the CFI values of the structural model is below 0.01 (ΔCFI= 0.001). The p value regarding the chi-square difference test (p=0.194) also indicates that there is no statistically significant difference between the models. The findings in question show that metric invariance is achieved and the factor loadings are equal between the groups. Findings regarding scalar invariance (CFI=0.918; RMSEA = 0.047; ΔCFI= 0.006; p=0.000) indicated that the p value of the chi-square test indicated that the difference between the models was significant, and that the CFI and RMSEA values showed good fit. In addition, the CFI difference between the models remained below 0.01. These findings provide evidence that scalar invariance was achieved, that is, the intercepts in the models were equal between women and men. On the other hand, findings for strict invariance (CFI=0.866; RMSEA=0.058; ΔCFI=−0.052; p=0.000) provide evidence that error variances were not equal between groups. While invariance was achieved at the structural, metric and scalar levels between women and men, strict invariance was not achieved. However, many researchers have emphasized that, unlike dichotomous items, scalar invariance supports group comparisons of observed means or factor means with continuous items, so strict invariance can be neglected in group comparisons (Meredith & Teresi, 2006; Putnick & Bornstein, 2016; Svetina et al., 2019, Vandenberg, 2002). As a result, as in the present study, since strict invariance can be neglected when comparing observed means from continuous items, the SD attitudes of prospective teachers were examined comparatively according to their gender.

3.3. Answer 2. Examining Attitudes Before /and During Covid-19

In this part of the study, firstly, the data collected before Covid-19 (2018-2019 spring semester) and during Covid-19 (2021-2022 spring semester) were analysed separately by gender and the results are given in Table 3. Secondly, the data obtained before and during Covid-19 were

analysed comparatively by both the total ASD and the gender of the prospective teachers, and these results are given in Table 4.

Table 4

SD Attitudes Before Covid-19 According to Gender / During Covid-19 According to Gender

| | Before Covid-19 | | | | | During Covid-19 | | | | |
| | Female (n=291) | | Male (n=121) | | | Female (n=421) | | Male (n=207) | | |
ASD	*M*	*SD*	*M*	*SD*	*t*	*M*	*SD*	*M*	*SD*	*t*
Environment	19.23	2.80	19.86	2.88	-2.062*	19.41	2.45	19.23	2.89	.821
Economy	21.38	2.35	21.96	2.44	-2.232*	22.25	2.14	21.81	2.74	2.192*
Society	23.21	2.50	22.81	2.48	1.468	23.74	1.86	22.91	2.91	4.323**
Education	22.43	2.47	22.50	2.42	-.236	22.84	1.88	22.32	3.01	2.635**
Total	86.25	7.64	87.12	7.93	-1.041	88.24	5.74	86.27	8.90	3.338**

*p<.05, **p<.01

It was previously stated that the scores that can be obtained from the total of the ASD will vary between 20-100 and the scores that can be obtained from the sub-scales of the ASD will vary between 5-25. When the means in Tables 3 and 4 are examined, it can be seen that the total ASD means vary between 86.25 and 88.24, and the sub-scale means vary between 19.23 and 23.74. Considering these means, it can be said that the attitudes of prospective teachers towards SD are generally high.

For the data collected before Covid-19, significant differences were found in favour of males between the environment and economy sub-scale means of female and male. The differences between the other sub-scale means are not significant. For the data collected during Covid-19, the differences between both the total ASD and the economy, society and education sub-scale means of female and male were significant in favour of the females.

Table 5

SD Attitudes Before and During Covid-19

ASD	Covid-19	Female + Male (n₁=412, n₂=628)			Female (n₁=291, n₂=421)			Male (n₁=121, n₂=207)		
		M	*SD*	*t*	*M*	*SD*	*t*	*M*	*SD*	*t*
Environment	Before	19.42	2.83		19.23	2.80		19.86	2.88	
				.388			-.900			1.914
	During	19.35	2.60		19.41	2.45		19.23	2.89	
Economy	Before	21.55	2.39		21.38	2.35		21.96	2.44	
				-			-			.487
	During	22.11	2.36	3.670**	22.25	2.14	5.098**	21.81	2.74	
Society	Before	23.09	2. 50		23.21	2.50		22.81	2.48	
				-2.489*			-			-.311
	During	23.47	2.29		23.74	1.86	3.253**	22.91	2.91	
Education	Before	22.45	2.46		22.43	2.47		22.50	2.42	
				-1.453			-2.499*			.536
	During	22.67	2.32		22.84	1.88		22.32	3.01	
Total	Before	86.51	7.73		86.25	7.64		87.12	7.93	
				-2.334*			-			.872
	During	87.59	6.70		88.24	5.74	3.952**	86.27	8.90	

*p<.05, **p<.01

The results of the analysis comparing the SD attitudes of prospective teachers before and during Covid-19 are given in Table 4. There are significant differences between both the total ASD and the economy and society sub-scale means of all prospective teachers. These differences were found in favour of scores obtained during Covid-19. Prospective teachers' total ASD, economy, and society sub-scale scores increased during Covid-19. In comparisons made by gender of prospective teachers, significant differences were found between the total ASD, economy, society and education sub-scale mean before Covid-19 and the means during Covid-19. Accordingly, the means during Covid-19 are higher than the means before Covid-19. On the other hand, there are no significant differences between the means before covid-19 and the means during covid-19 for the male. According to these results, it is possible to say that the increase during covid-19 is due to the increase in females' attitudes SD.

DISCUSSION

The first aim of the present study was to execute the Turkish adaptation of the ASD for prospective teachers, developed by Biasutti and Frate (2017) for the Italian university students, to examine the factorial structure with CFA and to obtain evidence for its reliability and measurement invariance. Finding related to this aim was consistent with previous study that examined the factor structure of the ASD on Italian university students. The Cronbach Alpha reliability coefficients for both the total ASD and its sub-scales of the Turkish ASD were close to the original ASD, but the McDonald's Omega reliability coefficients were much higher. These

calculated psychometric values of the Turkish ASD scale coincide with the psychometric properties of the original ASD scale developed by Biasutti and Frate, (2017) and show that it can be used for Turkish prospective teachers. In addition, it was observed that the measurement invariance of ASD according to gender gave good results in the configural, metric and scalar stages. This result showed that ASD scale scores can be compared according to gender.

The second aim of this study was to describe the attitudes of the teacher trainees towards sustainable development in Turkey and to analyse the attitudes of the students before and during the Covid-19 with the collected data. According to the analysis of the data obtained before and during Covid-19, the total ASD means are between 86.25 and 88.24, and the means for the sub-scales are between 19.23 and 23.74. When Tables 2 and 3 are examined, it can be seen that the environment sub-scale has the lowest means and the society sub-scale owns highest means. In general, prospective teachers' attitudes towards ASD are high. One reason for this may be that studies on Sustainable Development started in Turkey at the secondary and high school levels in the 1990s within the framework of UNESCO-UNEP. The beginning of the study is based on the agreement signed between UNESCO and the Turkish Ministry of Environment in 1990 (Özoğul, 1993). In this way, lessons related to sustainable development were added to secondary and high school programs. Although their content is insufficient and scattered (Özdemir, 2007), these programs continue at schools today. In fact, the results of many studies conducted in Turkey have shown that prospective teachers have a high attitude towards sustainability (as cited Derman & Hacıeminoğlu, 2017, Demirbaş, 2015). On the other hand, while the lowest means are related to the environment sub-scale, the highest means are related to the society sub-scale. When comparing the means of male and female students before Covid-19, the differences between the environment and economy sub-scale means are significant. Here the average for male is higher. However, when comparing the means during Covid-19, the differences between both the total ASD and the economy, society and education sub-scale means are significant. The means of females are higher than males. When comparing the means of both all participants and male and female before and during Covid-19, the difference between the total ASD, society and economy sub-scale means of all participants is significant. Means during Covid-19 are higher than means before Covid-19. When we compare females' means, the differences between total ASD, economy, society and education sub-scale means are found significant. Females' means during Covid-19 were higher than before Covid-19. The differences between males' means before and during Covid-19 are not significant. According to these results, there has been a positive increase in female students' attitudes towards both the total ASD and the dimensions of economy, society and education during the Covid-19 process. When the relevant literature is reviewed, it is seen that though in general females' attitudes towards sustainable development are more positive, there are also some studies reporting conflicting results (Pedikayil at all., 2023, Demirbaş, 2015). Gürbüz, Çakmak, & Derman (2013) found that the attitude scores of biology prospective teachers towards sustainable environment differed significantly in favor of female students. In addition, it was determined that female students were concerned about urban sprawl and the use of pesticides in agriculture and the possibility of extinction of many animal species in Turkey and were conscious about purchasing products that could be harmful to the environment. Moreover, it was found that female participants were more careful than male participants about the use of resources such as energy and water (as cited in Keleş, 2017). Many other studies emphasize that the females are more sensitive about sustainability (Uitto et al. 2003, Järvinen, 1995, Khan & Trivedi, 2015). Moreover, many researchers emphasize that the Covid-19 pandemic process has disruptive effects on gender equality against women in many countries, including Europe (Alon et al., 2020, Calò et al., 2021, Profeta, 2021, Krywult-Albanska & Albanski, 2021). Because of these effects, SD attitudes of female may have been found to be higher than male. Another important result among the findings is that there is no significant difference between the environmental sub-scale means. One reason may be that prospective teachers were isolated from the environment due to lockdown during the Covid-19 pandemic.

Consequently, the findings of the adaptation study have indicated that ASD is suitable to collect Turkish pre-service students' attitudes towards sustainable development. In addition, when their attitudes before and during Covid-19 were compared, in particular, it was observed that there was an increase in the attitudes of female attitudes, excluding the environmental sub-scale.

4.1. Theoretical and practical conclusion and implications

This study can be seen as important in two respects. The first is that the ASD scale, which includes the education dimension as well as the environment, economy and society dimensions, has been adapted for Turkish prospective teachers. In Turkey, there are various instruments used to measure sustainable development, environmental literacy measurement, and attitudes towards environmental sustainability at the secondary and higher education levels (Şahin & Erkal, 2017; Kaya, 2013; Tekgöz, Şahin & Ertepınar, 2010; Atasoy,2005). However, since there is no scale that also includes the education dimension in Turkey, this scale, which has been adapted, may be useful for researchers who will work on prospective teachers. Secondly, it is important to determine the attitudes of prospective teachers towards sustainable development before and during covid-19, and to compare their attitudes before and during Covid-19 separately according to their gender. Before Covid-19, male students' environment and economic sub-scale means were higher than females. The attitudes of females during Covid-19 were higher than males, both in total ASD and in economy, society and education sub-scales. At the same time, the means of females during Covid-19 in terms of total ASD, economy, society and education sub-scales were higher than before Covid-19, while there was no difference between the means of males. These results show that the Covid-19 pandemic may have particularly affected females' attitudes towards sustainable development. There is a need for studies that can improve males' attitudes. It is hoped that these results will contribute to the authorities and practitioners who determine educational policies in Turkey.

4.2. Limitations

This study has some limitations. First, the application for the Turkish adaptation of the ASD scale was conducted face-to-face in the 2018-2019 spring semester, and the main purpose was to examine the factor structure and reliability of the ASD scale. During the analysis, the Covid-19 pandemic broke out (end of 2019-early 2020), and online education was started in all educational institutions in Turkey (just as in many other countries). The researchers of this study re-administered the Turkish-adapted ASD scale on a similar sample group in the 2021-2022 spring semester to determine whether the Covid-19 pandemic has affected attitudes towards ASD. The second application was made online by providing the necessary conditions through the university's exam and survey application platform. Making the applications face-to-face and online separately may have affected the results. Second, the first application aimed to adapt the ASD scale into Turkish. Since the analysis results of the Turkish ASD scale have good fit indices and reliability coefficients, it was evaluated that it could be used as control data to examine the effect of the Covid-19 epidemic on attitudes towards SD. This was a necessity as conditions like the Covid-19 pandemic were impossible to recreate. It can be said that the results of this study should be considered within the framework of these limitations. Third, the Turkish adaptation study of the ASD scale was carried out on prospective teachers. In the future, psychometric properties can be determined by testing the ASD scale on all higher education students in Turkey.

4.3. Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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GENİŞLETİLMİŞ ÖZET

Giriş

Genel olarak ifade edildiğinde sürdürülebilir kalkınma, toplumun ekonomik, sosyal ve çevresel dengesini tanımlayan bir kavram olarak ele alınmakta (Collin, 2004; Kaya, 2013) ve ekonomi, toplum ve çevre boyutlarını içermektedir (Biasutti & Frate, 2017). Öte yandan, bireylerin ekolojik bir yaşam sürdürebilmeleri, yeniden üretilebilecek olandan fazlasını tüketmemelerine bağlıdır. Bu sorumluluğun geliştirilmesi bir eğitim modeli yardımıyla mümkün olabilir (Demirbaş, 2015). Son yıllarda sürdürülebilir kalkınmanın yaygınlaştırılabilmesi için eğitim bir disiplin alanı olarak kabul edilmiş ve Sürdürülebilir Kalkınma için Eğitim'e (SKE) olan ilgi giderek artmaya başlamıştır (Cotton vd., 2007; Michalos vd., 2012; Olsson, Gericke & Chang Rundgren 2015; Tilbury 2012). Bu ilgi nedeniyle UNESCO, 2005-2014 yılları arasındaki dönemi Sürdürülebilir Kalkınma Odaklı Eğitim Dönemi olarak ilan etmiş, 1992 yılında sürdürülebilir eğitim konusunda ilk eylem çağrılarından birini yayınlamıştır (Öztürk, 2017). Ayrıca, UNESCO, söz konusu amaçları üye ülkelerin eğitim uygulamalarına entegre etmek ve desteklemek için 2005 ve 2014 yıllarında çeşitli girişimlerde bulunmuştur. RUCAS ve Yükseköğretim Kurumları için EU-Tempus gibi çeşitli girişimler ve projeler (Biasutti & Frate, 2017) bunlara örnektir. RUCAS projesinin İtalyan Üniversite öğrencileri üzerindeki etkisini değerlendirmek amacıyla Biasutti ve Frate (2017) tarafından Sürdürülebilir Kalkınmaya Yönelik Tutum Ölçeği (SKT) geliştirilmiştir. Bu ölçeğin kuramsal çerçevesi çevre, ekonomi ve toplum boyutlarına ek olarak eğitim boyutunu da içermektedir (Biasutti & Frate, 2017).

Bu çalışmanın amaçları (1) Biasutti ve Frate (2017) tarafından geliştirilen Sürdürülebilir Kalkınmaya Yönelik Tutum Ölçeğini (SKT) Türk öğretmen adayları için uyarlamak, (2) öğretmen adaylarının Covid-19 öncesi ve sırasındaki tutumlarını cinsiyetlerine göre karşılaştırmalı olarak incelemektir.

Yöntem

SKT Ölçeğinin Türkçe Çevirisi

Yazarlardan ölçek&le ilgili gerekli izin aldıktan sonra iki dilbilimci ölçeği Türkçe'ye diğer iki dilbilimci ise Türkçe ölçeği tekrar İngilizce 'ye çevirmiştir. Bu uzmanlar çevirilerin gözden geçirmek ve ölçeğin Türkçe sürümüne karar vermek için ölçme ve değerlendirme uzmanı ile bir araya gelerek son şeklini vermişlerdir. Ölçeğin Türkçe versiyonu için bir pilot çalışma 2018 yılında yapılmış ve veriler AFA ile incelenmiştir. Sonuçlar ölçeğin Türkçe sürümü ile orijinal sürümünün benzer değerler verdiğini göstermiştir (Yurdabakan, 2018).

Katılımcılar ve Veri Toplama

SKT'nin DFA ile faktör yapısını incelemek, güvenirliğini ve cinsiyet açısından ölçüm değişmezliğini test etmek için veriler 2018-2019 bahar döneminde (Covid-19 öncesi) yüz yüze eğitim sırasında toplanmıştır. Katılımcıları Dokuz Eylül Üniversitesi Buca Eğitim Fakültesi'nin çeşitli bölümlerine devam eden 412 öğretmen adayı oluşturmuştur. Covid-19 salgını nedeniyle 2020'den itibaren Türkiye dahil birçok ülkede sokağa çıkma yasağı ilan edildiği için tüm okullar çevrimiçi eğitime başlamış ve 2022 yazına kadar devam etmiştir. 2021-2022 bahar döneminde

Covid-19 salgını sırasında öğretmen adaylarının sürdürülebilir kalkınmaya yönelik tutumlarını incelemek ve 2018-2019 verileri ile karşılaştırmak amacıyla SKT tekrar uygulanmıştır. Bu uygulamalara 2. sınıftan 4. sınıfa kadar toplam 628 öğrenci katılmıştır.

Ölçme Aracı

Sürdürülebilir Kalkınmaya Yönelik Tutum Ölçeği (SKT) Biasutti ve Frate tarafından üniversite öğrencileri için geliştirilmiş her biri 5 maddeden oluşan dört boyutlu 20 maddelik bir ölçektir. Boyutlar Çevre (madde 1-5), Ekonomi (madde 6-10), Toplum (madde 11-15) ve Eğitim (madde 16-20) olarak adlandırılmıştır. Ölçeğin madde faktör yükleri .33 ile .78 arasında değişmekte olup, Cronbach Alpha güvenirlikleri ise 0,66 ile 0,85 arasında bulunmuştur. SKT'nin 2. Alt örneklem verileri kullanılarak yapılan DFA sonuçları (RMSEA= .04, SRMR= .05, GFI= .92, AGFI= .89, CFI= .97, NNFI= .97, IFI= .97) iyi ve kabul edilebilir uyum indeksleri göstermiştir (Biasutti & Frate, 2017).

Bulgular

Türkçe SKT Ölçeğinin Doğrulayıcı Faktör Analizi ve Güvenirlik Katsayıları

Türkçe SKT ölçeğinin dört boyutlu yapısına uygun model çoklu uyum indeksleri ile incelenmiştir (Jackson, Gillaspy, & Purc-Stephenson, 2009). İnceleme sonuçları tüm uyum indekslerinin Türkçe SKT'nin dört boyutlu modeli için iyi olduğunu göstermiştir (GFI = 0,.96, AGFI = 0,95, CFI = 0,97, TLI = 0,99, SRMR = 0,025, RMSEA = 0,041 ve $\chi2/df$ = 2,04, p = 0,00). Türkçe SKT'nin Cronbach's Alpha güvenirliği 0,88 ile 0,68, McDonald's Omega güvenirliği ise 0,94 ile 0,76 arasında bulunmuştur. SKT'nin cinsiyete göre ölçüm değişmezliği Meredith (1993) tarafından önerilen dört aşamalı çok gruplu bir DFA ile incelenmiştir. Dört boyutlu SKT'nin cinsiyete göre ölçüm değişmezliği katı değişmezlik hariç, gözlemlenen veriler ile elde edilen faktör yapısının kadın ve erkekler arasında aynı olduğunu ve veri-model uyumu açısından iyi sonuçlar verdiğini göstermektedir (CFI=0,925> 0,90; RMSEA=0,047 <0,05). SKT'nin Türkçe versiyonu Ek'te verilmiştir.

Öğretmen Adaylarının Covid-19 Öncesi/ve Sırasındaki Tutumların İncelenmesi

Covid-19 öncesi (2018-2019 bahar) ve Covid-19 (2021-2022 bahar) sırasında toplanan verilerin cinsiyete göre analiz sonuçları, Covid-19 öncesi toplanan veriler için çevre ve ekonomi alt ölçek ortalamaları arasında erkekler lehine anlamlı farklılıklar olduğunu göstermiştir. Covid-19 süresince toplanan veriler için hem toplam SKT hem de ekonomi, toplum ve eğitim alt ölçek ortalamaları arasındaki farklılıklar kadınlar lehine anlamlı bulunmuştur. Öğretmen adaylarının Covid-19 öncesi ve sırasındaki tutumlarını karşılaştıran analiz sonuçları tüm öğretmen adaylarının hem toplam SKT hem de ekonomi ve toplum alt ölçek ortalamaları arasında Covid-19 dönemi lehine anlamlı farklılıklar olduğunu göstermiştir. Öğretmen adaylarının toplam SKT, ekonomi ve toplum alt ölçek puanları Covid-19 döneminde artış göstermiştir. Kadın öğretmen adaylarının Covid-19 öncesi toplam SKT, ekonomi, toplum ve eğitim alt ölçek ortalamaları ile Covid-19 sırasındaki ortalamaları arasında Covid-19 sırasındaki ortalamalar lehine anlamlı farklılıklar bulunmuştur.

Tartışma, Sonuç ve Öneriler

Türkçe SKT'nin DFA sonuçları, İtalyan üniversite öğrencileri için SKT'nin faktör yapısını inceleyen önceki çalışma ile uyumludur. Türkçe SKT ölçeğinin hesaplanan psikometrik değerleri, Biasutti ve Frate (2017) tarafından geliştirilen orijinal SKT ile örtüşmektedir.

Öğretmen adaylarının Covid-19 öncesi ve sırasındaki tutumları genel olarak yüksektir. Türkiye'de yapılan birçok araştırmanın sonuçları, öğretmen adaylarının sürdürülebilirliğe yönelik tutumlarının yüksek olduğunu göstermiştir (aktaran Derman & Hacıeminoğlu, 2017, Demirbaş, 2015). Öte yandan, kadın ve erkek öğrencilerin Covid-19 öncesi ortalamaları karşılaştırıldığında,

çevre ve ekonomi alt ölçek ortalamaları arasındaki farklar erkekler lehine anlamlıdır. Bununla birlikte, Covid-19 sırasındaki ortalamaları karşılaştırıldığında hem toplam SKT hem de ekonomi, toplum ve eğitim alt ölçek ortalamaları arasında kadınlar lehine farklar anlamlıdır. Covid-19 öncesi ve sırasındaki ortalamalar karşılaştırıldığında ise hem tüm katılımcıların hem de kadınların toplam SKT, ekonomi, toplum ve eğitim alt ölçek ortalamaları arasındaki farklar kadınlar lehine anlamlıdır. İlgili literatür incelendiğinde, genel olarak kadınların sürdürülebilir kalkınmaya yönelik tutumlarının daha olumlu olmasına rağmen, çelişkili sonuçlar bildiren çalışmaların da olduğu görülmektedir (Pedikayil vd., 2023, Demirbaş, 2015). Gürbüz, Çakmak ve Derman (2013) biyoloji öğretmeni adaylarının sürdürülebilir çevreye yönelik tutum puanlarının kadın öğrenciler lehine anlamlı bir şekilde farklılaştığını bulmuşlardır. Ayrıca, enerji ve su gibi kaynakların kullanımı konusunda kadın katılımcıların erkek katılımcılara göre daha dikkatli oldukları tespit edilmiştir (aktaran Keleş, 2017). Yanı sıra birçok araştırmacı, Covid-19 pandemi sürecinin Avrupa da dahil olmak üzere birçok ülkede kadınlar aleyhine toplumsal cinsiyet eşitliği üzerinde yıkıcı etkileri olduğunu vurgulamaktadır (Alon vd., 2020, Calò vd., 2021, Profeta, 2021, Krywult-Albanska & Albanski, 2021).

Bu çalışmanın, eğitim boyutunu da içeren SKT ölçeğinin Türk öğretmen adayları için uyarlanmış olması ve Covid-19 öncesi ve sırasındaki sürdürülebilir kalkınmaya yönelik tutumlarının cinsiyetlerine göre karşılaştırılmalı olarak incelenmesi açısından önemli olduğu söylenebilir. Sonuçlar, Covid-19 pandemisinin özellikle kadınların sürdürülebilir kalkınmaya yönelik tutumlarını etkilemiş olabileceğini göstermektedir.

APPENDIX

Turkish version of the ASD scale

Bu ölçek sizin **sürdürülebilir kalkınmayla** ilgili görüşlerinizi almayı amaçlamaktadır. Sonuçlar sadece bilimsel çalışma amaçlı kullanılacak olup, araştırmanın güvenirliği için gerçek düşüncelerinizi yansıtmanız önemlidir. Lütfen aşağıdaki maddeleri dikkatli biçimde okuyun ve size göre uygun olan seçeneği işaretleyiniz.

	Maddeler	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
1	İnsanlar çevreye müdahale ettiklerinde, genelde kötü sonuçların ortaya çıkmasına sebep olurlar.	(1)	(2)	(3)	(4)	(5)
2	Çevrenin korunması ile insanların yaşam kalitesi doğrudan bağlantılıdır.	(1)	(2)	(3)	(4)	(5)
3	Biyolojik çeşitlilik (doğal zenginlik), endüstriyel tarım ürünleri zararına yol açsa da korunmalıdır.	(1)	(2)	(3)	(4)	(5)
4	Kalkınmanın inşa edilmesi çevrenin korunmasından **daha az önemlidir.**	(1)	(2)	(3)	(4)	(5)
5	Çevrenin korunması endüstriyel büyümeden **daha önemlidir.**	(1)	(2)	(3)	(4)	(5)
6	Devletin ekonomik politikaları, daha çok para harcanmasını gerektirse de, sürdürülebilir üretimi artırmalıdır.	(1)	(2)	(3)	(4)	(5)
7	Toplum içindeki ekonomik farklılıkları azaltmak için insanlar daha çok özveride bulunmalıdır.	(1)	(2)	(3)	(4)	(5)
8	Devletin ekonomi politikaları, adil ticareti artırmalıdır.	(1)	(2)	(3)	(4)	(5)
9	Eğer bir ülke doğal kaynaklarını boşa harcıyorsa, devletin ekonomik politikaları harekete geçmelidir.	(1)	(2)	(3)	(4)	(5)
10	Dünyadaki açlık ve yoksulluğu azaltmak, sanayileşmiş ülkelerin ekonomik refahını artırmaktan **daha önemlidir.**	(1)	(2)	(3)	(4)	(5)
11	Dünyada barışı sürdürmek için her ülkenin yapabileceği birçok şey vardır.	(1)	(2)	(3)	(4)	(5)
12	Toplum/Devlet kadın ve erkekler için daha fazla eşit fırsatlar sunmalıdır.	(1)	(2)	(3)	(4)	(5)
13	Kültürler arası iletişim yol gösterici ve zenginleştiricidir.	(1)	(2)	(3)	(4)	(5)
14	Toplum/Devlet temel sağlık hizmetlerini ücretsiz sunmalıdır.	(1)	(2)	(3)	(4)	(5)
15	Toplum/Devlet ailelerin ve bireylerin refahı için sorumluluk almalıdır.	(1)	(2)	(3)	(4)	(5)
16	Öğretim elemanları öğrenci merkezli öğretim yöntemlerini kullanmalıdır.	(1)	(2)	(3)	(4)	(5)
17	Öğretim elemanları tarihsel bilginin yanı sıra geleceğe dönük düşünceyi de desteklemelidir.	(1)	(2)	(3)	(4)	(5)
18	Öğretim elemanları disiplinler arası çalışmaları desteklemelidir	(1)	(2)	(3)	(4)	(5)
19	Öğretim elemanları yerel ile küresel konular arasındaki bağlantıyı desteklemelidir.	(1)	(2)	(3)	(4)	(5)
20	Öğretim elemanları düz anlatım yapmaktan ziyade eleştirel düşünmeyi teşvik etmelidir.	(1)	(2)	(3)	(4)	(5)