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The Comparison of New Zealand and Turkey Within In-Service Teachers' Eco-Literacy Levels

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Abstract

Eco-literacy is not a new concept however it is difficult to define. It might be defined as an understanding of natural-social-economical-cultural systems and connections between biotic and abiotic factors within a sustainable future. This study aims to compare two countries' eco-literacy levels by an eco-literacy scale. The scale has five subsets: ecological intelligence, social intelligence, emotional intelligence, economy, and green consumer behaviour. The research group is in-service teachers and research countries are Turkey (TR) and New Zealand (NZ). The methodology of the study is a case study within a quantitative approach. It has been found that TR in-service teachers have a higher mean score in terms of economic, emotional, and ecological intelligence themes while NZ in-service teachers have a higher mean score in terms of social intelligence and green consumer themes. It is concluded that there are different and good applications in both countries and their researchers should increase their publications related to detailed education programs.

Introduction

Eco-literacy is not a new concept. Researchers have begun to discuss this concept for the last two decades. The main problem here is that eco-literacy does not have a common definition (ESD, 2015; Esposito, 2009; Kapogianni, 2015; Lira, Steinicke & Garcia, 2015; McBride, Brewer, Berkowitz & Borrie, 2013; Tursi, 2015). However, it might be defined as an understanding of natural-social-economical-cultural systems and connections between biotic and abiotic factors within a sustainable future (Disinger & Roth, 1992; Tursi, 2005). Capra (1996) emphasizes that a sustainable future and sustainable community depend on how people understand the natural environment and its connections.

Experimental studies related to eco-literacy are very limited and studies are mostly based on surveys. These surveys comprise different dimensions and eco-literacy is only one of these dimensions. These studies are mostly based on the economy-eco-literacy relationship (Esposito,

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2009; Kapogianni, 2015; Tursi, 2015) Many studies mention the theoretical background of eco-literacy such as environmental knowledge, attitude, awareness, consciousness (ESD, 2015; Esposito, 2009; Kapogianni, 2015; Lira et al., 2015; McBride et al., 2013; Tursi, 2015; Okur-Berberoglu et al., 2015; Okur-Berberoglu, 2019; Orr, 1992, 2002). The studies related to eco-literacy have started to increase however there is still a problem with how to measure eco-literacy (ESD, 2015).

Okur- Berberoglu (2018) develops an eco-literacy scale with five subsets: ecological intelligence, social intelligence, emotional intelligence, economy, and green consumer behaviour (App 1). Social intelligence, emotional intelligence, and economy have connections with ecological intelligence while ecological intelligence has a relationship with green consumer behaviour. If social intelligence, emotional intelligence, or economy subjects are improved then they might affect the development of ecological intelligence and thereby they might be effective on green consumer behaviour according to the alternative eco-literacy model (Okur- Berberoglu, 2018). This study aims to compare two countries' eco-literacy levels by the eco-literacy scale which was developed by the researcher. The research group is in-service teachers and these two countries are Turkey (TR) and New Zealand (NZ).

The TR group of the study comprises of in-service teachers who joined TUBITAK [The Scientific and Technological Research Council of Turkey] 4004 coded environmental education projects and these teachers were followed up after seven years. The NZ group is used as a kind of control group within this study because;

a. NZ is among developed countries while TR is among developing countries (G20) (UN Statistics Division, 2013). According to the NZ literature and HDI Report (2018), NZ has better applications and statistics in terms of sustainability and environmental education. (App. 2)

b. The researcher used another control group from Turkey which comprised of in-service teachers who had not had any environmental education before. TR main group had successful results according to this comparison (Okur- Berberoglu, 2020). However, the researcher wonders whether the TR group might have more successful results than a developed country's group or not.

c. It is emphasized that the follow-up process is also very important in terms of understanding the long-term effects of environmental education programs (Okur, 2012; Piller, 2002; Rickinson, 2001). Some researchers might prefer to follow up the in-service teachers after 2, 3, or 4 months (Csobod, 2002; Pande, 2002) while the others might prefer after 6 months (Hanna, 1995, Okur- Berberoglu, 2014, 2015c; Yalcin & Okur, 2014). This depends on the scope and the fund of the research (Okur, 2012). It could not be seen yet research related to environmental education which has a follow-up process after seven years either in NZ or in TR. This study might be important in terms of evaluating the long-term effects of education programs.

TR and NZ have a historical connection because of WWI/ Gallipoli Wars. Recently the comparison studies of these two countries have been increasing (Calik & Eames, 2012; Okur-Berberoglu, 2015a; Okur- Berberoglu & Berberoglu, 2015). One of these studies is related to the comparison of history curriculums (Okur- Berberoglu & Berberoglu, 2015); the other two are related to the comparison of environmental/outdoor educations (Calik & Eames, 2012; Okur- Berberoglu, 2015a).

Calik and Eames (2012) compare NZ and TR curriculums in terms of environmental and sustainability concepts because of the two countries' cultural-historical connection and having similar environmental problems. The researchers say *"However, since Turkey does not possess a teacher education program in environmental education, more needs to be done to enhance teachers' content knowledge around issues of sustainability and environmental pedagogies."* (p.425) However this expression is not exactly right. Unfortunately, they ignore TUBITAK

4004 environmental education projects intended for in-service teachers, primary school students, and pre-schoolers and these projects have positive outcomes.

TUBITAK 4004 coded projects and TR literature

TUBITAK has been financing environmental education projects since 1999 (Erentay & Erdoğan 2009; Okur-Berberoglu, 2016; Ozaner, 2004). These projects have firstly started at Termessos National Park (Soykan, 2009). TUBITAK and universities' collaboration aims to educate different age groups from pre-schoolers to in-service teachers (Okur- Berberoglu & Uygun, 2013). Calik and Eames's paper was published in 2012.

According to TUBITAK's archive, a total of fifty environmental education projects are supported in 2010 and 2011 (TUBITAK, 2010, 2011, 2012). Some of these projects are intended for in-service teachers and their budgets are quite high (Okur- Berberoglu & Uygun, 2013; Okur- Berberoglu, 2017a & 2017b). Recently the number of published papers has been increasing (Eryaman et al., 2010; Güler, 2009; Keles, Uzun & Varnacı- Uzun, 2010; Okur-Berberoglu, 2014, 2015a, 2015b; Yalcin-Ozdilek et al., 2011; Yalcin & Okur, 2014; Yardimci, 2009).

Guler (2009) manages outdoor education projects intended for in-teachers in 2008. There are 24 in-service teachers at the project which is only for 12 days. The research aims to figure out the expectations of in-service teachers from the project, to determine the self-efficacy level of teaching about environmental subjects, and to determine the change of personal ideas about environmental education. The project data are collected by semi-structured interviews and analysed by discourse analysis. As a result, the in-service teachers disclose that their expectation from the project is to have environmental knowledge, and they have it. They also express that they are very happy to have a favourable perspective of the world, they feel themselves more responsible for the natural environment.

Keles, Uzun and Varnaci-Uzun (2010) manage outdoor education projects intended for teachers in 2009. 25 pre-service teachers attend the project which is for 10 days. The research aims to figure out the environmental awareness and attitudes of the in-service teachers by the quantitative approach. The scales are carried out as pre/post/post-post tests (after 3 months). As a result, they find that environmental awareness of the in-service teachers is increased, and environmental attitude is changed as favourable.

Eryaman et al (2010) examine the effect of an ecopedagogy-based education program on in-service teachers via participatory action research. They find that the teachers can understand the relationship between economy-ecology-society for sustainable future and intended to share their acquisitions with their families and students. There is no follow-up process for this study.

Okur- Berberoglu (2014) studies the effect of an ecopedagogy-based education program on behaviour change, direct and indirect actions of in-service teachers via a qualitative approach. The data are collected before and after the program and the in-service teachers are followed up after six months. She finds that the ecopedagogy-based education program is successful to achieve ecological behaviour change, direct and indirect actions.

Yalcin and Okur (2014) aim to determine the electromagnetic field awareness development of in-service teachers who take part in an ecopedagogy-based environmental education via mixed methodology. The in-service teachers are followed up after six months. It is found that the in-service teachers' awareness develops throughout the education and they tend to be careful about using electrical devices in their daily lives.

Okur- Berberoglu (2015b) examines the impact of ecopedagogy-based education programs intended for in-service teachers on holistic perspective via qualitative approach. The data are collected before and after the program and the in-service teachers are followed up after six months. It is found that the ecopedagogy-based environmental education program is

effective to develop a holistic perspective of in-service teachers. The in-service teachers have an ecopedagogic perspective rather than an anthropocentric perspective.

Okur- Berberoglu (2015c) evaluates the short- and long-term effects of an ecopedagogy-based education program on environmental knowledge gaining of the in-service teachers via a quantitative approach. A knowledge test is carried out as a pretest, posttest, and after 6 months as a post-post test. It is found that the program is effective in gaining knowledge in the short term at a high level while it is effective in gaining population ecology knowledge in the long term.

As seen above there are ecopedagogy-based studies related to the professional development of in-service teachers in TR. However, they usually focus on the various dimensions of eco-literacy and do not directly mention eco-literacy. As can be seen below, some studies focus on eco-literacy however there are limited studies related to the professional development of in-service teachers in NZ.

NZ literature

Environmental subjects and development are also very important for NZ because of having special geographical structure and endemic species. Different government institutes such as the Ministry of Environment, Ministry of Education, Department of Conservation (DOC), educators, and researchers often mention sustainability/sustainable development of NZ within their reports, articles, and curriculum (The New Zealand Curriculum, 2007).

Bolstad (2005) considers three reasons why environmental education and sustainability subjects in the NZ curriculum have had difficulty finding a place within the practice of most schools. First, the underlying principles of environmental education are not very clear for many teachers. Second, the practices of environmental education pedagogies do not converge for many schools. Third, teachers want to teach environmental subjects however these subjects might be perceived as being limited within the curriculum. Bolstad (2005) emphasizes that there is a lack to teach environmental subjects within different perspectives such as social, economic, political, or ecological in teacher education programs until 1990 in NZ.

These environmental subjects are mostly taught under science, ecology, or the management of natural resources. Over the years, teacher education programs of NZ have been improved in terms of sustainability perspective (Bolstad, 2005) however Bolstad concludes that pre-service or in-service teachers still do not know how to teach environmental subjects. Bolstad (2005) warns that the professional development of in-service teachers for environmental subjects is underestimated. Enviroschools, therefore, is set up because of these educational criticisms.

Enviroschools program has been started in Hamilton in 1993 and the program has become available nationwide in 2002. This program is run by The Enviroschool Foundation/Toimata Foundation which is a not-for-profit trust. This foundation coordinates and supports environmental education programs at the local and national levels. (Bolstad, 2005; Bolstad, Joyce& Hipkins, 2015). Enviroschools try to present hand on and meaningful learning experiences and involve students in ecological ways of thinking, acting, and feeling in school, in their family, and the community. Envirochools also aim to build a sustainable community via communication, respect, and decision-making processes. The enviro school model supports that environmental education should be placed-based and connected with the physical, social, cultural, and spiritual environment of the school and its community (Enviroschools, 2019). This model also supports collaborations among government departments (eg. Ministry of Education, Department of Conservation), NGOs, or non-formal environmental education settings to support the teaching and learning processes of schools (Bolstad et al., 2015; Enviroschools, 2019)

Ministry of Education starts to fund the professional development of in-service teachers for environmental education in the late 1990s to support the enviroschool program. The Ministry of Education also publishes a Guideline for in-service teachers to show how to teach environmental and sustainability concepts (Ministry of Education, 1999). This professional development programs aim to show how to use the guideline. However, the professional development of in-service teachers is stopped in 2009 and there is still criticism about this decision. (Eames et al., 2010).

Eames et al (2010) evaluate three in-school professional development programs intended for in-service teachers. According to their report, these programs have positive outputs:

- In-service teachers evaluate the program as practical, enjoyable, and helping them to incorporate environmental/sustainability contents into their teaching (p. 60–61).
- This program has helped teachers gain a better understanding of all aspects of sustainability, and how to apply these ideas personally and in their schools.
- The teachers point out that the program has helped them learn how to support student-planned actions, and teaching and learning approach in sustainability (p.64).
- The teachers emphasize that they still do not have enough understanding of how to assess student

achievement in sustainability (p. 64).

- The teachers are keen on delivering sustainability subjects as an extracurricular activity (p.67-68)

There are detailed evaluation and assessment forms at the end of the report. However, there is no detailed information on how these programs have been designed and conducted. It is understood that professional development programs in NZ are carried out by each school management according to teachers' needs. (Eames et al, 2010; Ferrier-Kerr, Keown, & Hume, 2008; Guidelines, 2015)

Chalmers (2011), examines the perception of in-service teachers and pupils while participating in environmental and sustainability subjects in five primary school classrooms in NZ. She uses a qualitative approach while collecting the data. She finds that there is a lack of general understanding of environmental/sustainability concepts of teachers and pupils. Their perceptions are mostly ecologic. There should be a whole-school approach and collaboration while carrying out sustainability subjects in the school and integrating sustainability subjects across the curriculum. She emphasizes that teachers need to have a very well-organized professional development in terms of teaching sustainability subjects.

Bolstad et al (2015) evaluate the development and improvement of environmental/sustainability education applications in the NZ education system between 2002/3- 2014 years via academic publications and workshop reports. According to their report, there are positive improvements to take action in the last decade however there is still a need to collaborate between mainstream education stakeholders, teachers, adults, and schools to have a critical perspective on environmental/sustainability subjects and how to teach them to children. Teachers' professional development should be supported because they do not feel confident to teach environmental subjects.

Aguayo and Eames (2017) suggest using mobile technology to enhance the eco-literacy of primary school students and their parents within free-choice learning settings in NZ. They think that mobile technology is to facilitate the integration of classroom and outside-of-classroom learning experiences. The researchers also emphasize that there has been concern regarding a general lack of ecologic knowledge, social and ecological issues in NZ, especially in terms of adaptation and mitigation of climate change. This paper is at the theoretical level, there is no data collection related to the main topics.

Dada, Eames, and Calder (2017) examine the eco-literacy level of pre-service teachers who have environmental education courses at an NZ university. The research's main point is to

have confident and competent teachers to deliver proper sustainability education in schools. The researchers use a mixed methodology to collect the data. They find that the eco-literacy level of pre-service teachers slightly increases and the pre-service teachers feel confident to teach environmental subjects.

DePetris and Eames (2017) try to understand how a collaborative education model works to develop effective school-community partnerships within a project in Taupo. There are different governmental and non-governmental organizations in this model to increase the eco-literacy levels of young people. The researcher also points out that in-service teachers need to have professional development to take part effectively in the model.

As seen above NZ literature especially emphasizes that the professional development of in-service teachers should be supported in terms of how to teach environmental/sustainability subjects. There is not any specific institution like TUBITAK in NZ. Collaborations among schools, government institutions, NGOs, or communities are very important. Articles and reports also emphasize that place-based outdoor education pedagogies should be carried out to have a critical perspective on environmental/sustainability subjects. They refer to the ecopedagogical perspective even though they do not directly mention ecopedagogy philosophy and eco-literacy.

Method

The methodology of the study was a case study within a quantitative approach. An eco-literacy scale was used to collect the quantitative data. The data collection was completed between January 2017 and January 2018.

The eco-literacy scale

The eco-literacy scale developed by Okur- Berberoglu (2018) was used to collect data. (App. 1) Explanatory and confirmatory factor analyses were carried out while developing the scale by SPSS and LISREL. The explanatory factor analysis gave entry factor loads as 0.30 and above, the KMO value as 0.830 and the Bartlett dimensionality test as less than 0.000, the Cronbach Alpha coefficient as 0.78. The adaptation figures were obtained as X^2 /sd: 4.09, RMSEA: 0.087, SRMR: 0.0783, CFI:0.828, IFI:0.830, GFI:0.854, AGFI:0.807 in the confirmatory factor analysis. It was concluded that the figures out of the explanatory factor analysis were consistent for the measurement of the eco-literacy level of individuals (Buyukozturk, 2007; Sencan, 2005) and that its theoretical foundation was strong and solid (Simsek, 2007).

Quantitative data analysis

R statistics package program was used to analyze the data. Whether the data retrieved out of the in-service teachers feature a normal distribution was tested by boxplot graphs. The boxplot graphs showed normal distribution therefore it was concluded that parametric tests were suitable for the analysis. (Wickham & Grolemund, 2016) The analysis of the tests was evaluated by the independent sample t-test and ANOVA. These tests are suitable for comparisons of mean values if there are two (independent sample t-test) or more than two independent groups (ANOVA) (Buyukozturk, 2007; Peers, 1996). It was calculated the total scores of the whole scale and each theme. Each dependent variable was compared according to total scores.

Participants

There were two groups within this study. The first group comprised of in-service teachers who joined TUBITAK's environmental education programs between 2008 and 2011. TUBITAK wanted to have a common effect of environmental education programs by in-service teachers because teachers might share their environmental knowledge and experience with students and

their own families. Students might also share their acquisitions with their families. A successive common and ripple effect might happen by these knowledge and experience sharing ways. (TUBITAK Call for Paper, 2018) There were a total of 115 in-service teachers. The researcher could only reach 46 of the teachers (%40) after seven years by emails. There were 23 female and 23 male in-service teachers (Table 1).

The researcher classified the age to analyse properly and easily. There were three age groups: Under 30, 31-40, and Over 41. Most of the in-service teachers of TR were in the 'Under 30' group while most of the in-service teachers of NZ were in the 'Over 41' group. (see Table 1)

Table 1
The demographic comparison of NZ and TR

Gender	NZ	TR	Total
Male	20	23	43
Female	40	23	63
Age groups			
Under 30	7	23	31
31 to 40	18	16	34
Over 41	35	7	42
N	60	46	106

The second group comprised of in-service teachers of NZ. There were 60 in-service teachers (20 males, 40 females) in this group. (Table 1) The literature did not specify the importance of an individual group. Nevertheless, Goleman (2006, 2009) and McCallum (2005) mentioned the importance of adults on the economy, environment, and social interactions, therefore the data was collected from in-service teachers as adults.

Results

The comparisons were made according to countries, genders, education, and age groups.

Country comparisons

The first comparison was made between countries by independent samples t-test. There was not any meaningful difference between countries according to the total scores of the whole scale ($p>0.05$).

Table 2
The comparison of the countries in terms of each theme

Themes	Countries	N	Mean	sd	df	t	p
Economy	NZ	60	14.50	2.3	96.62	-3.1337	0.0022
	TR	46	15.86	2.1			
Emotional	NZ	60	11.76	2.4	101.31	-8.2372	0.0000
intelligence	TR	46	14.73	2.1			
Ecological	NZ	60	16.46	2.1	103.55	-5.2468	0.0000
intelligence	TR	46	18.36	1.9			
Social	NZ	60	17.13	2.5	97.77	3.2387	0.0016
intelligence	TR	46	15.47	2.7			
Green	NZ	60	15.48	3.2	94.047	2.74	0.0073
consumer	TR	46	13.67	3.4			

There were meaningful differences between NZ and TR in terms of each theme ($p< 0.05$, Table 2). It was found that TR in-service teachers had a higher mean score in terms of economic,

emotional, and ecological intelligence themes while NZ in-service teachers had a higher mean score in terms of social intelligence and green consumer themes.

Gender comparisons

There were meaningful differences between genders in terms of social intelligence and green consumer themes ($p < .05$) according to the independent-t-test. Female in-service teachers had a higher mean score than male in-service teachers. (see Table 3)

Table 3
The comparison of genders in terms of social intelligence and green consumer themes

Themes	Gender	N	Mean	sd	df	t	p
Social intelligence	Male	43	15.51	2.2	81.911	-2.8402	0.005
	Female	63	17.03	2.1			
Green consumer	Male	43	13.72	2.4	73.29	-2.3411	0.021
	Female	63	15.36	2.1			

Education comparisons

The third comparison was made between in-service teachers who had environmental education and did not have any education before. Most of the in-service teachers had environmental education before and meaningful differences were in favour of the educated in-service teachers ($p<0.05$). Educated in-service teachers had a higher mean score than the others in terms of a total score of the whole scale, economy, emotional and ecological intelligence. (see Table 4)

Table 4
The comparison between in-service teachers who had education and did not have any education before

	Education	N	Mean	sd	df	t	p
The total score of the whole scale	Yes	62	78.14	7.3	91.57	2.64	0.009
	No	44	74.31	7.5			
Economy	Yes	62	15.58	2.1	1.054	2.62	0.01
	No	44	14.40	2.3			
Emotional intelligence	Yes	62	14.04	2.0	75.983	5.4	0.000
	No	44	11.65	2.2			
Ecological intelligence	Yes	62	18.03	2.9	91.001	4.65	0.000
	No	44	16.25	3.1			

Age-group comparisons

The fourth comparison was made between age groups by ANOVA. There were meaningful differences between age groups and social intelligence, emotional intelligence, green consumer themes ($p < 0.05$).

Table 5
The ANOVA result between age groups and the social intelligence theme

	df	Sum suq	Mean sq	F value	p
Age-group	2	68.1	34.07	4.917	0.009
Residuals	103	713.6	6.93		

The difference in social intelligence theme was related to the 'Over 41' group (X:17.4). This group had the highest mean score according to the other groups. There were meaningful

differences between Over 41-Under 30 and Over 41-31 to 40 groups ($p<0.05$). (see Table 5, 6 & 7)

Table 6
Post-hoc= Tukey result: Mean levels of each age-group for social intelligence theme

	Under 30	31-40	Over 41
Mean	15.77	15.76	17.4
N	30	34	42

Table 7
Age group comparisons of social intelligence theme

Age-groups	diff	lower	upper	p
31 to 40-Under 30	-0.00196	-1.569	1.565	0.999
Over 41-Under 30	1.638	0.141	3.134	0.028
Over 41-31 to 40	1.640	0.196	3.084	0.021

The difference in emotional intelligence theme was related to 'Over 41' and 'Under 30' groups. Over 41 group had the lowest mean score (X:12.14) while the Under 30 group had the highest mean score (X: 13.93). There was, therefore, a meaningful difference between Over 41-Under 30 ($p<0.05$). (see Table 8, 9 & 10)

Table 8
The ANOVA result between age groups and the emotional intelligence theme

	df	Sum suq	Mean sq	F value	p
Age-group	2	62.4	31.208	5.727	0.004
Residuals	103	561.2	5.449		

Table 9
Post-hoc=Tukey result: Mean levels of each age-group for the emotional intelligence theme

	Under 30	31-40	Over 41
Mean	13.93	13.41	12.14
N	30	34	42

Table 10
Age group comparisons of the emotional intelligence theme

Age-groups	diff	lower	upper	p
31 to 40-Under 30	-0.521	-1.91	0.868	0.646
Over 41-Under 30	-1.79	-3.11	-0.463	0.005
Over 41-31 to 40	-1.268	-2.54	0.011	0.052

The difference of green consumer theme was related to 'Over 41' and '31 to 40' groups. Over 41 group had the highest mean score (X:15.86) while '30 to 40' group had the lowest mean score (X: 13.68). There was, therefore, a meaningful difference between 'Over 41-31 to 40' groups ($p<0.05$). (see Table 11, 12 & 13)

Table 11
The ANOVA result between age-groups and the green consumer theme

	df	Sum suq	Mean sq	F value	p
Age-group	2	98.4	49.19	4.406	0.0146
Residuals	103	1150.0	11.16		

Table 12
Post-hoc= Tukey result: Mean levels of each age-group for the green consumer theme

	Under 30	31-40	Over 41
Mean	14.23	13.68	15.86
N	30	34	42

Table 13
Age group comparisons of the green consumer theme

Age-groups	diff	lower	upper	p
31 to 40-Under 30	-0.556	-2.547	1.433	0.784
Over 41-Under 30	1.623	-0.275	3.523	0.10
Over 41-31 to 40	2.180	0.347	4.013	0.015

Discussion and Conclusion

It has been found six main results at the end of this study:

1. TR in-service teachers have a higher mean score for economy, emotional and ecological intelligence themes while NZ in-service teachers have a higher mean score for social intelligence and green consumer themes. (see Table 2)
2. There are meaningful differences between genders in terms of social intelligence and green consumer themes. Female teachers have a higher mean score than male teachers (Table 3)
3. Most of the in-service teachers have had environmental education before and meaningful differences are in favour of the educated in-service teachers. Educated teachers have a higher mean score than the others in terms of a total score of the whole scale, economy, emotional and ecological intelligence. (see Table 4)
4. There are meaningful differences between age groups and social intelligence, emotional intelligence, green consumer themes. The difference in social intelligence theme was related to the 'Over 41' group (X:17.4). This group has the highest mean score according to the other groups. (see Table 5, 6 & 7)
5. The difference of emotional intelligence theme is related to 'Over 41' and 'Under 30' groups. Over 41 group has the lowest mean score (X:12.14) while the Under 30 group has the highest mean score (X: 13.93). There is, therefore, a meaningful difference between Over 41-Under 30. (see Table 8, 9 & 10)
6. The difference of green consumer theme is related to 'Over 41' and '31 to 40' groups. Over 41 group has the highest mean score (X:15.86) while '30 to 40' group has the lowest mean score (X: 13.68). There was, therefore, a meaningful difference between 'Over 41-31 to 40' groups. (see Table 11, 12 & 13)

Country comparison

The meaningful result of the economy is in favour of the TR group while the social intelligence result is in favour of the NZ group. This result makes sense in terms of Turkey's economic and political situation. There has been a war in Syria since 2011. There are over three

million refugees in Turkey now and some of the refugees are registered employees while some refugees, especially children, work as unregistered (UNHCR Report, 2017).

Kaygisiz (2017) emphasizes that Syrian employees have a positive effect on Turkish local businesses because they, especially children, are cheap labour. However Syrian refugees complain about the discrimination they see from Turkish employees. The items of the economy theme are related to global companies, immigration, cheap labour. The TR group might evaluate this economic situation as a positive output and think it is very good to have cheap labour. The 'cheap labour' theme is also the main subject of the social intelligence items (App. 1). On the other hand, there are many global companies and immigration applications for NZ. These immigrant people might be very qualified. They might have good jobs in NZ and their rights are protected by the government. The NZ government regularly carries out surveys to immigrant people to understand whether they are happy to work in NZ or not. If the employer tries to misuse immigrants as cheap labour, they are prosecuted (MBI, 2018). NZ people might have a positive perspective on immigrant people this might explain why their social intelligence score is higher. Syrian people had to come to TR because of the war however NZ immigrants come to NZ with their own choices. This situation might be effective on immigrants' feelings (mental and physical) and productivity (MBI, 2018).

The other favourable result of the TR group is related to emotional and ecological intelligence. These items are mostly based on the effect of environmental subjects on mental and physical health. For example, Chernobyl Nuclear Accident happened in Ukraine in 1986. According to the reports more than 100,000 people had to be evacuated, two nuclear plant workers, and 28 people died from radioactive poisoning within two weeks as an immediate effect. Thyroid cancer cases in childhood increased in the long term in Ukraine and the northern side of Turkey (World Nuclear Association, 2014). The other important problem for Turkey is industrialization.

Many industrial regions release some heavy metals to the natural environment in Turkey such as in Sakarya, Ergene. The International Agency for Research on Cancer has also published some heavy metals such as Pb, Cd, Fe, Cu, and Zn in the carcinogens list. Yolal (2014) measures the Pb, Cd, Fe, Cu, and Zn levels of patients with bladder tumors in Ergene. The Ergene river has a high concentration of these metals. The river and its branches are heavily polluted because industrial organizations and settlements discharge their industrial and domestic wastes into the water without purification. He finds that Zn, Cu, Pb, and Cd are particularly high in patients' serums at the end of the research. All these subjects of eco-literacy themes are mentioned within the TUBITAK projects (Eryaman et al., 2010; Güler, 2009; Keles et al., 2010; Okur- Berberoglu, 2014, 2015a, 2015b, 2017a, 2017b, 2019; Yalcin-Ozdilek et al., 2011; Yalcin & Okur, 2014) therefore the results make sense. These studies also mention their detailed educational programs. On the one hand, NZ is presented as %100 Pure and maybe TR's problems might not be similar to NZ's environmental problems. On the other hand, the NZ literature (Bolstad, 2005; Bolstad et al., 2015; Eames et al, 2010; Ferrier-Kerr et al., 2008) mentions how important professional development of in-service teachers is. However, it could not be seen any research that shows detailed education programs related to the professional development of in-service teachers. Eames et al (2010) only evaluate three professional development programs however there is not any detailed explanation about the program.

The last stage of the eco-literacy scale is green consumer behaviour and the result is in favour of the NZ group. The result makes sense because the items are especially related to recycling (eg. plastic bags) and humble living. NZ government has banned using plastic bags at supermarkets therefore everyone has their reusable bags. (Ministry of the Environment, 2019) There are also opportunity shops in NZ. These shops are run by churches or NGOs such as Red Cross, Salvation Army. People can donate anything, and these opportunity shops sell second-hand goods at very cheap prices. These kinds of applications and shops are not common in TR.

According to HDI (2018) report, NZ is more productive and GNI is higher than TR however TR is more consuming than NZ, but this is not green consumerism. However, there is a common problem for the two countries: Gender inequality.

Gender comparison

According to HDI (2018), NZ is in the 34th rank while TR is in the 69th rank according to the gender inequality index (App. 2). The employed women level of NZ is higher than Turkey (HDI, 2018), but there is still a pay gap between genders in NZ (Statistics NZ, 2018). According to UNFPA (2019) and OECD (2019), Turkey is the 17th biggest economy in the world however it is the last 15th country in terms of gender equality. The items of social intelligence are related to cheap labour in the market. Women seem as 'cheap labour' like children therefore female teachers might be more sensitive in terms of feeling this inequality. Women are still seen as responsible for domestic responsibilities such as shopping, cooking (Horkheimer & Adorno, 2002). Green consumer items are related to shopping and recycling as well, therefore female teachers might be more interested in these subjects.

Education comparison

Of the in-service teachers, 58 % (62) have had environmental education before. These teachers have higher scores in terms of the total score of the whole scale, especially within the economy, emotional and ecological intelligence themes. NZ in-service teachers are asked on the scale whether they have had any environmental education before or not. Some of them have education from different sources such as Ecology project (4th year of the university), Eco design, Craigieburn Environmental Centre, Eye on Nature, Through Greenpeace and the Green Party, Tree planting, Sustainable living seminars, climate change projects, landscape architect, directed environmental research, Starfish Bobby Calf Project, Canterbury Environmental Trust - Environment Centre. TR in-teachers have education from TUBITAK projects. The researcher knows about TUBITAK projects however it is not known details of NZ education projects. The education projects of both countries might mention the same or similar subjects therefore they might have a high score in terms of the whole scale. However, it is thought that there are still problems for both countries:

The researcher tried to contact some enviroschool centers to find out their professional development programs in NZ, unfortunately, she could not have any reply. Examining NZ professional development programs is out of the scope of this study. However, NZ literature mentions how in-service teachers need to have professional development programs (Bolstad, 2005; Bolstad et al, 2015; Chalmers, 2011; DePetris & Eames, 2017; Eames et al., 2010). The researcher also joined a teacher forum related to environmental education for sustainability in NZ in 2011. Teachers complained about the same subject that Bolstad (2005) warned about (in the introduction). The teachers said that the NZ curriculum was so broad therefore they did not know how to teach sustainability subjects. Environmental subjects are quite complicated, and their content might change over the years. In-service teachers, therefore, might need to have professional development programs regularly.

There have been regular professional development programs in TR since 1999 (Erentay & Erdogan, 2009; Okur-Berberoglu, 2016) however there are still problems in terms of sharing program outputs. The number of the publication has been increasing (Eryaman et al, 2010; Güler, 2009; Keles et al, 2010; Kucuk & Yildirim, 2020; Okur- Berberoglu, 2014, 2015a, 2015b, 2015c, 2020; Yalcin-Ozdilek et al, 2011; Yalcin & Okur, 2014; Yardimci, 2009) however they are not enough. TUBITAK should set up rules to get published project outputs. Some researchers (Okur- Berberoglu, 2014, 2015a, 2015b, 2015c, 2017a, 2017b; Okur-Berberoglu et al, 2015; Yalcin-Ozdilek et al, 2011; Yalcin & Okur, 2014) especially have been emphasizing

that TUBITAK should publish a guideline for in-service teachers like NZ however there is not still guidance. It is thought that this is a big deficiency for TR.

Age-group comparison

Over 41 age-group has a higher mean level in terms of social intelligence and green consumer themes. These themes are related to working (cheap labour) and house (shopping) lives. This age group might be working, married, and having child/ren therefore they might be more sensitive to environmental subjects. Any environmental issue might cause them to change their work or family lives. (UNHCR Report, 2017) For example, the NZ government opens a new immigration category for people who were displaced by climate change (Robertson, 2016). Nuclear power is a big discussion subject for Turkey.

After experiencing the Chernobyl disaster and its reflections, people are quite sensitive and suspicious about nuclear power (World Nuclear Association, 2014). Turkey has a deal with Russia to build Akkuyu Nuclear Plant in 2010 (TAeK, 2018). Over 41 age-group of Turkey might be still remembering this disaster. Because of the life experiences, the Over 41 age group might be evaluated environmental subjects more logically while the Under 30 group might be evaluated environmental subjects more emotionally. According to brain development, the rational part of a teen's brain is not able to fully develop until age 25 or so, therefore these people think more emotionally (Johnson, Blum & Giedd, 2009).

This study is also important in terms of the follow-up process of environmental education programs. It is questioned the long-term effects of environmental education programs (Okur, 2012, Okur-Berberoglu et al., 2015; Okur-Berberoglu, 2020; Piller, 2002; Rickinson, 2001;). According to TUBITAK programs, it might be said that ecopedagogy-based environmental education programs are effective in the long term to increase eco-literacy levels of in-service teachers and Okur- Berberoglu (2020)'s research confirms this output. However, this output should be tested by different studies. NZ professional education programs are not very clear but NZ literature (Bolstad, 2005; Bolstad et al, 2015; Chalmers, 2011; DePetris & Eames, 2017; Eames et al., 2010; Ferrier-Kerr et al., 2008; Guidelines, 2015) refers to ecopedagogy. Ecopedagogy the concept is not very common in NZ however this concept might be a new research subject for NZ.

In a conclusion, there are different and good applications in both countries. TR's professional development is more central than NZ. TUBITAK funds all professional development of in-service teachers in TR while NZ prefers to carry out different professional development programs according to schools' and teachers' needs. However, TR's education programs are more approachable than NZ. There are more collaborations between government institutions (eg. Ministry of Education, DOC), NGOs, schools, non-formal education settings, and volunteers in NZ. TR's collaboration is very limited between TUBITAK, universities, and some NGOs. Both countries' researchers should increase their publications related to detailed education programs.

The researcher used the NZ group as a control group for this study. In terms of eco-literacy, the TUBITAK group has positive outputs but these outputs are not enough yet. In terms of the practical side, NZ has more successful applications than TR. Both countries might organize a common project to share theoretical and practical sides of the professional development education programs.

It cannot be generalized the results of this study and the results should be evaluated within a case study. It is needed to be done different comparison studies for environmental subjects because environmental subjects are quite complicated.

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Appendix 1. The ecoliteracy scale

		Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
Themes	Items					
Economy	1. I cannot afford sustainably produced goods.					
	6. Global companies flourish at the expense of local businesses.					
	7. Local businesses lay off workers when trying to compete with global companies, which is one of the reasons for migration to urban centres.					
	8. Immigration serves as a source of cheap labour for global companies.					
Social intelligence	2. I avoid cheap goods from overseas if I am aware that their production involves unjust labour conditions.					
	3. I avoid cheap goods from overseas if I am aware that their production involves the use of child labour.					
	14. I prefer to buy local produced vegetables and fruits.					
	17. I don't feel good when I learn that the production of a good I bought involved unjust labour conditions.					
Emotional intelligence	4. I try to emulate individuals who live sustainably.					
	5. I believe that environmental education is one of the ways to combat obesity.					
	18. I feel bad when I notice that nature has the power to defeat human progress.					
	23. I would be a much more laid-back person if I knew nothing about environmental issues.					
Green consumer	9. I try to reuse plastic bags.					
	10. I try to avoid using plastic bags when I go shopping.					
	11. I have my own water bottle with me at all times.					
	15. I try to extend the life of my clothes by sewing and patching them.					
Ecological intelligence	12. Environmental disasters can unfold in several parts of the world simultaneously.					
	13. The effects of an environmental disaster are not limited to the area where it took place.					
	16. I worry when I learn about increase in incidents of cancer among people living in industrial areas					
	28. It is obvious that economic development cannot happen without natural resources.					

Appendix 2. The comparison of two countries within some HDI indicators (HDI, 2018)

Indicators	**New Zealand (Rank:16) Very High Human Development**	**Turkey (Rank:64) High Human Development**
Human Development Index (HDI)	0.917	0.791
Gross National Income (GNI)	33,970$	24,804$
Employment to population ratio	65.8	45.8
Unemployment	4.9	11.3
Fossil fuel energy consumption	59.4	87.6
Renewable energy consumption	30.8	13.4
Red List Index	0.634	0.876
Median age	37.3	29.9
Gender inequality index	0.136 (Rank:34)	0.317 (Rank:69)