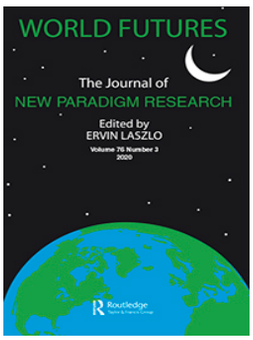

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An Ecological Intelligence Scale Intended for Adults

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ABSTRACT

Ecological intelligence (EI) refers to systemic thinking, ecophilosophy, holistic perspective, collective lifestyle and cultural commons. It is difficult to determine the exact nature of EI and its characteristics due to it being a complex concept. The aim of this study is to develop an EI scale intended for adults which is based on a holistic perspective, social intelligence and economy and try to specify the concept of ecological intelligence. The goodness-of-fit values were at an acceptable level. The results were Cronbach's alpha: 0.824; KMO: 0.878; X^2/df: 3.39; RMSEA: 0.077; SRMR: 0.0504; GFI, AGFI, NFI, NNFI, IFI, CFI $\geq$ 0.90. These results showed that the scale is reliable, and has validity and strong theoretical background. There are 12 items within the scale.

KEYWORDS

Adults; confirmatory factor analysis; ecological intelligence scale; explanatory factor analysis

Introduction

Once upon a time there was a Lake Amik in Hatay/Turkey. It had very rich—migratory bird, fish—biodiversities and fishponds were very common around the lake. Fishing, especially eel fishing, was a kind of source of income for residents according to Ottoman documents (Efe, 2016). Lake Amik was drained in 1975 by the legal decision of Suleyman Demirel who was the director of State Hydrolic Works. Lake Amik was transformed to agricultural land, Amik Valley. However by the time fish, bird biodiversities and agricultural production level decreased (Okur, 2004). There are still rivers (such as Asi (Orontes), Sancili, Yildirim,

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Bakras, Tahtakopru) and fishing activities on the Amik Valley. However, fishing is a kind of leisure activity anymore because fish abundance is quite low and the fish population of this Palearctic region is also endemic (Okur, 2004; Okur & Yalçin-Özdilek, 2008; Okur, Yalçin-Özdilek, & Baran, 2004).

Suleyman Demirel was the president of Turkey between 1993 and 2000 (Presidency of the Republic of Turkey, 2019). He confessed that it was a big mistake to drain Lake Amik (Çalışkan, 2003, p. 118). Recently, the state university of Hatay has been trying to recreate the lake (Çalışkan, 2003, p. 118); however, it looks like it will take a long time to recreate it because there are other problems on the region such as the airport which was built on the Amik Valley.

When I was a university student in Hatay at the beginning of 2000s, there was a discussion to build an airport on the Amik Valley in order to increase the economic development. The government wanted a report from the state university, and the researchers of the university declared that Amik Valley was not suitable to build an airport. There were three problems: Floods, migratory birds and wind. The valley had high flood risk in every rainy season, and it was still on the way of migratory birds. This region was also very windy, and there were wind powers stations on Amanos Mountains (Belen Section) (Okur, 2004; Özşahin, 2010; Özşahin & Kaymaz, 2013). The airport was inaugurated in December 2007 by the government despite the fact that there was an unfavorable report. I also remembered that the airstrip of the airport was first built, and every rainy season the airstrip was under the water. I had a flight to Hatay in 2010 and the flight was so bumpy because of the wind. Some bird incidents happened around 2010, too. Migratory birds stuck in the engines of the airplanes. The government unfortunately ignored the ecologic balance, biodiversity and breached the laws (Özşahin, 2010).

There is a dynamic balance in ecology (Capra, 2005) and unfortunately people—especially politicians—ignored this balance, whereas O'Sullivan (1999) says that we need a new political vision which evaluates the human community is a part of wider complex biotic community. Capra (2005) emphasizes that ecology is cyclical and there are tolerance limits to sustain the ecological balance. When people go beyond these limits, ecological systems cannot compensate it. As seen in Lake Amik case, people and politicians went beyond the tolerance limit and successive mistakes happened among politics, economy and ecology. It is obvious that people—especially politicians—do not have holistic perspective, whereas holistic perspective is also important for sustainable living.

Sustainable living embraces ecosystems and communities of organisms such as families, schools and indigenous tribes together (Brymer & Davids, 2012; Capra, 2005). For example, there are nomadic lifestyles on the world

such as the Yoruks in Tukey, people of the Mongolian steppes and Inuits in Canada. Sustainable living must be a requirement of their normal, nomadic lifestyle—otherwise they might not have survived (Bookchin, 1982). It is thought that there should be an intergenerational transfer between generations in terms of sustainable living (Bookchin, 1982).

Some researchers such as Bowers (2008, 2009, 2010), Goleman (2006, 2009), McCallum (2005), Schutte et al. (1998), Shumba (2011) and Sterling (2009) try to explain this type of sustainable lifestyle through "ecological intelligence." There are many experimental studies intended for adults or students that offer environmental outputs such as environmental attitude, awareness and knowledge which are subsets of ecological intelligence worldwide (Blair, 2008; Guler, 2009; Irwin, 2010; Keles, Uzun, & Varnaci-Uzun, 2010; Lugg & Slattery, 2003; Ozdemir, 2010; Palmberg & Kuru, 2000; Piller, 2002; Preston, 2004; Preston & Griffiths, 2004; Thomas, 2005). However, there is insufficient experimental study related to ecological intelligence, possibly due to the difficulty of developing a rigorous measurement scale.

The aim of this study is therefore to develop an ecological intelligence scale intended for adults which is based on holistic perspective, social intelligence and economy, and try to specify the concept of ecological intelligence. The scale should be more reliable with strong theoretical background and validity within inductive and deductive perspectives. The development of this scale took approximately 2 years. The developed scale can then be used to aid other researchers in terms of time, money and effort in this study.

Ecological Intelligence

Ecological intelligence should not be purely evaluated within a natural science and mechanistic perspective just because it includes the word "ecological" (Sterling, 2009). "Ecological" here reflects systemic thinking, ecophilosophy, holistic perspective (Bowers, 2010; Capra, 2005; Sterling, 2009), collective lifestyle and cultural commons (Bookchin, 1982; Bowers, 2008, 2009; Shumba, 2011). Shumba (2011) especially emphasizes that ecological intelligence can be taught and improved not only by formal education but also especially by intergenerational transfer as informal education; thus, adult education, parent education (Bronfenbrenner, 1986; Capra, 2005; Gokdere, 2005; Jenkins, 1989; Kasapoglu & Turan, 2008; Mahoney et al., 1999; Seginer, 2006) and informal education come to prominence. Some research (Capra, 2005; O'Sullivan, 1999) also points out the educational roots of ecological intelligence as holistic perspective, social intelligence and economy.

Firstly, ecological intelligence is related to either cognitive area or affective area (Shumba, 2011; Sterling, 2009). More experimental

programs that support the cognitive development of learners are required. Moreover, the cognitive domain should interact with the natural environment (Capra, 2005). Capra (2005) emphasizes that experiential learning is important in order to have holistic perspective and understand complex relationships of ecosystem. Secondly, ecological intelligence does not ignore individual differences because individual background also influences social community (Bowers, 2010; Capra, 2005; Shumba, 2011; Sterling, 2009). According to Capra (2005, p. 25), there is no "one-size-fits-all" sustainability curriculum. Every ecological issue might affect different people in different places; therefore, they might adapt different teaching principles of ecology to differing and changing the situations. Thirdly, the main aims of ecological intelligence are to develop social and environmental responsibility (Shumba, 2011; Sterling, 2009) and awareness, to think critically (Bowers, 2010; Capra, 2005), to pursue cooperative learning (Sterling, 2009), and to bring about behavioral change in the long term (Bowers, 2010; ESD Report, 2015; Sterling, 2009). Lastly, Pierre Walter (2009) and Stephen Sterling (2009) also refer to the educational philosophy roots of ecological intelligence as progressivism.

According to the literature as seen above, most of the papers related to ecological intelligence are at the theoretical level. They define ecological intelligence and explain its characteristics (Bookchin, 1982; Bowers, 2008, 2009, 2010; Capra, 2005; Goleman, 2006, 2009; McCallum, 2005; O'Sullivan, 1999; Shumba, 2011; Sterling, 2009). Akkuzu (2016) has developed an ecological intelligence scale based on the consumption behaviors of undergraduate students. Sterling (2009) emphasizes the importance of experimental studies in order to develop ecological intelligence and notes that few studies have been conducted.

Two subjects differentiate this study from Akkuzu's study. Firstly, her study is based on consumer behavior, a subset of ecological intelligence, and secondly, her study group consists only of undergraduate students. Ecological intelligence has a complex structure; therefore, this study focuses on multiple subsets of ecological intelligence. The subsets are holistic perspective, social intelligence and economy.

Holistic Perspective

First and foremost, ecological intelligence should have holistic perspective because there are seen and unseen webs among biotic and abiotic factors in the world. Every behavior, whether it is related to consumption or not, can impact directly or indirectly on the environment. People therefore should take responsibility for their every behavior to their environment and social community (Capra, 2005; Goleman, 2006, 2009; McCallum, 2005). Individualism has unfortunately been in the foreground recently

due to capitalist perspective, globalization and industrialization. However, the human being is a social creature and s/he should not isolate herself/himself from the social area because ecological intelligence is a social and collective process. Each environmental accumulation is transferred by intergenerational communication such as language; therefore, environmentally responsible behavior also needs to involve responsible social and economic behaviors (Bowers, 2008, 2009, 2010; Capra, 2005; Goleman, 2006, 2009; McCallum, 2005; Shumba, 2011; Sterling, 2009). At this point, social and economic responsible behaviors refer to social intelligence.

Social Intelligence

The other important subset of ecological intelligence is social intelligence, which refers to social responsibilities of people in terms of sustainability. For instance, people should be able to think about how goods are produced or whether there is any environmental or social/human exploitation within the production process (Goleman, 2006, 2009; McCallum, 2005; Orr, 2002). Economy is one of the important parts of human life, and it is not only important earning or spending money. People should also be able to think about what is going on while earning and spending money and whether there are any human or environmental exploitations taking place. For example, migrants are one of the most popular subjects in the world recently.

Some people have been leaving their home cities and countries recently due to reasons such as war or economic crisis. These people become cheap labor sources for their host cities/countries, and this is named "brown revolution." Brown revolution is massive in developing countries due to globalization and industrialization (The Economist, 2002; Food and Agricultural Organisation of United Nations [FAO] Report, 2003; Weiss, 2002). Migrant populations usually settle in urban areas, and this massive population places stress on urban life (Food and Agricultural Organisation of United Nations [FAO] Report, 2015). The rural population is also exposed to nonadaptation in urban social life, and a gap appears between expectation and reality in terms of social and economic lives. On the one hand, the Economist (2002) says that the brown revolution is unstoppable. On the other hand, stopping the brown revolution is not desirable in terms of an economic perspective; however, it may be slowed (FAO Report, 2003). FAO Report (2015) says that governments should support the rural population life with internal and external policies. The Economist (2002) emphasizes the revival of rural population as "green revolution" due to ecological development of the rural area related to the economy (FAO Report, 2003).

For example, 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 employee while some refugees, especially children, work as unregistered (UNHCR Report, 2017). Kaygisiz (2017) emphasizes that Syrian employees have positive effect on Turkish local businesses because they, especially children, are cheap Labor. However, Syrian refugees complain about discrimination they see from Turkish employees. As seen above, this brown revolution is also related to economy, global companies, immigration, and cheap labor.

Economy

One other subset of ecological intelligence is economy. Horkheimer and Adorno (2002), Marcuse (1964), O'Sullivan (1999), McCallum (2005) and Orr (2002) recall that the history of Western science has negatively affected our understanding of the natural environment; therefore, ecology and economy are considered as two different subjects. On the contrary, they should actually be considered as complementing subjects (Goleman, 2009; Kahn, 2010; Orr, 2002) because economy needs environmental and human resources in order to develop (Capra, 2005; Kumar & Budin, 2006; Marcuse, 1964; O'Sullivan, 1999). Kahn (2010) and Orr (2002) especially emphasize that economy should be based on sustainable development rather than exploitation of environmental and human resources. People should be able to think that all their needs, such as food, clothes and shelter, are based on natural resources; therefore, this critical thinking refers to economic responsible behavior.

Economically responsible behavior is also very important in this section because this subject is particularly related to adult education, the second distinctive point from Akkuzu's study. Adults are a working group and are earning money; therefore, they have a direct link to the economy and environment (Goleman, 2006, 2009; McCallum, 2005). Each sustainable living effort should be undertaken with an economic and critical perspective; thus, an individual can organize their personal behavior, and they should criticize their economic, social and environmental behaviors (ESD Report, 2015). When these three ecological intelligence subsets are evaluated together, it is realized that social intelligence might be related to the affective area, while economy might be related to the cognitive area despite the fact that it is difficult to classify these subsets. As seen above, "cheap Labor" subject might be related to either social intelligence or economy. Holistic perspective might be related to either cognitive or affective areas (Shumba, 2011; Sterling, 2009). Each concept requires in-depth study to express effectively (Lummis, 2002). Detailing each concept is outside the scope of this study.

Methodology

The study was approached quantitatively (Yıldırım & Şimşek, 2006). Explanatory and confirmatory factor analyses were carried out within this approach. The explanatory factor analyses had inductive perspective (Buyukozturk, 2007; Sencan, 2005), while the confirmatory factor analyses had deductive perspective (Simsek, 2007). The aim was to create a reliable scale with strong theoretical background and validity within these two perspectives.

The study consisted of four stages:

a. Determination of research context and participants.
b. Literature review and determination of the scale items.
c. Preparation and implementation of the scale.
d. Measurement of the reliability and validity.

Determination of Research Context and Participants

A sample group of adults from different backgrounds was obtained. The sample group of this study included housewives, undergraduate students, in-service teachers, academicians, engineers, health and media employees, government employees and laboratory technicians from Turkey (Appendix B). Of the participants, 60.1% (240) were female and 39.9% (159) of the participants were male. The literature did not specify the importance of an individual demographic. Nevertheless, Goleman (2006, 2009) and McCallum (2005) mentioned the importance of adults on the economy, environment and social interactions; therefore, data were collected from adults.

The individual evaluation of age subgroups was ignored as the number of participants from each subgroup varied from 126 to 9 (Appendix B). There was insufficient data to set up a model for subgroups with a low number of responses.

Moreover, the data were collected via personal relationships by snowball technique over 2 years, with participants voluntarily filling out a scale (Bolino & Turnley, 1999; Gim Chung, Kim, & Abreu, 2004). The researcher sent the test scale to close friends and family members via email. She wanted them to share the scale with their friends. Future research could investigate different subsets of ecological intelligence among various demographics of backgrounds.

Determination of the Scale Items

Literature including books by Daniel Goleman and Ian McCallum related to ecological intelligence were reviewed, and scale items were based upon

their works. Additionally, the socioeconomic situation of Turkey (author's home country) and personal observations were considered.

Turkey is one of the members of G20, developing countries and Organisation for Economic Cooperation and Development (OECD). The OECD publishes a Better Life Index report for member countries annually. This index is based on housing, income, jobs, community, education, environment, civic engagement, health, life satisfaction, safety and work–life balance. When the Better Life Index is considered, the results show that Turkey has average or below average results, especially in education and environment (OECD, 2015). The lifestyle of Turkish people is taken into consideration as observations of health and economy showed a discrepancy between real life and the OECD index.

This scale is, therefore, based on Turkey and Turkish culture. Turkey has seven geographical areas, and each of them has different cultural aspects. The subcultural aspects were ignored due to the difficulty in collecting data. Further research might focus on specific cultural groups in Turkey. The effects of globalization and industrialization (Weiss, 2002) on Turkey were focused on while generating the items. These effects also might be seen in other countries, and researchers could test this scale within their countries and cultures.

Finally, 30 items and three themes were determined at the end of the evaluations. However, it was difficult to decide which items to include because this study also aimed to specify the abstract concept of ecological intelligence. The author of "Ecological intelligence: Rediscovering ourselves in nature," Ian McCallum, evaluated the scale items as potential indicators of ecological intelligence.

Preparation and Implementation of the Scale

The trial scale was designed based on the five Likert style. The affirmative items were scored as 1—Completely disagree, 2—Partly disagree, 3—Not sure, 4—Partly agree, and 5—Completely agree. A complete reverse scoring was applied to the negative set of items. The scale was completed by 399 adults between 18 and 65 years of age via Google drive and QR code. Sencan (2005) noted that an acceptable sample size would have at least five events per entry; therefore, a sample size of 399 respondents was satisfactory for this study.

Measurement of the Reliability and Validity

The verified correlation value between the Cronbach's alpha reliability coefficient, and the entries was reviewed by SPSS 13 software. The scale was evaluated as reliable if the Cronbach's alpha coefficient level was

greater than 0.70 (Buyukozturk, 2007; Sencan, 2005). Entries with a correlation value below 0.30 were removed from the analysis. The explanatory factor analysis was run in order to locate the validity of the scale and to dimension the entries included in the scale after determination of their factor loads.

Buyukozturk (2007) and Sencan (2005) stressed that the factor load value should be 0.40 or higher when sorting the entries. It was noted that when the principal axis factoring and direct oblimin analysis were used together, they would facilitate formation of factors in the presence of an assumption of correlation within the factor (Creed & Machin, 2003; Hill, 1987). Principal axis factoring and direct oblimin were preferred in this study considering that this was the first work to develop a scale (Simsek, 2007).

In the explanatory factor analysis, the Kaiser–Meyer–Olkin (KMO) coefficient and Bartlett test were analyzed together. It was noted that a KMO value over 0.60 and a significant Bartlett test ($p < .05$) indicated that a factor could be derived from the data (Buyukozturk, 2007; Sencan, 2005).

Subsequent to the explanatory factor analysis, the confirmatory factor analysis was run with LISREL 8.0 (Joreskog & Sorbom, 1993, as cited in Simsek, 2007) statistics software. In the review of the confirmatory factor analysis, diagram and goodness-of-fit criteria and correction recommendations were considered.

In the diagram evaluation, the standardized values and the t value were taken into account. The standardized values were evaluated for the ability of each entry to represent its variable. The t value was reviewed to check the relevant entry had $p < .05$ significance.

With respect to the goodness of fit, the harmony between the relations in the model and the data was considered (Simsek, 2007). Here, the ratio between the chi square and the degree of freedom was evaluated. This ratio was expected to be a maximum of 3–4. The other criteria included RMSEA (Root Mean Square of Approximation), GFI (Goodness-of-Fit Index), AGFI (Adjusted Goodness of Fit Index), NFI (Normed Fit Index), NNFI (Non-Normed Fit Index), CFI (Comparative Fit Index), IFI (Incremental Fit Index) and SRMR (Standardized Root Mean Residual). Simsek (2007) and Fossati, Maffei, Acquarini, and Di Ceglie (2003) noted that the RMSEA and SRMR may fall below 0.08 and argued that a value below 0.05 could indicate a better fitness. Simsek (2007) noted that GFI, AGFI, NFI, NNFI, CFI and IFI values above 0.90 referred to a better fitness.

In the correction recommendations, the ratio between the chi square and the degree of freedom was considered. The impact of the correction on the decrease of the chi-squared value indicated an improved model. The factor loads of the dimensioned entries were evaluated to develop a three-dimensional scale inclusive of 12 items.

Results

According to Cronbach's alpha reliability analysis and factor analysis, 15 items had low correlation values and factor loads were under 0.40, so were removed from the scale. These 15 items were run by the confirmatory factor analysis and 3 items which had error covariance greater than three were removed from the scale, leaving 12 items remaining (Table 1).

As can be seen in Table 1, KMO was greater than 0.60, indicating the presence of themes in this scale. The Bartlett test was less than 0.05 and it showed that the sample size was sufficient to determine the themes. The scree plot graph (Figure 1) showed three sharp drops, indicating the presence of three themes.

The first theme as indicated by the initial sharp drop had a percentage variance related to eigenvalue of 36.866. The second theme's percentage of variance was 10.364, while the third theme's percentage of variance was 7.882 according to explanatory factor analysis. The other drops were very close to each other. According to the results, it was decided that ecological intelligence had three themes: holistic perspective, social intelligence and economy (Appendix A), and these three themes also had respectable Cronbach's alpha values either for each theme or for the whole scale (Table 2).

As can be seen in Table 2, the Cronbach's alpha reliability coefficient value of the whole scale was 0.824, while the coefficient values for the holistic, social intelligence and economy themes were 0.648, 0.683 and 0.753, respectively. These results indicated that the reliability scores were at a satisfactory level. The factor loads were more than 0.40. This meant that each item represented that theme very well.

Table 1. The goodness-of-fit results of explanatory and confirmatory factor analysis.

Goodness-of-fit values	Recommended values	The values of ecological intelligence scale
Explanatory factor analysis		
Item number		12
Theme number		3
Cronbach's alpha	≥0.70	0.824
KMO	≥0.60	0.878
Bartlett test	<0.05	0.000
Confirmatory factor analysis		
X^2/df	3–5	3.39
p-Value	<0.05	0.000
RMSEA	≤0.08	0.077
SRMR	≤0.08	0.0504
GFI	≥0.90	0.938
AGFI	≥0.90	0.905
NFI	≥0.80	0.909
NNFI	≥0.80	0.913
IFI	≥0.80	0.934
CFI	≥0.80	0.904

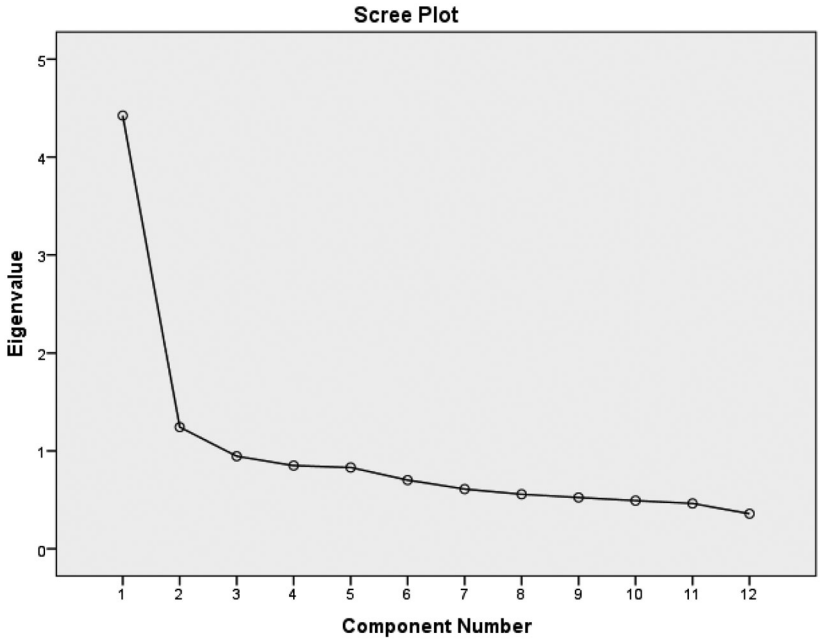

Figure 1. Scree plot—Eigenvalue graph.

Table 2. Themes and factor loads of the ecological intelligence scale.

	Themes and factor loads		
Scale items	I (Holistic)	II (Social intelligence)	III (Economy)
11 (1)	0.641		
16 (2)	0.566		
25 (3)	0.550		
19 (4)	0.518		
12 (5)	0.474		
4 (6)		0.688	
14 (7)		0.632	
5 (8)		0.601	
17 (9)		0.474	
7 (10)			0.791
6 (11)			0.790
8 (12)			0.734
Cronbach's alpha coefficient values of each theme	0.648	0.683	0.753
Cronbach's alpha coefficient value of whole scale	0.824		

Table 1 and Figure 2 showed that the ecological intelligence scale had goodness-of-fit values. All the results were confirmed by recommended values. According to Figure 2, each item represented a theme very well due to of standardized solutions being greater than 0.40 and t results less than 0.05. The scale was reliable and had validity and strong theoretical background.

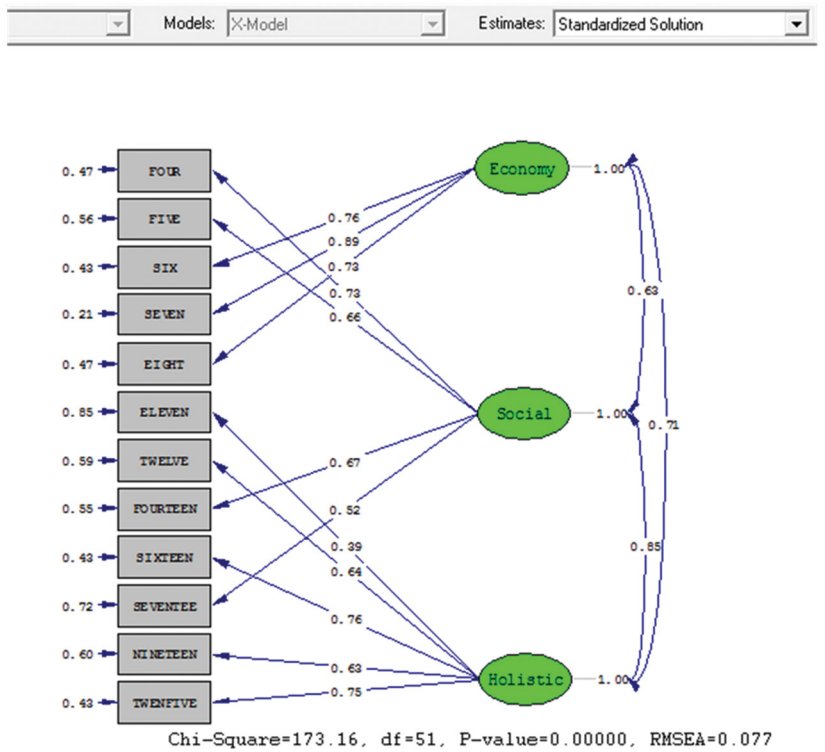

Figure 2. Path graph based on standardized solution of the ecological intelligence scale.

Discussion

Ecological intelligence is not a new concept; its subsets have been discussed since 1930s (Capra, 2005; Horkheimer & Adorno, 2002; Marcuse, 1964). However, some researchers (Bowers, 2008, 2009, 2010; Goleman, 2006, 2009; McCallum, 2005; Shumba, 2011; Sterling, 2009) began to name this discussion under "ecological intelligence" in the last decade. Nevertheless, it is difficult to define and characterize ecological intelligence. When we look at the experimental studies, it is realized that each of them has a theoretical background. It is therefore understandable to observe theoretical development for any subject before the experimental stage. Shumba (2011) and Sterling (2009) point out the importance of experimental and experiential learnings in order to improve ecological intelligence. This means more research on experimental studies should be considered.

Akkuzu (2016) developed an ecological intelligence scale based on the consumer behaviors of undergraduate students. Her study is very valuable; however, it is insufficient to completely describe ecological intelligence as it is a complex structure where each concept should be evaluated individually.

It also seems the study had some shortages in terms of methodology. Firstly, Akkuzu did not present all the scale items in her study; therefore, this study's results could not be compared. Secondly, Akkuzu had 95 items in the item pool, which increases the chance that the scale could be filled out randomly and carelessly in a voluntarily answered survey (Bolino & Turnley, 1999; Gim Chung et al., 2004). However, Akkuzu's perspective and this study's perspective overlap in terms of economy subject. Additionally, this study tries to specify holistic perspective and social intelligence within ecological intelligence in Turkey.

This study's results and the ecological intelligence scale were based on Turkey and Turkish lifestyle. When personal observation and the OECD (2015) Better Life Index are considered together, it is obvious that Turkish lifestyle is not sustainable and based on more consumption. However, better and satisfied life is not related to more earning and more consumption (O'Sullivan, 1999). When we consider Lake Amik case, it is obvious that everything was thought and done around economic development but it did not work well. This problem has also been carrying on with the airport construction after more than 40 years. Unfortunately, politicians and people could not think within holistic perspective and they try to find quick solutions for their economic problems. However, Capra (2005), Marcuse (1964) and O'Sullivan (1999) claim opposite of this quick solution perspective. They emphasize that people should evaluate human communities as a part of ecosystem. There is no quick solution in ecology because ecologic system is not linear; therefore, ecologic degradation and solutions happen in a long term (Capra, 2005; Marcuse, 1964; O'Sullivan, 1999). Turkey has still quick solution perspective at the construction of Akkuyu Nuclear Power Plant and gold mining on the Mount Ida. According to OECD (2015) Better Life Index and HDI (2018) Report, Turkey does not have satisfied applications and statistics in terms of economy, sustainability and environmental education. Turkey only tries to increase economic development without thinking ecologic balance. This kind of thinking did not work before as seen at the Lake Amik case; therefore, Turkish government should embrace O'Sullivan's (1999) new politic vision and should bring different networks together such as politicians, academics, farmers, inhabitants and NGOs (Capra, 2005). Otherwise, the Turkish government's act will be top-down approach and we have to see different ecologic and economic disasters in the future. I give examples from Turkey because the data were collected from Turkey. However, similar politic decisions might be seen in every country because we live in a capitalist system. We criticize the capitalist system but we do not know how to live and to think in another economic system. Capitalist or communist, these systems are based on ecologic and human resources (Horkheimer & Adorno, 2002; Marcuse, 1964). At least, we should try to have a peaceful and satisfied life with/in ecologic systems.

We know that indigenous cultures have succeeded to have this peaceful and satisfied life before. For example, there are also unique indigenous cultures in the world such as the Maori in New Zealand or Aboriginal people in Australia. These cultures are very important in terms of cultural diversity and sustainable life because they know how to live sustainable in the natural environment. They can easily share their environmental experiences with next generations (Capra, 2005). All these applications actually refer to traditional/indigenous ecological knowledge (TEK) (Berkes, 1993). Researchers might focus on unique cultural groups and TEK applications and use this scale within a mixed methodology in order to understand whether this scale is appropriate.

As has been expressed above, developing a scale is not simple. Two years were required to develop this scale. It should, however, not be thought that this scale is perfect despite the fact that all the results are at acceptable levels as can be seen in Tables 1 and 2 and Figures 1 and 2. First and foremost, this scale has not yet been tested by other researchers. If it will be used in future studies, then the performance of the scale can be tested and understood. Secondly, this study is based on quantitative approach. Qualitative and quantitative approaches have different perspectives, positive and negative sides (Atkins & Duckworth, 2019; Yıldırım & Şimşek, 2006). There is research related to a wide variety of environmental outputs. Some researchers (Guler, 2009; Irwin, 2010; Piller, 2002) use a qualitative approach, some use a quantitative approach (Keles et al., 2010) and some (Ozdemir, 2010) use both in a mixed methodology. This scale may be used in both approaches.

The term "ecological intelligence" may be related to environmental subjects; however, it should not be restricted solely to them. Shumba (2011, p. 93) and Capra (2005, p. 25) emphasize that people can evaluate all natural and social science subjects within their cultural values, which provides another area of research for the development of ecological intelligence. That is parent education because we learn our first values and cultures in our families. Capra (2005) emphasizes that solving environmental problems requires bringing people together within a network which includes parents, students, teachers, NGOs. If there is an intergenerational transfer in order to learn how to live sustainably (Bowers, 2008, 2009, 2010; Goleman, 2006, 2009; McCallum, 2005; Schutte et al., 1998; Shumba, 2011; Sterling, 2009), then we should not ignore parent education. There is research which mentions the importance of parents in children's lives (Bronfenbrenner, 1986; Gokdere, 2005; Jenkins, 1989; Kasapoglu & Turan, 2008; Mahoney et al., 1999; Seginer, 2006). However, research on the relationship between ecological intelligence and parent education could not be found yet.

Bronfenbrenner (1986) and Jenkins (1989) emphasize that parents have impact on children's IQ, ego and critical thinking developments—also known as the cognitive and affective developments of children.

Ecological intelligence also has cognitive and affective outputs such the development of social and environmental responsibility and awareness (Eryaman, Yalcin-Ozdilek, Okur, Cetinkaya, & Uygun, 2010; Guler, 2009; Shumba, 2011; Sterling, 2009) to think critically, (Bowers, 2010; Clover, 2002; Irwin, 2010; Robottom & Kyburz-Graber, 2000) to pursue cooperative learning (Preston, 2004; Robottom, 1987 as cited in Fien & Rawling, 1996; Sterling, 2009) and to bring about behavioral change in the long term (Emmons, 1997; ESD Report, 2015; Okur, 2012; Okur-Berberoglu, 2014; Piller, 2002; Sterling, 2009).

The other common point between ecological intelligence and parent education is philosophical roots. Jenkins (1989) says that parent education has progressivism roots. Pierre Walter (2009) and Stephen Sterling (2009) also mention progressivism origins of environmental education and ecological intelligence. It is understood that parent education and ecological intelligence have common properties; therefore, both educations should be evaluated together.

Regarding the ecological intelligence scale, it is limited within Turkish culture and difficult to generalize. However, the effects of globalization and industrialization on developing countries are similar (Weiss, 2002); therefore, other researchers, especially in developing countries, might use this scale in order to determine ecological intelligence.

To conclude, ecological intelligence is a complex concept. Holism, social intelligence and economy are determined to be subsets of ecological intelligence according to this study. However, more research with different approaches, sample groups and subsets should be carried out in the future.

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Appendix A

Table A1. Final version of the ecological intelligence scale.

	Completely agree	Partly agree	Not sure	Partly disagree	Completely disagree
Ecological intelligence scale					
1. I get my full water bottle while leaving home.					
2. I wonder about increasing of cancer events at industrial areas.					
3. Degenerated environmental conditions can cause negative effect on mental health.					
4. What a pity, people think that technology can solve every problem although technology cannot produce one gram organic honey.					
5. The reflection of environmental problems can be seen at the same time, in succession, and more than one area.					
6. I try to pattern people who have positive ecologic behavior in my social life.					
7. I prefer to buy local vegetables and fruits.					
8. I believe that one of the ways of fighting with obesity is environmental education.					
9. I have remorse to know some goods I buy are produced by exploitation of human work.					
10. One of the reasons of immigration of rural people is to loose job due to global firms					
11. Global firms prevent local producer to have profit					
12. People, who immigrate another place, are cheaper laborer sources for big companies.					

Appendix B

Table B1. Number and percentage of participants.

Participants	*N*	%
Undergraduate students	126	31.5
In-service teacher	97	24.3
Civil servant	48	12.2
Housewife	46	11.5
Academician	37	9.2
Health sector employee	16	4.2
Media sector employee	11	2.7
Engineer	9	2.2
Laboratory technician	9	2.2
Total	399	100