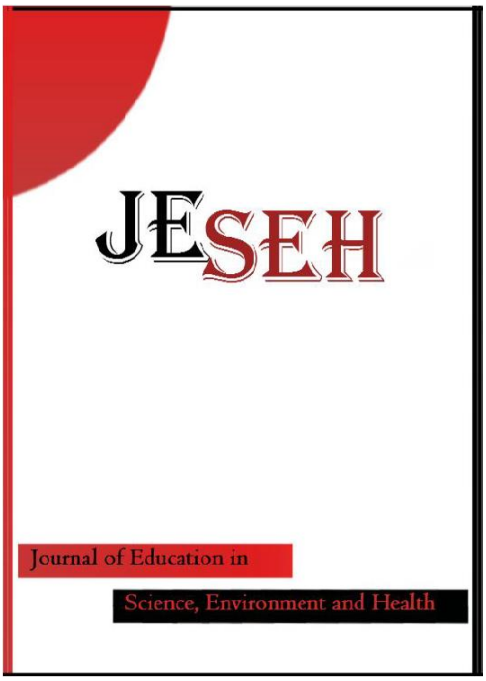

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Are University Students Willing to Participate in Environmental Protection Activities (EPAs)? – Sub-dimensions of Ecological Intelligence as Predictors

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Abstract

Ecological intelligence is a comprehensive understanding that aims to create an awareness regarding how human activities affect ecosystems and to promote preventing unconscious consumption behaviors that would lead to a sustainable life. It enables us to take social, economic and environmental responsibility, also to act cooperatively and sensitively against ecological problems. All this would pave the way for maintaining strong global sustainability in our ecological objectives. This study explores the levels of ecological intelligence (LoEI) of university students; it also investigates the role of the sub-dimensions of ecological intelligence in predicting future participation in environmental protection activities (EPAs). The data were collected via ecological intelligence scale (EIS) and written open-response assessment (WORA) form by using a sample of 179 students. According to the results, the model to predict participation in EPAs indicated that a good discriminative ability with a prediction accuracy of 79.3%. We found that the most significant variables for the prediction of willingness to participate were ecologically conscious purchasing behavior (ECPB), ecological sensitivity (ES), ecological knowledge sharing (EKS) among the sub-dimensions of the EIS. This study is an important contribution to solve environmental problems by developing an ecological intelligence responding to the individual, social and economic needs of the next generation.

Introduction

Due to the many problems such as global climate change, species extinction, pollution of natural resources, ozone layer destruction, our planet and its ecosystems advancing towards a breaking point (Dyment et al., 2014; Foster et al., 2008; Organisation for Economic Co-operation and Development [OECD], 2014). These problems rapidly disrupt the ecological balance of nature and threaten the sustainability of the existence of humanity and other life forms in nature. When the main cause of these ecological problems and ecological destruction that we face today is investigated, it is seen that the major role is human actions (Goleman, 2009; Goleman et al., 2010; McCallum, 2008; Orr, 2004; UN Environment Programme [UNEP], 2006). Miéville (2015, p. 16) emphasizes the impact of human actions in ecological changes by establishing a link between human actions and ecological problems. The idea that human actions lead to ecological destruction has become more evident with the 'mechanical approach' in the enlightenment and the industrial revolution. Although this approach is the understanding of the world that today's modern industrial civilization owes its existence to, it has led to more production and consumption than nature can bear. The unconscious excessive consumption of people with the concern of being able to provide their vital needs has brought about ecological problems that are difficult to compensate until today. Researchers point out that due to excessive consumption, the impact of human actions on the environment has reached a significant extent and we are entering a new geological period called the Anthropocene (Miéville, 2015; Waters et al., 2015). In the emergence of this period, the man on a large scale has a role in determining power on a global scale; he has become a biological, chemical, and geological actor (Crutzen, 2002; Zalasiewicz et al., 2011). Recent years saw such disastrous developments as the rapid melting of polar glaciers, extreme rise of the limit values in climate change, as well as the increase in floods and droughts (Steffen et al., 2007) which are all caused by human actions. It indicates that we need to adopt an ecocentric worldview instead of an anthropocentric one, also that we need to develop a new type of consciousness. At this point, it is very important to solve environmental problems by developing a new ecological consciousness and taking a collective approach. Environmental movements, such as EPAs involving collective action, have emerged in response to such ecological destruction in ecology-based social struggles.

A New Kind of Ecological Paradigm: Let's Explore Our Ecological Intelligence

Sustainability problems are complex and interrelated, specific key abilities are needed to be able to solve these problems (Wiek et al., 2011). Studies in the literature emphasize the need to lay the foundations for a new ecological paradigm for solving sustainability problems (Bowers, 2010; McCallum, 2008; Sterling, 2009). At this point, researchers ground the realization of paradigmatic transformation associated with solving environmental problems on individuals discovering and developing their ecological intelligence. Ecological intelligence, based on how our activities affect the ecosystem, comes across as an understanding that drives us to change our buying behaviors to live a sustainable life. The development of ecological intelligence brings about individual and social responsibility in the face of ecological problems (Goleman, 2009; Shumba, 2011; Sterling, 2009).

McCallum (2008) stated that we are conscious, romantic species and are the guardians of our zoo; however, if we do not accept this, we will continue to be the creators of our disaster. The importance of taking responsibility in the face of ecological problems, as well as the measures taken individually, to play an active role in environmental activities as a collective and especially to take part in various EPAs, cannot be ignored (Kirchain et al., 2017; Wang et al., 2010). Individuals who are aware of the problems related to nature are sensitive to nature, support individual and social developments, are conscious consumers, have environmental concerns, are open to innovation, and are willing to engage in acts against ecological problems on the level of social action. The seeds of ecological intelligence can influence individuals of the natural world and, possibly, actions (Hornbuckle, 2008). The main purpose of this study is to determine whether ecological intelligence has a role in predicting the actuality of an individual's participation in future EPAs.

Based on Howard Gardner's (1983) theory of multiple intelligences, psychologist and science journalist Daniel Goleman describes ecological intelligence as an 'all-encompassing sensibility' (Goleman, 2009, p. 44) that reveals the interconnections between human actions and their impacts on the planet, human health, and social systems. Ecological intelligence embraces the holistic, organismic or ecological worldview and arises in response to the limits of the modernist worldview, which rejects the dominant mechanical approach (Bowers, 2010). It is a more humanistic, relative, and less consumeristic lifestyle based on ecological intelligence. In this context, ecological intelligence is a type of consciousness that guides our behavior to live a sustainable life in our living space, including cognitive and affective components. Regarding the ecological intelligence concept; Goleman (2009), states that the individual can be an environmentally conscious producer and consumer by knowing her/his own impacts, favoring the improvements, and sharing what he/she learns. When the definition of this concept, outlined by Goleman (2009), is examined closely, ecological intelligence leads the individual to evaluate ecological problems in economic, social, and environmental dimensions. So, the ecological intelligence, which has been indispensable for sustainable development in recent years, approaches environmental problems, not from a single point of view, but a variety of dimensions including the above-mentioned ones (Flower, 2006; Lummis, 2002).

Social, economic, and environmental aspects are also the basis of sustainability (Fischer et al., 2020; Purvis et al., 2019). On this basis, ecological intelligence is also a key pathway for strong sustainability in our ecological objectives (Fischer et al., 2020). When approached from all these aspects, ecological intelligence enables us to comprehend systems in all their complexity and to better understand the interaction between what is natural and what is man-made. However, this understanding requires enormous multidisciplinary knowledge, and it is extremely important to have a collective understanding to get ahead in this complexity. As a community, we need to learn on the one hand what dangers we face, what causes them, and how to neutralize them, and on the other hand, we need to move forward by recognizing the new options these solutions offer (Bowers, 2010; Goleman, 2009). It is at this point that the approach to ecological problems with community psychology is a crucial step in the fight for sustainability.

The Role of Ecological Intelligence in Sustainability with Its Various Sub-dimensions

Maintaining strong global sustainability is possible by preventing unconscious consumption behaviors that lead to the extinction of nature (Murphy et al., 2008). This is why it is important to determine the conscious purchasing behavior that constitutes more of the cognitive side of ecological intelligence. Bayazıt Hayta (2009) emphasizes that if our consumption behavior improves, manufacturers would be forced to focus on environmental problems that may occur during the processes of production, transportation, and procurement. At the United Nations Conference on Environment and Development (1992) it is stated that unsustainable consumption and production models are the main cause of environmental degradation (Akenji & Bengtsson,

2014). At this point, our conscious purchasing behavior, which ecological intelligence will bring to us, will contribute to sustainability in terms of both economic and environmental change. On this basis, it is extremely vital to determine individuals' informed purchasing behavior levels and subsequently to establish whether their purchasing behavior has a role in their future actions for sustainability or not.

One of the serious consequences of increasing consumption habits today is the hidden impacts of products on the ecosystem (Tukker & Jansen, 2006). Azapagic (2003) states that the environmental and health impacts of the product must be considered during the entire supply chain within the framework of the life-cycle approach. When we examine the hidden impacts of each product we buy, we encounter problems such as climate changes, greenhouse effects, thinning of the stratospheric ozone layer, and depletion of natural resources (Collins et al., 2006). As the production and consumption forms developed within the framework of the economic competition approach are taken into consideration, it is seen that the products manufactured using cheap raw materials also cause problems that disrupt human psychology and physiology. Besides, the toxic effects that workers are exposed to during the manufacture of products and therefore the working conditions also reveal the importance of the hidden impacts from social and environmental aspects. In this context, knowing the hidden impacts of products will contribute to sustainability in various aspects. This is possible through the identification and development of ecological awareness, i.e. ecological intelligence, regarding the individual, social and economic benefits of the needs of the next generation.

Understanding how nature is sustainable, everything that constitutes life is interconnected, and that it continues in ecological balance include empathy development with all life forms (McCallum, 2008). Therefore, ecological intelligence is also related to the affective domain (Sterling, 2009) and it naturally evolves from the development of social and emotional intelligence (Goleman et al., 2012). Because having ecological intelligence leads the individual to act sensitively at the point of receiving products that are harmful to the ecological balance and to react accordingly when necessary. This enables us to take social and environmental responsibility and act cooperatively against ecological problems. Goleman (2009) emphasizes the importance of collective understanding by stating that when sharing ecological knowledge, we need to think by acting together like insects. Ecological intelligence requires a collective and collaborative effort, as no single mind is able to grasp all the essential knowledge regarding our ecological problems and the countless potential impacts of our actions on the environment (Kirchain et al., 2017). In particular, this collective understanding took its place on the agenda with the period of the Industrial Revolution, when environmental problems became more evident, and with this understanding, many environmental organizations emerged. Today, environmental activities on a global scale are continuing within the scope of this understanding. Individuals who are sensitive to ecological issues become a member of international voluntary environmental organizations such as the 'World Wide Fund for Nature (WWF)', 'Greenpeace' and/or national voluntary environmental organizations in their countries. People are expected to act together in solving environmental issues for a more sustainable world, share ecological knowledge, and take an active part in various activities (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2012). This is especially possible with the ecological consciousness acquired during the education and training process. On this basis, it is predictable that students at the university level who are trained to take on all these responsibilities will also be individuals with a high level of ecological intelligence. Many studies are based on university-level students' awareness of the significance of protecting the environment in a sustainable society and their ability to actively participate in environmental activities to use and develop ecological intelligence (Chili, 2014; Suwandi et al., 2017). From this point of view our research seeks to answer the following questions:

- What are the levels of ecological intelligence of university students?
- What are the university students' average scores and levels concerning the sub-dimensions of ECPB, HEIP, ES, and EKS?
- What are the students' views on the sub-dimensions of ecological intelligence?
- Do the sub-dimensions of ecological intelligence predict their participation in future EPAs?

Method

Research Model

The research was carried out by the synthesis of qualitative and quantitative methods in accordance with a descriptive research model. The synthesis of these two methods by taking into consideration the research problem and its nature together increases the quality of the research by eliminating the shortcomings of using a single method (Greene, 2005).

Sample

The participants of the study consisted of university students (N:179) attending the Primary School Teacher Education Program of the Faculty of Education of a State University in the western part of Turkey. The study group was determined by a purposeful sampling method. Students who took the Environmental Education Course were included in sample group. Participants were informed about the purpose of the study and the data tools. We received consent forms for their voluntary participation. Demographic categories of the students (class, gender, age, etc.) are shown in Table 1.

Table 1. The frequencies and percentages of the sample in three demographic categories

Categories	f	%
Gender		
Female	118	65.9
Male	61	34.1
Age		
18-19	76	42.5
20-21	85	47.4
22-23	12	6.7
24-25	6	3.4
Grade		
1	86	48.0
2	93	52.0

To achieve the fundamental purposes of our survey, we asked the students 1a) whether they were members of environmentalist organizations, 1b) whether they were participating in EPAs, 1c) whether they consider to participate in future EPAs. The distributions of students' answers according to these questions are shown in the Figure 1a, 1b, 1c.

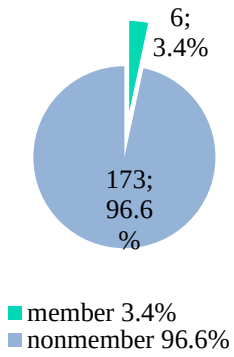

Figure1a. Distribution of membership status

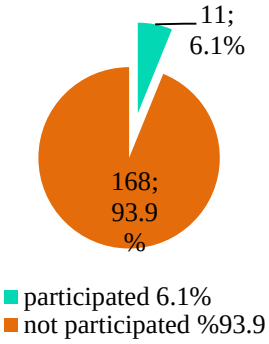

Figure 1b. Distribution of attendance status

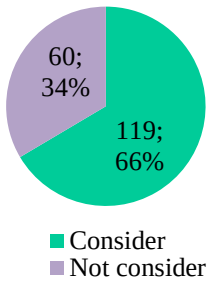

Figure 1c. Considering to attend EPAs

Instruments

Ecological Intelligence Scale (EIS)

The EIS developed by Akkuzu (2016) is a measurement tool aiming to determine LoEI, which is inspired by Goleman's (2009) consumption behavior of individuals. This scale basically enables us to determine our ecological intelligence levels from various perspectives such as purchasing behaviors, hidden impacts of a product, ecological sensitivity, and knowledge sharing. It also facilitates to establish the ecological problems caused by our consumption behavior economic, social, and environmental aspects in terms of reproduction. The EIS, which is valid and reliable with the data obtained from university students studying in various departments of the Faculty of Education, has scale items that can be applied to both university-level students and adults of all ages. On this scale, which is of the 5 point Likert type, frequency categories and scores are 'Always' (5), 'Often' (4), 'Sometimes' (3), 'Rarely' (2), and 'Never' (1). The EIS consists of 41 items and 4 sub-dimensions. One of the

sub-dimensions is ecologically conscious purchasing behavior (ECPB) (14 items) that includes statements about what individuals pay attention to when purchasing products. Another sub-dimension of the scale is hidden ecological impacts of products (HEIP) (12 items) that is related to the hidden impacts that individuals create in the ecosystem during the production and consumption stages of the products they purchase. The third sub-dimension, called ecological sensitivity (ES) (10 items) that reveal individuals' awareness and sensitivity to ecological problems. The fourth sub-dimension of the scale is ecological knowledge sharing (EKS) (5 items), which emphasizes the importance of sharing information about ecology. The reliabilities of the sub-dimensions are respectively .86, .82, .80 and .70. The minimum score that can be taken from the scale is 41, while the maximum score is 205. In our research, the EIS was used to determine the level of ecological intelligence that the students have and to evaluate the average scores obtained from the scale for the students' participation in future EPAs.

The Written Open-Response Assessment (WORA) Form

We prepared the WORA form in order to examine in depth the students' views on the sub-dimensions of ecological intelligence. This form consisted of a total of four open-ended questions and originally prepared by the researchers (Table 2). Two experts were asked their opinions before the questions were applied to the students. One of the experts was environmental science specialist and the other was chemistry education specialist. Students were provided to answer these questions in approximately 30 min.

Table 2. WORA form questions

Sub-dimensions	Questions
ECPB	Please explain the relationship between consumer behavior of people (buying products, etc.) and environmental issues.
HEIP	Do you think that the products you buy have hidden impacts on environment? What do you think the hidden impacts might be?
ES	What kind of responsibilities or precautions do you prefer to take when you consider your role as a consumer in dealing with environmental issues?
EKS	Do you share the information concerning the precautions you take against environmental problems in your social environment (family, relatives, friends, etc.)? How do you share?

Data Analyses

Data collection tools were applied to students during the fall semester of the 2018-2019 school years. The data were scored and coded according to scale characteristics and transferred to computer media. The data for conformance with a normal distribution was tested with the Shapiro-Wilk test and all data were found to show normal distribution ($p>0.05$). Descriptive statistical analysis was used as data analysis to determine the students' LoEI and the mean ($\bar{X}$), standard deviation (S), minimum and maximum values were calculated for each dimension of the scale (Table 3). The dependent variable examined in the research is the willingness of the students to participate in EPAs. Logistic regression analysis was preferred to study the relationship between ecological intelligence sub-dimensions and the categorical dependent variable. Through this analysis, the probability of realization of one of the values (0, 1) that the dependent variable can reach is estimated. In the estimation of parameters in the logistic regression model, the maximum likelihood has been used as one of the most widely preferred techniques in the literature. With this technique, a prediction is made that selects the parameters for which the observed data is most likely to be contained within the regression model (Ward & Ahlquist, 2018).

We utilized content analysis in order to study WORA forms from which the qualitative data of the research was obtained. Based on the qualitative data, themes have been created. Besides, in the results, the students' sentences are quoted one-to-one and the related theme is given with sample expressions (e.g., [S23]). We used the agreement rate formula of Miles and Huberman (1994) and reached a 97%.

Results

The results of the study are discussed in two main topics. First, the scores of the students from the sub-dimensions of the EIS and the overall scale, as well as the content analysis results are presented. Second, the

willingness of the students to participate in EPAs according to their scores on the EIS is estimated with the results of logistic regression analysis.

Students' LoEI

Table 3 indicated that the students' LoEI were a fraction above the average level. We determined that they received slightly above average scores of 3.5 and 3.6, respectively, from the sub-dimensions of HEIP and ECPB, while the rating scores were 3.8 and higher in the sub-dimensions of ES and EKS. The lowest score on the scale appears to belong to the sub-dimension of HEIP.

Table 3. Descriptive statistics on EIS and its sub-dimensions

Sub-dimensions	N	Min	Max	S	$\bar{X}$	Rating scores	Levels
HEIP	179	24	60	6.92	42.4	3.5	Slightly above average
ECPB	179	39	69	5.88	50.2	3.6	Slightly above average
ES	179	25	49	4.50	37.9	3.8	High
EKS	179	9	25	3.14	18.8	3.8	High
Total	179	116	184	14.6	149.3	3.6	Slightly above average

Content Analysis of WORA

The results of content analysis are presented in this section. The percentages of themes are ranked from high to low in Figure 2.

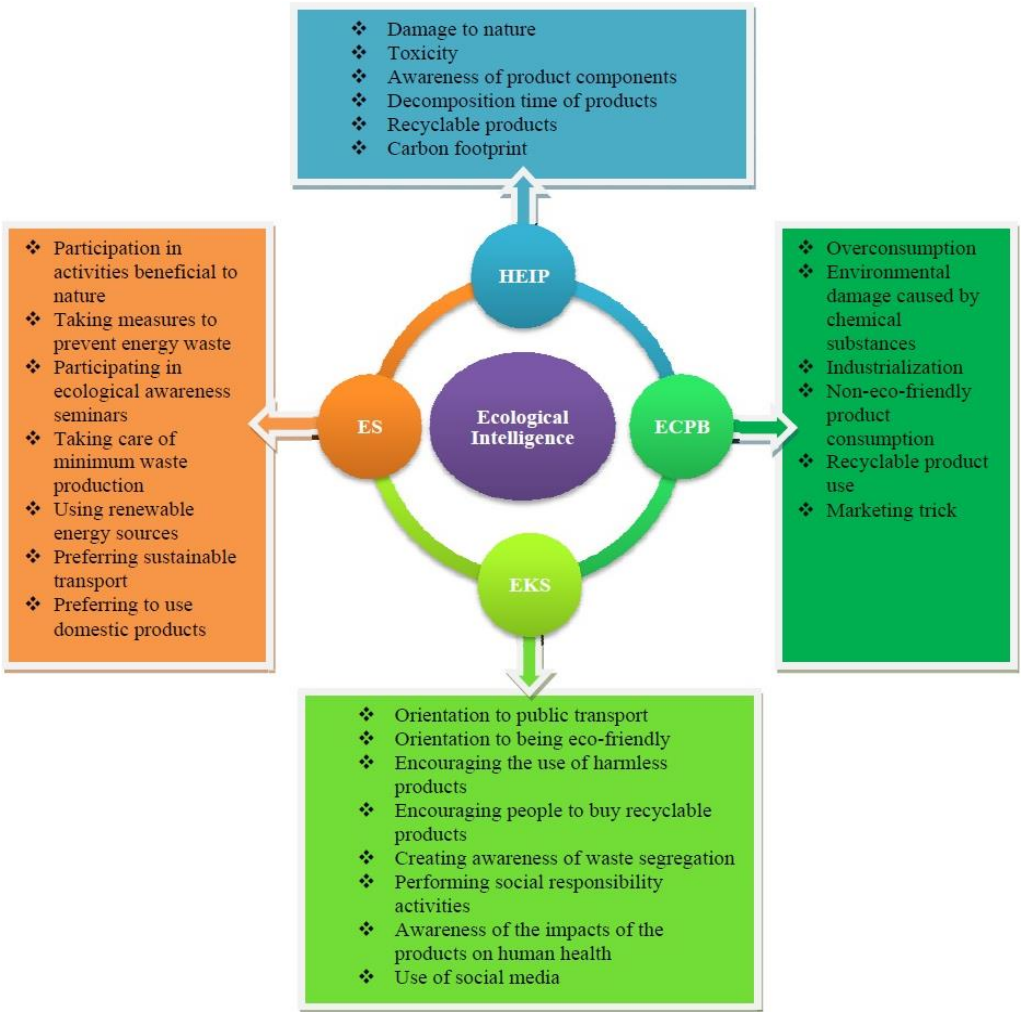

Figure 2. Theme diagram for sub-dimensions of ecological intelligence

Students' Views on the Sub-dimension of ECPB

About conscious purchasing behavior, 40% of the students focused more on 'overconsumption' behavior related to environmental problems and expressed that consumption led to environmental problems on a global scale.

> People always buy more than they need. The especially cheap or falling price of products is very popular. No one thinks about the damage to the environment when buying. For example, when he sees a cheap T-shirt, he buys more than he needs. [S52]

In the study, 20% of the students stated that their purchasing behavior should be changed considering the 'harms that chemical substances cause to the environment' in the contents of the products. 12% of students also expressed their opinion on the preference of 'use of recyclable products' when purchasing products.

> People often buy (plastic) products that are hard to recycle and the production of these plastic products is based on oil and much damage is done to nature during production. [S40]

> Because the products people consume are returned to nature as waste, the soil, the water, everything gets polluted. So the consumer is hurting nature. To give an example of this, if a water bottle we take is thrown into the soil instead of recycling, the soil becomes contaminated. The right thing is recycling. [S150]

Students' Views on the Sub-dimension of HEIP

As seen in Figure 2, views on the hidden ecological impacts of products are summarized in a total of six theme titles. It is observed that the majority of students (45%) pay the most attention to the hidden impacts of the products and what they put forward is 'damage to nature'. It is also understood that the students are careful to pay attention to the content of the products (12%) in the expressions they use, but they do not have sufficient knowledge about the hidden impacts of the products.

> ...for example, roll-on deodorants should be used instead of spray deodorants...Herbal cleaning agents should be preferred instead of hazardous chemical cleaning agents. [S18]

> Although bleach seems to have nothing to do with global warming, bleach affects global warming by polluting the water and then spreading it. [S122]

It is observed that 24% of the students also touched on the theme of 'toxicity' in the hidden impacts of the products.

> The products we buy are necessarily harmful to both the environment and human beings. But I do not know exactly who are hurt by the products in this process, what their toxic effects are. Unfortunately, we are not informed about this. [S8]

> Since we all are a consumer, of course, I think we are affected. Chemical drugs found in the food we eat, GMO foods, artificial fertilizers and heavy metals involved in the soil through the food we eat is disrupting our health. [S34]

In the answers to the question, 7% of students think they do not know enough about recycling.

> We throw the products we buy into the same dustbin, regardless of whether they're recycled or not. We are not conscious of these matters. [S83]

Students' Views on the Sub-dimension of ES

Based on the themes regarding ES, 25% of the students stated that they preferred to 'participate in activities beneficial to nature' in terms of ecological sensitivity. Among these activities, they included the afforestation (planting of seedlings, etc.) studies most in their statements.

> I take care to participate in afforestation...I take care to use public transport. [S59]

> Afforestation is a process where new forests are planted on treeless land. We participate and support such activities. Because green areas are one of the most important investments of cities, accessible green spaces make cities livable. [S45].

Besides, 22% of the students on their sensitivity to environmental problems 'taking measures to prevent energy waste', 17% 'participating in ecological awareness seminars' and 13% 'creating minimum waste' expressions related to the themes are encountered.

> We're participating in environmental awareness seminars and trying to acquire ecological consciousness. [S97]

> We also have a recycling bin in our house. We throw our trash in the trash can. We collect waste oils and batteries and dump them in their boxes. [S83]

> We need to recycle wastes. Thus, there is no need to search for new raw materials for the production of consumables. In this way we can prevent both air and environmental pollution [S78].

Students' Views on the Sub-dimension of EKS

Students shared more information about 'orientation to public transportation' (21.5%), 'orientation to be eco-friendly' (21.5%), 'encouraging to use harmless products' (21.5%) in their social environment for environmental problems.

> ...I'm warning people around me to use public transport. [S59]

> We walk as much as possible instead of using cars. We encourage the people around us to take measures to limit our city's carbon dioxide production. One of the areas where fossil fuel consumption, which directly causes carbon emissions, occurs most in daily life, is transportation. We can make a surprising contribution to nature by renewing our transportation habits [S17].

> We're trying not to throw rubbish around but to use organic matter. We tell the people around us the harm of polluting the land. When a person pollutes the environment, they will both commit suicide and commit murder, so we explain this to them thoroughly. [S62]

Besides, 8% of the students stated that they carried out 'social responsibility activities' on environmental issues.

> ...I buy what I need without brand obsession. I attend awareness conferences and pass it on to my friends. [S24]

In summary, given these views of the students, we are faced with students whose levels of ecological intelligence are not low. These views also support scores from the sub-dimensions of ecological intelligence that emerge as a result of quantitative analyses. Therefore, revealing the willingness of this group of students with a moderate level of ecological intelligence to participate in future environmental activities provides an insight into whether these groups of students at this level will actively participate in EPAs.

Logistic Regression Analysis

Logistic regression analysis was performed to determine the sub-dimensions of the EIS that were effective in the students' willingness to participate in EPAs. The independent variables of the research considered to be effective on the willingness to participate in EPAs are x_1: ECPB, x_2: HEIP, x_3: ES, x_4: EKS. Participation in EPAs was the dependent variable of research (y) and is coded as 0 - I do not consider; 1 - I consider.

The results of the Wald test were used to determine whether the independent variables were significant or not. Besides, Exp (β) values indicate the exponential function of the logistic regression coefficient in other words odds ratios (Field, 2009). The effects of all other sub-dimensions of the EIS except HEIP on the dependent variable were significant at a 95% confidence interval (Table 4). The results indicated positive β coefficients for the independent variables. Since the odds ratios of the independent variables were measured higher than 1, they were in the direction of increase. When we examined the maximum likelihood coefficient estimates which were

calculated after the analysis, ES and EKS variables had a greater impact on the students' willingness to participate in EPAs than other variables. As a whole, the rise in students' LoEI increases their tendency to participate in EPAs.

Table 4. Results of the analysis on sub-dimensions in the logistic regression model

Sub-dimensions	β	S.E	Wald	df	Exp(β)	p
Constant	-14.282	2.542	31.563	1	.000	.000
ECPB	0.094	0.042	5.063	1	1.099	.024
HEIP	0.023	0.033	0.499	1	1.023	.480
ES	0.129	0.057	5.060	1	1.137	.024
EKS	0.244	0.080	9.377	1	1.277	.002

The Regression Model Established as a Result of Logistic Regression Analysis

$$log - odds = ln\left(\frac{p_i}{1-p_i}\right) = 14.282 + 0.094.x_1 + 0.129.x_3 + 0.244.x_4$$

The Goodness of Fit Test for the Logistic Regression Model

The efficiency of explaining the dependent variable of the model in the best way was examined with the goodness of fit of the model. The Hosmer - Lemeshow test was used to evaluate goodness of fit for logistic regression model. The chi-square value for the test was 12.575 with a significance level of .127 ($p>0.05$). The fact that this non-significant p-value indicates that the model has an acceptable alignment, in other words, the model fits the data (Hosmer & Lemeshow, 2000, p. 156).

To test the goodness of fit, the classification table was also used. This table was created by cross-classification of the dependent variable of the research (willingness to participate in EPAs). The classification table presents the observed and the predicted outcomes and the predictive accuracy of the logistic regression model (Table 5).

Table 5. Classification table of the logistic regression model

Participation in EPAs	Observed	Predicted		Percentage correct (%)
		Not consider	Consider	
	Not consider	35	25	58.3
	Consider	12	107	89.9
Overall percentage (%)				79.3

The accuracy percentages in the classification showed that 58.3% of students who did not intend to participate in EPAs and 89.9% of students who did. Regarding the students' willingness to participate in EPAs, we found that 60 students marked 'I do not consider' and 119 marked 'I consider' (Figure 1c.). However, as we can see from the classification table as a result of the data, 25 of the students in the 'not considering' group were actually estimated in the 'considering' group. Similarly, 12 of the 119 students who had selected the first 'I consider' option were again classified in the 'not considering' group. As a result, the findings of a total of 179 students accurately estimated the impact of the sub-dimensions of the EIS on students' participation in EPAs by 79.3%.

Discussion and Conclusion

In our study, we examined the university students' LoEI and their participation in future EPAs regarding ecological intelligence levels by logistic regression. The results from the EIS showed that the students' LoEI were a fraction above the average level. Furthermore, the research results from the logistic regression analysis indicated that the students' LoEI and their willingness to participate in EPAs in the future were related. Increasing the students' levels of knowledge and awareness about environmental issues affects their attitudes and behaviors towards the environment (Akkuzu, 2016; Campbell Bradley et al., 1999). Having ecological intelligence, as it contains cognitive and affective components, drives our behavior to live a sustainable life in our living space (Goleman, 2009; McCallum, 2008). In the struggle for sustainability, students can approach the foundation of environmental problems from various dimensions, including social, economic and environmental, when they acquire this ecological awareness that develops with knowledge and awareness (Fischer et al., 2020).

Bateson (1972) emphasizes that, given the nearly seven billion people who have adopted the individual-centered consumer-dependent lifestyle, if it can slow down the current rate of environmental destruction, it is necessary to learn to use ecological intelligence more in the direction of daily life. Hence, it is predictable that the students who have advanced ecological intelligence will care about environmental issues in their future lives. Consistent with this interpretation, a study conducted in China demonstrated that students with a higher level of environmental knowledge and a more positive attitude towards the environment are more likely to engage in environmentally responsible behavior in the future than other students (He et al., 2011). Wang et al. (2010) asserted that the way to solve environmental problems is to improve and increase public ecological awareness, people's responsibilities to protect the environment, and harmony between human beings' behaviors and the environment through environmental education and training.

Conclusions on the Sub-dimension of ECPB and the Role of ECPB in Participating in EPAs

Results showed that students were engaged in behaviors varying between 'often' and 'sometimes' levels in their consumption habits decisively with an approach to ecological consciousness. In the results of the WORA in which the relationship between purchasing behavior and environmental issues was asked, the students focused more on overconsumption behavior. Students argued that individuals' unconscionable purchasing behavior leads to overconsumption, which in turn is effective in environmental problems. The results of research in accordance with this assertion reveal that consumers do not accept overconsumption as personal responsibility and that many do not perceive that purchasing actions have a significant impact on the environment (Connolly & Prothero, 2003; Pereira Heath & Chatzidakis, 2012). Another theme that emerged within the scope of this dimension was to take into account the chemical hazard in their contents when purchasing products. A significant proportion of the students stated that the products should be purchased by taking into account the damage caused by the chemicals in the contents of the products to the environment. In this context, the students emphasized that individuals had a materialistic conception of consumption. We can deduce from the concept of materialist consumption that its results are a form of behavior without considering its impacts on the environment. Other research that supports this conclusion demonstrates that the understanding of consumption has a negative relationship with individuals' beliefs about environmental responsibility (Kilbourne & Pickett, 2008). The unconscious consumption of people with the concern of being able to provide their vital needs has brought about ecological problems that are difficult to compensate until today. For example, one of the main causes of climate change is the cycle of production and consumption (Goleman, 2009; Steffen et al., 2007). Therefore, the sustainable environment and sustainable development can be mentioned through sustainable production and consumption, which is based on the principle of less waste generation, where less natural resources and energy are used (Knowles et al., 2012).

The results of the sub-dimension of ECPB regarding the participation of students in EPAs revealed that the students would highly likely participate in such activities. Consistent with this conclusion, studies suggest that individuals' purchasing behaviors are related to their environmental attitudes (Chen & Chai, 2010; Mansaray & Abijoye, 1998; Schwepker & Cornwell, 1991). We can infer that individuals who positively exhibit environmental attitudes and behaviors apply these behaviors while consuming. Human beings must acquire such a consciousness of consumption in their early childhood education. Because ecological intelligence includes cognitive and affective components, the development of ecological consciousness and responsibility for the environment, as well as the reflection of behavior, covers a long period (Sterling, 2009).

Conclusions on the Sub-dimension of HEIP and the Role of HEIP in Participating in EPAs

We found that the students participated in behaviors related to this dimension ranging from 'often' to 'sometimes' level. We also determined that the lowest scores belonged to this sub-dimension. We identified that the students focused more on the damage that products cause to nature and their toxic effects on human beings. The students stated that both they and the society did not have sufficient knowledge of this theme and therefore they did not have an awareness of themselves. However, in perceiving future dangers related to the hidden impacts of products, one must exceed the threshold limits of perception and develop the ability to see the uncertain (Goleman, 2009). Another result of this dimension was that very few of the student preferred recyclable products. The reason of this problem may be that recycling is not perceived consciously enough. Additionally, Emanuel and Adams (2011) determined that although college students pay attention to recyclable products in general, a majority of them did not prefer environmentally friendly products in their purchases. In this context, we can infer that environmental awareness and knowledge should be learnt together in order the students to become further conscious of the ecosystem.

The results of the logistic regression analysis of HEIP also showed that it was not an effective variable in the regression model. The reason for this is the lack of knowledge of the students can be considered. Because we may conclude that students do not know about the pollution that occurs in the process of manufacturing, consuming and discarding a product. This indicates that individuals act without considering the environmental effects of the products. On an equal footing with these results, there are numerous studies revealing that even individuals who are environmentally conscious, give priority to secondary factors such as price, brand, and quality, yet they do not attach enough importance to its harmful impacts on the environment while purchasing a product (Othman & Umar, 2000; Said et al., 2003).

Conclusions on the Sub-dimension of ES and the Role of ES in Participating in EPAs

Considering the results, the students opted for 'often' items related to ecological sensitivity. Therefore, this result shows that students are individuals who feel responsible for ecological problems. At the same time, we drew from the statements they used in the themes of the talks such as doing activities beneficial to nature, paying attention to energy saving, taking care of minimum waste production. On the other hand, as the regression analysis results of such a sample group with high ecological sensitivity were examined, we found that the sub-dimension of ES had a predictor effect on the students' participation in future EPAs. In this context, we can assert that the ecological sensitivity of the students is an essential factor in shaping their environmental behavior. Johnson (2004) stated that the philosophy of good living is possible with life where there is sustainability from an environmental standpoint and that ecological sensitivity is a determining component for sustainability. In line with the results of ES in our research is the study of Yılmaz et al.(2009). Their study disclosed that the ecological sensitivity plays an important role in purchasing an ecological product. Similarly, in her study concerning the views of university students, Gheith (2013) reached the conclusion that students had a positive relationship between environmental values and environmental behavior; she emphasized that as the ecocentric perspective increases, the level of pro-environmental behavior will increase as well. A new environmental paradigm understanding arises against the anthropocentric world perspective in the individual with increasing environmental values, and this understanding initiate the environmental ethic, ecological conscience, and ecologically sustainable culture. In this way reflections of personal values trigger alternative perspectives that may stimulate a more flexible viewpoint toward environmental sensitivity (Hart, 2003). From that viewpoint empathy also can be developed through direct contact with other living things. Goleman et al. (2010) stated that we can expand our circles of empathy to consider the quality of life of other life forms, feel genuine concern about their well-being, and act on that concern. Because expanding empathy influences motivation to help by adding to rational cause-and-effect analysis. In this way, individuals with an ecological sensitivity who develop empathy also develop socially and environmentally responsible behaviors for ecological problems, which enable individuals to assume universal responsibility for sustainable development (Dobson, 2007). Therefore, this behavior enables individuals to understand the reasons underlying ecological problems, to conceive potential solutions that can be produced and to play an active role in environmental activities. In our research, we can infer that students with high ecological sensitivity have a sustainable environmental understanding and can take part in future EPAs.

Conclusions on the Sub-dimension of EKS and the Role of EKS in Participating in EPAs

Another results in terms of EKS the students 'often' shared their ecological knowledge about the products they had purchased and the ecological problems caused by the products with their friends and family. Relying upon the results of our study, we further investigated what sort of information the students share with people in their social environment. Considering the results, students encourage people in their social environment to use harmless products, to prefer public transport, to take part in social responsibility activities. Said et al. (2003) emphasized in their study that the development of environmentally responsible behavior can be increased with registering the clubs about nature, environmental seminars, environmental campaigns, and through active participation in outdoor activities. In this context, we can suggest that individuals can develop socially in terms of this behavior by carrying out activities related to environmental protection. This clearly demonstrates that there is a reciprocal relationship between EKS and participation in EPAs. Individuals who promote the spread of ecological knowledge are also individuals who can act cooperatively by adopting collective understanding (Goleman, 2009; Shumba, 2011; Sterling, 2009). In this regard, taking responsibility and reacting to ecological problems as a community forms a social dimension in collective and environmental understanding and encourages individuals to participate together in environmental activities for a sustainable world. At this point, fact that the sub-dimension of EKS in the regression model is encountered as a significant variable also in our study results and thus is a predictor variable, proves that it is a crucial dimension supporting students'

participation in future EPAs and encouraging individuals in this direction. The students' views that came to light within the scope of EKS also confirmed this result with various themes. For example, leading students to be eco-friendly in their social environment is another indicator of ecological knowledge sharing. In the study carried out by Kreis and Rauch (1999) students were trained primarily on production, consumption, and trade in the social responsibility project 'Neighborhood Store'. Afterward, these students visited their neighbors who lived in the neighborhood and discussed their consumption and shopping habits and tried to make changes in their consumption habits over time. The behavior of modeling from interpersonal relationships, especially close environment, can also improve environmental protection awareness among people. In line with our conclusion, Estrada-Vidal and Tójar-Hurtado (2017) have also suggested that we are influenced by the advice and consumption habits of those in our immediate environment and that we can support sustainability by achieving improvements in environmental and social dimensions.

Limitations and Recommendations

We are aware that our findings are still limited, because we examined only a small sample of the university students. To reveal the university students' LoEI and confirm model, further study is needed especially with a broader scope of samples in various universities by using clustering analysis based on the score levels (high, medium, low). In this model, the sub-dimensions of ECPB, ES, and EKS indicate the students' willingness to participate in future EPAs. This result should be discussed again with similar studies on different sample groups to determine whether the predictor variables overlap. At the same time, this study, which reveals the students' thoughts through survey and WORA form, is descriptive, so the levels of development in the sub-dimensions of ECPB, HEIP, ES, and EKS can be revealed in more detail through studies supported by qualitative methods.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the authors.

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