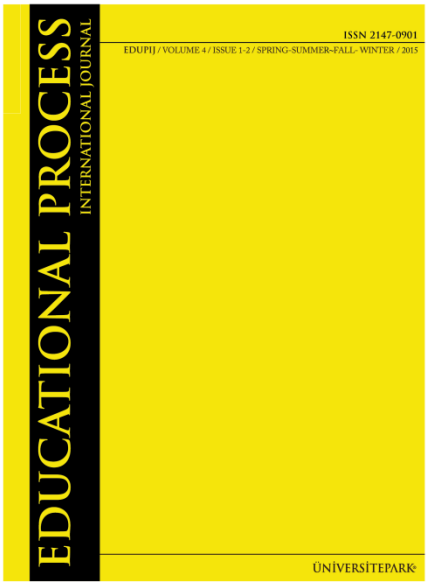

Educational Process: International Journal

ISSN 2147– 0901 (Print) Journal homepage: www.edupij.com

EDUCATIONAL PROCESS: INTERNATIONAL JOURNAL
EDUPIJ / VOLUME 4 / ISSUE 1-2 / SPRING-SUMMER~FALL-WINTER / 2015

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To cite this article: Saricam, H., & Sahin, S. H. (2015). The Relationship between the Environmental Awareness, Environmental Attitude, Curiosity and Exploration in Highly Gifted Students: Structural Equation Modelling. *Educational Process: International Journal, 4* (1-2), 7-17.

To link to this article: http://dx.doi.org/10.12973/edupij.2015.412.1

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EDUPIJ / VOLUME 4 / ISSUE 1–2 / 2015 / pp. 7–17.

The Relationship between the Environmental Awareness, Environmental Attitude, Curiosity and Exploration in Highly Gifted Students: Structural Equation Modelling

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Abstract

The basic purpose of this study was to examine the relationships between environmental awareness, environmental attitude, curiosity and exploration in highly gifted students with structural equation modelling. The secondary aim was to compare highly gifted and non-gifted students' environmental awareness, environmental attitude, curiosity and exploration levels. Participants were 311 (154 highly gifted, 157 non-gifted) secondary school students in Turkey who volunteered to take part in this study. All of the participants were either 13 or 14 years old, with a mean age of 13.77 years. For gathering data, Environmental Awareness Scale, Environmental Attitude Scale, Curiosity and Exploration-II were used. While analyzing the data, Pearson correlation analysis, independent samples t test, and structural equation model were used. According to the findings, highly gifted students' environmental awareness, environmental attitude, curiosity and exploration scores were higher than non-gifted students'. Indices of Structural Equation Modelling (SEM) indicated that the increase in the curiosity and exploration scores of the highly gifted children increased the environmental awareness; in this case, the environmental attitudes were affected positively.

Keywords: curiosity and exploration, environmental awareness, environmental attitude.

DOI: 10.12973/edupij.2015.412.1

EDUPIJ / ISSN 2147– 0901 © 2015

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Introduction

Curiosity has been a matter that has attracted the attention of researchers for many years (Berlyne, 1954; McReynolds, Acker, & Pietila, 1961). Curiosity is even one of the basic motives of the scientific, philosophical, technological and also artistic developments (Inan, 2012). Curiosity, which is generally considered as a positive trait, was defined as learning and passion by Aristotle and Cicero. Since the second half of the twentieth century, educators have admitted that curiosity is significant and motivating in the student's learning factor (Borowske, 2005). Loewenstein (1994), who conducted experiments related to curiosity in the field of psychology, stated that the reason behind curiosity cannot be answered in nature.

Curiosity is considered as the desire for experience or new information and an important premise for exploration (Litman & Silvia, 2006). Curiosity and exploration are the state of two valuable motives and emotions that exist in the nature of all living beings (Gerber, 2009; Kashdan & Fincham, 2004; Kashdan & Silvia, 2009). In the literature, it is seen that curiosity has different dimensions. These dimensions include curiosity as informative (Litman, 2005; Litman, Collins, & Spielberger, 2005; Schmitt & Lahroodi, 2008), perceptive (Collins, Litman, & Spielberger, 2004; Loewenstein, 1994), sensory (Litman, Huckins, & Russon, 2005), social (Renner, 2006) state and continuity (Spielberger & Reheiser, 2009). Curiosity indicates the intensity and frequency of situational experiences (Silvia, 2008) as an abstract and lifelong personality trait (Silvia & Kashdan, 2009). In a general sense, curiosity can be explained as "the desire for noticing, revealing and exploring the new, difficult and indefinite incidents and the potential of coping with the situation" (Kashdan & Silvia, 2009; Silvia, 2008). Individuals try to explore new things, meet new people and know new things as active participants during the adaptation to life (McReynolds et al., 1961). Exploration is a personality trait (Green & Campbell, 2000) and arises as a significant factor in the formation of the styles of a baby's attachment to its mother during its early years. Thanks to the desire for exploration, babies know about their environment and learn new things (Aspelmeier & Kerns, 2003).

"Awareness" is the direction of the attention to the flow of instant experiences, deliberately and without judgment (Gilbert, 2005). In another definition of awareness, discrimination and acceptance of subjective experiences is mentioned (Kabat-Zinn, 2003). Siegel, Germer, & Olendzki (2009), define awareness as a process where internal and external stimulus flow is monitored without judgment. Dunlap and Jones (2002) approached the concept of awareness from a different perspective, and defined it as the ability of a person to do something for his environment besides getting information about the current problems and matters that influence the nature locally and trans-locally. Accordingly, self-awareness also includes personal environmental philosophy. In other words, self-awareness and environmental awareness complement each other.

"Environmental awareness" is defined as the formation of environmental sensitivity through the conscious perception of environmental problems by the individual, and by behaving accordingly, taking precautions to protect the environment (Coertjens, Pauw, Maeyer, & Petegem, 2010). It is expected from the individuals, who are aware of the environment and worry about the effect of the environmental problems on themselves, to give importance to the environment and behave accordingly in each of their activities while

living, because behaviors of the individuals against the environment result from a reflection of their environmental awareness (Gadenne, Kennedy, & McKeiver, 2009).

Attitude is formed from feelings, opinions and behaviors with regard to an object. However, these dimensions aren't independent from each other. They influence each other mutually and are influenced from each other, and consistency exists among them most of the time (Eagly & Chaiken, 1993). This attitude generally keeps the individual prone to behaving against the attitudinal object. An individual, who has a positive attitude towards an object, will be prone to behaving positively towards this object, approaching it, showing concern for it, supporting and helping it. But the individual who has a negative attitude towards an object will tend to be uninterested in this object or move away from it, criticize or even damage it (Wilson, Dunn, Kraft, & Lisle, 1989).

Attitude towards the environment is a consistent learned reaction given as approaching environment-related matters positively, not approaching them or remaining impartial to them (Flamm, 2006, 2009). According to Erten (2005), attitude towards the environment is formed from all the positive or negative behaviors and opinions of people towards the environment such as fear, anger, unease, and value judgment which result from environmental problems, and a preparedness for the solution of environmental problems. Poortinga, Steg, & Vlek (2004) assert that individuals' attributes like interest and attitude are also influential, besides their knowledge, in their behaviors towards the environment. Environmental problems must be handled on a problem by problem basis in order to enable individuals to develop positive attitudes towards the protection of the environment. Individuals can improve their ability of making a decision on the problem itself, which is a significant process in the development of this consciousness, and helps them with seeing that matter as a problem, collecting information about the matter, examining the natural environment and conducting analyses (Knamiller, 1987). It is without doubt that relying on these ideas, individuals with a negative attitude towards the environment will be insensitive to environmental problems and they will even continue to create environmental problems.

Being highly gifted is the asynchronic development that puts forth internal experiences different from the normal standards qualitatively and quantitatively and includes advanced skills (Morelock, 1992). It is accepted that highly gifted children must have a high level of talent, high creativity and high potential of duty responsibility. Being highly gifted is defined as the combination of these three traits when the individual practices these three traits for performance with a special effort (Hallahan & Kaufmann, 1991). Children, who continuously exhibit remarkable human behaviors and are regularly successful, are qualified as highly gifted (Cutts & Moseley, 2001). Highly gifted students differ from normal students in many aspects (Ginsberg & Harrison, 1977), for example, academic success (Siegle & McCoach, 2002), metacognition (Delcourt, Cornell, & Goldberg, 2007), and problem-solving skills (Betts & Neihart, 1988). Moreover, these differences are not limited to only academic and ideological fields, but are also observed in the social emotional field. For instance, highly gifted children emotionally have higher vulnerability when compared to the norm and their social emotional developments also differ (Neihart, Reis, Robinson, & Moon, 2002). Besides, a person may also develop different attitudes towards an object, thing or nature (Cetinkaya, 2013).

Nature's capability to renew itself is limited. Therefore, it is quite significant to prevent the destruction of existing ecological balances in order that humans can continue living

(Uzun & Saglam, 2006; Yesilyurt, Gul, & Demir, 2013). This situation necessitates handling the solution of the problem and developing different strategies. It is assumed that highly gifted individuals will behave more sensitively than other people in the case of such problems, as in many problems. In order to prevent this opinion from remaining just an assumption, the environmental awareness and environmental attitude levels of highly gifted and non-gifted (normal) children will be compared in this study. Where any difference is shown, the reason will be shown based on the difference in the curiosity and exploration level. The following hypotheses have been presented in line with this aim:

- H_1: Environmental attitude scores of highly gifted children will be found higher than those of the normal children.
- H_2: Environmental awareness scores of highly gifted children will be found higher than those of the normal children.
- H_3: Curiosity and exploration scores of highly gifted children will be found higher than those of the normal children.
- H_4: The increase in the curiosity and exploration scores of highly gifted children will increase their environmental awareness; in this case, the environmental attitudes will be affected positively. This model is shown in Figure 1.

Figure 1. Estimated structural equation model

Methodology

Data was obtained from 311 (154 highly gifted, 157 non-gifted) secondary school students in Turkey who volunteered to take part in this study. The participants were all aged 13 or 14, with a mean age of 13.77 years (Sd = 2.26). Males made up 55.19% (n = 85) of the highly gifted students, and females 44.81% (n = 69). 93 of the highly gifted students are in the 8th grade, with 61 in the 7th grade. Males made up 42.04% (n = 66) of the non-gifted students, with females accounting for 57.96% (n = 91). 102 non-gifted students are in the 8th grade, and 55 are in the 7th grade.

Curiosity and Exploration Inventory-II (CEI): Curiosity level was measured by using CEI-II as developed by Kashdan et al. (2009), and consists of ten items (e.g., "Everywhere I go, I am out looking for new things or experiences") and two dimensions. Each item was rated on a 5-point Likert-type scale (1=strongly disagree through to 5=strongly agree). Turkish adaptation of this scale was performed by Acun, Kapikiran, & Kabasakal (2013). According to confirmatory factor analysis, 10 items yielded two factors as original form and that the two-dimensional model was well fit (χ^2= 69.41, df= 34, RMSEA = .05, SRMR = .04, CFI = 98, NNFI = .97). Factor loadings ranged from .45 to .73. Cronbach alpha internal consistency coefficient was found as .81 for the whole scale, .81 for the first subscale (stretching) and .68 for the second subscale (embracing).

Environmental Awareness Scale (EAS): Environmental awareness levels were measured by using EAS, developed by Okur-Berberoglu and Uygun (2012). EAS consists of 18 items and this one-dimensional model was well fit (χ^2/df=3.39, RMSEA = .08, SRMR = .05, GFI = 86, AGFI

= .82). Factor loadings ranged from .44 to .67. Cronbach alpha internal consistency coefficient was found to be .86 for the scale.

Environmental Attitudes Scale EAS): Attitudes towards environment levels were measured by using EAS, developed Okur-Berberoğlu and Uygun (2012). EAS consists of 18 items and this one-dimensional model was well fit (χ^2/df=3.23, RMSEA = .08, SRMR = .07, GFI = 84, AGFI = .80). Factor loadings ranged from .30 to .59. Cronbach alpha internal consistency coefficient was found to be .80 for the scale.

Highly gifted and non-gifted students who were given parental and school permission to participate received a set of surveys (paper-and-pencil) during 20 minutes of one class period. Researchers administered the self-report questionnaires to the students in the classroom environment; participants were all volunteer students, not from intact classes. The measures were counterbalanced in their administration. While analyzing the data, Pearson correlation analysis, independent samples t test, and structural equation model were used. The structural equation modeling method is a technique used within the process of testing theories and developing new models. This is true because of reasons such as its success in testing complicated models, the ability to conduct several analyses at once, suggest any new modifications for the relationship network in the examined model, facilitates examining intervention and moderation effects and takes measurement mistakes into account (Bagozzi & Fornell, 1982). In this study, structural equation modeling is employed to determine curiosity and exploration and its connection to environmental awareness and environmental attitudes in terms of acceptable cause-result variables and their indicators. To test the structural equation model, to investigate appropriate theoretical models and to enable unification of measurement errors in both the observed and latent variables, path analysis was employed in place of multiple regression analysis (Anderson & Gerbing, 1988). In the current study, environmental awareness, curiosity and exploration were latent variables, whilst environmental attitude was the observed variable.

Findings

The t test applied in order to understand whether highly gifted or non-gifted students' environmental awareness, environmental attitudes, curiosity and exploration levels showed differences, and the findings are shown in Table 1.

Table 1. T test results about highly gifted and non-gifted students' environmental awareness, environmental attitudes, curiosity and exploration levels

Variables	Students	N	Mean	Sd	t	Cohen's d
Curiosity and exploration	Highly gifted	154	25.62	4.12	4.34**	.74
	Non-gifted	157	23.61	4.03		
Environmental awareness	Highly gifted	154	58.37	9.10	2.97**	.29
	Non-gifted	157	55.97	8.75		
Environmental attitude	Highly gifted	154	53.87	6.89	2.83**	.40
	Non-gifted	157	51.01	7.35		

**p< .01

As illustrated in Table 1, curiosity and exploration mean scores of highly gifted students (χ=25.62) were higher than those of non-gifted students (χ=23.61), t= 4.34 p< .01 with a significance level of .01. As a matter of fact there is a good equalization because of Cohen's d (effect size) = .74. This finding shows that there is a difference statistically between highly gifted and non-gifted students' curiosity and exploration levels. In addition, environmental awareness mean scores of highly gifted students (χ=58.37) were higher than those of non-gifted students (χ=55.97), t= 2.97 p< .01 with a significance level of .01.

There is a small level of equalization because of Cohen's d (effect size) = .29. This finding shows that there is statistical difference between highly gifted and non-gifted students' environmental awareness scores. Moreover, environmental attitudes mean scores of highly gifted students (χ=53.87) were higher than those of non-gifted students (χ=51.01), t= 2.83 p< .01 with a significance level of .01. This showed a normal equalization because of Cohen's d (effect size) = .40. This finding proved a statistical difference between highly gifted and non-gifted students' environmental attitudes levels.

For highly gifted students, Table 2 shows the inter-correlations of the variables, mean, standard deviation, and internal consistency coefficients of the variables used.

Table 2. Descriptive statistics, alphas, and inter correlations of the variables

Variables	**1**	**2**	**3**
1. Curiosity and exploration	1		
2. Environmental awareness	.50**	1	
3. Environmental attitudes	.46**	.74**	1
Mean	25.62	58.37	53.87
Standard deviation	4.12	9.10	6.89
Alpha	.86	.88	.87

**p<.01

When Table 2 is examined, it is seen that there are significant correlations between environmental attitudes, environmental awareness, curiosity and exploration. Environmental attitudes (*r*=.46, p<.01), environmental awareness (*r*=.50, p<.01) were related positively to curiosity and exploration. Moreover, environmental awareness was associated with environmental attitudes (*r*=.74, p<.01).

During configuration of the structural equation model to explain highly gifted student's environmental attitudes, two variables, namely environmental awareness, and curiosity and exploration were examined. This model was developed based on observed variables comprised of all items and latent variables comprised of environmental awareness, and curiosity and exploration. For showing the goodness-of-fit of the model's suitability, GFI, SRMR, RMSEA, CFI, AGFI, NFI and the χ^2/df were used. Table 3 indicates the model's goodness-of-fit values (Byrne, 2006).

Table 3. Goodness-of-fit values

Fit indexes	**Perfect fit**	**Model results**
χ^2/df	χ^2/df<3	1.90
RMSEA	0 < RMSEA < 0.05	0.044
SRMR	SRMR <0.05	0.046
AGFI	0.90 < AGFI < 1	.91

Fit indexes	Perfect fit	Model results
CFI	0.95 < AGFI < 1	.95
GFI	0.95 < AGFI < 1	.96
NFI	0.95 < AGFI < 1	.94

In Table 3, all of the indexes, except for χ^2/df<2, AGFI, GFI, show perfect compatibility, which means that the measurement model displayed a good level of compatibility. Path coefficients are shown in Figure 2.

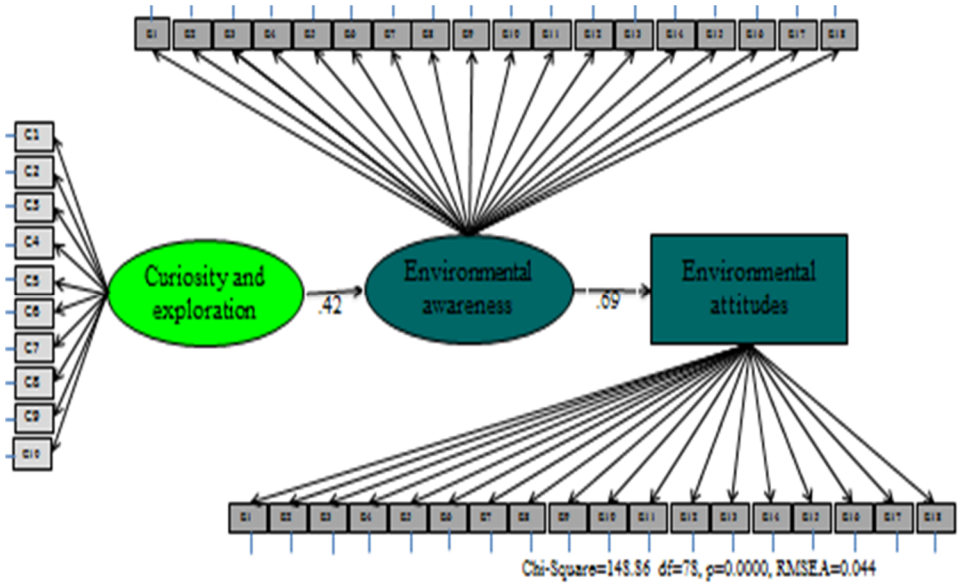

Figure 2. The result of environmental attitudes model (standardized coefficients)

Figure 2 demonstrates that all the coefficients between variables are deemed significant. Curiosity and exploration have significant effect on environmental awareness. Furthermore environmental awareness has a positive significant effect on environmental attitudes.

Conclusion and Discussion

The main purpose of the research was to compare the environmental awareness, environmental attitude, and curiosity and exploration level in highly gifted and non-gifted (normal) children and to examine the relationship between these variables in highly gifted children. In line with this purpose, the first finding of the research presented that the environmental attitude scores of highly gifted children were higher than those of the non-gifted children. As the second finding, the environmental awareness scores of highly gifted children were higher than those of the non-gifted children. According to Piechowski's (1997) claim, highly gifted individuals feel intense emotions against global problems. Aydin, Coskun, Kaya, & Erdonmez (2011), found in their study that environmental attitudes of highly gifted individuals were quite high. Highly gifted individuals are more intensely interested and worried about global environmental problems, as long as they are kept informed (Clark, 1997; Cullingford, 1996). Moreover, in Sontay, Gokdere, and Usta's (2014) study, highly gifted children exhibit more environmentalist behaviors than their non-gifted peers. All these findings and claims support the study findings.

Another finding of the research is that the curiosity and exploration scores of the highly gifted children were found higher than those of their non-gifted peers. Axtell (1966) found in his study that the curiosity level of the highly gifted students at early adolescence were higher than that of the normal students. And Whitmore (1980) asserted that high alertness, interest and curiosity were among the most significant traits of the highly gifted people. Similarly Henderson, Gold, & McCord (1982), discovered that imagination and curiosity levels of highly gifted students were higher than those of their normal peers. Curiosity and exploration are the key motives of the highly gifted students in creativity (Beghetto, 2011; Beghetto & Kaufman, 2007; Jang, 2009). The statements above are all parallel with the findings of this present study.

The most important finding of the research is the fact that environmental awareness level increases as the curiosity and exploration level increases in highly gifted children. They exhibit more positive environmental attitudes as their environmental awareness increases. In other words, curiosity and exploration level is one of the reasons behind the high environmental awareness and positive environmental attitude scores in highly gifted children. With regard to our examinations of the literature, no similar finding was found, which increases the originality of the study. It can be said that in light of these findings, that all the hypotheses asserted at the outset of the research were confirmed.

When the highly gifted individuals, who are quite interested in the negative changes that occur in an environment (Lovecky, 1993), receive an environment-oriented education, they may act as protective shields in making important decisions about the environment or environment-related implementations. Therefore, the curiosity and exploration level of highly gifted children can be utilized in environmental and nature-related education, and the education can thereby be made more efficient.

Notes

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