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Scienceandtechnology teacher candidates'awareness of sustainable development

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Abstract

This study was conducted in order to identify in which level teacher candidates comprehend sustainable development concept and the change of level which they link the indicators of this concept to sustainability according to grade levels.The study was carried out with 240 teacher candidates who study science and technology education. The sample was consisted of 50 candidates in first grade, 59 candidates in second grade, 60 candidates in third grade and 71 candidates in fourth grade from Karadeniz Technical University and Artvin Çoruh University. 55 indicators of sustainable development in UN report was arranged as a survey form in open-ended questions and applied to the sample. Moreover, their opinion was got by interviewing in a semi-constructed manner with the candidates who participated in the research. Data that gathered from the study performed in a cross-sectional way from the progressive research method was analyzed with qualitative analysis. It was established that the candidates could not relate sustainable development indicators to sustainability in desired level, that they did in just peripheral and economic level and that there existed differences in terms of grade levels.

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Keywords: candidate science teacher; sustainable development; sustainable development indicators; progressive research method

1. Introduction

Sustainability has emerged as a concept that is controversial unstable and comes into prominence, nowadays in which the nature is devastated in irreversible way (Macris & Georgakellos, 2006). It is seen that applications that was carried out in this approach are not widespread at the same level although the sustainability concept is

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commonly used at global level (Current Situation Report, 2012).On the other hand the solution of problems that poses threat to ecosystems and environmental problems and the prevention of the emergence of problems depend on sustainability (Saka & Şahintürk, 2013). As part of sustainable development it is required that today's demands should be supplied without endangering the next generations' ability to supply their demands as mentioned in Brutland Report (Dedeler-Bezirci, 2005). Agenda 21, a dynamical program, which was adopted by 170 states in Rio, is both a beginning of a global partnership for sustainable development and draw attention to inequalities in national and international level, rising poverty, hunger, diseases and illiteracy and deterioration in ecosystem. In addition to this the program recommends supplying basic needs, improving life standards, protecting and managing ecosystems at a better way and the global partnership concept that will pave the way to a safe future as a solution (Emrealp, S, 2005). These topics in Agenda 21 are the leading elements for the world's society on the way to 21st century. Thus this approach steers us to environment education for sustainable development from just environment education (Dedeler – Bezirci, 2005). The significance ofeducation was emphasized in Current Situation Report (2012) as a precondition and the most efficient means in attaining the sustainable development vision. Education is the precondition for taking decision based on knowledge, democratization and a suitable method. In this respect, the years between 2005 and 2014 was declared as the UN Decade of Education for Sustainable Development in the General Assembly of United Nations (unesco.org). The main aim of education activity for sustainable development is to inform everybody who has opportunity to benefit from education in utilizing natural resources and activating a sustainable lifestyle (unesco.org.tr).Education for sustainable development is regarded as a prominent addition to reach the sustainable future by the way of affecting behaviors and improving private values, improving the awareness in every topic (Pavlova, 2009).

The selected item of "Improving the understanding and awareness of sustainability in society", that is one of the four prominent area which was determined in education for sustainable development area by UNESCO, is the cornerstone of this survey. It is seen that there exists the aim of recognizing the interaction between the individual, the environment and the society and improving the consciousness of sustainable development related to the society, the economy and the natural resources when the science and technology course curriculum that has a goal of that everybody grows up as a science literate , is observed. The education of teachers is confronted in this point due to the fact that the understanding of sustainability and growing up of the next generations in this way can be attained by education. That how competent the teachers who will raise next generations should be determined. In this respect, the lackness of a study on sustainable development indicators of science and technology teacher candidates and in which level they are correlated to sustainable development demonstrates the originality of this survey.

2. Purpose

This study was conducted in order to identify in which level teacher candidates comprehend sustainable development concept and the change of level which they link the indicators of this concept to sustainability according to grade levels.

3. Method

The study was carried out with 240 teacher candidates who study science and technology education in spring term of 2013-2014. The sample was consisted of 50 candidates in first grade, 59 candidates in second grade, 60 candidates in third grade and 71 candidates in fourth grade from Karadeniz Technical University and Artvin Çoruh University. 55 indicators of sustainable development in UN report was arranged as a survey form in open-ended questions and applied to the sample (www.un.org) (Annex 1). The teacher candidates was asked to mark the ones that they link to sustainable development , from the 55 items and to explain in what respect they link in order to examine how they correlate the sustainable development to sustainability in terms of social ,environmental and economic dimensions. Moreover, their opinion on sustainable development was got by interviewing with 10 candidates who participated in the survey in a semi-constructed manner. The awareness of candidates on the subject was questioned with this interview and the data gathered was employed in order to support survey data. Data that gathered from the study performed in a cross-sectional way from the progressive research method was analyzed with qualitative analysis. The focus of progressive research method is to emphasize how a phenomenon, an event or a

case that are being researched change or improve in a defined period of time. Studies can be carried out on a sample that can be equivalent to the sample on the life cycle that it will follow instead of the determination of the improvement level by working on a sample for a long time in cross-sectional studies (Çepni, 2010).

4. Findings

Related articles and rates which are correlated with the social, environmental and economic indicators of the sustainable development by candidate teachers are given in Table 1.

Table 1. Social, environmental and economic indicators of the sustainable development by candidate teachers

Indicator Category	Indicators	% Ratio
Social Indicators	Percentage of the population living below the poverty line in equality theme	55
	Unemployment rate in equality theme	62
	The nutritional status of children in health theme	42
	The percentage of people graduating from high school in education theme	37
	Adult literacy rate in education theme	51
	Population growth rate in population theme	45
Environmental Indicators	Concentration of air pollution in cities in atmosphere theme	48
	The use of agricultural chemicals in soil theme	41
	The areas affected by desertification in soil theme	32
	The concentration ratio of algae in coastlines in ocean, sea and coast theme	25
Economic Indicators	The material intensity of use in patterns of consumption and production theme	20
	The annual energy consumption per capita in patterns of consumption and production theme	39
	The utilization of renewable energy sources in patterns of consumption and production theme	45
	Energy use density in consumption and production theme patterns	25
	The recycling and reuse of waste in patterns of consumption and production theme	52

Table 1 shows the indicator categories and correlation ratio which candidate teachers correlate with sustainable development

They have generally stated the other indicators except those specified in Table 1 as increase/decrease or positive/negative effects to sustainable development. It has been determined that they left the comment boxes blank. It has been determined that 3rd and 4th grade teacher candidates, associate the sustainable development to the environmental indicators in a better way, and especially the 1st and 2nd grade university students who did not take the environmental education course don't have sufficient information about biology and environmental issues.

It has been found out that they did not make any explanations about the articles containing the concepts such as greenhouse gases, ozone, algae, groundwater, ecosystems, renewable energy, and radioactive waste. However, it has been pointed out that they also cannot make any explanation about the indicators related to the concepts associated with the economics such as GNP, GDP and R&D expenditures.4th grade teacher candidates particularly emphasized the economic indicators. The teacher candidates, who mentioned the problems of unemployment and poverty indicators, stated that these two indicators are the biggest obstacles for the sustainable development. Five of the interviewed teacher candidates have interpreted the concept of sustainable development as "more production, more energy, more employment, and more money". In general, interviewed teacher candidates have specified that almost all of the indicators are correlated to sustainable development but they do not know how they would explain it. However, it has been found out that they are agree on this imperfect knowledge can be overcome through education.

5. Discussion and conclusion

It has been concluded that teacher candidates could not associate the most of the sustainable development indicators to the sustainability in expected level. When their responses to open-ended questions were observed, it

was determined that they correlate the sustainable development indicators with the sustainability in only environmental or only economic dimension.

Saka and Şahintürk had been identified that in 2013 in their study conducted with attitudes of the forest engineering and class teacher candidates towards sustainable environment, students have knowledge only on the environmental dimension of the sustainable development but not on its other dimensions. It has been thought that the reason for the emergence of these narrow-minded perspectives may be the viewpoints to the concept of sustainable development are not interdisciplinary.

When analyzed according to grade levels, it has been observed that correlation levels of the 1st and 2nd grade university students are lower compared to 3rd and 4th grade university students. It has been reached the conclusion that while the 3rd grade university students emphasized on environmental issues; 4th grade university students focused on the economic dimension.

It has been thought that the reasons for emergence of this result are the science and technology teacher candidates in their 3rd grade had taken the environmental education lesson when this research was carried out and 4th grade students who are in graduation situation had job finding and economic concerns.

6. Suggestions

Until now, global issues in environmental education have been primarily discussed in the field of sustainable development studies. However, anthropological and economic, social, mental health related aspects of environmental problems have not been subject of a study (Bezirci, 2005).In this context the effects of sustainable development indicators on humans must also be studied from this aspect as well.

The family is the leading institution in providing basic education and training for children. At this point, it is extremely important to provide first education for sustainability by family. (Çepel, 1995).On the one hand families can have a strong influence on environmental protection by raising their children with environmental awareness, but on the other hand they can cause the problems to increase in case they behave in un unconscious manner. The family which is the basic unit of society serves important functions because a family is both the user of many consumer products and has a great role in bringing up environmentally conscious children (Erkal, Şafak & Yertutan, 2011).

It is necessary to improve appropriate educational materials and strategies to improve new methods and their implementation for sustainable development training for the teachers of future. The lack of printed and visual documents about sustainable development to enlighten the society and to increase awareness is indicated by Kaya, Çobanoğlu and Artvinli (2011). Additionally, they stated that there is not enough qualified training at any level of education. Therefore, educational materials are required for education for sustainable development with an integrated approach, not only for training teachers but also for education for sustainable development at primary level.

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Appendix 1

	Indicators	Explanations
1	Proportion of the population living below the poverty line	
2	Income inequality index	
3	Unemployment rate	
4	Proportion of average female wage to average male wage	
5	Nutritional status of children	
6	Mortality rate of children under 5	
7	Life expectancy at birth	
8	Population rate that has sufficient waste water treatment service	
9	Population Proportion with access to safe drinking water	
10	Proportion of population with access to basic health services	
11	Vaccination of children against infectious diseases	
12	Rate of use of contraceptive method	
13	Number of children graduated from primary school	
14	Number of high school graduate adults	
15	Adult literacy rate	
16	Living space per capita	
17	Registered crime rate per 100,000 people	
18	Population growth rate	
19	Greenhouse gas emissions	
20	Consumption of ozone-depleting substances	
21	Concentration of air pollution in cities	
22	Arable lands	
23	Fertilizer use efficiency	
24	Use of agricultural pesticides	
25	Proportion of land area covered by forests	
26	Tree-cutting intensity	
27	Areas affected by desertification	
28	Size of urban residential areas	
29	Concentration ratio of algae in coastlines	
30	Percentage of population living in coastal areas	
31	Annual hunting rate of the significant species	
32	Annual rate of use of groundwater	
33	Amount of organic matter in water	
34	Area of selected key ecosystems	
35	Proportion of protected areas	
36	Presence of important species	
37	Gross domestic product (GDP) per capita	
38	Investment share in GDP	
39	Balance of payments for goods and services	
40	Proportion of debt to GDP	
41	Received Foreign aids as a percentage of GNP	

42	Material intensity of use
43	Annual energy consumption per capita
44	Rate of use of renewable energy resources
45	Intensity of energy use
46	Industrial and municipal solid waste generation
47	Hazardous waste generation
48	Management of radioactive waste
49	Recycling and reuse of waste
50	National Sustainable Development Strategies
51	Application of approved global agreements
52	Number of fixed telephone lines per 1000 population
53	Number of internet access per 1000 population
54	Gross domestic expenditure on R&D as a percent of GDP
55	Human and economic loss due to natural disasters