Evaluation of the Knowledge and Misconceptions of Science Teacher Candidates in Turkey Regarding the Greenhouse Effect Through the Use of Drawings

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Abstract
The aim of this study was to identify, through the use drawings, the knowledge and misconceptions of science teacher candidates regarding the greenhouse effect, and to thereby categorize their level of knowledge on this subject. The study was conducted with a group of 327 science teacher candidates. In this study, science teacher candidates were asked to demonstrate their knowledge of the greenhouse effect by answering questions in writing and through the use of drawings. The answers to the study questions were also evaluated through a descriptive analysis. Based on the study results, it was observed that students erroneously associated the greenhouse effect with the thinning of the ozone layer, with greenhouses used in agriculture, with air pollution, with acid rain, and with global warming.
Keywords: Greenhouse Effect, Misconception, Drawing, Science Teacher Candidates

Introduction
The reckless and inconsiderate damage inflicted upon the environment by humans inevitably disrupts the natural balance of our world. Due to human activities, temperatures worldwide are increasing at an alarming rate, leading to changes in climate that present a serious threat for our world. Global warming, which is caused by the greenhouse effect, is the most serious environmental problem and challenge faced by present-day societies.

The "greenhouse effect" is called as such, as it resembles the heating process that occurs in greenhouses. While the glass structures in greenhouses permit the entry of sunlight, they do not permit the transmission of infrared light that is reflected, which causes warming. Even on a cold winter day, the inside of the greenhouse can be hot as long as the sun shines (Chiras, 2001). The greenhouse effect is a natural process that maintains the average global temperature at approximately 15 °C. Without the greenhouse effect, our world would have been much cooler, with an average temperature of approximately -18 °C (Spence, 2007). The natural greenhouse results from the fact that atmospheric gases absorb outgoing longwave radiation to a greater extent than incoming solar radiation. This has the effect of warming the surface of the earth through the retention of longwave radiation, and regulates its heat balance. The greenhouse effect is indispensable for the existence of life on earth (Türkeş, 2001).

The phenomenon known as global warming refers to the increase in average temperatures on the surface of the earth and in the lower layers of the atmosphere (i.e. the lower and middle troposphere) due to the rise in atmospheric greenhouse gas levels (Türkeş, 2006). The researches demonstrate that CO_2 and other greenhouse gases that cause global warming have distinguishably changed the chemical composition of the earth's atmosphere compared to 100-150 years ago (Flavin, 1990). In addition to a higher than normal amount of greenhouse gases, which have vital functions, the change has caused a disruption of the climatic stability of the earth (Spence, 2007; Denhez, 2005).

Considering the sources of greenhouse gases that contribute to global warming, effective measures for managing and resolving this environmental problem include decreasing the use of fossil fuels, increasing the use of renewable energy, reducing the destruction of forests and other green spaces, implementing policies for increasing the area of forests and green spaces, increasing the use of recycled and environment-friendly products, ensuring effective waste management, and implementing measures for preventing unplanned urbanization.

As global warming has become one of the most significant environmental problems that threaten our world, it is essential to properly educate individuals regarding the greenhouse effect. Environmental problems such as global warming can only be resolved through the coordinated efforts of conscious individuals. Raising conscious individuals, in turn, requires well-trained teachers. It is thus necessary to include subjects regarding the environment in teacher training programs, since teachers assume a vital role in the raising of conscious

individuals.

Drawings are important and useful in that they allow students to effectively reflect their knowledge, misconceptions, and conceptual changes regarding a particular subject, without being limited by words or sentences (White and Gunstone, 1992; Ayas, 2006). Drawings reflect a large amount and variety of information, and take less time to complete than other methods used for assessing the thoughts and concepts of students. Drawing-related activities are also easily understood and performed by students, thereby increasing their utility for researchers (Atasoy, 2004). In addition, drawings enable the identification of knowledge and beliefs among students that might not be fully or adequately expressed when using words (Ayas, 2006). Furthermore, drawings also allow students who normally dislike answering questions to enjoy the assessment process and to provide answers rapidly (Thomas & Silk, 1990). The literature shows that drawings are used in many different fields to demonstrate the knowledge and misconceptions of students (Prokop and Fancovicová, 2006; Acar and Tarhan, 2008; Bartoszeck et. al., 2008; Kara et. al., 2008; Köse, 2008; Uzunkavak, 2009a, 2009b; Çelikler and Topal, 2011; Çelikler and Kara 2012). In this context, the aim of the current study was to identify through the use drawings the knowledge and misconceptions of elementary school science teacher candidates regarding the greenhouse effect, and to thereby categorize their level of knowledge on this subject.

Methods

The study was performed by using the general screening model. This model, which is generally used on populations with large numbers of individuals/subjects, involves the screening of the entire population or of a group, case, or sample within the population, with the aim of determining the general characteristics of the population in question (Karasar, 2011).

The study sample was determined according to the "eligibility sample," which is defined as the group of individuals from the study population who could be reached for study purposes (Frankel and Wallen, 2003). The study sample included 327 science teacher candidates between the ages of 17 and 23 from the Faculty of Education, Department of Science Teaching, of a public university in Turkey. Of these teacher candidates who voluntarily participated in the study, 88 were first-year, 68 were second-year, 136 were third-year, and 35 were fourth-year students.

In this study, science teacher candidates were asked open-ended questions that required them to demonstrate their knowledge of the greenhouse effect in writing and through the use of drawings. The names of the teacher candidates were kept confidential. In this context, all participating students were assigned an identifying "code," written in the following format: $F^1_n...F^4_n$ (F^{grade}_n). Examples of answers given by the students are provided in the following sections.

Data Analysis

The written explanations and drawings provided by the students were categorized into different groups according to six levels previously described by Kara (2007). The answers to the study questions were then evaluated through descriptive analysis. The levels used for the evaluation of the study data are provided in Table 1.

Table 1. A six level evaluation table which are formed to evaluate theoretical knowledge and drawing about greenhouse effect

Levels	Statements
Level 1	No Theoretical Knowledge/Drawing
Level 2	Wrong Theoretical Knowledge/Drawing
Level 3	Partly Wrong And Inadequate Theoretical Knowledge/Drawing
Level 4	Theoretical Knowledge/Drawing With Misconceptions
Level 5	Accurate But Incomplete Theoretical Knowledge/Drawing
Level 6	Completely Accurate And Perfect Theoretical Knowledge/Drawing

Results

In this study, science teacher candidates were asked to demonstrate their knowledge of the greenhouse effect in writing and by using drawings. The science teacher candidates' written descriptions and drawings regarding the greenhouse effect were analyzed in order to assess their level of knowledge and misconceptions. The data obtained from the teacher candidates' written descriptions and drawings are shown in Table 2.

Table 2. Evaluations results of theoretical knowledge regarding greenhouse effect

Levels	Grades																Total			
	1th				2nd				3th				4th				TK		D	
	TK		D		TK		D		TK		D		TK		D					
	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Level 1	3	3	4	4	2	4	6	6	8	7	34	33	2	6	3	7	15	5	50	15
Level 2	16	17	33	35	9	17	23	24	28	24	30	29	2	4	12	29	**55**	**18**	**98**	**29**
Level 3	7	8	8	8	9	17	11	12	15	13	11	10	3	11	**13**	**32**	34	11	43	13
Level 4	**60**	**64**	49	51	30	58	34	35	49	43	24	23	0	0	0	0	**139**	**49**	**107**	**31**
Level 5	7	8	2	2	2	4	22	23	15	13	5	5	23	67	13	32	47	16	42	12
Level 6	0	0	0	0	0	0	0	0	0	0	0	0	4	12	0	0	4	1	0	.0

(TK: Theoretical Knowledge; D: Drawing)

According to Table 2, 5% of the science teacher candidates were unable to provide any written theoretical description regarding the greenhouse effect, while only 1% could provide a correct and complete description of the greenhouse effect. It was noted that all of the teacher candidates with correct and complete knowledge of the greenhouse effect were fourth-year students. Among first-year, second-year, and third-year students, the ratio of those with misconceptions regarding the greenhouse effect was 64%, 58%, and 43%, respectively. On the other hand, 67% of fourth-year students had correct yet incomplete knowledge of the greenhouse effect.

Concerning the teacher candidates' drawings, it was observed that 15% of the candidates were unable to provide any drawings, while 12% provided partially correct yet incomplete drawings. Overall, the study results showed that none of the teacher candidates were able to provide an accurate and complete drawing regarding the greenhouse effect. Based on the level of the drawings they were able to make, it was determined that 51% of first-year students and 35% of second-year students had misconceptions regarding the greenhouse effect. While 33% of third-year students could not provide any drawings, 23% provided drawings that reflected misconceptions regarding the greenhouse effect. In addition, 32% of fourth-year students provided drawings that reflected incorrect and incomplete knowledge, while 32% provided drawings that reflected correct yet incomplete knowledge.

Table 3. Misconceptions about greenhouse effect

Misconceptions	Grades												Total			
	1th				2nd				3th				TK		D	
	TK		D		TK		D		TK		D					
	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Vegatable glasshouse	**21**	**43**	**23**	**39**	**16**	**53**	**16**	**49**	9	18	11	46	**46**	**33**	**50**	**43**
Ozone layer depletion	5	10	20	34	0	0	7	21	**13**	**27**	4	16	18	13	31	27
Air Pollution	2	4	4	7	12	40	8	24	**13**	**27**	0	0	37	27	12	10
Acid rain	18	37	12	20	2	7	2	6	10	20	5	21	30	22	19	16
Global Warming	3	6	0	0	0	0	0	0	0	0	0	0	3	2	0	0
Circulations	2	0	0	0	0	0	0	0	4	8	4	17	4	3	4	4

Table 3 indicates that first-year, second-year, and third-year teacher candidates had various misconceptions regarding the greenhouse effect. On the other hand, it was determined that none of the fourth-year students had any misconceptions regarding the greenhouse effect. Based on an evaluation of the theoretical descriptions written by the science teacher candidates, it was observed that 33% associated the greenhouse effect with agricultural greenhouses; 13% associated the greenhouse effect with the thinning of the ozone layer; 27% associated the greenhouse effect with air pollution; 22% associated the greenhouse effect with acid rain; and 3% associated the greenhouse effect with the water/carbon cycle. Furthermore, 2% of the students described the greenhouse effect as being a consequence of global warming (i.e. students inversed the cause-and-effect order between the greenhouse effect and global warming). In their drawings, 43% of the teacher candidates drew agricultural greenhouses, 27% drew a representation of the thinning of the ozone layer, 16% drew a representation of acid rain, 10% drew a representation of air pollution, and 4% drew a representation of the water/carbon cycle. Most of the first-year and second-year teacher candidates associated the greenhouse effect with agricultural greenhouses. The drawings of these teacher candidates also reflected this particular association they made. Among third-year teacher candidates, 27% associated the greenhouse effect with the thinning of the ozone layer, while 27% associated it with air pollution. However, these third-year students were unable to provide drawings that reflected these associations they made.

Based on the written answers and drawings, it was determined that the teacher candidates provided incorrect answers and inaccurate drawings regarding the greenhouse effect. Examples of answers (Level 2) provided by the teacher candidates are listed below:

"Emitted gases are transformed due to the effect of solar rays, which causes them to return to nature and harm living organisms. This process is called the greenhouse effect." (F^1_{64})

"The greenhouse effect refers to the decrease in oxygen levels and the increase in carbon dioxide levels that is taking place worldwide." (F^2_8)

"It is a system that keeps harmful gases out." (F^3_{21})

"Certain atmospheric gases, such as methane and water vapor, hold onto to carbon dioxide, causing the temperature of the atmosphere to rise. This effect is known as the greenhouse effect." (F^4_{13})

Examples of Level 2 drawings made by the teacher candidates are shown in Figure 1:
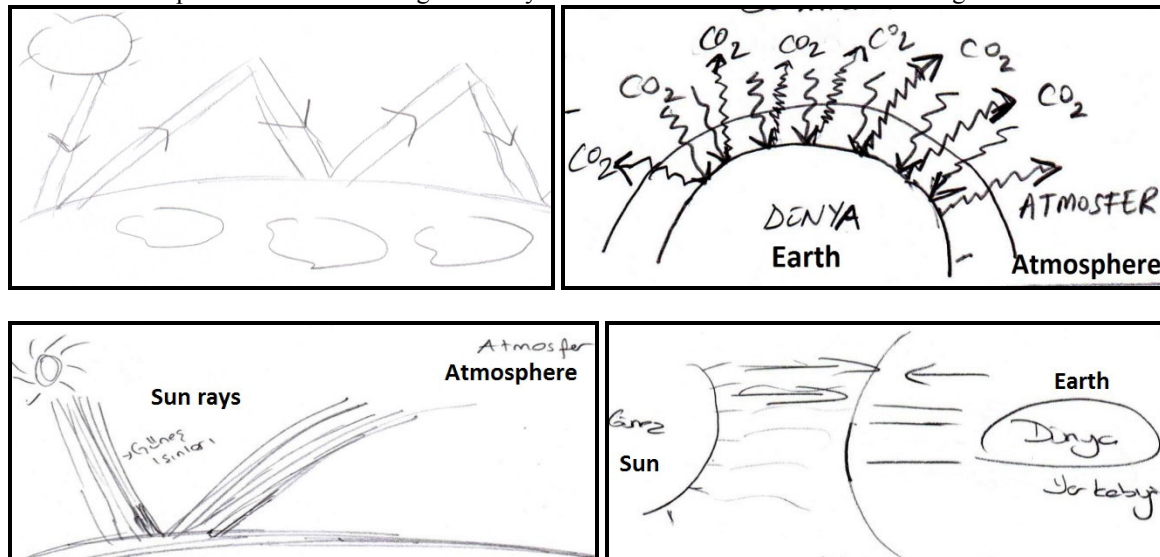
Figure 1. Irrelevant wrong drawing which are example level 2

Based on the written answers and drawings, it was determined that the teacher candidates provided partially correct and incomplete answers and drawings regarding the greenhouse effect. Examples of answers (Level 3) provided by the teacher candidates are listed below:

"The greenhouse effect refers to what happens when foreign gases enter the atmosphere. These gases adversely affect the atmosphere. Because of these effects, the atmosphere becomes impermeable to harmful radiation. This causes the atmosphere to warm up. This, in turn, results in climate change. The polar ice caps start to melt. All these effects lead to global warming." (F^1_{51})

"Reflected radiation contributes more to warming the earth than incoming solar rays. Solar rays are absorbed by atmospheric gases such CO_2 and water vapor. This causes the earth to warm up. This process is called the greenhouse effect." (F^2_{29})

"While a portion of the incoming solar radiation is reflected by the atmosphere, the remaining portion passes through the atmosphere. This radiation that passes mixes with harmful gases in the atmosphere, which adversely affects the air. This process is called the greenhouse effect." (F^3_{51})

"Solar radiation reaches the atmosphere. Due to the greenhouse gases in the atmosphere, some of this radiation reflected back, while some of it is absorbed by the earth. This has the effect of reducing the levels of harmful gases in atmosphere. This process is known as the greenhouse effect." (F^4_7)

Examples of Level 3 drawings made by the teacher candidates are shown in Figure 2:
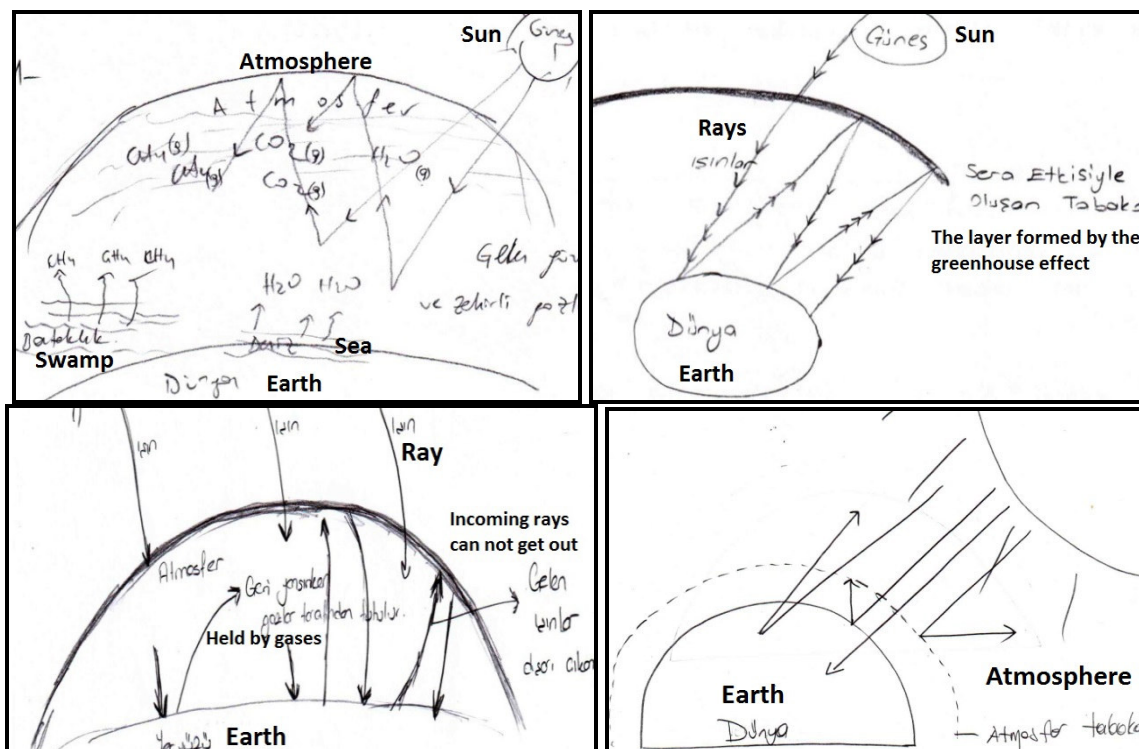
Figure 2. Partly wrong and inadequate drawing which are example level 3

Based on the written answers and drawings, it was determined that the teacher candidates erroneously associated the greenhouse effect with the ozone layer, acid rain, air pollution, agricultural greenhouses, cycles, and global warming (in that they perceived the greenhouse effect as a consequence of global warming, rather than its cause). Examples of misconceptions (Level 4) described by the teacher candidates are listed below:

"The greenhouse effect refers to the increased exposure of the earth's surface to direct solar radiation due to the depletion of the ozone layer." (F^1_4)

"The greenhouse effect is caused by pollution." (F^1_{54})

"Due to the thinning of the ozone layer, solar radiation reaches the surface of the earth directly. The greenhouse effect is caused by this harmful solar radiation that reaches our world." (F^2_{17})

"The greenhouse effect refers to the cultivation of vegetables and fruits for human consumption. The greenhouse effect allows vegetables and fruits to mature earlier." (F^2_{27})

"The greenhouse effect refers to a process that takes place within the context of the water cycle; it is the condensation of evaporated water due to an encounter with a mass of cold gas." (F^3_{44})

"The greenhouse effect is caused by acid rains that are formed through the accumulation of harmful gases in the atmosphere. It is also one of the consequences of global warming." (F^3_{28})

"The greenhouse effect is caused by the depletion of the ozone layer." (F^3_{70})

"The greenhouse effect is caused by the disruption of the carbon cycle in the atmosphere." (F^3_{62})

Examples of Level 4 drawings made by the teacher candidates are shown in Figure 3:
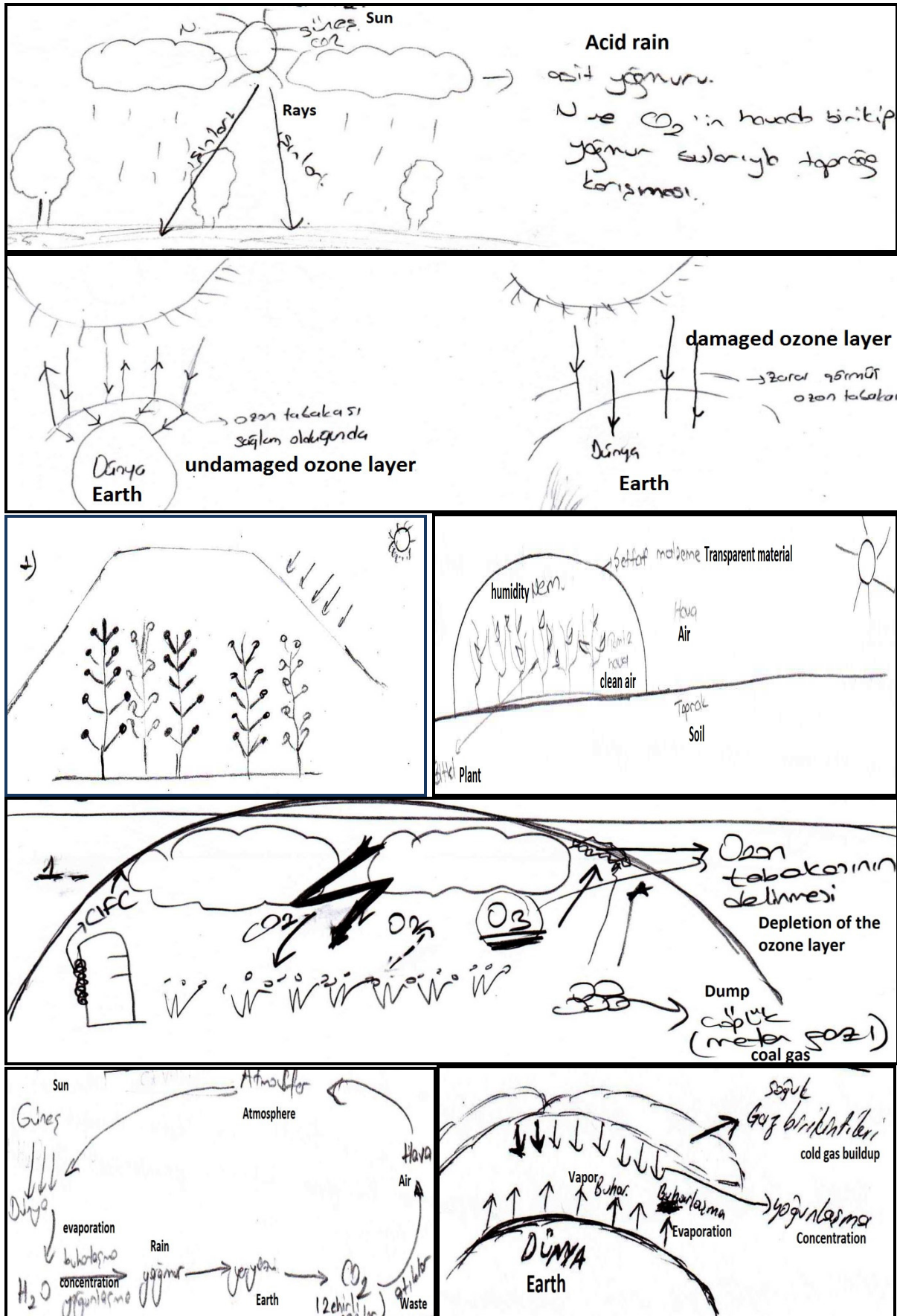
Figure 3. Theoretical knowledge and drawing with misconceptions which are example level 4

Based on the written answers and drawings, it was determined that the teacher candidates had correct yet incomplete knowledge regarding the mechanism of the greenhouse effect and the different types of greenhouse gases. In addition, the teacher candidates were aware that global warming is caused by the greenhouse effect. Examples of correct yet incomplete answers (Level 5) regarding the greenhouse effect provided by the teacher candidates are listed below:

"The earth is warmed more by reflected outgoing radiation than by incoming solar radiation. This reflected outgoing radiation is absorbed by carbon dioxide and water vapor. This has the effect of warming the earth. The absorption of outgoing radiation by these gases is called the greenhouse effect. The increase of the greenhouse effect causes the polar ice caps to melt and disrupts the natural balance of the earth." (F^1_{12})

"Radiation reflected from the surface of the earth is absorbed by carbon dioxide, methane and water vapor. This has the effect of warming the earth. The absorption of this reflected radiation by these gases is called the greenhouse effect." (F^2_{10})

"The increase in the levels of greenhouse gases causes more solar radiation to be retained by the earth. The resulting increase in worldwide temperatures causes global warming. Global warming leads to detrimental changes such as the melting of the polar ice caps and alteration of the seasons. (F^2_{40})

"Reflected radiation contributes more to warming the earth than incoming solar rays. This reflected outgoing radiation is absorbed by CO_2, CH_4, and water vapor, causing the world to warm up. The absorption of this reflected radiation by these gases causes the greenhouse effect." (F^4_{12})

Examples of Level 5 drawings made by the teacher candidates are shown in Figure 4:
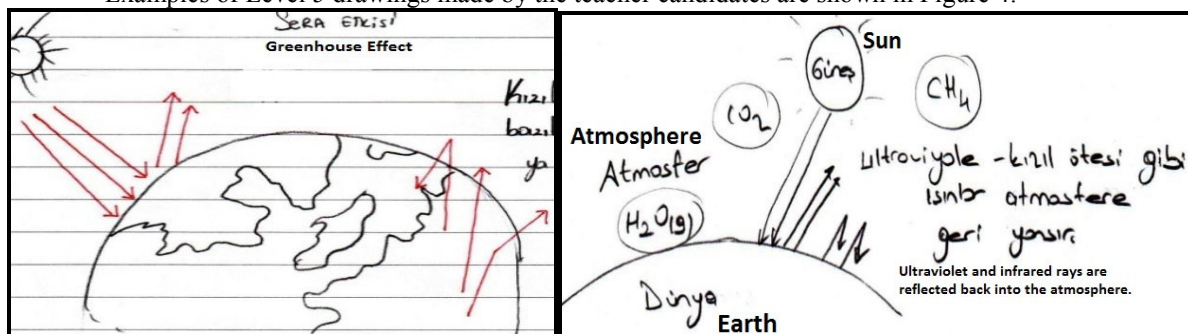

Figure 4. Accurate but incomplete theoretical drawing which are example level 5

Based on the written answers and drawings of the teacher candidates, it was determined that these candidates were knowledgeable about the mechanism of the greenhouse effect and the different types of greenhouse gases. In addition, the students expressed that the greenhouse effect is a natural phenomenon, and that global warming is caused by the increase in the atmospheric concentration of greenhouse gases. However, the teacher candidates were not able to reflect their knowledge onto their drawings. Examples of correct answers (Level 6) provided by the teacher candidates are listed below:

"Solar radiation is reflected back to the atmosphere by the earth; this reflected radiation is absorbed/retained by greenhouse gases such as CO_2, methane, water vapor, nitrogen oxides, CFC, and ozone, causing the earth to warm. This is a natural process. However, increased accumulation of greenhouse gases in the atmosphere as a result of air pollution and other factors will cause more radiation to be absorbed/retained, which in turn will further increase the earth's temperature. This is similar to the way in which the interior of a car that has been left under the sun warms up. The increase of the greenhouse effect causes global warming." (F^4_{18})

Conclusions

Based on the study results, it was determined that, except for the fourth-year students, the majority of the teacher candidates erroneously associated the greenhouse effect with the thinning of the ozone layer, the greenhouses used in agriculture, air pollution, acid rain, and global warming (i.e. as its consequence, rather than cause). Previous studies have shown that similar misconceptions were shared by other teacher candidate populations. For instance, Groves and Pugh (1999) described elementary school teacher candidates who believed that acid rain is one of the causes of the greenhouse effect, while Çelikler and Kara (2011) described chemistry and biology teacher candidates who believed that the thinning of the ozone layer would cause an increase in the greenhouse effect. Furthermore, Coşkun and Aydın (2011) observed that the teacher candidates they evaluated had various misconceptions regarding the ozone layer problem, the greenhouse effect, acid rains, and nuclear energy. The current study's results were parallel to these observations.

The current study results also showed that drawing is an effective method for determining the knowledge and misconceptions of individuals regarding a particular subject, without words being a factor that

limits expression. Examples of previous studies that have evaluated students' level of knowledge through the use of drawings include Bartoszeck et al.'s (2008) study regarding organs in the human body; Kara et al.'s (2008) study regarding the concept of light; Uzunkavak's (2009a) study regarding Newton's Laws; Köse's (2009) study regarding photosynthesis and respiration in plants; Uzunkavak's (2009b) study regarding the concept of work; Çelikler and Topal's (2011) study regarding carbon dioxide and the water cycle; and Çelikler and Kara's (2012) study regarding the periodic table. In these studies, drawings have allowed the students' knowledge of the subject to be determined in a more effective way. The current study showed that while the teacher candidates had difficulties expressing their knowledge regarding the greenhouse effect in writing, they found it was easier to reflect their knowledge through drawings.

The study results showed that, although the teacher candidates' knowledge of the greenhouse effect increased by the end of their four-year education program, they still lacked knowledge on various aspects of the greenhouse effect, and continued to harbor certain misconceptions regarding this subject. The increase observed in the teacher candidates' level of knowledge during the four-year period might be due to the "Environmental Science" course, which was part of their second-year curriculum; and the "Special Subjects in Chemistry," which was part of their third-year curriculum. The misconceptions of the teacher candidates might be due either to their pre-existing (i.e. pre-university) misconceptions on the subject, or to their erroneous structuring of the concepts they learned on the subject.

In order to leave a livable world to future generations, it is seen that it is vital to educate conscious and sensitive individuals . The teachers who produce conscious and sensitive communities are seen to have an important mission to give a direction to the destiny of the world. Therefore, it is important for the mission that teachers undertake to determine their information and perception for global warming and the greenhouse effect, which is a global problem and to eliminate the existing misconceptions and lack of information.

As global warming is one of the leading environmental problems of our day, educating students on the greenhouse effect is of considerable importance. For this reason, it is necessary to employ student-centered methods and techniques to ensure the effective and lasting learning of subjects related to the greenhouse effect; and to provide students learning environments comprising appropriate educational activities that will assist in remedying any misconceptions they might have on the subject of the greenhouse effect.

References

Acar, B., & Tarhan, L. (2008). Effects of cooperative learning on students' understanding of metallic bonding. *Resarch in Science Education*, 38, 401-420.

Ayas, A. (2006). *Kavram Öğrenimi. "Fen ve teknoloji öğretimi"* (Ed. S. Çepni). Ankara: Pegema Yay.

Atasoy, B. (2004). *Fen ve teknoloji öğretimi*. Ankara: Asil.

Bartoszeck, A. B., Machado, D. Z. & Amann-Gainotti, M. (2008). Representations of internal body image: A study of preadolescents and adolescent students in Araucaria, Paraná, Brazil. *Ciências & Cognição,* 13(2), 139-159.

Chiras, D. (2001). Environmental science, creating a sustainable future. 6th ed. Sudbury: Jones and Bartlett Publishers.

Coşkun M., & Aydın F. (2011). Geography teachers candidates' perceptions towards the "greenhouse effect". *American-Eurasian J. Agric. & Environ. Sci,*. 10(2), 290-295.

Çelikler, D. & Topal, N. (2011). İlköğretim fen bilgisi öğretmen adaylarının karbondioksit ve su döngüsü konusundaki bilgilerinin çizim ile saptanması. *Journal of Educatıonal and Instructıonal Studıes In The World*, 1(1).

Çelikler, D., & Kara, F. (2011). Determining the misconceptions of pre-service chemistry and biology teachers about the greenhouse effect. *Procedia Social and Behavioral Sciences*, 15, 2463–2470.

Çelikler, D. & Kara, F. (2012). İlköğretim fen bilgisi öğretmen adaylarının periyodik çizelge konusundaki bilgilerinin çizim yoluyla saptanması. *Journal of Research In Education and Teaching*, 1(3).

Denhez, F. (2005). Küresel ısınma atlası. NTV Yayınları.

Flavin, C. (1990). Slowing global warming. American Forests. May-June. 37, 46.

Frankel, J.R., & Wallen, N.E. (2003). *How to design and evaluate reseach in education*. (5th ed). New York: McGraw Hill.

Groves, F.H., & Pugh, A. (1999). Elementary pre-service teacher perceptions of the greenhouse effect. *Journal of Science Education and Technology*, 8(1), 76-77.

Kara, İ. (2007). Revelation of general knowledge and misconceptions about Newton's laws of motion by draving method. *World Applied Sciences Journal*, 2(S), 770-778.

Kara, İ., Avcı, E.D., & Çekbaş, Y. (2008). Fen bilgisi öğretmen adaylarının ışık kavramı ile ilgili bilgi düzeylerinin araştırılması. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, 46-57.

Karasar, N. (2011). *Bilimsel araştırma yöntemleri*. (22th ed). Ankara: Nobel.

Köse, S. (2008). Diagnosing student misconceptions: Using drawings as a research method. *World Applied*

Sciences Journal, 3(2), 283-293.

Prokop, P., & Fancovicová, J. (2006). Students' ideas about the human body: Do they really draw what they know? *Journal of Baltic Science Education*, 2(10), 86-95.

Spence, C. (2007). *Küresel Isınma*, Pegasus Yay.

Thomas, G.V, .& Silk, A.M.J. (1990). *An introduction to the psychology of children's drawings.* Hemel Hempstead: Harvester Wheat Sheaf.

Türkeş, M. (2001). Hava, iklim, şiddetli hava olayları ve küresel ısınma. *Devlet Meteoroloji İşleri Genel Müdürlüğü 2000 Yılı Seminerleri*. 1, 187-205.

Türkeş, M. (2006). İklim değişikliğiyle savaşım, Kyoto Protokolü ve Türkiye. *Mülkiye*, 259, 101-131.

Uzunkavak, M. (2009a). Öğrencilerin newton kanunları bilgilerinin yazı ve çizim metoduyla karşılaştırılması. *SDU International Journal of Technologic Sciences,* 1(1), 29-40.

Uzunkavak, M. (2009b). Öğrencilerin iş kavramında pozitiflik-negatiflik ayrımı becerilerinin yazı ve çizim metoduyla ortaya çıkarılması. *SDU International Journal of Technologic Sciences*, 1(2), 10-20.

White, R. T., & Gunstone, R. F. (1992). *Probing understanding*. London: The Falmer Pres.

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