

# Examining the Global Climate Change Awareness of Social Studies Teacher Candidates: Mixed Method Research

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Received Date 13.04.2024  
Accepted Date 30.10.2024  
Publication Date 10.02.2025

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Cite this article: Özgün, A., İşçi, T.G., & Yazıcı, K. (2025). Examining the global climate change awareness of social studies teacher candidates: Mixed method research. *Educational Academic Research*, 56, 56-66.



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## ABSTRACT

The aim of the research is to examine the awareness of social studies teacher candidates' awareness of global climate change and to determine their views on the subject. For this reason, the research was conducted using explanatory sequential design from mixed research methods. Convenience sampling method was used in determining the participants. Accordingly, quantitative data was collected from 357 social studies teacher candidates, and after the quantitative data were analyzed, 20 teacher candidates were selected on a voluntary basis and interviews were conducted. In this context, "Global Climate Change Awareness Scale", "Semi-Structured Interview" and "Personal Information Form" were used as data collection tools. Quantitative and qualitative data were analyzed by descriptive statistical methods and content analysis respectively and the collected data were combined and interpreted. As a result of the research, it was determined that social studies teacher candidates' awareness of global climate change was at a high level. While it was determined that there was no statistically significant difference in the global climate change awareness levels of social studies teacher candidates in terms of gender, grade, taking courses on environmental education and being a member of environmental protection organizations variables, a statistically significant difference was found between global climate change awareness levels and the variable of following visual publications on the environment. It was determined that the results obtained from the qualitative findings of the research were similar to the results obtained from the quantitative findings.

**Keywords:** Global climate change, awareness, social studies, teacher candidate.

## Introduction

Human beings, who have tried to adapt to their environments since the moment they existed on Earth, have made various interventions in the environment in line with their own interests over time. These interventions have increased especially with the technological developments that started to gain momentum with the industrial revolution, causing the environment to be more affected by human elements than natural elements, and causing various environmental problems such as air, water, soil pollution and climate change (Özer, 1974). Climate change, which is expressed as one of these problems, differs from other environmental problems because it is indirectly affected by other environmental problems and covers a more global area due to its impact size.

Climate change is defined as natural or human-induced changes in the basic characteristics of the climate system (temperature, precipitation) that can be detected over a

long period of time (ten years or more) by statistical studies (IPCC, 2022). It is stated that natural processes such as volcanism, orogenesis and eirogenesis occurring on earth also cause climate change (Erinç, 1984). However; incorrect land use, destruction of forest areas (Justus & Fletcher, 2006) and increase in greenhouse gas emissions (Doğan & Tüzer, 2011) are known to have a greater impact on it. According to the Intergovernmental Panel on Climate Change (IPCC), this impact is 95% (IPCC, 2022) and the most important reason for climate change is human activities (UN, 1992). Climate change causes a decrease in biological diversity, the destruction of natural resources, the formation of extremely dry and extremely cold climates, the melting of glaciers and a rise in sea levels (Öztürk, 2002). At this stage, the impact of human activities on climate change and the magnitude of the problem has necessitated a global struggle (Intergovernmental Panel on Climate Change, 2001), and conferences and agreements have been made around the world to prevent this change.

When considered within the historical process, it can be seen that many international conferences have been held and agreements have been signed regarding climate change since the second half of the 20th century. The issue of climate change was indirectly mentioned in the context of environmental problems in the "1972 United Nations Conference on Man and Environment Stockholm Report", "1975 United Nations Environment Program (UNEP)", "1977 Tbilisi Declaration" and "1987 Brundlant (Our Common Future) Report". It was directly addressed in the 1992 Rio Declaration Climate Crisis Convention", "2005 Kyoto Protocol", "2015 Paris Climate Agreement" and "2022 United Nations Climate Change Conference" (Mitchell, 2003; Mitchell et al., 2020; Spycher & Winkler, 2022).

Both in the signed agreements and in the conferences held on the subject, it is frequently emphasized that combating the global climate change problem cannot be achieved only through legal measures and that young generations should also be educated about global climate change (Kwauk, 2020; Urbańska et al., 2022). One of the aims of the training to be carried out is to increase the awareness level of students on the subject. It is thought that, through training to raise awareness about global climate change, the negative consequences caused by the problem can be largely stopped or reduced (Boeve-de Pauw & Van Petegem, 2011), and students will be willing to produce long-term solutions on the issue (Mochizuki & Bryan, 2015).

In Turkey, issues related to global climate change are tried to be introduced to students within the scope of the "Social Studies" course at the secondary school level. In 2022, "Teaching Fields, Appointment and Teaching Principles" was updated by the Head Council of Education and Morality (MoNE, 2022) a course titled 'Environmental Education and Climate Change' was added to the courses to be taught by social studies teachers (MoNE, 2022). In this context, social studies teachers are expected to be knowledgeable and to have high awareness about global climate change, which is thought to be directly proportional to their professional development as well as the quality of the education they receive at the university. The environmental knowledge, skills, attitudes, values and awareness that teachers acquire during their university education will also affect the awareness of the students they will educate. For this reason, it is believed that teachers and teacher candidates who will educate future generations should have high levels of global climate change awareness (Fortner, 2001). In the literature review on the subject, it was seen that there are studies on global climate change awareness of teachers and teacher

candidates (Eze, 2020; Khalidi & Ramsey, 2021; Tok & Cebesoy, 2017; Ünal & Önder, 2022). However, no study has been found that addresses the global climate change awareness of teacher candidates who will be the instructors of the social studies course, which has a different place from other branches regarding global climate change. Considering the fact that the subject of global climate change is included in the newly added "Environmental Education and Climate Change" course and the Social Studies course, the absence of such a study in the literature shows the importance of this study.

### **Purpose of the Study**

It is thought that determining social studies teacher candidates' awareness of global climate change and the factors causing this awareness during their education will affect the quantity and quality of the further education to be given to teacher candidates on global climate change. In the long term, it is expected that the awareness of climate change as a global problem will increase and precautions will be taken. For this reason, the aims of the study were determined as to examine the global climate change awareness levels of social studies teacher candidates and their opinions as to the variables that affect their global climate change awareness. Within the scope of the research, answers were sought to the following problems:

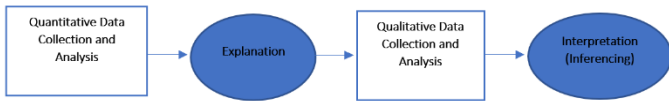
- What is the level of global climate change awareness of social studies teacher candidates?
- Does social studies teacher candidates' awareness of global climate change vary according to gender, grade, and following printed and visual publications?
- Do the opinions of social studies teacher candidates whose global climate change awareness levels are high also support this awareness?

### **Method**

#### **Research Model**

In this research, a mixed research method was preferred in order to deeply examine the participants' perspectives on the global climate change awareness of social studies teacher candidates. In mixed research methods, explanatory sequential design constituted the research pattern. The explanatory sequential design is based on starting with the quantitative phase and then conducting a qualitative study to explain the quantitative results (Creswell, 2021). For this reason, the research was conducted by taking the following steps into consideration (Figure 1):

1. Quantitative data were collected and analyzed.
2. Qualitative questions were created in line with the results obtained.
3. Interviews were conducted to explain the quantitative results.
4. Qualitative data was analyzed.
5. Interpreted by explaining the qualitative results and the quantitative results.



**Figure 1.**  
*Data Collection Processes*

**Study Group**

Convenience sampling method was used to determine the participants. 357 social studies teacher candidates studying at 3 state universities in the Central Anatolia Region constitute the study group of the quantitative and qualitative part of the research. Quantitative data were collected from 357 social studies teacher candidates, and after the quantitative data were analyzed, 20 teacher candidates were selected from the same group on a voluntary basis and interviewed. Convenience sampling is expressed as a sampling type preferred in cases where it is close to the researchers and easy to access and other sampling types cannot be used (Baltacı, 2018).

**Data Collection Tool**

“Global Climate Change Awareness Scale”, “Semi-Structured Interview” and “Personal Information Form” were used as data collection tools.

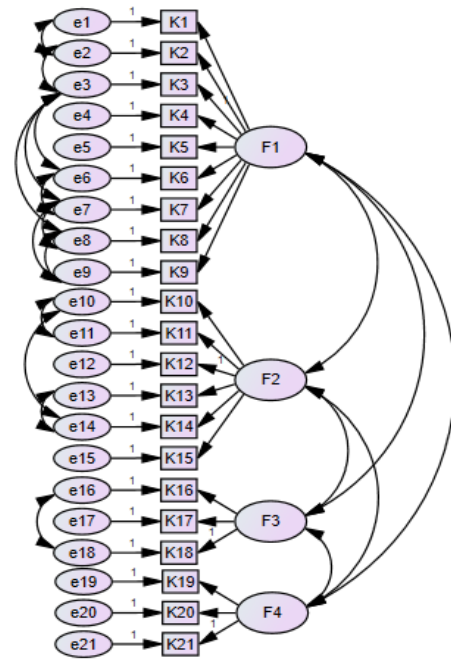
The ethical process in the study was as follows:

- Ethics committee approval was obtained from Niğde Ömer Halidemir University University Ethics Committee (Date: 29.11.2022, Number: E-86837521-050.99-285534)
- Informed consent has been obtained from the participants.

**Global Climate Change Awareness Scale**

The "Global Climate Change Awareness Scale" developed by Deniz et al. (2021) was used to determine the global climate change awareness levels of social studies teacher candidates. In the exploratory factor analysis conducted by the researchers, the KMO value was found to be .866, the Bartlett Sphericity test was found to be significant, and a scale consisting of 21 items and 4 factors was obtained. The Cronbach Alpha coefficient calculated to determine the internal consistency of the scale was found to be reliable

with .826. In the confirmatory factor analysis, CMIN/sd, AGFI, IFI, CFI and RMSEA values showed perfect fit. It was determined that GFI and SRMR values showed acceptable compliance.



**Figure 2.**  
*Confirmatory Factor Analysis*

According to confirmatory factor analysis, the values of AGFI (.90), NFI (.90) and GFI (.92) were calculated to be at an acceptable fit level, while the values of  $X^2/df$  (1.66), IFI (.96) and CFI (.95) were found to be at good fit level.

Table 1 shows the compliance measurement values stated by Schermelleh-Engel and Moosbrugger (2003).

**Table 1.**  
*Compliance Measurement Values*

Compliance Measures	Good Fit Values	Acceptable Fit Values
$X^2/df$	<3	$3 < (X^2/df) < 5$
IFI	.95 < IFI < 1.00	.90 < IFI < .95
GFI	.95 < GFI < 1.00	.90 < GFI < .95
AGFI	.90 < AGFI < 1.00	.85 < AGFI < .90
NFI	.95 < NFI < 1.00	.90 < NFI < .95
CFI	.95 < CFI < 1.00	.90 < CFI < .95

**Personal Information Form**

The personal information form created in the research includes the variables "Gender, grade level, whether students have taken an environmental education course, and whether students follow visual and printed publications on the environment".

### Semi-Structured Interview Form

In the qualitative section of the research, a semi-structured interview form was prepared as to social studies teacher candidates' awareness of global climate change. While preparing the semi-structured interview form, first the relevant literature was examined and draft questions were prepared accordingly. Draft interview questions were presented to 2 faculty members who are experts in social studies education in order to obtain expert opinions. In line with expert opinions, the draft form was reshaped and presented to a faculty member working in Turkish education to determine compliance with grammar rules and difficult-to-understand expressions. A pilot application was conducted with two teacher candidates according to the final version of the semi-structured interview form.

### Data Analysis

#### Analysis of Quantitative Data

SPSS 21 and AMOS 24 package programs were used to analyze the data. After deleting extreme values from the scale, Skewness and Kurtosis values were examined to determine distribution normality. Skewness and Kurtosis values of the data obtained from the personal information form and the global climate change awareness scale were examined and it was determined that the values were within the range of  $-1.5/+1.5$ , which means that the data is normally distributed (Tabachnick & Fidell, 2013). Accordingly, parametric tests such as independent groups t-test and one-way analysis of variance (ANOVA) tests were used (Tanriverdi, 2019). One-way analysis of variance (ANOVA) was used for the grade level variable, and independent groups t-test was used for the variables of gender, whether students had taken an environmental education course, and whether they followed visual and printed publications on the environment. The Cronbach Alpha reliability coefficient of the global climate change awareness scale was calculated as .837.

#### Analysis of Qualitative Data

A semi-structured interview form was used for the qualitative data of the research. Semi-structured interview is defined as a data collection tool prepared to obtain detailed information by adhering to pre-prepared questions and to obtain the same type of information from different people (Yıldırım & Şimşek, 2021). In this research, a semi-structured interview form was directed to 20 teacher candidates studying in the department of social studies education and they were asked to answer it in a quiet environment. The participants' answers to the semi-structured interview form were transferred to the computer environment for analysis. Content analysis method was used to analyze the data. Content analysis is expressed as a systematic technique that helps to make

inferences in order to determine human behavior and nature (Boyrac & Tepe, 2019). Themes, categories and codes were created in line with the content analysis.

In the qualitative section of the research, the relevant literature was taken as a basis in the preparation of the data collection tool used to ensure its credibility, and utmost care was taken to be objective. To achieve transferability, the steps of the process are presented to the reader in detail and direct quotations are included. In order to check the consistency of the codes obtained during the analysis process, a different researcher was also asked to make an additional coding. To calculate the consistency of the coding made by two different researchers, the [Reliability=Consensus/(Consensus + Dissensus)] formula prepared by Miles and Huberman (1994) was used. The calculation concluded that there was a consistency between 92% and 96%. Finally, the data obtained in the research are stored by the researchers to ensure confirmability, which is external validity.

### Results

In this section, the findings obtained as a result of the analysis of the data are discussed under two headings: findings obtained from the quantitative and qualitative sections.

#### Findings from the Quantitative Section of the Research

The findings obtained from the quantitative part of the research are included in this section.

Table 2 includes the findings regarding the total mean scores of social studies teacher candidates regarding their global climate change awareness levels.

**Table 2.**

*Findings on Global Climate Change Awareness Levels of Social Studies Teacher Candidates*

Global Climate Change Awareness Scale	n	$\bar{x}$	Level
Total Score Average	360	3.54	I agree

In calculating the arithmetic mean scores of the answers given by social studies teacher candidates to the questions on the global climate change awareness scale, a 5-point likert type from "Very Low (Strongly Disagree) ( $1.00 < \bar{x} \leq 1.80$ )" to "Low (Disagree) ( $1.81 < \bar{x} \leq 2.60$ )", "Medium (Undecided) ( $2.61 < \bar{x} \leq 3.40$ )", "High (Agree) ( $3.41 < \bar{x} \leq 4.20$ )" and "Very High (Strongly Agree) ( $4.21 < \bar{x} \leq 5.00$ )" was used. In line with the data obtained, it can be interpreted that the total score average of social studies teacher candidates obtained from the global climate change awareness scale is at a high level ( $\bar{x}=3.54$  (I agree) ( $3.41 < \bar{x} \leq 4.20$ ). Based on this finding, it can be stated that social studies teacher candidates' global climate change

awareness is high.

Table 3 includes the findings regarding the global climate change awareness levels of social studies teacher

candidates according to the gender variable.

**Table 3.**

*Independent T-Test Results on Global Climate Change Awareness Levels of Social Studies Teacher Candidates in terms of Gender*

Gender	n	$\bar{x}$	Ss	sd	t	p
Female	262	3.56	.564	358	1.172	.242
Male	98	3.48	.551			

When Table 3 is examined, it can be seen that no statistically significant difference was detected between the global climate change awareness levels of social studies teacher candidates in terms of gender variable. [ $t_{(358)}=1.172$ ;  $p > .05$ ]. Based on this finding, it can be asserted that

gender does not affect the global climate change awareness levels of social studies teacher candidates.

Table 4 presents the findings regarding the global climate change awareness levels of social studies teacher candidates according to the grade level variable.

**Table 4.**

*One-Way ANOVA Results on Global Climate Change Awareness Levels of Social Studies Teacher Candidates in terms of Grade*

Grade	n	$\bar{x}$	Ss	VK	KT	sd	KO	F	p
1 <sup>st</sup> Grade	100	3.60	.580	Between Groups	1.353	3	.451	1.439	.231
2 <sup>nd</sup> Grade	107	3.53	.527	Within Groups	111.570	356	.313		
3 <sup>rd</sup> Grade	93	3.45	.570	Total	112.923	359			
4 <sup>th</sup> Grade	60	3.58	.561						
Total	357	3.54	.560						

It is seen that there is no statistically significant difference global climate change awareness levels of social studies teacher candidates [ $F_{(3-356)}=1.419$ ,  $p > .05$ ] in terms of the grade levels they study at. As a result, it can be claimed that the grade levels at which social studies teacher candidates' study have no effect on their global climate change awareness levels.

Table 5 presents the findings regarding the global climate change awareness levels of social studies teacher candidates according to the variable of their following of visual publications.

**Table 5.**

*Independent T-Test Results Regarding the Global Climate Change Awareness Levels of Social Studies Teacher Candidates in terms of the Variable of Following Environmental Visual Broadcasts on the Environment*

Following visual broadcasts on the environment	n	$\bar{x}$	Ss	sd	t	p
Yes	243	3.59	.564	358	2.771	.006*
No	117	3.42	.536			

\* $p < .05$

Table 5 shows that there is a statistically significant difference between social studies teacher candidates' global climate change awareness levels in terms of the variable of following visual publications on the environment. [ $t_{(358)}=2.771$ ;  $p < .05$ ]. Considering this finding, it can be expressed that visual content publications are effective in the global climate change awareness levels of social studies teacher candidates.

Table 6 presents the findings regarding the global climate change awareness levels of social studies teacher candidates according to the variable of their following of printed publications.

**Table 6.**

*Independent T-Test Results Regarding the Global Climate Change Awareness Levels of Social Studies Teacher Candidates in terms of the Variable of Following Environmental Printed Publications on the Environment*

Following printed publications on the environment	n	$\bar{x}$	Ss	sd	t	p
Yes	112	3.66	.530	358	2.752	.006*
No	248	3.48	.537			

\* $p < .05$

Table 6 shows that there is a statistically significant difference between social studies teacher candidates' global climate change awareness levels in terms of the variable of following printed publications on the environment. [ $t_{(358)}=2.752$ ;  $p < .05$ ]. Accordingly, it can be stated that printed publications are effective in social studies teacher candidates' awareness of global climate change.

### Findings from the Qualitative Part of the Research

In the findings section of the research, the data were presented in the form of categories, themes and codes the opinions of social studies teacher candidates regarding their global climate change awareness were tried to be determined.

The participants were first asked: "What kind of impact do you think global climate change has on the natural and human environment you live in? Explain." The codes and categories in Table 7 were obtained based on the replies to the question.

**Table 7.**

*Opinions of Social Studies Teacher Candidates Regarding the Effects of Global Climate Change on The Natural and Human Environment*

Category	Theme	Code	f
Impact on the environment	What might happen as a result of global climate change	Melting glaciers	8
		Extreme temperatures	8
		Drought	7
		Forest fires	7
		Change in seasonal periods	6
		Increase in epidemics	4
		Migrations	4
		Global warming	3
		Excessive rainfall	3
		Deforestation	3
		Famine	3
		The extinction of species or the decrease in biodiversity	3
		Increase in the amount of acid in ocean waters	3
		Wars	3
		Floods	2
		Increase in ocean water levels	2
		<b>Total:</b>	

When the data in Table 7 is examined, it is seen that the participants' opinions on the effects of global climate change on the natural and human environment are diverse. As a result of the analysis of the question posed to the

participants, the codes in Table 7, the theme of "What may occur as a result of global climate change" and the category of "Impact on the Environment" were reached. Accordingly, the fact that the participants mostly expressed the consequences that are likely to be experienced as a result of global warming instead of the consequences that may be experienced as a result of global climate change shows that they experienced conceptual confusion. In response to the question, the participant nicknamed F2 stated, "Forest fires occurred in our country due to drought and extreme heat caused by global climate change. Especially in the fires that occurred last year, many forest areas burned. Living creatures became extinct." The participant M8 asserted "The melting of glaciers and the increase in ocean water levels as a result of global warming caused by global climate change negatively affect the order of the natural and human environment."

The second question to the participants was "Are you informed about the agreements and organizations regarding the prevention of global climate change?" In reply to the question, the categories and codes in Table 8 were obtained.

**Table 8.**

*Opinions of Social Studies Teacher Candidates on the Agreements and Organizations Regarding the Prevention of Global Climate Change.*

Code	Theme	Code	f		
International Treaty	Measures	Kyoto Protocol	10		
		Paris Climate Agreement	3		
		UN Framework Convention on Climate Change (UNFCC)	2		
		Rio Convention	1		
		Intergovernmental Panel on Global Climate Change	1		
		<b>Total:</b>			<b>17</b>

When the data in Table 8 is examined, it is seen that the participants' opinions on the agreements and organizations regarding the prevention of global climate change are not at a sufficient level. As a result of the analysis of the question posed to the participants, the codes in Table 8, the theme "Precautions" and the category "International Agreements" were reached. Accordingly, it appears that the participants have insufficient knowledge about agreements and organizations regarding the prevention of global climate change. The participant F8 expressed her opinion through the following statement; "As far as I know, the purpose of the Framework Convention on Climate Change is to ensure that the amount of greenhouse gases in the atmosphere is kept constant in a way that does not pose a danger to the climate system. The purpose of the

Kyoto Protocol is to reduce the greenhouse gas emissions of industrialized countries." The participant M9 stated; "I don't have much information. But I know that the Kyoto Protocol was signed to reduce greenhouse gas emissions. However, countries such as America do not comply with this protocol, and other countries also violate the articles of the protocol using this situation as an excuse."

The third question to the participants was, "What are the issues that cause global climate change according to printed and visual publications? Please explain." and the themes, categories and codes in Table 9 were reached.

**Table 9.**

*Opinions of Social Studies Teacher Candidates on the Issues That Cause Global Climate Change*

Category	Theme	Code	f
Causes	Causes global climate change	Fossil fuels	16
		Greenhouse gas	14
		Forest fires and destruction	10
		Depletion of the ozone layer	7
		Global warming	5
		Chemical wastes	3
		Industrial activities	3
		Deodorants	3
		Rapid population growth	2
		Formation of urban heat islands	1
		Increase in carbon footprint	1
<b>Total:</b>			<b>65</b>

When the data in Table 9 is examined, it is seen that the participants' opinions on the issues that cause global climate change are diverse. As a result of the analysis of the participants' replies, the codes in Table 9, the theme "Causes of global climate change" and the category "Causes" were reached. Based on the answers given by the participants, it was concluded that harmful gases that mostly enter the air affect global climate change more. Participant F12 revealed her opinion on the issue by saying; "We can consider the most important cause of global climate change as human-induced activities. These activities can be listed as the burning of fossil fuels, especially coal, the increase in greenhouse gas emissions and the resulting increase in the rate of carbon dioxide in the atmosphere." The participant M6 stated "The depletion of ozone layer due to the excessive use of fossil fuels and chemicals such as oil, natural gas, perfume and deodorant is among the factors causing global climate change." and underlined the effect of ozone layer depletion.

The fourth question was asked to the participants: "Is there a relationship between global climate change and energy consumption? Please explain." and the themes, categories and codes in Table 10 were obtained.

**Table 10.**

*Social Studies Teacher Candidates' Views on the Relationship Between Global Climate Change and Energy Consumption*

Category	Theme	Code	f
Energy consumption	The effect of increasing energy consumption on global climate change	Increase in greenhouse gas emissions due to excessive use of fossil fuels	10
		Increasing use of fossil fuels with the increase in industrial activities	6
		Increasing energy consumption with rapid population growth	5
		Changes in energy consumption rates with changing seasonal periods	3
		<b>Total:</b>	<b>24</b>

When the data in Table 10 is examined, it is understood that the participants' have diverse opinions on the relationship between global climate change and energy consumption. As a result of the analysis of the question posed to the participants, the codes in Table 10, the theme "The impact of increasing energy consumption on global climate change" and the category "Energy consumption" were reached. When the data in Table 10 is examined, it is seen that the participants' opinions on the relationship between global climate change and energy consumption are limited. The participant F1 presented her opinion on the issue with these words; "Our energy consumption is increasing due to the increasing world population day by day. For this reason, renewable energy sources should be used instead of fossil fuels." Emphasizing the role of industrialization, the participant F12 stated, "With industrialization, excessive consumption of fossil fuels such as coal, oil and natural gas and greenhouse gas emissions in the atmosphere increase uncontrollably, negatively affecting global climate change."

The fifth and final question to the participants was, "What are the personal measures you have taken to combat global climate change? Please explain." and the themes, categories and codes in Table 11 were obtained.

**Table 11.**

*Opinions of Social Studies Teacher Candidates Regarding the Measures They Personally Take to Combat Global Climate Change*

Category	Theme	Codes	f
Personal precautions	In the fight against global climate change	Using public transportation	12
		Using energy-saving products	7
		Reducing deodorant use	6
		Not throwing garbage into the environment	6
		Protecting green areas and planting trees	5
		Saving water	2
		Using recycle bins	2
<b>Total:</b>			<b>40</b>

The data in Table 11 shows that the participants' opinions on the measures they personally take to combat global climate change are diverse. As a result of the analysis of the question posed to the participants, the codes in Table 11, the theme of "Combating global climate change" and the category of "Personal precaution" were reached. Considering the data in Table 11, it can be stated that the participants' opinions on the relationship between global climate change and energy consumption are limited. Also, it can be seen that the opinions of the participants regarding the measures they personally take to combat global climate change are diverse but not sufficient. The participant F10 asserted, *"I try to be very careful about drought, which is one of the consequences of global climate change. I take care not to let the tap water flow in vain."* And underlined the importance of water. Approaching the issue with a broader perspective, the participant F13 said, *"I am careful not to use more perfume than necessary, I do not throw away my garbage in the environment, I protect the green areas, I take care not to let the tap water flow in vain. I attach importance to recycling."*

### Mixed Findings

This section of the research includes findings on blending the data obtained from quantitative and qualitative analyses according to the mixed research design. It was determined that social studies teacher candidates have a high level of global climate change awareness. The fact that social studies teacher candidates explain the effects of global climate change on the natural and human environment and the precautions they take against global climate change also supports the finding that their global climate change awareness is high. However, the fact that

social studies teacher candidates explain the relationship between global climate change and energy consumption only as increasing population, fossil fuels and industrial activities is seen as insufficient compared to their global climate change awareness levels. This finding also explains why social studies teacher candidates' global climate change awareness is not at a "Very High" level. When social studies teacher candidates' global climate change awareness is considered according to gender and class variables, it was determined that there was no statistically significant difference. The qualitative findings also show that the gender and class of social studies teacher candidates do not have any effect on their global climate change awareness. In the qualitative section, the fact that social studies teacher candidates state the factors causing global climate change in these publications supports and explains the quantitative findings.

### Discussion

The results obtained based on the findings are discussed in this section of the study, which aims to reveal the global climate change awareness levels of social studies teacher candidates and their views on global climate change. Firstly, the average of the total score of the teacher candidates, who were determined as the study group, from the global climate change awareness scale and the range of this score were examined. Accordingly, it was concluded that social studies teacher candidates' awareness of global climate change is at a high level. This result is similar to that of other studies on the subject in the literature (Ay & Yalçın-Erik, 2020; Beasy et al., 2023; Howard-Jones et al., 2021; Romero Aliza et al., 2021). Based on the results, teacher candidates were asked about the effects of global climate change on the natural and human environment. It was determined that social studies teacher candidates expressed answers such as "melting of glaciers, extreme heat and drought, forest fires, seasonal changes, excessive rainfall, extinction of living things" as the effects of global climate change. In addition, it was observed that teacher candidates expressed the importance of "using public transportation, using energy-saving products, reducing the use of deodorant, not polluting the environment, protecting green areas, forestation, saving water and using recycling bins" as the precautions they personally took in the fight against global climate change. In the relevant literature (Salo & Nissinen, 2017; Tolppanen & Kärkkäinen, 2021; Wynes & Nicholas, 2017) it is understood that teacher candidates emphasize that individual measures to be taken will be effective in reducing climate change. The answers given by the participants also support the conclusion that their awareness of global climate change is high. However, it is thought that teacher candidates'



explanation of the relationship between global climate change and energy consumption in terms of only increasing population, fossil fuels and industrial activities is insufficient compared to their global climate change awareness levels.

It is seen that social studies teacher candidates mostly include extreme temperatures or global warming in their answers to the results of global climate change. It is noteworthy that none of the participants stated that global climate change causes extreme cooling. This situation shows that social studies teacher candidates have insufficient knowledge of the subject and also have misconceptions. This result coincides with results of several studies in the literature (Güler et al., 2020; Matkins & Bell, 2007; Michail et al, 2007; Papadimitriou, 2004; Seroussi et al., 2019).

When social studies teacher candidates' awareness of global climate change was considered in terms of gender, it was determined that there was no statistically significant difference. The fact that global climate change awareness is more related to the affective field rather than the characteristics attributed to the individual from birth may explain this result. The results of several studies in the literature (Ambusaidi et al., 2012; Ay & Erik, 2020; Aydın, 2010; Eroğlu & Aydoğdu, 2016) also support this result.

When the global climate change awareness levels of social studies teacher candidates are examined according to the variable of the grade level, it is seen that there is no statistically significant difference between the grades. This result is similar to the result of the study conducted by Karadağ and Acar (2020). The fact that the majority of teacher candidates, regardless of grade, agreed on the Kyoto Protocol answer to prevent global climate change indicates that the subject was learned from different sources rather than course content at grade levels. In this context, it is thought that issues related to global climate change should be addressed in various course contents in social studies teaching departments.

### Conclusion and Recommendations

It was concluded that a statistically significant difference existed between the global climate change awareness of social studies teacher candidates in favor of the teacher candidates who follow printed publications and visual broadcasts. Based on this result, it can be claimed that printed publications and visual broadcasts have a positive impact on teacher candidates' awareness of global climate change. When the social studies teacher candidates were asked learned about the issues from printed publications and visual broadcasts, they mentioned "fossil fuels, greenhouse gases, forest fires, global warming, chemical waste and population growth" as the factors that were claimed to cause global climate change in printed

publications and visual broadcasts. It can be stated that these results support the conclusion obtained from the quantitative findings.

In line with the above-mentioned results, the following recommendations can be made:

- In order for social studies teacher candidates to have a "Very High" level of global climate change awareness, materials such as documentaries, short films and research articles on the subject can be included in the courses.
- "Today's World Problems" course, which was previously a compulsory course, can be taught as compulsory in the Social Studies Teaching program again.
- Considering the impact of printed publications and visual broadcasts on global climate change awareness, such publications can be included in course content.
- Social studies teacher candidates' awareness about preventing global climate change can be raised.

**Ethics Committee Approval:** Ethics committee approval was obtained from Niğde Ömer Halidemir University University Social and Humanitarian Ethics Committee (Tarih: 29.11.2022, Sayı: E-86837521-050.99-285534)

**Informed Consent:** Written informed consent was obtained from participants who participated in this study.

**Author Contributions:** Concept-AÖ-TGİ-KY; Design-AÖ-TGİ-KY; Supervision-AÖ-TGİ-KY; Resources- AÖ-TGİ-KY; Data Collection and/or Processing- AÖ-TGİ-KY; Analysis and/or Interpretation-AÖ-TGİ-KY; Literature Search-AÖ-TGİ-KY; Writing Manuscript-AÖ-TGİ-KY; Critical Review- AÖ-TGİ-KY;

**Conflict of Interest:** The authors have no conflicts of interest to declare.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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