

## EXPLORING PRE-SERVICE TEACHERS' EXPERIENCES OF ENGAGING IN SUSTAINABLE ENVIRONMENT: A TURKEY-ITALY eTWINNING PROJECT

### COMPROMISO EN SOSTENIBILIDAD POR PARTE DE DOCENTES EN FORMACIÓN: UN PROYECTO eTWINNING ENTRE TURQUÍA E ITALIA

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#### **Abstract:**

The research initially delves into the outcomes of an international eTwinning project focused on heightening awareness among future primary school teachers about the causes and consequences of climate change within the framework of sustainable environmental education<sup>1</sup>. Employing qualitative research methodologies, the investigation took the form of a case study. The participant group consisted of 13 pre-service teachers studying at Mersin and Balıkesir Universities in Turkey as well as the University of Palermo in Italy in the academic year 2021-2022. Researchers utilized a semi-structured interview format crafted specifically for the study. The objectives encompassed enhancing the understanding of pre-service teachers regarding sustainable environmental education, fostering their familiarity with eTwinning to enable cross-cultural interaction with other European pre-service teachers. Furthermore, emphasis was placed on elevating pre-service teachers' awareness about foreign language utilization and the integration of information and communication technology (ICT)<sup>2</sup>.

**Keywords:** pre-service primary school teachers; eTwinning; sustainable development; environmental education.

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<sup>1</sup> This eTwinning project was awarded in the ITE teacher training category in 2022 +by the General Directorate of Innovation and Educational Technologies of the Ministry of National Education in Turkey.

<sup>2</sup> A brief summary of this research was presented as an abstract at the 6<sup>th</sup> International Symposium of Education and Values (ISOEVA-2022) held on October 27-30, 2022, in Kemer, Antalya, Turkey.

**Resumen:**

La investigación profundiza inicialmente en los resultados de un proyecto internacional eTwinning centrado en concienciar a los futuros docentes de primaria sobre las causas y consecuencias del cambio climático en el marco de la educación ambiental sostenible<sup>3</sup>. Empleando metodologías de investigación cualitativas, la investigación tomó la forma de un estudio de caso. La cohorte participante estuvo compuesta por 13 futuros profesores matriculados en las universidades turcas de Mersin y Balıkesir, así como en la Universidad italiana de Palermo durante el año académico 2021-2022. Los investigadores utilizaron un formato de entrevista semiestructurada elaborando específicamente para el estudio. Los objetivos abarcaban mejorar la comprensión de los maestros en formación sobre la educación ambiental sostenible, fomentando su familiaridad con eTwinning para permitir la interacción intercultural con otros futuros docentes europeos. Además, se hizo hincapié en aumentar la conciencia de los futuros docentes sobre la utilización de lenguas extranjeras y la integración de las tecnologías de la información y la comunicación (TIC)<sup>4</sup>.

**Palabras clave:** maestros de Educación Primaria en formación; eTwinning; desarrollo sostenible; Educación ambiental.

**1. Introduction**

The term 'sustainable development' gained global significance following the *Our Common Future* report by the World Commission on Environment and Development (WCED) in 1987. Defined by the United Nations, this principle revolves around utilizing natural resources to fulfill present needs while ensuring their prudent management and conservation to meet the needs of future generations (Imperatives, 1987). Sustainable development epitomizes a harmonized approach encompassing environmental, social, and economic dimensions (Arslan, 2018). The significance of this concept arises from the imperative need to use resources efficiently and judiciously in a world constrained by limited natural resources.

Striking a balance between economic growth, social well-being, and environmental protection underscores the crucial importance of sustainable development in catering to the future generations' requirements (Langhelle, 1999). The holistic nature of sustainable development necessitates an approach that transcends mere economic progress, encompassing social and environmental dimensions. In line with this, the objectives outlined in the United Nations' 2030 Sustainable Development Agenda (2015) address pivotal concerns like eradicating poverty, lessening disparities, ensuring access to clean water and sanitation, and tackling climate change. Sustainable development entails a delicate equilibrium between averting environmental degradation, conserving natural resources, fostering social equity, and promoting economic growth—a fundamental prerequisite for the sustained well-being and longevity of humankind (Öztürk, 2017). Since the turn of the 21<sup>st</sup> century, nations across the globe have been collectively striving to advance sustainable development and foster a sustainable environment, endeavoring to secure the well-being of current and future generations. This has contributed to the growing prominence of the term 'sustainable environment' within the field of educational sciences.

<sup>3</sup> Este proyecto eTwinning fue premiado por el Ministerio de Educación Nacional, Dirección General de Innovación y Tecnologías Educativas de Turquía en la categoría de formación docente ITE en el año 2022.

<sup>4</sup> Un breve resumen de esta investigación se presentó en el VI Simposio Internacional sobre Educación en Valores (ISOEVA-2022 celebrado del 27 al 30 de octubre de 2022 en Kemer, Anatolia, Turquía.

### 1.1 An eTwinning project on climate change and sustainability

The recent global Covid-19 pandemic has vividly highlighted the interconnection between our quality of life, health, the habitats of all living beings, and the environment. Our casual and rapid consumption of natural resources is swiftly altering ecosystems, leading to issues such as global warming, climate change, desertification, drought, increased natural disasters, pollution, and the spread of global viruses. These signs indicate that without appropriate measures, living conditions on our planet will progressively worsen (Turkey Environmental Report, 2020, p.11).

Climate change stands as a paramount global challenge. It encompasses not only ecological occurrences but also significantly affects various facets of life such as the economy, energy, industrial investments, social structure, and legal frameworks. The excessive reliance on fossil fuels, deforestation, and the accumulation of greenhouse gases in the atmosphere disrupts its chemical equilibrium, resulting in global warming and subsequent climate change due to the greenhouse effect. This shift is prompting a transition from conventional models of endless growth and consumption towards sustainable and balanced development models—specifically, green economy and policies (Republic of Turkey Ministry of Environment, 2012).

Addressing climate change necessitates a comprehensive approach. Efforts focused on sustainable development are imperative. Education in sustainable development alters individuals' perspectives on the environment, creating a safer, healthier world and enhancing overall quality of life. This educational approach fosters awareness, critical thinking, and empowers individuals to explore novel concepts and devise innovative methods and tools (Keleş, 2007).

In particular, three actions in the field of education and training stand out in the Green Consensus (European Commission, 2019): 1. Preparation of a European competence framework that will help develop and evaluate knowledge, skills and attitudes on climate change and sustainable development. 2. Providing Member States with new financial resources to make school buildings and operations more sustainable. 3. Updating the Skills Agenda and the Youth Guarantee Program to increase employability in the green economy.

It is known that irresponsible environmental behavior lies at the root of many environmental problems. Therefore, the biggest aim of *environmental education* should be to raise sensitive people who show responsible environmental behavior (Aydın et al., 2011). In particular, UNESCO sees teachers as the main key to sustainable development and states that teachers' qualifications should be given importance. In this way, the United Nations' 2030 Sustainable Development Goals were born. The roadmap to achieve the education target adopted in November 2015 guides governments and partners on how to translate commitments into action. Many of the 17 Sustainable Development Goals also have educational elements in their goals. Education is a human right and a force for sustainable development and peace.

Every goal on the 2030 Agenda requires education to empower people with the knowledge, skills and values to live with dignity, build their lives and contribute to their communities. The roadmap to achieve this is the *Education 2030 Framework for Action* (FFA, <https://en.unesco.org/node/265600>). The target audience for this document is *teacher education* professionals, education professionals, teacher support workers and other professional development providers. In this report teachers' development should be accepted as a *lifelong learning process* rather than a one-time element. In this context, it is very important for teachers to have the necessary competencies to include ICT in their professional practice, to ensure that education is equal and qualified. Teacher competencies include the ability to manage knowledge, structure problems, and integrate open-ended software tools and subject-

specific practices with student-centered teaching methods and collaboration projects to support students' in-depth understanding<sup>5</sup>.

According to the 2013 OECD International Education and Training Survey, TALIS report, in order to prepare prospective teachers for their careers in the most effective way possible, pre-service training takes into account the integration of three key components: academic knowledge of the subjects to be taught; teaching theory, including teaching skills, support for students during training; and hands-on classroom experience that allows candidates to deal with everyday issues in education and to manage classrooms in a variety of situations (OECD, 2014). As stated in the *Assessment & Teaching of 21<sup>st</sup> Century Skills* report, the new curriculum should go further to include skills such as collaboration and digital literacy that will prepare students for 21<sup>st</sup> century employment.

In this context, the European Parliament and the Council of the European Union adopted the *Recommendation on Key Competences for Lifelong Learning* (2018). Such document stresses the importance of facilitating mutual learning among member states and recommends cooperation with them. Besides, the report underlines the importance of frameworks for specific competences to facilitate their development and evaluation where necessary, evidence-based guidance material on new forms of learning and supportive approaches, support tools such as online training courses, self-assessment tools, eTwinning for education staff and other stakeholders, initiatives to further develop and promote education for sustainable development in line with UN Sustainable Development Goal 4 on inclusive and equitable education and lifelong learning opportunities. In this context, while eTwinning recognizes the existence of a variety of international frameworks, as well as the wealth of national frameworks that are significantly dependent on the circumstances and culture of each country, it uses the key competences concept of the European Union as a reference point. eTwinning encourages the formation of school teams to support the development of projects involving collaborative education and a cross-curricular approach. It provides the necessary time and space for them to develop pedagogical competences such as technology-enriched education, content and language integrated learning, international cooperation, and project-based learning<sup>6</sup>.

The evolving landscape of education necessitates a reinvigorated emphasis on a spectrum of skills beyond the conventional roles embedded within the profile of a 21<sup>st</sup>-century educator. UNESCO (2020) underscores the pivotal significance of teachers cultivating an array of competences such as cultural acumen, effective communication, critical thinking, and problem-solving abilities. Within this context, the enhancement of Initial Teacher Education (ITE) quality emerges as a global imperative (Korthagen et al., 2006). Responsive teacher education programs play a foundational role in fortifying and refining ITE initiatives. Herein lies the critical role of eTwinning within the realm of teacher education. Originating under the aegis of the European Commission's e-learning program and later extending through the Erasmus+ program, eTwinning serves as a platform that facilitates international collaborative prospects. Teachers utilize this platform to craft projects employing digital collaboration and seamlessly integrate these projects within the educational curriculum. When these initiatives are incorporated by universities in their educational faculties, they play a pivotal role in enhancing the pedagogical skills of prospective educators. The multifaceted advantages offered by eTwinning activities extend to educators, students, and aspiring teachers, encompassing realms such as fostering international cooperation, nurturing intercultural comprehension, promoting professional

<sup>5</sup>[http://yegitek.meb.gov.tr/meb\\_iys\\_dosyalar/2021\\_01/18130452\\_UNESCO\\_OYretmenlere\\_Yonelik\\_Bilgi\\_ve\\_YletiYim\\_Teknolojileri\\_Yegitim\\_Cercevesi.pdf](http://yegitek.meb.gov.tr/meb_iys_dosyalar/2021_01/18130452_UNESCO_OYretmenlere_Yonelik_Bilgi_ve_YletiYim_Teknolojileri_Yegitim_Cercevesi.pdf)

<sup>6</sup>[https://www.myk.gov.tr/images/articles/TYC/Yayinlar/Hayat\\_Boyu\\_Ogrenme\\_icin\\_Anahtar\\_Yletmeler\\_Tavsiye\\_Karari\\_2018.pdf](https://www.myk.gov.tr/images/articles/TYC/Yayinlar/Hayat_Boyu_Ogrenme_icin_Anahtar_Yletmeler_Tavsiye_Karari_2018.pdf)

development, honing communication skills, and addressing individual learning disparities (Başaran et al., 2020; Camilleri, 2016; Carpenter & Tanner, 2013; Crisan, 2016; Gajek, 2018; İzgi Onbaşılı et al., 2022; Velea, 2012). eTwinning activities not only serve as a directive for teachers and student educators but also encourage comprehensive exploration within the context of diverse projects. Universities are afforded the opportunity to equip future educators with the requisites for the modern era by elevating the quality of their teacher education programs through the integration of eTwinning and a critical review of their educator training policies.

With this study, the use of eTwinning was primarily aimed to increase the awareness of pre-service primary school teachers about the causes and effects of sustainable environment and climate change.

For this purpose, answers to the following problems and sub-problems were sought:

1. What are the opinions of pre-service teachers on global warming?
2. What are the opinions of pre-service teachers on climate change?
3. What are the opinions of pre-service teachers on sustainable environmental education?
4. What are the opinions of pre-service teachers about their involvement in the international eTwinning project on sustainable environmental education?

## **2. Methodology**

### **2.1 Research model**

This study constitutes a case study, a qualitative research approach aiming to offer an extensive portrayal of a limited system (Merriam, 2018) and to examine the impact of the relevant case (Yıldırım & Şimşek, 2014). Case studies serve as a widely applied research method across multiple disciplines like social sciences, business, education, health, and engineering. They are especially valuable in exploring intricate problems or seeking in-depth understanding. In a case study, the "case" denotes the specific subject or units chosen for comprehensive examination, be it events, groups, organizations, individuals, or processes. In this research, the "case" encompasses the pre-service classroom teachers participating in the eTwinning project. It delves into activities devised to heighten their awareness regarding global warming, climate change, and sustainable environmental education, analyzing the impacts on these pre-service teachers. Essentially, a case study serves as a roadmap guiding the researcher from the preliminary stages of formulating research questions to the ultimate stages of presenting findings related to those initial questions. It involves various intermediate stages like data collection and analysis (Yıldırım & Şimşek, 2014). Interviews were the means employed for data collection in this research.

### **2.2 Data collection tools**

Within the study, researchers utilized a qualitative data collection tool in the form of a semi-structured interview developed through Google Forms. Pre-service educators were requested to complete this interview form online. As outlined by Merriam (2018), semi-structured interviews provide a space for participants to articulate their perceptions and thoughts authentically. The data analysis employed the content analysis method, incorporating direct quotations extracted from participants' statements (Yıldırım & Şimşek, 2014). Prior to the analysis phase, the interview forms were labeled sequentially (P1, P2, P3...) and the responses were categorized under specific question headings. Themes were then identified in alignment with the research inquiries. The analysis process involved the generation of codes derived from the participants' responses, ultimately completing the analytical phase.

**2.2.1 Semi-structured interview form:** A semi-structured interview form developed by the researchers was used as a qualitative data collection tool in the study. Opinions were received from three academicians in the classroom teaching department for the content validity of the form. As a result of the expert opinion, it was stated that the questions were understandable and suitable for the purpose of the research. The open-ended questions prepared for the sub-problems within the scope of the study are as follows:

Table 1

*Open-ended questions directed to teacher candidates regarding the sub-problems of the research*

	Sub-problems	Interview questions
1	What are the opinions of pre-service teachers about global warming?	<ul style="list-style-type: none"> <li>• What do you think about global warming?</li> </ul>
2	What are the opinions of pre-service teachers about climate change?	<ul style="list-style-type: none"> <li>• What do you know about climate change?</li> <li>• What are the effects of climate change on natural disasters that have increased in our country and in the world in recent years?</li> <li>• Which Web 2.0 tools would you consider using when designing an activity on climate change?</li> </ul>
3	What are the opinions of pre-service teachers about sustainable environmental education?	<ul style="list-style-type: none"> <li>• What do you think about sustainable environmental education?</li> <li>• Write down three concepts of sustainable environmental education that come to mind.</li> </ul>
4	What are the opinions of pre-service teachers regarding their engagement in the international eTwinning project focused on the environment?	<ul style="list-style-type: none"> <li>• What are your thoughts on taking part in the eTwinning project as a prospective teacher? Has it contributed to you? (How did your digital competences affect you in terms of intercultural communication?) Please explain.</li> <li>• Which Web 2.0 tools did you use during the project? What Web 2.0 tools would you consider using when designing an event on climate change?</li> </ul>

### 2.3. Validity and reliability

The researchers utilized a computer to translate interview transcripts into a 50-page document. The qualitative information extracted from the interviews underwent scrutiny through the content analysis method. The goal of content analysis is to cluster interconnected data into themes, subsequently organizing and interpreting them to ensure reader comprehension (Yıldırım & Şimşek, 2006). In this research, data triangulation occurred through the utilization of interview questions and all activities devised by prospective teachers. Direct quotations from participant statements were integrated in alignment with the determined themes and codes within the interview data analysis. To uphold research validity, coders regularly convened, ensuring reliability. The formula proposed by Miles and Huberman (1994) measured the reliability among coders, resulting in a reliability score of 90. This study's findings were deemed dependable for the research.

## 2.4 Study group

The study group of this research was carried out with student teachers (pre-service teachers) studying in two universities in Turkey (University of Mersin and Balıkesir University) and one in Italy (University of Palermo) in the academic year 2021-2022. All 13 pre-service teachers are female. Participants are between the age of 20 to 23. The distribution of the participants by country and universities is presented in Table 2.

Table 2  
*The distribution of the participants*

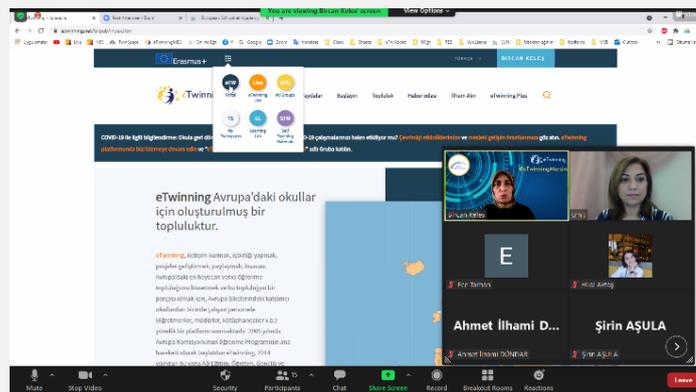
<i>Participants</i>	<i>Country</i>	<i>University</i>	<i>Class Grade</i>	<i>Age</i>	<i>Gender</i>
P1	Turkey	Mersin	3	20	F
P2	Turkey	Mersin	3	21	F
P3	Turkey	Mersin	3	22	F
P4	Turkey	Mersin	3	20	F
P5	Turkey	Mersin	4	22	F
P6	Turkey	Mersin	4	22	F
P7	Turkey	Balıkesir	3	20	F
P8	Turkey	Balıkesir	3	20	F
P9	Turkey	Balıkesir	3	20	F
P10	Turkey	Balıkesir	3	20	F
P11	Italy	Palermo	4	22	F
P12	Italy	Palermo	4	23	F
P13	Italy	Palermo	5	23	F

## 2.5 Research procedures

In Table 3 below, the stages and activities of the eTwinning project are given respectively.

Table 3  
*Tasks and their distribution regarding the research process*

<i>Tasks</i>	<i>Descriptions</i>
1.	Preparation For the project, the eTwinning provincial coordinator organized an information seminar about the portal. All prospective teachers learned how to use the eTwinning website.  Figure 1 <i>Information meeting with provincial coordinator</i>



2. Registration Each teacher trainer made pre-service teachers a member of the portal by getting approval from NSS.
3. Meetings Online meeting with project partners. Planning the project and assigning tasks

Figure 2  
Screenshot of the activities done on the TwinSpace of the project



4. Permission documents Permission documents were sent to pre-service teachers and asked to sign. Each teacher trainer collected the documents of their own country and forwarded them to the project coordinators.
5. Meeting with teachers All teacher trainers and pre-service teachers introduced themselves on this Padlet:  
[https://padlet.com/umitizgi1/Turkey\\_Italy\\_eTwinning](https://padlet.com/umitizgi1/Turkey_Italy_eTwinning)
6. Promotional videos of participating universities Each university's group prepared a video for the promotion of their university and shared it with each other on this Padlet:  
<https://padlet.com/ileniaingargiola/bz24ae0tcfao91a>
7. Project Logo Pre-service teachers prepared a logo for the project.

Figure 1  
Project logo selected by voting

		 <p>WHAT KIND OF WORLD DO WE WANT?</p>
8.	Meeting pre-service teachers	Pre-service teachers organized an online meeting by themselves and discussed the project.
9.	Activity 1	As mixed country teams, they researched the causes and consequences of the climate crisis and shared their research using Web 2.0 tools (trying to create different products such as posters, presentations, infographic tools).
1.	Activity 2	They created a chart or graph showing the changing climates the Earth has experienced since the Ice Age, as can be seen in this Padlet: <a href="https://padlet.com/seleneleotta/rjfx0jsnlkfi8pir">https://padlet.com/seleneleotta/rjfx0jsnlkfi8pir</a>
1.	Activity 3	<p>They attended face-to-face and online seminars with expert guests to raise awareness about nature and environmental protection.</p> <p>They watched different videos of the 5<sup>th</sup> European Climate Change Adaptation events (ECCA 2021) hosted virtually by the European Commission. They wrote reports about it and discussed it.</p> <p>ECCA:  <a href="https://www.youtube.com/channel/UC4TtWZytp-ShUzffnPOvzgw/videos">https://www.youtube.com/channel/UC4TtWZytp-ShUzffnPOvzgw/videos</a></p> <p>After this activity, each group researched videos and animations about global warming and climate change for primary school students in accordance with the primary school curriculum in their own country. Later, these videos were applied in primary schools as an activity.</p>
1.	Activity 4	<p>They attended the webinar “Climate Change and Digitalization in Europe”.</p> <p>Figure 2  <i>Webinar: Climate Change and Digitalization in Europe</i></p> 

1.	Activity 5	They made a digital story about preventing natural disasters around the world due to climate change. For this, they wrote the script, determined the Web 2.0 tools and created a digital story with voiceovers. The title of the story is "A Better World".
1.	Activities with pupils	They applied the digital stories and many activities they prepared with pupils in primary schools. They turned the activities with primary school students into video clips. See some examples on:  <a href="https://www.youtube.com/watch?v=B9d5ZuXoqDg&amp;t=2s">https://www.youtube.com/watch?v=B9d5ZuXoqDg&amp;t=2s</a> <a href="https://www.youtube.com/watch?v=goCz_wdlx6U&amp;t=2s">https://www.youtube.com/watch?v=goCz_wdlx6U&amp;t=2s</a>
1.	Final meeting and interview questions	They were asked to fill in open-ended questions with a Google form.

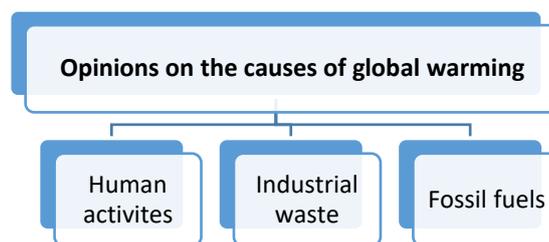
### 3. Findings

For this reason, the research tried to explore the experiences of participating in the eTwinning project *Sustainable Environment* by analyzing the answers of the participating pre-service teachers to the following questions: What do you think about global warming and climate change? What are your suggestions about climate change? What do you think about sustainable environmental education? What do you think about eTwinning projects? What Web 2.0 tools can you use in eTwinning projects? The interview questions were analyzed within the scope of the questions. The findings are presented in order under the headings.

#### 3.1 Pre-service teachers' opinions about global warming

Participants expressed their opinions on the *causes* of global warming under the following headings: *Human activities*, *industrial waste* and *fossil fuels*. Their opinions on the *consequences* of global warming are: for humanity (*hunger*, *water scarcity*, *water pollution*) and for nature (*fires*, *epidemics*, *earthquakes*, *storms*, *hurricanes*, *decrease in agricultural product varieties*). And their opinions on the *prevention* of global warming are *using renewable energy sources and reducing the use of fossil fuels*. There are some quotes about this below:

Figure 5  
Pre-service teachers' opinions on the causes of global warming



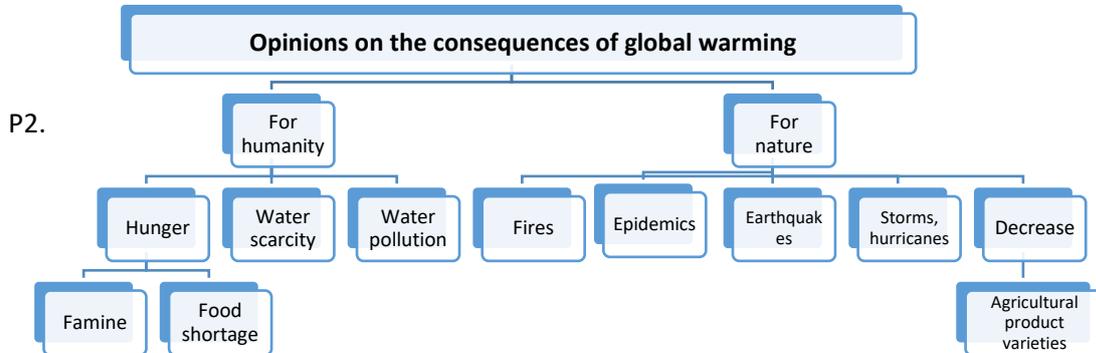
P6. *Global warming is increasing due to some uncontrolled activities of people. Our world is drifting towards an irreversible crisis. With people's efforts, we can make progress.*

P.10. *Global warming is the long-term heating of the Earth's climate system observed since the pre-industrial period due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in the Earth's atmosphere.*

Regarding the causes of global warming, participants emphasized that the main factors contributing to global warming are human activities, industrial waste and fossil fuels. They

expressed concern about the irreversible crisis that the world is approaching due to uncontrolled activities and emphasized that this issue should be addressed urgently.

Figure 6  
Pre-service teachers' opinions on the consequences of global warming



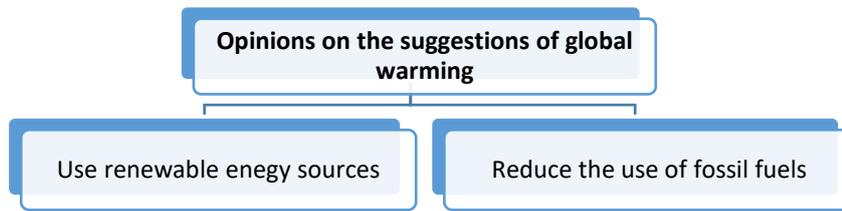
*Global warming poses a serious threat to both human life and the natural environment. In order to reduce the effects of global warming, some duties fall on people.*

*P12. Of course, we live and know the frightening consequences of global warming. However, while working on this subject, I realized that I still have my shortcomings. We continue to cause global warming. In the process of teaching this subject, I should not be one of the people who continue to cause. Unfortunately, while global warming continues rapidly, it creates new causes and consequences apart from the old known causes and results. Global warming is actually more important than I thought for the future of the world. The effect of global warming is attributed to more concrete bad events such as earthquakes, floods, fires and epidemics. We must take greater measures to prevent the global challenge. It is up to us humans to prevent this.*

*P13. As a result of global warming, water and agricultural products are decreasing and famine is beginning to affect the whole world. Overheating creates drought, hunger and famine. Global warming is a big problem that has been going on for years and we have a hard time making our voices heard. Worst of all, these current problems have caused and will create major problems. To make an analogy, we have a big iceberg in front of us. And we (a quarter of the population) only see the tip of the iceberg. I hope that we, as teacher candidates, can bring this awareness to the next generations.*

Regarding the consequences of global warming, participants outlined its impact on both humanity and nature. They identified problems such as hunger, water scarcity, water pollution, fires, epidemics, earthquakes, storms, hurricanes, and decrease in agricultural product varieties. The severity of these consequences led student teachers to realize that they should not contribute to the ongoing problem. One participant acknowledged his personal shortcomings and emphasized the need to take more precautions to prevent global warming. In addition, there was a consensus among the participants that global warming poses a serious threat to human life and the environment. They acknowledged their responsibility to mitigate its impacts and expressed a common duty to combat this global problem. The realization that global warming goes beyond known causes and effects and affects the future of the world has led to calls for increased awareness and action.

Figure 7  
Pre-service teachers' opinions on the suggestions of global warming



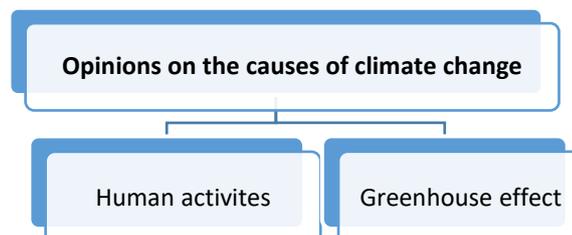
P11. *Global warming indicates the effect of the increase in the average temperature of the Earth's atmosphere recorded in the last hundred years. With the activities of the eTwinning activities we have seen how the temperature has increased from the ice age to today and this makes us understand that we must act to solve this problem. We can, for example, reduce the use of fossil fuels and use clean energy from renewable sources.*

It can be said that pre-service classroom teachers have gained a deeper understanding of the causes and consequences of global warming through the project they carried out, based on their opinions. Global warming is an important issue that affects pre-service teachers. As the future educators responsible for learning, teaching, and raising awareness about environmental issues such as global warming and climate change, pre-service teachers may need to understand and address these issues. Having courses or projects related to global warming and environmental problems in education programs can help pre-service teachers gain knowledge and awareness in these areas. Pre-service teachers have connected the causes of global warming to human activities, fossil fuels, and industrial waste. They have reached the conclusion that both humans and nature suffer as a result. Consequently, factors such as rising temperatures and extreme weather conditions reduce agricultural productivity, leading to food insecurity. The reduction of water resources contributes to water scarcity and negatively affects energy production. They have also pointed out that high temperatures facilitate the spread of diseases. Pre-service teachers have expressed their opinions on the need to reduce the use of fossil fuels and transition to clean energy sources to combat global warming. In conclusion, prospective teachers' perspectives emphasize the seriousness of global warming and the urgent need for proactive measures. They acknowledged their role in raising awareness and emphasized the importance of taking urgent and comprehensive measures to prevent further environmental degradation and its far-reaching consequences. Pre-service teachers expressed their determination to transfer this awareness to future generations, emphasizing the important role education plays in overcoming this global challenge.

### 3.2 Pre-service teachers' opinions about climate change

Participants expressed their opinions on the *causes of climate change* under these headings; human activities and greenhouse effect. There are some quotes about this below:

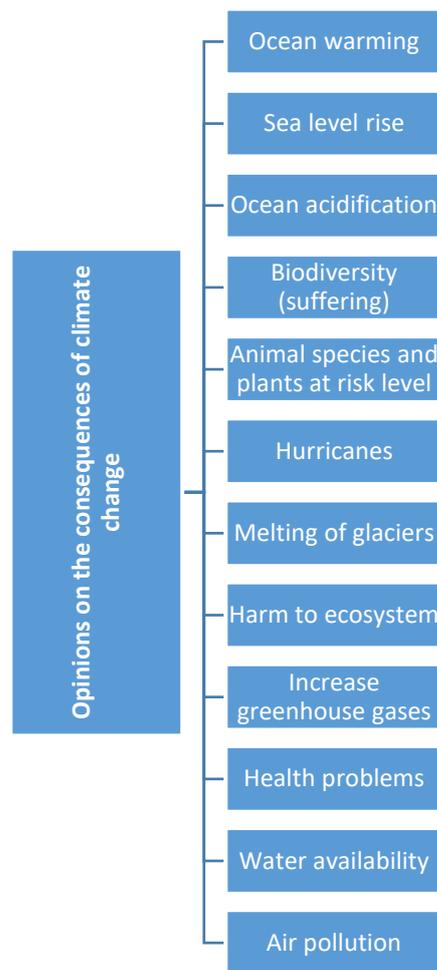
Figure 8  
Pre-service teachers' opinions on the causes of climate change



P3. *Climate change is a set of serious environmental alterations attributable to human activities, responsible for greenhouse effect and the consequent rise in global temperature.*

And their opinions on the **consequences of climate change** are: *ocean warming, sea level rise, ocean acidification, biodiversity, species animal and plants at risk level, hurricanes, melting of glaciers, harm to ecosystem, increase greenhouse gases, health problems, water availability.* There are some quotes about this below:

Figure 9  
Pre-service teachers' opinions on the consequences of climate change



P9. *The long-term effects of climate change include further ice melt, ocean warming, sea level rise, and ocean acidification. The entire biodiversity is suffering from these phenomena. Many animal and plant species are at risk of extinction due to constantly changing climatic conditions, such as rising temperatures in the oceans or the desertification of many areas.*

P10. *Climate change has many effects. Increasing temperatures, drought, floods, severe hurricanes, the frequency of extreme weather events, melting of glaciers, and rising sea water levels are examples of climate change. All of these cause great harm to the ecosystem. The rise of flooding over time has left some cities in danger. Since deforestation produces pollutants,*

*there is a tremendous increase in greenhouse gases. Heat waves caused by global warming can result in many diseases and deaths.*

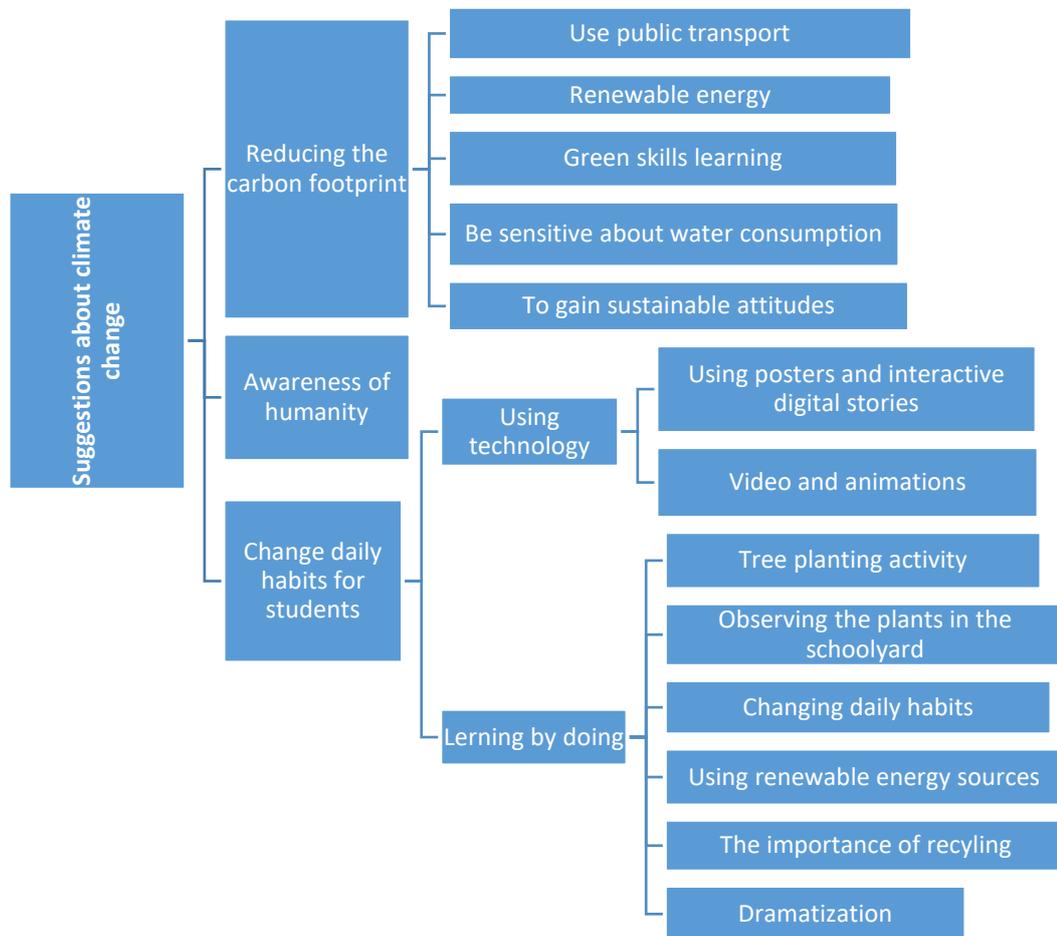
*P11. Climate change is the main cause of drought and reduced water availability. These cause worsening of productive, agricultural and industrial activities, the aggravation of diseases and conflicts between countries. Moreover, there are events such as hurricanes, floods, storms and fires, calamities that can make entire territories uninhabitable. Air pollution and fine dust are also a threat, causing health problems. The entire biodiversity is suffering from these phenomena. Many animal and plant species are at risk of extinction due to constantly changing climatic conditions, such as rising temperatures in the oceans or the desertification of many areas.*

Turning to the consequences of climate change, participants highlighted a range of impacts, including ocean warming, sea level rise, ocean acidification, threats to biodiversity, and risks to various animal and plant species. Quotes from participants underscored the long-term effects, such as ice melt, biodiversity loss, and the endangerment of species due to changing climatic conditions. The participants also discussed the broader effects of climate change, encompassing increasing temperatures, drought, floods, severe hurricanes, the frequency of extreme weather events, melting glaciers, and rising sea levels. They pointed out the significant harm inflicted on ecosystems, with flooding endangering cities and deforestation contributing to heightened greenhouse gas levels. The implications of global warming, such as heat waves, were noted for their potential to cause diseases and fatalities. Moreover, the study participants acknowledged climate change as a key factor in drought and reduced water availability, impacting productive, agricultural, and industrial activities. This, in turn, exacerbates diseases and conflicts between nations. The potential consequences, including hurricanes, floods, storms, and fires, were highlighted as calamities capable of rendering entire territories uninhabitable. The threat of air pollution and fine dust contributing to health problems was also recognized. In summary, the pre-service teachers' opinions on climate change reveal a comprehensive understanding of its causes and far-reaching consequences. They underscore the urgency of addressing human-induced environmental alterations, recognizing the threats posed to biodiversity, ecosystems, and human well-being. The participants call for collective action to mitigate the impacts of climate change, emphasizing the need for sustainable practices and increased awareness to address this global challenge.

### **3.2.1 Pre-service teachers' suggestions about climate change**

Participants expressed their opinions about climate change in three main topics; *reducing the carbon footprint, awareness of humanity and change daily habits for students*. Detailed suggestions on these main topics are also presented in Figure 10.

Figure 10  
Pre-service teachers' suggestions about climate change



There are some quotes on the suggestions about this topic:

P3. *I can set an example for my students with small steps to change their daily habits. I would like them to change their way of life, for example, to eliminate the unnecessary use of energy and to eliminate the use of vehicles in short distances from their lives. We can plant trees together, collect waste in their homes for the importance of recycling.*

P9. *The activities I would like to do in my future class are recycling or gardening to explain the importance of plants. The activity in the project that inspired me was the digital storytelling. The activities I would like to do in my future class are recycling and gardening to explain the importance of plant care. Also, I would also present the activity on digital storytelling made during the project.*

P11. *In addition, it can be another remarkable activity to include climate change in drama activities with our students.*

P12. *In order to create environmental literacy, it is necessary to start by telling and imagining the ecosystem in the classroom.*

Pre-service teachers engaged in the eTwinning project have associated the causes of climate change with the greenhouse effect and human activities. The greenhouse effect, a natural occurrence, involves certain gases in the atmosphere trapping solar radiation, elevating the Earth's temperature. Research findings illustrate that these participants have highlighted the

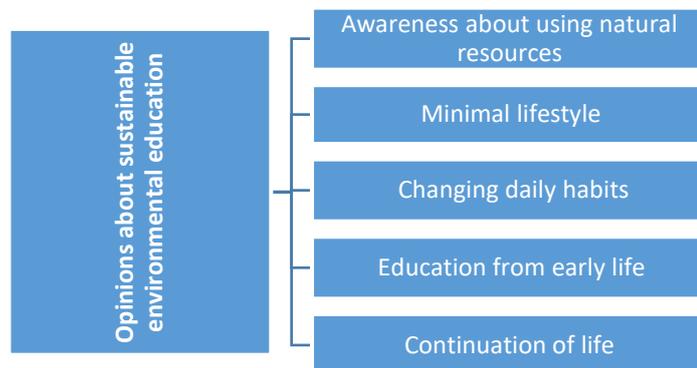
repercussions of climate change. They identified issues like rising sea levels impacting coastal regions through erosion and increasing the threat of flooding. Additionally, extreme weather conditions pose challenges to agriculture and settlements. Moreover, they acknowledged that elevated temperatures may result in health concerns, and reduced water resources could exacerbate water scarcity, potentially leading to the spread of diseases and health issues. Furthermore, changing climatic conditions, such as rising ocean temperatures or desertification, put numerous animal and plant species at risk of extinction. These pre-service teachers put forth innovative ideas concerning climate change. Their suggestions hold promise for future students and the education system. They propose various measures, including reducing unnecessary energy consumption in their students' daily routines, advocating for decreased car usage in short distances, fostering the significance of recycling by planting trees together, guiding students in home waste collection, establishing recycling or garden-greenhouse projects to raise awareness about the importance of plants, and elucidating the ecosystem in the classroom to enhance environmental literacy.

### 3.3. Pre-service teachers' opinions about sustainable environmental education

Participants expressed their opinions about sustainable environmental education under these headings; *awareness about using natural resources, minimal lifestyle, changing daily habits, education from early life, and continuation of life.*

Figure 11

*Pre-service teachers' opinions about sustainable environmental education*



Participants stated their opinions about sustainable environmental education as below:

P1. *Sustainable environmental education is a guiding course for students in transferring natural resources to future generations and ensuring their continuation.*

P3. *It is a very important step for a sustainable environment for individuals to learn that they can continue their lives with a minimal lifestyle.*

P8. *Today, sustainable environmental education is very important because it allows future generations to be educated for the common good, for the whole of society, so that a livable and healthy environment is created.*

P11. *I think that sustainability awareness will be created when everyone in the society changes their usual habits for the world we live in and for our own health. So small changes will become habits and people will be able to take bigger steps. States are also required to make regulations on behalf of energy resources.*

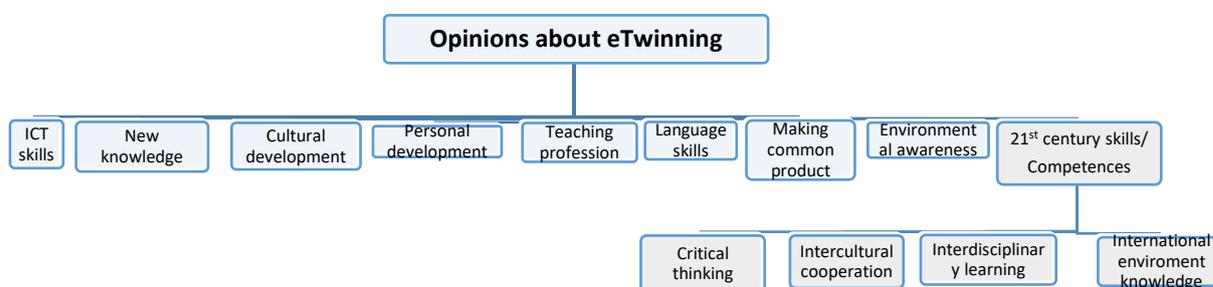
The pre-service teachers participating in the eTwinning project have emphasized the importance of sustainable environmental education in shaping the future generations. They have stated that

a minimalist lifestyle should be instilled in students from a young age. Furthermore, they have expressed that the education provided lays a significant foundation for students to develop awareness of environmental issues and to construct a sustainable world in the future. It can be anticipated that teachers who embrace sustainable environmental education can encourage the sustainable use of natural resources, foster environmental awareness, and help students understand their environmental responsibilities.

### 3.4. Pre-Service teachers' opinions about eTwinning

When asked about their opinions on eTwinning, all participants talked about the positive effects of their participation: ICT skills, cultural development, personal development, professional development, language skills, 21<sup>st</sup> century skills, critical thinking, intercultural cooperation, interdisciplinary learning. The opinions of the participants are shown in Figure 12.

Figure 12  
Pre-service teachers' opinions about eTwinning



Participants stated their opinions about eTwinning as below:

P4. *My experience with eTwinning has been very formative. The activities have allowed the learning of new knowledge, the strengthening of the English language and the strengthening of various transversal skills, including critical thinking, intercultural competencies and the ability to interact and cooperate in an international setting. The project What kind of world do we want? has increased environmental awareness. In addition, it has allowed the development of soft skills related to the relational-collaborative area, entrepreneurship, communication, creativity and critical thinking. Various key competences have been strengthened including digital, linguistic, citizenship, interpersonal and cultural.*

P7. *It was a very nice and exciting experience to take part in the eTwinning project. With this project, we prepared joint products using technology. With eTwinning, we had an idea about different cultures. It was very enjoyable and nice to talk about what we can do with our friends from different cultures who are preparing to step into the teaching profession.*

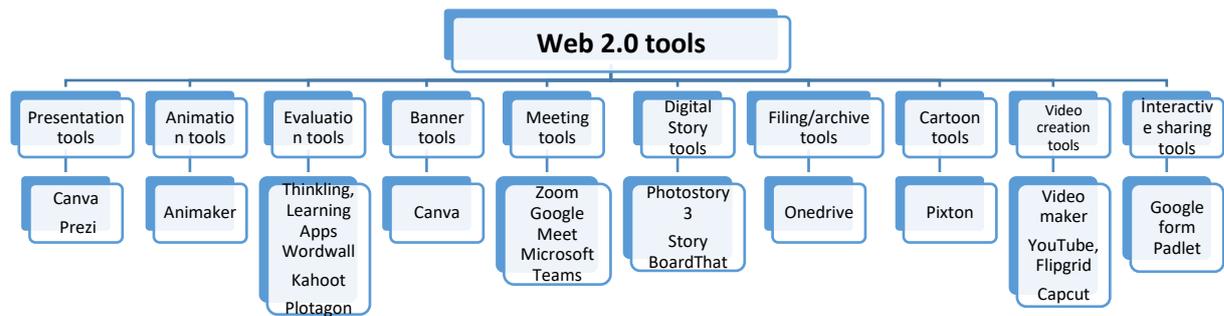
When considering the opinions of the pre-service teachers mentioned above, it can be seen as a gratifying situation that those who experienced the eTwinning project for the first time have highlighted its positive aspects. In this context, pre-service teachers have expressed that this project has enhanced their competences in various areas (language, ICT, cultural, professional, etc.). This project has been recognized and appreciated, as evidenced by the award it received from the Ministry of National Education of Turkey, MEB YEĞİTEK, in 2022 for its contributions to multiple fields.

### 3.4.1 Web 2.0 tools used by pre-service teachers in their eTwinning projects

Pre-service teachers stated that they used various Web 2.0 tools while preparing their eTwinning projects. As seen in Figure 13, these are the following: presentation, animation, evaluation, meeting, digital story, filing/archive, cartoon, video creation and interactive sharing tools.

Figure 13

Web 2.0 tools that pre-service teachers use while preparing their projects



Participants expressed their opinions on the Web 2.0 tools they used in the eTwinning project as follows:

P1. *During the project, I used Canva, Padlet, Photo Story, Storyboard That, OneDrive, Splice, Piktochart, Prezi, Google Forms, Zoom and Microsoft Teams. I can also benefit from these applications when designing events. In addition, applications such as Plotagon, Wordwall, Learning Apps, Kahoot can be used.*

P5. *The web 2.0 tools I used during the project were Padlet, Google Meet for the first online meeting, Canva for infographics, YouTube for watching webinars with experts, Keynote for interactive graphics, Flipgrid for university videos, and Storyboard for storytelling.*

P8. *I used CapCut, Video Maker, Animaker during the project. I would use these apps again.*

The pre-service teachers who noted improvements in their ICT skills have particularly gained in-depth knowledge and proficiency in using web 2.0 tools. In this context, they have utilized presentation, animation, assessment, meeting, digital storytelling, filing/archiving, cartoon, video creation, and interactive sharing tools.

## 4. Discussion and conclusions

When the findings obtained from the qualitative analysis of the answers given by the pre-service teachers to the open-ended questions were examined, the following main topics emerged: What Web 2.0 tools could be used by the pre-service teachers in an eTwinning project; benefits to them of working in an eTwinning project; the effect of an eTwinning project on sustainable environmental education on ideas about concepts such as global warming and climate change.

The outcomes indicated that the participants regarded climate change as a significant global challenge and recognized their duty to provide education in this field. They expressed their intent to foster future students' engagement in projects concerning themes such as 'zero waste', 'carbon footprint', and 'recycling' by enhancing their sensitivity to the concepts of 'sustainable environment', 'climate change', and 'global warming'. The findings underscore the readiness of teacher candidates to innovate new educational resources and methodologies for combating climate change. Simultaneously, they articulated their commitment to focusing on instilling values of sustainable environmental education in upcoming generations. These conclusions are

congruent with studies demonstrating the interest of university students in climate change education (Paschall & Wuestenhagen, 2012).

By increasing their sensitivity to the concepts of 'sustainable environment', 'climate change' and 'global warming', the participants can encourage their future students to work on projects on the concepts of 'zero waste', 'carbon footprint' and 'recycling'. They have claimed that they would work with a focus on bringing the values of sustainable environmental education to the next generations.

Examining their experience of being involved in the eTwinning project, all participants have reported the following advantages: improving ICT skills, enabling intercultural exchange, increasing motivation and group participation, improving language skills, improving group cooperation and communication. While preparing the activities in this project, the pre-service teachers benefited from various types of Web 2.0 tools (preparing presentations, animation, evaluation, organizing online meetings, digital stories, cartoons, video editing, etc.).

They have prepared detailed activities on the causes and consequences of global warming. It has been observed that they have shared very detailed information with the researchers in their answers to open-ended questions. They have stated that, in order to prevent global warming, especially fossil fuel consumption should be reduced and more should be directed towards renewable energy sources. They have also argued that we are experiencing problems related to climate change due to the behavior patterns of humanity, and unfortunately, these problems will be passed on to the future unless precautions are taken. They said that we should adopt more minimal lifestyles, consume less and be more respectful to nature. They stated that the education we will give children starting from a young age is very important and applied projects, such as eTwinning, can be implemented at all levels of education from the very beginning.

The Sustainable Development Goals emphasize that every student should have knowledge and skills in sustainability and global justice. Although existing research in this field increases our level of knowledge, new studies that further examine the effects of educational interventions are needed (O'Flaherty & Liddy, 2018). As a result of the eTwinning project with pre-service primary school teachers in Turkey and Italy, it has been observed that pre-service teachers are both more sensitive about sustainable environment and believe wholeheartedly in the importance of such projects. In future studies, large-scale studies can be planned with student teachers from different departments and primary school pupils. More countries can participate in eTwinning projects and various projects can be carried out on larger samples.

## 5. Suggestions

The findings obtained in this article are very valuable and reveal that environmental issues in education play an important role in the education of teacher candidates and their transfer to students. Here are some suggestions in light of these findings:

- While pre-service teachers gain awareness about climate change and sustainable environment, materials and educational methods that will convey these issues to students need to be developed. In this regard, the design and implementation of new educational materials and methods should be supported.
- It was emphasized that pre-service teachers will convey these issues to pupils from an early age. In this regard, it is important to include environmental education and sustainability issues more in schools and to create educational programs that target not only knowledge transfer but also attitude and behavior change.

- Extensive studies need to be conducted with pre-service teachers and primary school students from various disciplines. These studies can help us better understand effective practices in environmental education and their impact.
- International cooperation projects, such as eTwinning projects, offer an important opportunity for students to promote intercultural exchange and raise awareness of environmental issues. It is important to expand such projects to cover more countries and students/teachers.
- Education should aim to provide knowledge and skills on sustainability and global justice. At this point, new studies that further examine the effects of educational interventions are needed.
- These suggestions can guide further studies and practices on environmental education and the role of teachers in education.

## References

- Arslan, F. (2018). Türkiye’de sürdürülebilir üretimde organize sanayi bölgelerinin rolü: manisa organize sanayi bölgesi (MOSB) örneği. *Marmara Coğrafya Dergisi*, 167-182. <https://doi.org/10.14781/mcd.386213>
- Aydın, F., Kaya, H. & Kaya, H. (2011). Evaluation of the environmental sensitivity of social sciences high school students. *Marmara Journal of Geography*, 24, 229-257.
- Başaran, M., Kaya, Z., Akbas, N. & Yalcin, N. (2020). Proje tabanlı öğretim sürecinde etwinning faaliyeti’nin öğretmenlerin mesleki gelişimlerine yansımaları. *Eğitim Kuram ve Uygulama Araştırmaları Dergisi*, 6(3), 373-392.
- Camilleri, R. (2016) Global education and intercultural awareness in eTwinning. *Cogent Education*, 3(1). <https://doi.org/10.1080/2331186X.2016.1210489>
- Carpenter, J. & Tanner, S. (2013). Study of the impact of eTwinning on participating pupils, teachers and schools. *A proposal to the European commission*. Education for Change.
- Crisan, G. I. (2013). The impact of teachers' participation in eTwinning on their teaching and training. *Acta Didactica Napocensia*, 6(4), 19-28.
- European Commission (2019). *The European green deal*. <https://eurlex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN>
- European Union (2015). *Education & Training 2020 - Schools policy, shaping career-long perspectives on teaching. A guide on policies to improve Initial Teacher Education*. [http://ec.europa.eu/education/library/reports/initial-teachereducation\\_en.pdf](http://ec.europa.eu/education/library/reports/initial-teachereducation_en.pdf)
- European Union (2018). *Council Recommendation of 22 May 2018 on key competences for lifelong learning*. [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604\(01\)](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01))
- Gajek, E. (2018). Curriculum integration in distance learning at primary and secondary educational levels on the example of eTwinning projects. *Education Sciences*, 8(1), 1-15.
- Imperatives, S. (1987). *Report of the World Commission on environment and development: Our common future*. <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
- İzgi, Onbaşıllı, Ü., Sezginsoy, Şeker, B., Claeys, H., Mancel, C., Gulbay, E. & Powers, R. (2022). Experiences of qualified teachers of the future in the scope of an international eTwinning project. *International Online Journal of Primary Education*, 11(2), 293-311.

- Korthagen, F., Loughran, J. & Russell, T. (2006). Developing fundamental principles for teacher education programs and practices. *Teaching and Teacher Education*, 22(8), 1020-1041. <https://doi.org/10.1016/j.tate.2006.04.022>
- Keleş, O. (2007). *Implementation and evaluation of ecological footprint as an environmental education tool for sustainable living* [Unpublished doctoral dissertation. Gazi University Institute of Educational Sciences in Ankara, Turkey].
- Langhelle, O. (1999). Sustainable development: Exploring the ethics of our common future. *International Political Science Review*, 20(2), 129-149.
- Merriam, S. B. (2018). *Qualitative research: a guide to design and implementation*. Nobel Publishing House.
- Miles, M. B. & Huberman, A. M. (1994). *Qualitative data analysis: an expanded sourcebook*. Sage
- Ministry of Environment and Urbanization, General Directorate of Environmental Impact Assessment, Permission and Inspection (2020). 6<sup>th</sup> of Turkey Environmental Report, Ankara. <https://webdosya.csb.gov.tr/db/ced/dokumanlar/turkiye-cevre--8230-48359-20210421084531.pdf>
- O'Flaherty, J. & Liddy, M. (2018). The impact of development education and education for sustainable development interventions: a synthesis of the research. *Environmental education research*, 24(7), 1031-1049.
- OECD (2014). *TALIS 2013 Results. An international perspective on teaching and learning*. OECD Publishing.
- Öztürk, M. (2017). Sustainable development-oriented education: Theoretical framework, historical development and practical recommendations. *Elementary Education Online*, 16(4), 1-11.
- Paschall, M. & R. Wuestenhagen. 2012. More than a game: learning about climate change through role-play. *Journal of Management Education*, 36(4), 510-543.
- Republic of Turkey Ministry of Environment (2012). *Climate change and Turkey*. <https://csb.gov.tr/>
- Uluçınar, S. S., Aslan, O. & Cansaran, A. (2008). Investigation of environmental knowledge and environmental attitudes of primary school students in terms of different variables. *Elementary Education Online*, 7(2), 496-511.
- UNESCO (2020). *Rethinking education: Towards a global common good?* United Nations Educational, Scientific and Cultural Organization. <https://unesdoc.unesco.org/ark:/48223/pf0000232555>
- United Nations (2015). *Transforming our world. The 2030 agenda for sustainable development*. United Nations, Sustainable Development. <https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>
- Velea, S. (2012). Transnational school partnerships supported by ICT. Benefits for learning. In I. Roceanu (Coord.). *Leveraging technology for learning. Volume 1* (pp. 377-382). Edetura Universitară.
- Yıldırım, A. & Şimşek, H. (2014). *Qualitative research methods in the social sciences*. Seçkin Publishing.