

A Discursive Analysis of Pre-Service EFL Teachers' Views on Climate Change

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Abstract

Education for Sustainable Development (ESD) is associated with a strong focus on the environment and climate change. Within the context of ESD studies, there is a growing line of research, which demonstrates that the issue of climate change forms an integral part of the ESD teaching and learning process. Accordingly, it is of critical importance to acquire a thorough and nuanced understanding of how pre-service teachers view the issue of climate change. In this light, the present article introduces a study that analyses how a group of Ukrainian pre-service teachers of English as a Foreign Language (EFL) (hereinafter referred to as participants) views the issue of climate change. To that end, the participants were requested to write a reflective essay titled "My View on Climate Change before and during the War in Ukraine". The discursive analysis of the participants' essays focused on the following two aspects: (i) the participants' descriptors of climate change manifested by adjectives and (ii) the participants' emotional states associated with climate change. The results of the unpaired t-test indicated that there was a statistically significant difference between the adjectives that described the participants' views on climate change before the war in Ukraine and those of the ongoing war. It followed from the unpaired t-test that there was no statistically significant difference between the means of emotive lexica associated with climate change before and during the war. The findings and their implications to the fields of EFL and ESD, respectively, are further described in the article.

Keywords: Climate change, Education for Sustainable Development (ESD), pre-service EFL teachers, views on climate change.

Introduction

Education for Sustainable Development (ESD) plays a crucial role in the implementation and promotion of the UN's 17 Sustainable Development Goals (Kushwah et al., 2025; Salite et al., 2025), which seek, *inter alia*, to protect the planet and its environment (Freitag-Hild & Goertz, 2025; Kapranov, 2024). Accordingly, ESD involves a strong focus on the environment and climate change (Abramovich & Shauli, 2025). ESD's attention to the environment is relevant as never before in "an era of uncertainties, frequent disasters, and social, cultural, economic, environmental instabilities, where tipping points are crossed leading to the unknown" (Eilam, 2025, p. 112). Within the context of ESD studies, there is a growing line of research, which demonstrates that the issues of environmental sustainability and climate change, respectively, form an integral part of the ESD teaching and learning practices (Iliško et al., 2010; Kapranov, 2021; Leite, 2024; Pettig & Singer-Brodowski, 2024; Salite et al., 2024).

Whereas environmental sustainability and climate change have established their validity in the teaching and learning of a number of primary and secondary school subjects (Fandino, 2013; Kapranov, 2013; Veselinovska & Kirova, 2013), environmental- and climate change-related issues remain relatively unexplored in the context of English as a Foreign Language (EFL) (Kazazoglu, 2025; Lidström Brock, 2025). For instance, little is known about pre-service EFL teachers' views on climate change (Maijala et al., 2023; Öztürk & Cubukcu, 2026). Furthermore, there is insufficient research on pre-service EFL teachers' views on climate change during the time of conflicts, wars, and the global polycrisis (Akkurt Çağlar, 2022; Kapranov & Voloshyna, 2023; Lautensach et al., 2025).

Against this background, the present article introduces a study that seeks to shed light on how a group of pre-service EFL teachers (hereinafter – participants) views the issue of climate change. The participants are third-year Bachelor students enrolled in the EFL teacher program at a university in Ukraine. The participants' enrolment in the program has coincided with the war in Ukraine that started in February 2022. In this light, the time frame of the participants' enrolment provides a unique lens to explore their beliefs concerning climate change in the context of the full-scale invasion of Ukraine.

Specifically, the study aims to unveil how the participants view the issue of climate change through the prism of their reflective discourse. In this regard, we emphasize that the study is grounded in the theoretical premises of reflective discourse by pre-service language teachers formulated by Farrell (2015, 2016, 2017). Whilst we dwell on the theoretical framework further in the article, we should note, for now, that reflective discourse by pre-service language teachers can provide a wealth of data on their own beliefs about teaching and learning, as well as on their immediate contexts (Farrell, 2018). Capitalizing upon Farrell's (2019, 2023) theoretical approach to pre-service language teachers' reflective discourse, we seek to examine a corpus of reflective essays written by the participants in order to identify and analyze (i) discursive descriptors of climate change and (ii) emotional states associated with climate change. Accordingly, the study is set to answer the following research questions (RQs):

RQ 1: What discursive descriptors of climate change are found in the corpus?

RQ 2: What emotional states associated with climate change are found in the corpus?

The relevance of the study is manifold. First of all, as mentioned above, there is

scanty research on pre-service EFL teachers' views on the issue of climate change (Boon, 2016; Putri et al., 2024). Consequently, our study will contribute to the existing body of publications on this under-researched topic. Second, the relevance of the study is substantiated by the contention that pre-service teachers are role models to the young generation of learners (Kapranov, 2017; Salite et al., 2023), who may get inspired by them to pay attention to the problems associated with the environment and climate change (Rushton et al., 2026). Third, the relevance of the study consists in uncovering an emotional dimension related to the participants' views on the issue of climate change (Mizin & Slavova, 2023, 2025). Fourth, the study may unveil the need to raise the participants' climate change awareness and integrate it into their teaching and learning experiences (Salite et al., 2021).

Further, the article proceeds as follows. First, we outline the theoretical foundations of the study. They involve an approach to pre-service language teachers' reflective discourse developed by Farrell (2015, 2016, 2017, 2018). Second, we provide a review of the literature on the topic of pre-service EFL teachers' views on climate change. Third, we introduce the study, present the results and discuss them. Finally, we conclude the article with a summary of the major findings and their pedagogical implications.

Theoretical Considerations: Pre-Service Teachers' Reflective Discourse

Given that reflective practices have taken hold in the tertiary teacher training sector (Kirsner et al., 2007; Pedro, 2005), the present study is anchored in the theoretical premises of pre-service teachers' reflective discourse developed by Farrell (2013, 2015, 2016, 2017, 2018, 2019, 2021, 2022, 2023). Farrell's approach to reflective discourse by pre-service teachers is encapsulated by the following contention: "The capacity of being able to reflect is now seen as an important part of a language teacher's education and training" (2022, p.1). According to Farrell (2021, p. 60), pre-service language teachers' "reflective practice generally means that language teachers systematically examine their beliefs and practices". Taking into consideration the fact that the participants in the present study are pre-service EFL teachers, i.e., future teachers of EFL, Farrell's (2023) contention is particularly relevant to our investigation, which will be presented further in the article.

Farrell (2019) posits that reflective practices and reflective discourse can provide the voice and agency to the cohorts of pre-service language teachers. Farrell (2022, p. 36-37) specifies that pre-service language teachers' reflective practices may pertain to the following levels of reflectivity:

Recollective reflection. This type of reflection allows language teachers to make sense of past experiences and give new, deeper insight into the meaning of those experiences. Active or interactive reflection. This type of reflection allows language teachers to make immediate decisions during class as events unfold. Anticipatory reflection. This type of reflection allows language teachers to plan, decide on a course of action and anticipate future consequences of such actions (Farrell, 2022, p. 37).

Farrell (2015, 2016) contends that reflective discourse by pre-service language

teachers offers a critical perspective on their individuality and personal experiences. Moreover, pre-service language teachers' reflective discourse "situates the act of reflection" (Farrell, 2021, p. 61) by drawing attention to pre-service teachers' contextualized reflections, which they have acquired and learned through various opportunities that arise during their teaching and learning encounters (Farrell, 2017, 2018).

In particular, Farrell (2021, 2023) underscores the significance of written reflective discourse produced by pre-service language teachers. He argues that writing facilitates pre-service teachers' (i) self-learning about reflection, (ii) discovering innovative reflective practices, and (iii) maintaining insightful and meaningful reflective practices (Farrell, 2013, 2016). Crucially, Farrell (2021) suggests that

reflective writing can include written accounts of teachers' thoughts, classroom observations, assumptions, beliefs, attitudes, and experiences about their practice both inside and outside the classroom (Farrell, 2013). Teachers can include record of critical incidents, perceived problems/issues, and insights that occurred during lessons (reflection-in-action) in order to gain new understandings of their own teacher learning and instructional practices (Farrell, 2021, p. 63).

It follows from Farrell (2013, 2021) that written reflective discourse pertains not only to pre-service language teachers' professional trajectories but also involves instances associated with out-of-classroom experiences. Accordingly, Farrell (2015) defines pre-service language teachers' reflective practices as

a cognitive process accompanied by a set of attitudes in which teachers systematically collect data about their practice, and, while engaging in dialogue with others, use the data to make informed decisions about their practice both inside and outside the classroom (Farrell, 2015, p. 123).

Farrell (2015, 2016, 2017) indicates that pre-service language teachers' ability to reflect on professional, i.e., teaching- and learning-related matters, may map onto their capacity to provide structured and meaningful reflections on the other matters that are not directly related to their professional sphere of interest. Presumably, climate change is one of the areas that the participants in the present study can reflect on. Prior to proceeding to the study, we will review the literature on pre-service EFL teachers' views on the issue of climate change.

Literature Review: Pre-Service EFL Teachers' Views on Climate Change

There is a growing body of literature on how pre-service EFL teachers view the issue of climate change in the context of their teaching and learning experiences (Boon, 2016; Kapranov, 2021). The literature involves a broad spectrum of facets that pertain to (i) the notion of empowerment associated with the issue of climate change (Putri et al., 2024), (ii) the view on climate change within the tenets of environmental sustainability (Findik et al., 2021), (iii) the involvement of ESD-centered principles in the teaching and learning about climate change in an EFL classroom (Saiful & Setyorini, 2023; Saiful & Yuniarti, 2024), and (iv) the beliefs and perceptions of climate change by pre-service EFL teachers

(Bedir, 2021; Sundh et al., 2021).

The notion of empowerment associated with the issue of climate change is broached by Putri et al. (2024), who argue that pre-service EFL teachers should foster young EFL learners' eco-consciousness and awareness of climate change as a global issue, which impacts upon people's lives globally and locally. Specifically, Putri et al. (2024) posit that the global climate crisis and its dramatic impact on the local communities should be taught explicitly to the cohorts of pre-service EFL teachers. Also, pre-service EFL teachers should facilitate the introduction of climate change-related concepts and environmental sustainability to young EFL learners.

The anchoring of pre-service EFL teachers' perceptions of climate change in the tenets of environmental sustainability is explored by Findik et al. (2021). By means of investigating a group of pre-service EFL teachers in Turkey, these authors have established that the majority of pre-service EFL teachers share a narrow view on ESD, which obscures the link between ESD, on the one hand, and climate change awareness, on the other. Furthermore, Findik et al. (2021) demonstrate that Turkish pre-service EFL teachers do not recognize the connection between English Language Teaching (ELT) and climate change. At the same time, the authors show that pre-service EFL teachers should be familiarized with ESD-related principles and climate change literacy.

The involvement of ESD-centered principles in the teaching and learning about climate change in an EFL classroom is the central theme of the articles by Saiful and Setyorini (2023), and Saiful and Yunianti (2024), in which they investigate how pre-service EFL teachers integrate climate change into their ELT experiences. Specifically, pre-service EFL teachers in the study conducted by Saiful and Yunianti (2024) are reported to be adequately equipped to integrate climate change into an EFL classroom. Furthermore, Saiful and Setyorini (2023) inform that pre-service EFL teachers in their study foster sustainable practices and integrate climate change into EFL curricula. Similarly, pre-service EFL teachers in Saiful and Yunianti's (2024) study are described as having (i) sufficient understanding of climate change and (ii) willingness to address the issue of climate change in EFL settings.

Pre-service EFL teachers' views on climate change are addressed by Bedir (2021) and Sundh et al. (2021). Bedir (2021) contends that whilst the majority of the pre-service teachers in his study are environmentally-aware, they ignore societal, economic, and climate change-related aspects of ESD. Furthermore, Bedir (2021) notes that pre-service EFL teachers in his study rarely have ESD training during their formal education. Conversely, Sundh et al. (2021) demonstrate that climate change awareness and training are fairly sufficiently represented in Northern Europe (e.g., Sweden). Their study shows that Swedish pre-service EFL teachers regard climate change as a global challenge. Furthermore, Sundh and his colleagues (2021) suggest that climate change and ESD should be included in the EFL-related curricula.

As shown in the literature review, research on pre-service EFL teachers' views on climate change involves a variety of themes, approaches, and linguo-cultural backgrounds. Currently, however, there is a paucity of studies that shed light on how Ukrainian pre-service EFL teachers view the issue of climate change. Further in the article, we present a study that seeks to generate new knowledge on this research area.

The Present Study

As noted above, we seek to compensate for the under-researched scientific niche that analyses Ukrainian pre-service EFL teachers' views on climate change. We are acutely aware of the fact that our study is only the first attempt at unpacking a complex issue of how pre-service EFL teachers in Ukraine view climate change. Given the novelty of the study, we confine our investigation to elucidating the participants' views on climate change through a discursive lens. Specifically, the study is focused on establishing how the participants portray climate change discursively by means of (i) using adjectives associated with the noun phrase "climate change" and (ii) describing their emotional states related to climate change (see the RQs of the study in the introduction).

To reiterate, the study is grounded in the theoretical tenets proposed and developed by Farrell (2013, 2015, 2016, 2017, 2018, 2019, 2021, 2022), whose seminal publications focus on the role of reflective practices and reflective written discourse in pre-service language teachers' personal and professional trajectories (Farrell & Farrell, 2024). According to Farrell (2019, 2023), pre-service language teachers' reflective practices involve their own (i) beliefs about teaching and learning, (ii) responsibility for their actions in the classroom, and (iii) engagement in reflective teaching. Furthermore, pre-service language teachers' reflective practices presuppose a discursive space for expressing self-analysis, self-evaluation, and the identification of underlying assumptions and beliefs (Farrell, 2016). Critically, our study is guided by Farrell's (2022, p. 37) notion of recollective reflection, which "allows language teachers to make sense of past experiences and give new, deeper insight into the meaning of those experiences".

Informed by Farrell's theoretical framework, we recruited 20 participants (three males, 17 females, mean age 20.7, standard deviation 2.6), who were enrolled in a university program designed for pre-service EFL teachers at a medium-sized state-run university in Central Ukraine. The participants' area of specialization was EFL for secondary school. It should be noted that the participants' curriculum did not involve any modules or courses that were focused on ESD or climate change education. The participants' curriculum for the study year 2025–2026 is described in Table 1 in conjunction with the number (N) of teaching hours for the autumn semester (A/S) and spring semester (S/S), respectively.

Table 1
The Participants' Curriculum in the Autumn Semester 2025 and the Spring Semester 2026

#	Academic Disciplines	N Hours A/S	N Hours S/S
1	EFL oral and written communication	195	195
2	Theoretical linguistics	180	-
3	Grammar of English	180	180
4	English didactics	9	120
5	Methodology of educational work of an EFL teacher	90	
6	English literature	120	120
7	The foundations of tactical medicine	90	-

Crucially, we should explain that EFL teaching programs at Ukrainian universities could be described in terms of gender imbalance (Kapranov & Voloshyna, 2023), i.e., the unequal distribution of males and females, with females outnumbering males. Also, we should underscore that the cohorts of Ukrainian undergraduate students majoring in humanities (e.g., EFL) could not be referred to as numerous (Torubara, 2025). The group of participants in the present study could be argued to share the typical characteristics of Ukrainian EFL population in terms of (i) modest numbers and (ii) gender imbalance with a clear numerical prevalence of female students.

The participants signed the consent form that allowed the authors of the article to collect, store, and process their written reflections for scientific purposes. The participants' personal data were coded to ensure confidentiality. Accordingly, the participants' real names were coded and, instead, the codes from P1 (i.e., P as in "participant" and the number) to P20 were used in the study. We should specify that the participants did not receive any points towards their course credits, marks for their participation, or any form of remuneration and/or reimbursement. Furthermore, their participation was strictly voluntary and did not form part of the credited coursework.

In the spring semester of 2026, the participants were requested to write a reflective essay between 300 words (minimum) and 500 words (maximum) on the topic "My View on Climate Change before and during the War in Ukraine". We specifically instructed the participants to reflect upon their view on climate change (i) before the war in Ukraine and (ii) during the ongoing war. It should be noted that by requesting the participants to reflect back on how they viewed the issue of climate change before the war could pose some limitations associated with the participants' long-term memory, i.e., what they were able to remember in conjunction with the pre-war views on climate change. Consequently, we treated the first parts of their reflective essays with caution, given that they dealt with their views on climate change before the war. Crucially though, no instructions were given to the participants in terms of stylistic elaboration and the focus on form rather than content. The instructions, however, suggested the focus on authenticity rather than style and linguistic accuracy. The participants were given two working days to write their reflections and send them to the authors of the article. All the participants completed the task of essay writing. The descriptive statistics of the corpus of the participants' essays are summarized in Table 2.

Table 2
The Descriptive Statistics of the Corpus

#	Descriptive Statistics	Value
1	The total number of essays	20
2	The total number of words	8 445
3	Mean words	422.3
4	Standard deviation words	62.1

The corpus was analyzed in order to identify discursive descriptors associated with the noun phrase “climate change” employed by the participants in the essay parts pertaining to their views in climate change (i) before the war and (ii) during the ongoing war in Ukraine. Specifically, we focused on the use of adjectives associated with the noun phrase “climate change” as descriptors that would be indicative of the participants’ views on the issue of climate change. Methodologically, we identified the adjectives associated with the noun phrase “climate change” manually in (i) attributive positions (e.g., “unbearable climate change”), (ii) predicative positions (e.g., “climate change was terrible”), (iii) the positions after indefinite pronouns (e.g., “climate change is nowhere in my life”), and (iv) co-ordinate adjectives (e.g., “unbearable and terrible climate change”). The list of the adjectives identified manually was, thereafter, processed in the program AntConc (Anthony, 2022) to factor out possible omissions (Kapranov, 2017).

The identification and calculation of lexical words and phrases associated with the participants’ emotional states vis-à-vis the issue of climate change was carried out in line with the studies conducted by Mizin and Slavova (2023, 2025). Specifically, we sought to identify and compute the occurrence of emotional lexica originated from various word classes (for instance, nouns, verbs, and verb forms, etc.) that manifested the participants’ emotional states associated with climate change before and during the war in Ukraine. The lexica were coded by the authors of the article and processed in the IBM SPSS Statistics (Version 20.0) to compute the frequency of their occurrence in the corpus, inclusive of their respective total number (N), means (M), and standard deviations (SD). The results of the analysis are further presented and discussed in the subsequent section of the article.

Results and Discussion

In line with the RQs in the study, we analyzed the corpus of the participants’ reflective essays to identify, quantify and discuss (i) discursive descriptors of climate change manifested by adjectives and (ii) emotional states associated with climate change. Given that the study is contextualized in the ongoing war in Ukraine, one could assume that a highly stressful atmosphere of the teaching and learning surroundings would result in the participants’ indifference to the issue of climate change. However, the results of the corpus analysis indicate that the opposite is the case. Overall, the participants’ essays suggest that climate change is a topic that resonates with the participants, even though they have had no formal training in climate change education and/or ESD. In unity with Farrell’s (2021, 2022) theoretical framework, we may contend that the participants’ reflective essays on climate change provide them with an opportunity to manifest their distinct voices on the issue of climate change. Further in the discussion, we will dwell upon the findings in detail and address the RQs of the study.

The Discussion of RQ 1: Adjectives as Discursive Descriptors of Climate Change

As mentioned above, we focus on the identification and quantification of adjectives as discursive descriptors of climate change in the corpus. The results of the corpus analysis reveal that there are 60 qualitatively different types of adjectives (total N 144, M 2.0, SD 2.5) that are associated with the participants' views on climate change. In Table 3, we summarize the frequency of adjectives that occur in the participants' views on climate change both before and during the war in Ukraine. In total, there are 11 types of such adjectives (see Table 3).

Table 3

Adjectives Associated With the Participants' Views on Climate Change Before and During the War

#	Adjectives	Before the War	During the War
1	Abstract	4 (M 1.0, SD 0)	1 (M 0, SD 0)
2	Ecological	2 (M 1.0, SD 0)	3 (M 1.5, SD 0.5)
3	Environmental	5 (M 1.0, SD 0)	20 (M 1.8, SD 0.7)
4	Extreme	1 (M 0, SD 0)	1 (M 0, SD 0)
5	Global	7 (M 1.0, SD 0)	6 (M 1.2, SD 0.4)
6	Long-term	1 (M 0, SD 0)	4 (M 1.3, SD 0.5)
7	Natural	2 (M 1.0, SD 0)	1 (M 0, SD 0)
8	Obvious	1 (M 0, SD 0)	1 (M 0, SD 0)
9	Personal	1 (M 0, SD 0)	2 (M 1.0, SD 0)
10	Sustainable	1 (M 0, SD 0)	6 (M 1.0, SD 0)
11	Visible	1 (M 0, SD 0)	1 (M 0, SD 0)

Based upon the means presented in Table 3, the application of the unpaired t-test indicates that there is a statistically significant difference between the adjectives that describe climate change before the war (M 0.45, SD 0.52) and during the war (M 4.18, SD 5.6), namely $t(20) = 2.19$, $p = 0.0399$ with 95% confidence interval. Whilst the findings are significant, we, nevertheless, should reiterate that the participants have reflected on their pre-war views on climate change in retrospect. That is why we should, perhaps, interpret the significance of the findings with caution. At the same time, however, the participants' reflections on their pre-war views on climate change are not at all unusual, given that pre-service language teachers' reflective practices may involve recollective reflections, which enable the participants to make sense of past experiences and provide insight into the meaning of those experiences (Farrell, 2019, 2022).

In terms of the findings summarized in Table 3, it is notable that the adjectives *environmental* and *sustainable* are used substantially more often in the current conditions of the ongoing war in contrast to the participants' pre-war views on climate change that

they provided retrospectively. The frequently occurring adjective *environmental* in the corpus is exemplified by the following excerpt:

When the war started, my only concern was safety. One year into the war my perspective began to change. I mean war itself causes severe environmental damage: destroyed infrastructure, polluted environment, and harmed ecosystems. Seeing that makes me realize that war and climate change are interconnected in many ways, like they threaten our safety, cause hardships, and have long-lasting consequences. (P1, female)

Arguably, the high frequency of the occurrence of the adjective *environmental* in the corpus lends support to a number of prior studies (Bedir, 2021; Sundh et al., 2021), which indicate that environmental considerations play a critical role in pre-service EFL teachers' views on climate change. Furthermore, the analysis of the corpus demonstrates that the participants frequently employ the adjective *sustainable* to express their views on climate change. The use of *sustainable* is illustrated by excerpt (2) below.

Now I think that climate change is closely connected with peace and stability. Sustainable development is impossible without peace, and environmental protection is impossible during the war. Today, my view of climate change is more realistic. I understand that even in difficult times, the rebuilding of our country should include sustainable solutions. Climate change can still be a global problem, but now I see it connected to a peaceful and sustainable future (P2, female).

The adjective *sustainable* is utilized by several participants, who regard sustainability as a viable way out of the climate crisis. They tend to equate it with green technologies and the need to spread awareness of sustainability among primary and secondary EFL students. This finding is in alignment with the literature (Findik et al., 2021; Saiful & Setyorini, 2023; Saiful & Yuniarti, 2024), which posits that environmental sustainability as one of the major ESD-related principles should be addressed in the EFL classroom. At the same time, however, the participants do not offer concrete pathways and/or lesson samples that illustrate their positive views on climate change through the lens of sustainability. This observation supports prior research (Bedir, 2021; Findik et al., 2021; Sundh et al., 2021), which suggests that sustainability should be practically involved in the teaching and learning of foreign languages, in particular, EFL, on the primary and secondary school levels.

Whereas the participants employ only 11 types of adjectives to describe climate change both before and during the war (see Table 3), in total, they use 34 types of adjectives (N 63, M 1.9, SD 1.4) to express their views on climate change before the start of the war. In this group of adjectives, there are adjectives that are used by the participants exclusively in connection with their retrospective reflections on climate change before the war, namely *acute* (N 2, M 1.0, SD 0), *alarming* (N 3, M 1.0, SD 0), *disconnected* (N 1, M 0, SD 0), *distant* (N 4, M 1.0, SD 0), *economic* (N 1, M 0, SD 0), *gradual* (N 1, M 0, SD 0), *human* (N 1, M 0, SD 0), *important*

(N 3, M 1.0, SD 0), *international* (N 1, M 0, SD 0), *little* (N 1, M 0, SD 0), *local* (N 1, M 0, SD 0), *major* (N 1, M 0, SD 0), *melting* (N 3, M 0, SD 0), *normal* (N 1, M 0, SD 0), *primary* (N 1, M 0, SD 0), *record-breaking* (N 1, M 0, SD 0), *renewable* (N 1, M 0, SD 0), *rising* (N 3, M 1.0, SD 0), *scientific* (N 1, M 0, SD 0), *serious* (N 3, M 1.0, SD 0), *slow-moving* (N 1, M 0, SD 0), *strange* (N 1, M 0, SD 0), and *unusual* (N 1, M 0, SD 0). Whilst the occurrence of the aforementioned adjectives is (i) confined to the participants' pre-war views on climate change and (ii) not significant statistically, it, nevertheless, suggests that the participants associated the issue of climate change before the war with a threat and/or a crisis (for instance, *acute*, *alarming*, *important*, *international*, *major*, *record-breaking*, *serious*, *strange*, and *unusual*), a distant and irrelevant issue (for example, *disconnected*, *distant*, *economic*, *gradual*, *little*, *local*, and *slow-moving*), and an anthropogenic phenomenon that is viewed through a scientific lens (specifically, *human*, *melting*, *normal*, *primary*, *renewable*, *rising*, and *scientific*).

The results show that the participants use 37 types of adjectives (N 81, M 2.2, SD 3.2) in relation with their views on climate change during the war. There are adjectives that are specific to the ongoing wartime period: *academic* (N 1, M 0, SD 0), *acid* (N 1, M 0, SD 0), *chemical* (N 3, M 1.0, SD 0), *colder* (N 1, M 0, SD 0), *complex* (N 1, M 0, SD 0), *contaminated* (N 2, M 1.0, SD 0), *dangerous* (N 2, M 1.0, SD 0), *fragile* (N 1, M 0, SD 0), *green* (N 2, M 1.0, SD 0), *hard* (N 1, M 0, SD 0), *harsher* (N 1, M 0, SD 0), *huge* (N 1, M 0, SD 0), *immediate* (N 2, M 1.0, SD 0), *interconnected* (N 1, M 0, SD 0), *man-made* (N 1, M 0, SD 0), *massive* (N 2, M 1.0, SD 0), *national* (N 1, M 0, SD 0), *poisoned* (N 1, M 0, SD 0), *rapid* (N 1, M 0, SD 0), *real* (N 2, M 1.0, SD 0), *tangible* (N 1, M 0, SD 0), *terrible* (N 1, M 0, SD 0), *unstable* (N 1, M 0, SD 0), *urgent* (N 1, M 0, SD 0), *warmer* (N 1, M 0, SD 0), and *worse* (N 2, M 1, SD 0). Being not statistically significant, these adjectives, however, imply that the participants view climate change during the war in Ukraine through the prism of negative consequences of anthropogenic climate change (for instance, *acid*, *chemical*, *colder*, *complex*, *contaminated*, *dangerous*, *fragile*, *hard*, *harsher*, *huge*, *immediate*, *interconnected*, *man-made*, *massive*, *poisoned*, *rapid*, *terrible*, *unstable*, *urgent*, *warmer*, and *worse*). Additionally, the participants utilize a number of adjectives associated with climate change science (e.g., *academic*, *real*, and *tangible*), renewables (e.g., *green*), and the scale of climate change (e.g., *national*). Again, the occurrence of these adjectives is not statistically significant and restricted to the participant' wartime views on climate change. However, the sheer presence of the aforementioned adjectives opens an avenue for future research to explore whether or not pre-service EFL teachers, who hail from different parts of the world, would view the issue of climate change in a similar vein.

The Discussion of RQ 2: The Participants' Emotional States Associated With Their Views on Climate Change

As far as RQ 2 of the study is concerned, the analysis of the corpus shows that there are observable differences between the participants' emotional states associated with climate change before and during the war, as demonstrated in Table 4.

Table 4
The Participants' Emotional States Associated With Climate Change Before and During the War

#	Emotional State	Before the war	During the war
1	Anxiety	3 (M 1.0, SD 0)	3 (M 1.0, SD 0)
2	Apathy	-	1 (M 0, SD 0)
3	Concern	3 (M 1.5, SD 0.5)	5 (M 1.3, SD 0.4)
4	Danger	1 (M 0, SD 0)	8 (M 1.3, SD 0.5)
5	Disaster	-	6 (M 1.0, SD 0)
6	Fear	-	1 (M 0, SD 0)
7	Horror	-	5 (M 0, SD 0)
8	Loss	-	3 (M 1.0, SD 0)
9	Optimism	8 (M 1.3, SD 0.5)	4 (M 1.0, SD 0)
10	Pain	-	3 (M 1.0, SD 0)
11	Realism	-	4 (M 1.3, SD 0.5)
12	Sadness	1 (M 0, SD 0)	1 (M 0, SD 0)
13	Seriousness	4 (M 1.3, SD 0.5)	5 (M 1.0, SD 0)
14	Shame	1 (M 0, SD 0)	-
15	Stress	-	5 (M 1.3, SD 0.4)
16	Survival	-	5 (M 1.0, SD 0)
17	Trauma	-	3 (M 1.0, SD 0)
18	Worry	1 (M 0, SD 0)	7 (M 1.2, SD 0.4)

Judging from Table 4, the participants refer to 18 qualitatively different emotional states related to the issue of climate change before and during the war in Ukraine. It follows from the unpaired t-test, however, that there is no significant difference between the means of emotive lexica associated with climate change before the war (M 0.73, SD 0.69) and those of the ongoing war (M 0.97, SD 0.45), $t(12) = 0.775$, $p = 0.464$ with 95% confidence interval.

Discussing the findings that uncover the participants' emotional states related to the issue of climate change before and during the war in Ukraine, it should be noted that the participants experience several emotional states during the war, which they would not relate to climate change in the normal pre-war conditions, namely (i) apathy, (ii) disaster, (iii) fear, (iv) horror, (v) loss, (vi) pain, (vii) realism, (viii) stress, (ix) survival, and (x) trauma. Among the aforementioned emotional states, disaster, horror, stress and survival are mentioned relatively frequently. However, disaster is referred to the most by the participants in the descriptions of their war-specific emotional states associated with climate change. For example, a female participant indicates that after the war has started, she perceives climate change as a man-made disaster due to the destruction of the Kakhovka power station, cf.

My view of climate change was influenced by the destruction of the Kakhovka hydroelectric power station. I do not remember the exact date

of its destruction, but the loss of the Kakhovka water reservoir was the event that seriously affected my perception of climate change. It affected the climate of the southern regions. Now I realize that this will lead to an increase in the continentality of climate and spring and early summer may become even hotter, and the warm period will begin earlier (P18, female).

As far as the emotional states that are present in the participants' views on climate change both before and during the war are concerned, danger is reported by the participants the most. This finding is further supported by the presence of such adjectives as (i) *dangerous*, (ii) *extreme*, and (iii) *worse* (see Table 3). Taken in synergy with the emotional states associated with climate change during the ongoing war, the participants' views on climate change are clearly marked as dangerous. This observation is illustrated by a male participant, who posits that "Now I see climate change differently, like the war also destroys climate and nature, pollutes the air and damages the soil, burns the forests, and fields become dangerous" (P17, male).

Conclusions

In the study, we sought to explore how a group of participants, who were pre-service EFL students at a university in Ukraine, viewed the issue of climate change. Specifically, the study aimed to establish how the participants portrayed the issue of climate change by means of using adjectives and perceived climate change emotionally in a corpus of reflective essays written on the topic "My View of Climate Change before and during the War in Ukraine". The analysis of the participants' essays revealed that they employed an array of qualitatively different types of adjectives in relation to the issue of climate change. Whereas there was a broad palette of climate change-related adjectives, the participants were found to use such frequent adjectives as *environmental* and *sustainable*. The findings suggested that the participants tended to equate the issue of climate change with the environment and sustainability. Additionally, the corpus analysis uncovered that the participants seemed to associate climate change with the emotional states of danger and disaster.

The findings of the present study could offer several pedagogical implications that could be relevant to the fields of EFL and ESD. The pedagogical implications could be labelled as "ESD-wilds", which were based upon the analogy with the "digital wilds", i.e., informal and self-directed exposure and use of digital spaces. In terms of the ESD-wilds, i.e., informal, extramural, personalized and autonomous exposure to ESD and climate change education, our study demonstrated that the participants could express their views on the issue of climate change without any formal training in climate change education and/or ESD. In other words, they formulated their views on climate change within the context of no formal support provided by ESD-focused courses and/or modules. Hence, their views on the issue of climate change could be argued to originate from a variety of unstructured sources that resembled those of "digital wilds".

Quite possibly, their views on climate change were influenced by a mandatory course in the foundations of tactical medicine that formed part of their curriculum (see Table 1). However, this contention could not be verified by the analysis of the participants'

essays. The contention, however, could open an avenue to explore in future studies whether there could be a cross-fertilization effect that could enable skills transfer from the participants' courses in hard sciences (for instance, first medical aid, tactical medicine, etc.) to their EFL major. In any case, it would be desirable in Ukrainian EFL contexts to consider a cross-disciplinary approach to climate change education within the field of EFL studies. In this regard, we could suggest the introduction of, at least, some elements of climate change- and ESD-related topics to pre-service EFL students in the form of cross-disciplinary seminars and the inclusion of climate change-related teaching and materials into EFL modules. For example, it would be logical to include climate change fiction (cli-fi) in the course in English literature, or introduce elements of ESD into the course in EFL didactics.

Without diminishing the results of the study, the following research limitations should be outlined. First, we should note that the participants' essays involved, partially, memory-based reflections that should be treated with caution due to the involvement of long-term memory and its limitations concerning the extent of what the participants could remember about their views on climate change before the war. Second, the cohort of participants in the study was unbalanced in terms of the gender representation. In the future, it would be reasonable to recruit a gender-balanced group of participants. Third, the group of participants in the study was rather limited. For the sake of future research, a more substantial cohort of participants would be desirable. Fourth, it would be advisable for future studies to juxtapose the views on climate change by pre-service EFL teachers with those of in-service EFL teachers. Lastly, a follow-up questionnaire on the topic of ESD-related activities would be a useful means of extending and validating the present study. Hopefully, the aforementioned shortcomings could be remedied in the forthcoming investigations.

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