Investigating Thai Local Secondary School English Teachers' Perceptions of Climate Change and Its Classroom Teaching
การสำรวจความรับรู้ของครูสอนภาษาอังกฤษชาวไทยในโรงเรียนมัธยมศึกษาระดับท้องถิ่น เรื่องการเปลี่ยนแปลงสภาพภูมิอากาศและการสอนในชั้นเรียน

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Abstract

Background and Objectives: Despite Thailand's vulnerability to climate change, the topic is underrepresented in the national curriculum. This research investigated Thai local secondary school English teachers' perceptions of climate change and the attitudes towards teaching this topic in the classroom. It explores whether the researcher's training program, *"Climate Awareness through English Classroom Activities,"* which provides practical classroom strategies, enhances the linkage between climate change and human life, and indicates the possibility of instructional implementation, will be able to increase their willingness and confidence to teach this topic.

Methods: A two-day teacher training program, *"Climate Awareness through English Classroom Activities,"* was organized to collect data from 25 participants through a test, two questionnaires with open-ended items, an evaluation form, and personal interviews. This research employs a mixed-method approach. The quantitative data were analyzed using a 1–10 rating Likert scale, and percentages to interpret the responses. Descriptive statistics were used to summarize the quantitative findings. The qualitative data were analyzed through content-based interpretation.

Results: The results indicated that the teachers' climate change knowledge was moderate, with an average score of 6.5 out of 10. While 96% believed they would be affected by climate change, only 27% could briefly identify its impacts. Nonetheless, all participants agreed on the importance of teaching climate change to secondary school students, demonstrating a positive attitude toward integrating the topic into English classrooms. They recognized climate change as a global issue requiring awareness. The training was reported to have positively influenced the teachers' environmental perspectives and achieved a satisfaction rating of 4.7 out of 5. Additionally, 90% of the teachers reported a shift in their attitudes, attributing it to realizing that teaching climate change in English classrooms was less complex than they had initially thought.

Application of this study: The findings suggest that this kind of training projects can enhance English teachers' perceptions and attitudes, as well as foster their confidence and willingness to teach climate change in the classroom. The data from these research results are beneficial to policymakers and educational strategists working to promote climate change awareness among students.

Conclusions: The findings suggest that tailored teacher training programs can significantly enhance English teachers' perceptions of climate change and their confidence in teaching the topic. The positive shift in attitudes and increased willingness to integrate climate change into English classrooms highlight the potential for such training to effectively support climate change education. This study contributes to the development of climate change education in EFL contexts, offering practical guidelines in connecting environmental issues with English language instruction.

บทคัดย่อ

ที่มาและวัตถุประสงค์: แม้ว่าประเทศไทยจะเปราะบางจากการเปลี่ยนแปลงสภาพภูมิอากาศ แต่หลักสูตรแกนกลางกลับไม่ได้บรรจุเนื้อหาในหัวข้อนี้มากเท่าที่ควร งานวิจัยนี้จึงสำรวจความรับรู้ของครูสอนภาษาอังกฤษชาวไทยในโรงเรียนมัธยมศึกษาระดับท้องถิ่นเรื่องการเปลี่ยนแปลงสภาพภูมิอากาศและทัศนคติต่อการสอนเรื่องดังกล่าวในชั้นเรียน โดยมุ่งสำรวจว่าการจัดการอบรมที่ผู้วิจัยพัฒนาขึ้นเรื่อง "การสร้างความตระหนักรู้ด้านสภาพภูมิอากาศโดยใช้กิจกรรมในชั้นเรียนภาษาอังกฤษ" ซึ่งเป็นการนำเสนอกลยุทธ์การสอนในห้องเรียนที่สามารถนำไปใช้ได้ เสริมสร้างความเชื่อมโยงเรื่องการเปลี่ยนแปลงสภาพภูมิอากาศกับชีวิต และชี้ให้เห็นถึงความเป็นไปได้ของการจัดการเรียนการสอนนั้น สามารถเพิ่มความสมัครใจและความมั่นใจของครูในการสอนหัวข้อนี้ได้หรือไม่

วิธีการศึกษา: งานวิจัยได้จัดโครงการฝึกอบรมครู 2 วัน ในหัวข้อ "การสร้างความตระหนักรู้ด้านสภาพภูมิอากาศผ่านกิจกรรมในชั้นเรียนภาษาอังกฤษ" เพื่อเก็บข้อมูลจากผู้เข้าร่วมจำนวน 25 คน โดยใช้แบบทดสอบ แบบสอบถามปลายเปิด 2 ชุด แบบประเมินผล และการสัมภาษณ์ส่วนบุคคล งานวิจัยนี้ใช้การวิจัยแบบผสมผสาน โดยวิเคราะห์ข้อมูลเชิงปริมาณด้วยมาตราส่วน (scale) 1-10 ลิเคิร์ตสเกล และเปอร์เซ็นต์ เพื่อตีความคำตอบที่ได้ และใช้สถิติเชิงพรรณนาเพื่อสรุปผล ส่วนข้อมูลเชิงคุณภาพใช้การวิเคราะห์เนื้อหา

ผลการศึกษา: ผลการวิจัยแสดงให้เห็นว่าครูมีความรู้เรื่องการเปลี่ยนแปลงสภาพภูมิอากาศในระดับปานกลาง โดยได้คะแนนเฉลี่ย 6.5 จาก 10 คะแนน ขณะที่ 96% เชื่อว่าตนเองจะได้รับผลกระทบจากการเปลี่ยนแปลงสภาพภูมิอากาศ ทว่ามีครูเพียง 27% ที่สามารถระบุผลกระทบโดยสังเขปได้ อย่างไรก็ตาม ครูทุกคนเห็นพ้องถึงความสำคัญของการสอนเรื่องการเปลี่ยนแปลงสภาพภูมิอากาศแก่นักเรียนมัธยมศึกษา และแสดงทัศนคติเชิงบวกต่อการบูรณาการหัวข้อนี้ในชั้นเรียนภาษาอังกฤษ เนื่องจากมีความเห็นว่าการเปลี่ยนแปลงสภาพภูมิอากาศเป็นปัญหาระดับโลกที่ต้องมีการตระหนักรู้ การฝึกอบรมมีผลเชิงบวกต่อมุมมองด้านสิ่งแวดล้อมของครู และได้รับคะแนนความพึงพอใจที่ 4.7 คะแนน จากคะแนนเต็ม 5 คะแนน นอกจากนี้ 90% ของครูรายงานว่ามีทัศนคติที่เปลี่ยนแปลงไปเมื่อได้ตระหนักว่าการสอนเรื่องการเปลี่ยนแปลงสภาพภูมิอากาศในชั้นเรียนภาษาอังกฤษไม่ได้ซับซ้อนอย่างที่คาด

การประยุกต์ใช้: ผลการวิจัยชี้ให้เห็นว่าโครงการอบรมในลักษณะนี้สามารถพัฒนาการรับรู้และเปลี่ยนแปลงทัศนคติของครูภาษาอังกฤษ และสามารถเสริมสร้างความมั่นใจและความสมัครใจในการสอนเรื่องการเปลี่ยนแปลงสภาพภูมิอากาศในชั้นเรียนได้ นอกจากนี้ ข้อมูลจากผลวิจัยยังเป็นประโยชน์แก่ผู้กำหนดนโยบายและนักกลยุทธ์ด้านการศึกษาที่มุ่งเสริมสร้างความตระหนักรู้เกี่ยวกับการเปลี่ยนแปลงสภาพภูมิอากาศให้กับนักเรียน

บทสรุป: ผลการวิจัยแสดงให้เห็นว่าการจัดอบรมครูที่ออกแบบเฉพาะสามารถเพิ่มความรับรู้เกี่ยวกับการเปลี่ยนแปลงสภาพภูมิอากาศและเพิ่มความมั่นใจในการสอนหัวข้อนี้ให้กับครูผู้สอนภาษาอังกฤษได้อย่างมีนัยสำคัญ การเปลี่ยนแปลงทัศนคติในเชิงบวก และระดับความสมัครใจที่จะบูรณาการเรื่องการเปลี่ยนแปลงสภาพภูมิอากาศเข้ากับชั้นเรียนภาษาอังกฤษที่เพิ่มขึ้น ชี้ให้เห็นว่าการฝึกอบรมสามารถช่วยขับเคลื่อนการศึกษาเกี่ยวกับการเปลี่ยนแปลงสภาพภูมิอากาศได้อย่างมีประสิทธิภาพ การศึกษานี้มีส่วนช่วยในการพัฒนาวงการศึกษาด้านการเปลี่ยนแปลงสภาพภูมิอากาศในบริบทของการเรียนการสอนภาษาอังกฤษเป็นภาษาต่างประเทศ (EFL) โดยเสนอแนวทางที่สามารถนำไปใช้ได้จริงในการเชื่อมโยงประเด็นด้านสิ่งแวดล้อมกับการเรียนการสอนภาษาอังกฤษ

Introduction

The ongoing observation and assessment of climate change and its repercussions affirm its urgency as a global priority (IPCC, 2023). Thailand's geographical and socio-economic characteristics, particularly in the northeastern and southern provinces, make it vulnerable to climate change, and it has been ranked as the 9th country most affected by climate change from 2000 to 2019 on the Long-Term Climate Risk Index, conducted by the GermanWatch Global Climate Risk Index, 2021 (Eckstein, Künzel, & Schäfer, 2021). Thailand also ranked 50th out of 163 countries regarding children most at risk from the impact of climate change (UNICEF, 2021). Despite this worrisome data, UNDP (2021) reported that Thai youths under the age of 18 had little belief in a climate emergency, ranking 8th among 9 countries in the Asia–Pacific region, with only 64% believing that climate change constituted an emergency. These findings affirm the need for Thailand to prioritize climate change education (CCE) within the national agenda.

Climate Action is goal 13 of 17 sustainable development goals (SDGs), which were proposed by the United Nations (UN) and were adopted by all UN member states in 2015 as part of the 2030 agenda for sustainable development. As the lead UN agency for education for sustainable development (ESD), UNESCO has been a strong advocate for CCE and recognizes that teachers play a crucial role in its promotion (UNESCO, 2021a). UNESCO expected ESD to be a core component of all education systems at all levels by 2025 (UNESCO, 2021b). However, when assessing whether CCE had been integrated into school curricula through a review of national curriculum frameworks from 100 countries, UNESCO (2021c) revealed that 47% made no reference to climate change. Looking at references to climate change in Thailand's basic education core curriculum 2008 (BE 2551), the monitoring and evaluating climate communication and education (MECCE) found that 'climate change' terminology was mentioned only

once, with 'sustainability' mentioned 7 times, 'biodiversity' 8 times, and 'environment' 18 times. Though the learning standards and indicators of the national curriculum were revised in 2017, climate change-related content was still not included (UNESCO, 2023). Manosorn & Samipak (2022) viewed that the state's efforts including the 2017 curriculum revision, the initiation of Earth System Science curriculum, and the Global Learning and Observations to Benefit the Environment (GLOBE) program. Lack of efficient PR, and unattractive activities in their textbooks all contributed to the failure to enable students to realize the severity of climate change and to adapt to its impact.

Looking at Thailand's Climate Change Master Plan 2015–2050, strategies to develop support mechanisms for the education sector to foster climate change adaptation and mitigation are briefly addressed in Chapter 3: Building Capacity Towards Climate Change Management. Section 3, subsection 3.1 outlines supportive measures for academics and educational institutions such as encouraging collaboration between academic networks and incorporating environmental and climate change concepts into the school curriculum at all levels (ONEP, 2015 : 98-99). However, Manosorn and Samipak pointed out that these measures had not been adequately made known to elementary and secondary schools in the country. Titipongvanich et al. (2020) surveyed 395 elementary schools under the Office of the Basic Education Commission and found that curriculum development and assessment, student activities, and budget constraints were the main weaknesses in building climate change awareness among students.

In Thailand—as in many countries where CCE has not yet been systematically integrated into the curriculum—embedding climate change content into existing school subjects may offer a more effective and immediate path forward. Given that English serves as a global medium of communication, the English language classroom presents a unique opportunity to introduce climate-related topics. While global frameworks such as those developed by UNESCO emphasize the importance of integrating CCE across all subjects, how such guidance can be interpreted and explored in local classroom contexts—particularly in EFL settings—remains underexplored. This research thus investigates local secondary school English teachers' perceptions of climate change and its teaching within English classrooms. A two-day teacher training program was conducted in 2023 to introduce lectures and adaptable classroom activities related to climate change.

1. What are the teachers' perceptions of climate change?

2. What are their perceptions on its teaching in the English classroom?

3. Does the training program increase teachers' willingness and confidence to teach climate change in the English classroom?

Literature Review

The following sections explore the body of literature concerning the need to understand teachers' perceptions of climate change, and how English as a school subject can accommodate the topic of climate change.

The Need to Understand Teachers' Perceptions of Climate Change

Dal et al. (2015) affirmed that teachers' understanding and awareness of climate change are essential for fostering students' comprehension of the topic. Therefore, it is crucial to prioritize the education of teachers on this issue. However, numerous studies have shown that many teachers still lack sufficient knowledge to effectively teach the subject. Winter et al. (2022) contended that educational institutions still struggle to provide students and prospective

teachers with the essential skills and knowledge to become advocates for climate action. Both current and aspiring teachers often have the same basic or incorrect understanding of key climate change concepts as their students. Consistent with survey results from Wise (2010) and Dawson (2012), a study by Herman, Feldman, and Vernaza-Hernandez (2017) investigating science teachers in Florida and Puerto Rico, which are regions vulnerable to climate change, found that many high school science teachers held misconceptions about the causes of climate change. Herman concluded that science teachers' knowledge of climate change was deficient and that would certainly influence their teaching. Herman then proposed that the first step to resolve this problem was to 'determine the teacher's conceptions and beliefs about fundamental climate change science ideas and the extent they address those ideas in the classroom' (Herman et al. 2017 : 455). Seroussi et al. (2019) reviewed similar surveys and literature spanning 1995–2018 and confirmed that while the distorted beliefs of climate change among teachers were diminishing, they still persisted. Seroussi et al. addressed three dimensions for assessing individuals' understanding of climate change: knowledge, beliefs, and attitudes. The first two categories are interrelated. In the case of climate change, where its consequences are not experienced equally by all, its existence could be perceived not as knowledge but as a belief which is controlled by cognitive mechanisms involving emotions and social or personal influences (Capstick & Pigeon, 2014 ; Lorenzoni & Pidgeon, 2006 ; Weintrobe, 2013, as cited in Seroussi et al., 2019). The third category, attitude, is a psychological tendency which is linked to personal behaviour. For example, if the teachers recognize climate change as controversial, they might try to avoid teaching it, even if they are experts in the field. Chowdhurry et al. (2021) conducted a survey on teachers' perception of climate change focusing on its significance, causes, consequences, and mitigation in Bangladesh, another climate-vulnerable region, and affirmed that it is crucial to understand teachers' perceptions of climate change as they would pass on their knowledge, beliefs, and practices to their students. They also found that sociodemographic and academic factors also play a role in the formation of each individual perception of climate change. What Herman, Seroussi et al. and Chowdhurry et al. clearly agreed upon is that assessing teacher's understanding of the content knowledge of climate change, and their beliefs or attitudes of the topic can shed light on the teachers' level of confidence or readiness to foster climate change awareness for students. This also reveals their motivations, challenges, and perceived opportunities when addressing such a complex and interdisciplinary topic as climate change.

Building on these perspectives, Supa & Dasa (2024) addressed the lack of research on developing appropriate instruments to assess climate awareness in Thailand, highlighting the absence of validated tools, particularly for youths. Consistent with Herman, Seroussi et al. and Chowdhury et al., Supa and Dasa affirmed that understanding, attitudes, and behaviors are the three essential components of climate awareness assessment. Supa and Dasa proposed a validated instrument comprising a test to measure understanding of climate change and a questionnaire to evaluate attitudes and behaviors. Their survey of 300 youths also suggested that incorporating additional methods, such as behavioral observation and interviews, could provide more comprehensive results. Additionally, their research recommended that teachers should prioritize equipping high school students with knowledge about climate change, including its physical consequences, the human behaviors driving it, and strategies for mitigation.

The literature review highlights that fostering the teaching of climate change among students requires qualified teachers, whose qualifications can be evaluated through their knowledge, beliefs, attitudes, and perception. While these terms are often used interchangeably, this research defines perception specifically in the context of climate change as an individual teacher's understanding and response to information about climate change. This definition encompasses the cognitive and emotional processes that shape attitudes toward climate-related issues.

Climate Change Education and English Language Teaching

Newsome et al. (2023 : 508) believe that limiting the topic of climate change to a specific course, like science, would deprive students of understanding the issue from economic, social, cultural, ethical, technological, and political perspectives. Newsome supports the idea proposed by Gibb (UNESCO, 2016 : 12–14), which suggests that every subject has the potential to incorporate the topic. In his contribution to UNESCO's publication, Gibb suggests practical guidelines on how to teach climate change in all subject areas. For example, students could be asked to create posters showing the impacts of climate change for their art class, make graphs to show changes in school energy use for their math class, or write poems and stories in response to photos or videos about climate change for their English class. He notes that climate change is a complex issue which is also ever-changing; therefore critical, creative, and future thinking skills need to be embedded into classroom activities. Critical thinking skills can help filter information that needs validation. They can lead to possible solutions, while future thinking skills enable students to envision the future and the short and long-term effects of a decision. Climate action projects and extracurricular activities are also encouraged to 'empower students to use their learning as the basis for making positive change in their lives, schools, and communities. Beach et al. (2017) believe that the English classroom can accommodate the topic of climate change in many ways. Students can engage with various kinds of news, advertisements, films, songs, personal stories, and fiction and non-fiction texts such as poems, plays, and novels. They can read about the effects of global warming and develop empathy while discovering how other people across the globe are coping with the consequences of a climate crisis. They can learn to use communicative tools to express their ideas and voice their environmental concerns. Through the process of critical reading, students can examine how human activities contribute to climate change in economic and political aspects and question our relationship with the natural world. Micalay-Hurtado & Poole (2022) advocated for the field of English Language Teaching (ELT) to critically examine how language practices and pedagogies can shape attitudes, ideologies, identities, and actions in response to the climate crisis and promote sustainability. Nur et al. (2022) saw the need for language teachers to embrace a 'green pedagogy' that includes language teacher professional development, environmentally-based curriculum, and environmentally-based materials and resources, and acknowledged an urgent need for more research and professional development programs on incorporating environmental issues into ELT. Silvhiany et al. (2023) called for further research on climate change education (CCE) in English as a Foreign Language (EFL) and proposed connected learning and ecojustice pedagogy to support the development of climate change awareness.

While existing research has established the importance of understanding teachers' perceptions of climate change and the potential of English language teaching to address environmental issues, there remains a significant gap in understanding how these intersect in the Thai context. Specifically, no studies have investigated Thai English teachers' perceptions of climate change or their readiness to integrate climate change education into English language teaching. This gap is particularly significant given Thailand's high vulnerability to climate change impacts and the low climate change awareness among Thai youth. Additionally, while UNESCO (2021c) has highlighted the absence of climate change content in the national curriculum, there has been limited research on practical approaches to integrate climate change education into existing subjects, particularly in language classrooms. This study addresses these gaps by examining local English teachers' perceptions and investigating whether targeted training can enhance their readiness to teach climate change content through English language instruction.

At present, there appears to be no comprehensive or widely adopted framework for integrating climate change into English as a Foreign Language (EFL) or English as a Second Language (ESL) instruction. Efforts in this area are primarily characterized by individual initiatives, resource development, and thematic lesson plans, rather than a formalized framework. The field is still in its developmental stages, presenting significant potential for the creation of a structured framework that aligns climate change education with EFL/ESL learning objectives. This offers educators and researchers an opportunity to contribute to the development of an emerging area of interdisciplinary pedagogy. Thus, this research aims to contribute to the growing body of knowledge by introducing practical classroom activities related to CCE to local teachers, in order to examine their perceptions of teaching climate change and their willingness to integrate it into English language instruction.

Research Method

The research employed two sets of instruments: (1) a two-day teacher training titled "Climate Awareness Through English Classroom Activities", designed to introduce classroom activities integrating CCE to the teacher participants, and (2) data collection instruments consisting of a test on climate change perception, two questionnaires with open-ended items, a training evaluation form, and personal interviews. Data were collected at three stages: before, during, and after the training. This small-scale exploratory study employed a mixed-methods design, combining rating scales, Likert-type items, open-ended questionnaires, and interviews. This variety of instruments was chosen to accommodate the limited sample size while enabling a nuanced investigation of participants' perceptions.

1. Research Design

1.1 The 2-day teacher training

A two-day training, *'Climate Awareness Through English Classroom Activities,'* was organized at Silpakorn University for Thai English teachers from the local area. The training began with a lecture from a guest speaker from the business sector on current trends and communication related to climate change, followed by lectures from UNESCO Bangkok on CCE, providing an overview of how the business and education sectors are working to mitigate climate change globally.

The following sessions introduced practical classroom activities that integrated CCE using a theme-based approach. There were four modules, each built on the existing pedagogical framework of Communicative Language Teaching (CLT) (Richards, 2006), incorporating elements of Content-Based Instruction (CBI) (Stoller, 2002), Task-Based Instruction (TBI) (Nunan, 2004), and Project-Based Learning (PBL) (Beckett & Slater, 2005). These approaches were selected for their ability to promote meaningful use of language in real-world contexts, support content integration, encourage learner autonomy, and develop essential skills such as critical thinking and collaboration—qualities that align closely with the goals of climate change education. The modules also drew from Gibb's and Beach et al.'s proposals on embedding critical thinking into language learning. Module designs were approved by senior experts in EFL. The details are as follows.

(1) *Approaches to Teaching Climate Awareness in the English Classroom*: This session introduced communicative activities with the focus on climate change lexicon and current global events through games and interactive activities. It also demonstrated how to apply online resources like UNESCO's digital posters on Climate Science Literacy in Asia and the Pacific to classroom teaching.

(2) *Building Empathy and a Global Citizenship Mindset*: This session incorporated the idea proposed by Beach et al. that empathy can be fostered if learners are exposed to the consequences of climate change on a global scale. The activities encouraged learners to explore the impacts of these consequences on other living beings and to write a personal letter to express empathy for those affected.

(3) *Encouraging Critical and Innovative Thinking*: This session encompassed the idea proposed by both Gibb and Beach et al. that critical thinking can help filter information that needs validation and investigate human behaviours that exacerbate climate change.

The session emphasized the concept of climate literacy, encouraging participants to validate information circulated in the media. It also asked them to think creatively and innovatively to develop practical solutions, drawing inspiring examples from LittleInventors.org which is a website that fosters creativity in children by transforming their imaginative ideas into real inventions with the help of professionals.

(4) *From Classroom to Community:* This session applied project-based learning, prompting participants to brainstorm ways they can mitigate climate change at the local level. Examples were drawn from global and local innovations including UNESCO Green Citizen Project which promotes environmental awareness and action by empowering individuals, particularly youth, to become active contributors to sustainable development and climate change mitigation.

1.2 Instruments for data collection

The research employed a series of instruments to collect both quantitative and qualitative data. Given the participants' relatively similar backgrounds and the novelty of the topic in the Thai EFL context, it was deemed appropriate to develop tailored question sets. These instruments were designed in alignment with the approaches proposed by Herman, Chowdhury et al., Seroussi et al., and Supa and Dasa. Perceptions of climate change were assessed first to gauge the teachers' knowledge and understanding. Subsequently, questionnaires with open-ended items were used to explore teachers' views on teaching climate change in the English classroom. The assessment design followed Supa and Dasa's framework, incorporating objective items (e.g., true/false questions) and subjective or essay-style items to capture attitudes and beliefs. An evaluation form was used to assess the teachers' satisfaction with the training. Additionally, personal interviews were conducted to capture aspects not addressed in the test and questionnaires. The instruments had been affirmed by academics from the field of ELT and the clean energy sector in Thailand. They were also approved by the Silpakorn University Research Ethics in Human Research Committee. Participants gave their written consent prior to completing each instrument. They could choose to omit certain items that they felt were too difficult to answer or that made them feel uncomfortable. The details of the instruments are as follows.

A test on knowledge and perceptions of climate change

The test contained five sections asking participants to 1) decide whether 10 given statements were true or false, 2) identify three major impacts of climate change, 3) indicate whether they believed they would be affected by climate change in the future and provide explanations, 4) define five key current climate-related terms, and 5) rate the urgency of climate change based on their feelings using a 1–10 rating scale. The full test is included in Appendix A.

The test was designed to assess both factual knowledge and subjective perceptions related to climate change. Sections 1 and 4 contained objective items (true/false statements and key term definitions) to gauge conceptual understanding. Sections 2 and 3 elicited personal reasoning and lived perspectives, while Section 5 used a numerical rating scale to assess perceived urgency. This combination was chosen based on the work of Herman, Seroussi et al.,

Chowdhury et al., and Supa and Dasa, who emphasize the importance of assessing both knowledge and beliefs in understanding climate change awareness. The questions were tailored to suit the participants' general teaching background and level of familiarity with climate change discourse.

Responses to objective items were scored for accuracy, while open-ended responses such as definitions and explanations were evaluated descriptively based on completeness, relevance, and alignment with accepted climate change concepts. No formal rubric was applied, as the analysis was exploratory and aimed at gaining insight into participants' existing understanding and perceptions rather than assigning precise scores. As the instruments were newly developed for this study, they were reviewed by academics in the fields of English language teaching, and clean energy to ensure content validity and contextual appropriateness. Due to the small sample size and the exploratory scope of the study, statistical validation methods such as Cronbach's alpha or factor analysis were not applied. The instruments were not pilot-tested separately; however, items were refined based on expert feedback prior to implementation. These limitations are acknowledged in the interpretation of the findings.

Research questionnaires

The first questionnaire, administered before the training, contained four open-ended items designed to elicit teachers' attitudes toward the importance of teaching climate change in the English classroom, the availability and sufficiency of relevant content in their teaching materials, their sources of information, and their past experience raising environmental awareness with students. The full questionnaire is included in Appendix B.

The second questionnaire, administered after the training, also contained four open-ended items. It aimed to explore whether the training offered useful insights or applications for classroom practice, any changes in attitude toward climate change and its teaching in English, and participants' interest in specialized English teaching resources related to the topic. The full questionnaire is included in Appendix C.

Evaluation of the training

The training was conducted as a university-approved academic service project under the Faculty of Arts, Silpakorn University. A standard five-point Likert-type scale, based on the Faculty's official evaluation form for academic service, was used to assess participants' satisfaction with the training.

Interview

Unstructured interviews were conducted with a few voluntary participants to obtain insights not covered by the test or questionnaires. Interviews were conducted in Thai to allow participants to express their ideas comfortably and comprehensively.

2. Participants

The participants were 25 Thai teachers of English from 16 secondary schools in the mid-west region of Thailand who voluntarily participated in the training. Convenience sampling was used due to accessibility and scheduling constraints. Since all participants were qualified secondary English teachers residing in the same region and sharing a relatively homogeneous cultural background, the study did not control for variables such as academic background, religion, or ethnicity. Data collection was not contingent on age, gender, or years of teaching experience. While this sampling method was suitable for the exploratory nature of the study, the absence of detailed demographic data is acknowledged as a limitation. All participants completed informed consent forms and were made aware of their right to withdraw from the study at any time.

3. Data analysis

This research employed a mixed-methods approach. Quantitative data were collected through a 1–10 rating scale, a Likert scale, and true/false items. These responses were analyzed using percentages and descriptive statistics. Qualitative data, collected through open-ended questionnaire items and interviews, were analyzed through content-based interpretation to identify patterns and common perceptions. A total of 25 participants took part in the training and were invited to complete all instruments; however, not all participants completed every component. The instruments and procedures are described in detail in the preceding sections.

Research Results

Given the small sample size and exploratory scope of the study, quantitative data were interpreted descriptively, and qualitative responses were analyzed through content-based interpretation. The following subsections are organized according to the study's research objectives.

Test on Perception of Climate Change

Item 1 of the test assessed the perception of climate change in scientific, policy-related, and behaviour-related aspects. Participants needed to determine if each statement was true or false. If unsure, they could also choose not to respond. The average score was 6.58 out of 10. The details of responses are presented in Table 1.

Table 1 Results of the Test

Statements (True or False)	Correct Answers	Incorrect Answers	No Answers
1. All fossil fuels will run out within this century.	9	14	1
2. Current severe changes in weather patterns are not the result of global warming.	22	1	1
3. Global warming can trigger an emergence of dormant or new viruses.	17	4	3
4. The EU and the US will ban all new combustion engine vehicles by 2035.	9	9	6
5. Thailand has announced that it will achieve net-zero greenhouse gas emission by 2035.	13	5	6
6. Some countries already rely on almost 100% clean and renewable energy.	18	3	3
7. Some countries have already imposed taxes on goods that emit CO_2 during production.	21	1	2
8. Eating a plant-base diet cannot reduce global warming.	16	5	3
9. Using electric vehicles (EVs) can reduce global warming.	20	2	2
10. You can plant trees and earn credits to exchange for money.	13	5	6
Total answers = 240	158	49	33

Statement 2 received the most correct answers (22 correct answers = 92%) which revealed an almost unanimous belief that climate change causes severe weather events. Statement 7 received one fewer correct answer (21 correct answers = 88%) acknowledging an awareness of climate change in relation to the rising prices of consumer goods due

to carbon taxes. Next were statements 9 (20 correct answers = 83%) and 6 (18 correct answers = 75%). These two statements pertain to clean energy consumption. It is plausible that participants who correctly answered both statements were reasonably aware of global energy trends. Statements 3 (17 correct answers = 71%) and 8 (16 correct answers = 67%) showed that over half of the participants could link climate change to other aspects such as the emergence of a new virus and eating habits. Statements 5 and 10 received an equal number of correct answers (correct answers 13 = 54%, incorrect answers 5 = 21%, and no answers 6 = 25%) revealing that about half were aware of national CO_2 reduction targets and climate change policies that may present financial benefits to voluntary individuals. Statements 1 and 4 received the least correct answers (9 correct answers = 37.5%). Of all ten statements, the ratio of incorrect answers for statement 1 was significantly high (14 answers = 58%), exhibiting an unsubstantiated belief that fossil fuels would run out within the next 80 years. Scientifically, fossil fuels are finite resources, but technological advancements have extended their availability in recent times. It is likely that they will still be part of the energy mix by 2050, but their consumption will decrease significantly in favor of renewable energy sources (EIA, 2023; International Energy Agency, 2021). However, there is a lot of conflicting information when using internet searches. It was discovered that the nature of this particular subject was complex because it involved the finite nature of fossil fuels, the interpretation of reserves and production data, market supply dynamics, technological advancements, rising demand for renewable energy, media coverage, and personal preference. As for statement 4, the proportion of the correct answers was smaller than the incorrect answers and no answers combined. This similar proportion also occurred with statements 5 and 10, where slightly over half of the participants chose the correct answers. Interestingly, these three statements pertained to commitment and policies relating to CO_2 reduction. The results thus suggest that information, particularly regarding global or foreign policies and trends related to CO_2 reduction, may not have been thoroughly circulated within the community of school teachers. It should be noted that the average knowledge score of 6.58 out of 10 was derived solely from item 1 (true/false statements). Other test items were analyzed separately and did not contribute to this score.

Item 2 of the test assessed the participants' perceptions of climate change in terms of its impacts. It asked the participants to state 3 major impacts of climate change. The rather unusual results are presented in Figure 1.
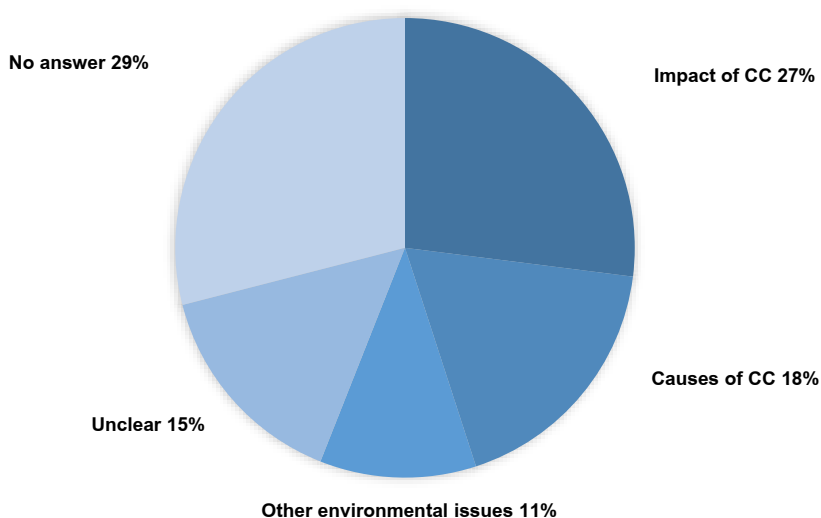

Figure 1 Responses to Identifying Climate Change Impacts

(**Source:** Sawaddee & Chiravate, 2025a)

There were 19 responses (27%) that managed to address the impacts of climate change. The most frequently mentioned impacts were related to heat, including 'global warming' (7 answers) and 'hot weather' (1 answer). It is worth noting that these two phrases were expressed in a static manner. They signify the state of being warm or hot rather than warmer or hotter and therefore do not require any action or attention. Three responses were related to natural catastrophes, including 'disasters' and 'floods'. Despite being negative words, both 'disaster' and 'flood' were expressed without such tone. Two responses were 'new viruses' which adhered to statement 3 in item 1, and two responses were related to animal extinction. Altogether, these four responses show that some participants could relate the impact of climate change in a biological aspect. The remaining responses were 'seasonal change' and 'lack of food' which relate to the living aspect. Climate change disrupts climate patterns, leading to reduced agricultural yield and compromised food security.

There were 13 responses (18%) that addressed the causes of climate change rather than the impacts. The most frequently mentioned causes were related to deforestation and air pollution (9 answers). Since the participants were not native English speakers, this could have been due to a misinterpretation of the word 'impact'.

Eight responses (11%) were not relevant to the impact of climate change. They were related to other environmental issues such as plastic trash, inefficient waste management, and overconsumption. These answers indicated that climate change was perceived merely as another environmental problem in school rather than as a distinct and urgent issue.

Unclear responses included single words which connoted insufficient detail, such as, 'climate', 'education', 'economic', 'engines', 'population' and 'habitat'. These words can relate to climate change, but are not impacts and contain insufficient information.

Item 3 of questionnaire 1 asked if the participants thought they would be affected by climate change in the future. The results are presented in Figure 2.
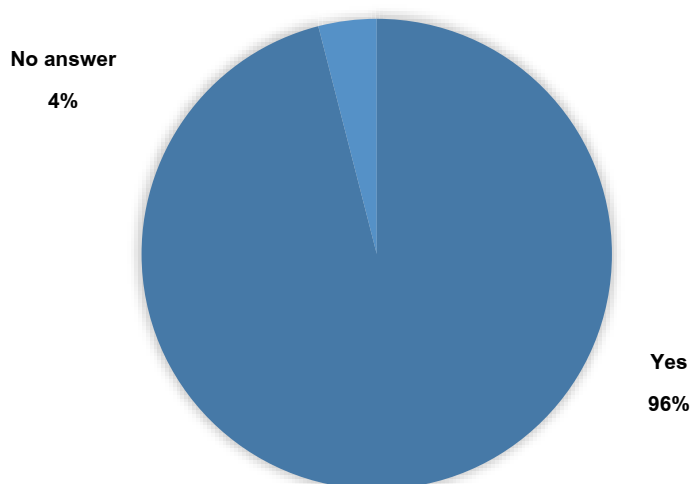

Figure 2 Respondents' Answers to Whether They Thought They Would Be Affected by Climate Change

(**Source:** Sawaddee & Chiravate, 2025b)

Almost everyone agreed that they would be affected by climate change. However, when examining the given explanation, it was found that most answers were short, vague, and not self-related. The most frequently mentioned phrase was 'global warming' (6 responses = 25%). The rest were 'disaster', 'flood', 'lack of food', and 'diseases'. Five responses (21%) did not explain how climate change would affect them, but rather stated the fact that climate change had effects, for example, 'Everybody is affected' and 'The government should do something". The nature of the answers from this part is similar to those in item 2 in that they are very short and lack specific detail.

Section 4 of the test assessed the participants' awareness and knowledge of five current climate related key terms. The results are presented in Figure 3.
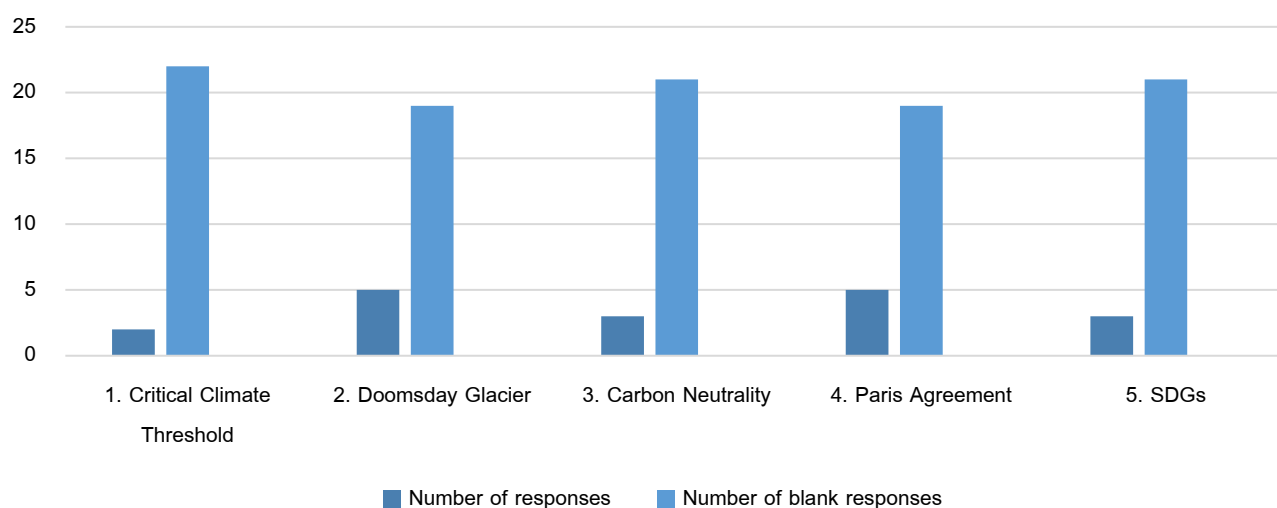

Figure 3 Awareness of 5 Selected Key Terms

(**Source:** Sawaddee & Chiravate, 2025c)

It is evident that the majority of the participants were completely unfamiliar with these terms and consequently left this part blank. Assessing the explanations of these five terms revealed a similar nature to items 2 and 3 of this questionnaire in that they were very short and unclear. Responses describing critical climate threshold included 'something that triggers or worsens the climate' and a 'problem about climate change'. The words 'something' and 'about' clearly denote a sense of uncertainty. Four responses described the Doomsday Glacier very broadly as ice melting. One response mistakenly stated that the melting was at the North Pole, while another response stated that it was at both poles. The vagueness and the errors suggest that the responses could stem from an attempt to interpret the key terms rather than a display of current awareness and knowledge. Three responses described carbon neutrality quite differently. One response described it as 'the way to make carbon less than before' which is generally correct, but still ambiguous. Another response simply stated that it was the equivalent of carbon zero, and the remaining response stated that it referred to 'the gas from vehicles'. Clearly, the knowledge of what carbon neutrality is and how it differs from carbon dioxide and zero carbon emissions was not well understood among secondary English school teachers. Five responses described the Paris Agreement as an agreement to 'stop climate change', 'reduce combustion engine uses', 'reduce the emission of CO_2', and 'reduce carbon', whereas one response mentioned 'reduce global issues'. While the first four responses seemed to express the correct aim of the agreement, no further detail was given. Thailand officially ratified the Paris Agreement in 2016 and updated its nationally determined contribution (NDC) to reduce greenhouse gas emissions by 30–40% by 2030. The country also declared its goals to achieve carbon neutrality by

2050 and net-zero greenhouse gas emissions by 2065 (UN Treaty Collection, 2016; UNFCCC, 2022). This shows that the country's solid commitment to the agreement seemed to contrast with the current level of awareness among the participants. Finally, three respondents described SDGs. One response provided only the full form of the initialism. Another provided the full form and noted that climate change was goal 13. The third described it as 'a plan for solving global warming.' It is apparent that none of the participants was truly aware of SDGs. Very few knew what the letters stood for, and were not aware of how the goals were interpreted and implemented.

Section 5, the last section of the test, assessed the participants' perceptions of the urgency of climate change on a 1–10 scale. The average was 7.54 indicating that climate change was perceived as somewhat urgent, but not critical. However, IPCC (2023) reported with high confidence that climate change had already led to significant damage and increasingly permanent losses in the ecosystems. About half of the global population was already living in areas highly vulnerable to climate change. These regions face more frequent and severe weather events like floods, droughts, and heat waves, which threaten food and water security and worsen social inequality and poverty. The World Bank has estimated that without immediate and decisive actions, climate change will displace approximately 216 million people by 2050 (Ehui & Rigaud, 2022). The World Health Organization (WHO) also stressed that climate change poses health threats and projected that if the warming continues to exceed 2°C, 1.4 billion people will be exposed to heat stress by 2050 (Ghebreyesus et al., 2023). International agencies working on climate change all agree that immediate and ambitious actions are needed to mitigate these impacts and limit global warming to 1.5°C. Therefore, perceiving the urgency of climate change as urgent but not critical is an understatement. The relatively high urgency rating may reflect general concern or exposure to climate discourse in the media, rather than an in-depth understanding of climate change concepts, as indicated by the limited knowledge shown in other parts of the test.

Questionnaire 1

Item 1 of questionnaire 1 asked the participants if it was important for secondary students to learn about climate change, especially in English. All participants agreed that it was important. The analysis of the responses found that 11 answers (46%) perceived climate change as an important issue that everyone should be aware of. Four responses stated that nobody could avoid living with climate change, three responses recognized it as a global problem, two responses expressed the need to protect the world from climate change, and one response stated that people were still ignorant to the problem. Three responses were left blank. Looking further into the responses, the reasons for secondary school students to learn about climate change in class were identified. Five answers (21%) pointed out that climate change should be taught in an English classroom because most of the information regarding climate change is in English. The remaining responses (9 responses = 37.5%) did not specifically focus on the context of an English classroom, but rather on classrooms in general. Three responses stated that it was the role of teachers to guide students and lead the community. Responses regarding the students included the need for opportunities to discuss possible solutions, learn relevant key terms, assess credible information, possess environmental awareness, and identify causes and effects of climate change.

Item 2 of questionnaire 1 asked the participants about the access and availability of material related to climate change and whether they thought the information was sufficient. The results are shown in Figure 4.
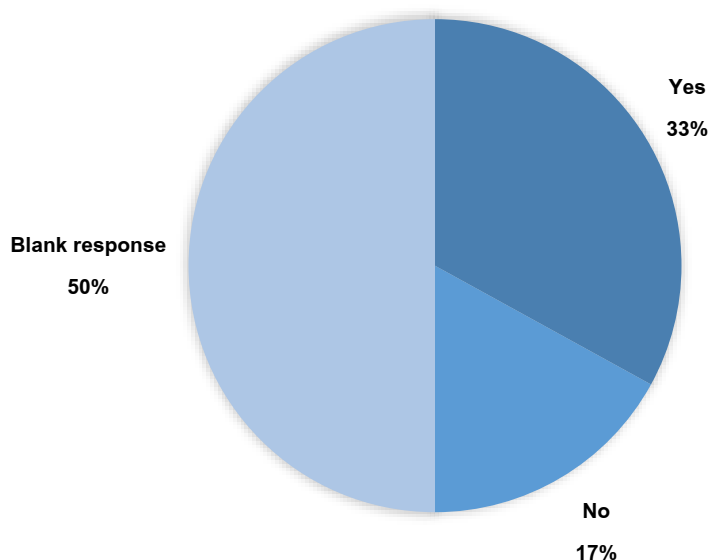
Figure 4 Percentage of Respondents With Classroom Materials Covering Climate Change

(**Source:** Sawaddee & Chiravate, 2025d)

The proportion of blank responses combined with the response 'No' totaled 67%, indicating both a lack of interest and a lack of climate change-related resources. Further details revealed that information regarding climate change was challenging as the vocabulary level did not match the competency level of secondary school students. Eight responses (33%) indicated 'Yes' and mentioned that their information sources included textbooks, newspaper articles, websites, and YouTube video clips. However, these responses did not provide further details regarding the suitability of the content or its application in the classroom. Regarding having sufficient materials, 11 responses (45.8%) indicated 'No,' while the remaining participants did not respond. This result highlights a clear lack of interest in, and availability of, resources and materials related to climate change. Further details revealed that printed materials were outdated, and the credibility of online content was questionable.

Item 3 of questionnaire 1 asked the participants to identify where they obtained climate change information. While there were 25 participants, only 18 responded to this item, with some participants giving multiple responses. This resulted in a total of 19 responses presented in Table 2.

Table 2 Resource Types for Climate Change Knowledge

Type of Resource	Number of Responses	Examples of Sources
Website	9	UNEP, NASA, National Geographic, the British Council
Social media	8	Facebook, YouTube, TikTok
Printed material	6	Newspapers, textbooks
Documentary series	1	Netflix
Knowledgeable persons	1	

The most frequently mentioned resource was websites (9 responses = 37.5%), which indicates that this is probably the most convenient type of resource for teaching materials. The websites mentioned in the responses were also highly credible, demonstrating a sound level of media literacy. Social media was almost as popular, but since no specific name of the creator was given, it was hard to determine the nature of the content or justify their credentials. Printed materials like newspapers and textbooks were still considered a good source of information.

Item 4, the last question of questionnaire 1, asked the participants whether they thought it was possible to raise environmental awareness in their classroom and whether they had done it before. The results are presented in Figure 5.
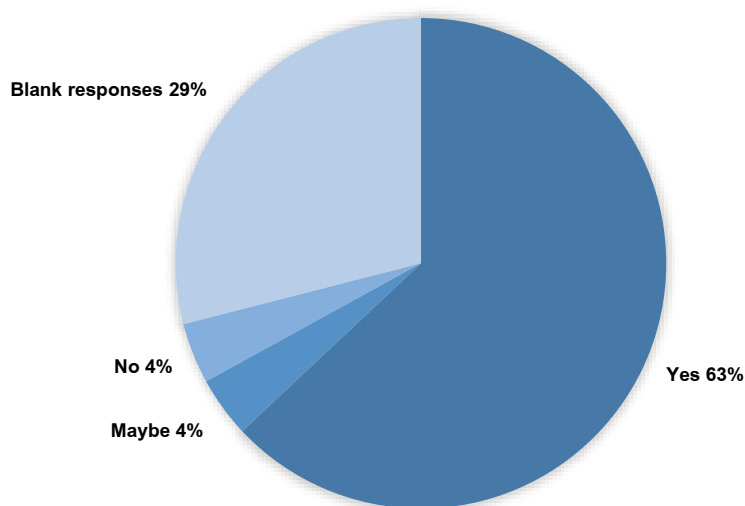

Figure 5 Respondents' Perceptions on the Possibility of Raising Environmental Awareness in the Classroom

(**Source:** Sawaddee & Chiravate, 2025e)

Over half of the respondents stated 'Yes,' with 7 responses indicating prior efforts such as encouraging students to save water, electricity, and paper; creating climate change posters; and organizing projects to solve environmental problems. This demonstrates that some practical environmental efforts have been implemented at the classroom level. It also suggests that climate change has likely been integrated with other environmental issues. Only one response stated that raising environmental awareness in the classroom was not possible, mentioning that their attempts had failed, but no further details were provided.

Questionnaire 2

This questionnaire was distributed after the participants had completed the 2-day training to assess the impact of the training. A total of 20 participants were eligible to complete the questionnaire.

Item 1 asked if the participants had discovered anything useful that could be applied to their classrooms. All respondents agreed that the training was useful, highlighting a positive attitude towards the training. Figure 6 reveals the aspects from the training that the respondents thought they could potentially use.
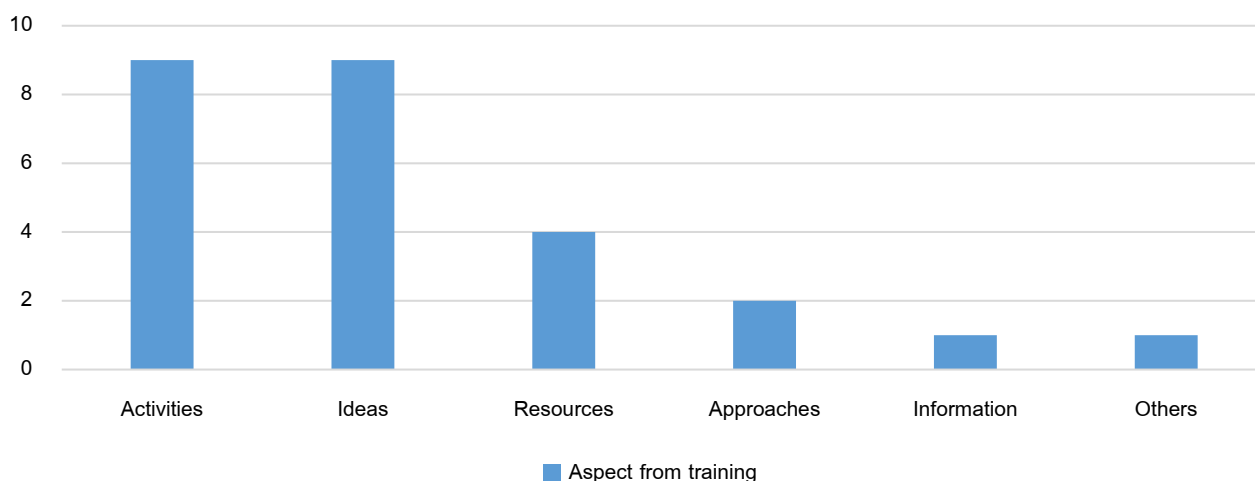
Figure 6 Respondents' Perceptions of What Could be Applied to Their Classroom From the Training

(**Source:** Sawaddee & Chiravate, 2025f)

The proposed activities and ideas from the training were mentioned the most frequently, totaling 69%. This confirmed that the activities and ideas were useful and could be practically transferred to actual classrooms. Further responses revealed that participants were more open to teaching climate change in their classrooms to foster environmental awareness among students. They recognized the crucial role that teachers play and believed that connecting the causes and effects of climate change to students' everyday lives through classroom activities would be effective. Four responses (20%) said that they discovered useful resources including UNESCO's climate science literacy poster series (2022d), websites, and applications. Two responses (10%) recognized practical approaches to integrate language teaching with critical thinking and effective classroom techniques. The remaining responses mentioned updated information on climate change. Others referred to the awareness and inspiration gained from the training.

Item 2 of questionnaire 2 asked if the participants' attitudes towards climate change shifted after attending the training. The results are presented in Figure 7. This finding is based on a post-training, open-ended question (Appendix C, Question 2) and reflects participants' self-perceived changes in attitude, not a matched pre/post measurement.
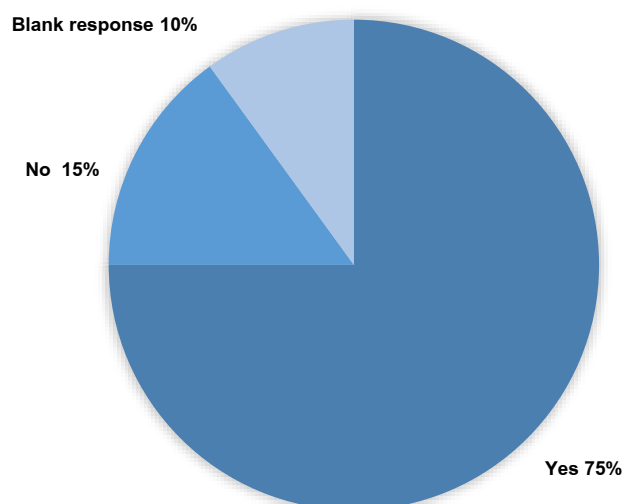

Figure 7 Respondents With a Change of Attitude Towards Climate Change

(**Source:** Sawaddee & Chiravate, 2025g)

Fifteen responses (75%) indicated that their attitudes had changed, with participants gaining more awareness and perceiving climate change as a closer, more immediate issue. Three responses stated that their attitudes did not change because they were already aligned with the training's perspective. Therefore, the total percentage of participants who believed climate change was an important issue amounted to 90%. Further details of the responses revealed that 50% expressed an enthusiasm in making behavioral changes including being more mindful with daily activities that contribute to global warming, saving natural resources, having more empathy for those affected by climate change, and sharing information with students in class. This aligned with the third category of assessment mentioned by Seroussi et al., (2019) which stated that attitude is linked to personal behavior. As Chowdhurry et al. (2021) noted, it is likely that what teachers perceive as vital will be passed on to students. Additionally, 25% of the respondents indicated that they discovered something new: that climate change was closely connected to daily activities, highlighting its urgency and the importance of teaching it to students. Finally, 10% expressed concern that sufficient actions for change have not yet been taken.

Item 3 of questionnaire 2 asked if the participants' attitudes towards teaching climate change in an English classroom changed after attending the training. The results are presented in Figure 8. As with the previous item, this result derives from an open-ended post-training question (Appendix C, Question 3) and was not analyzed through a pre/post statistical comparison.
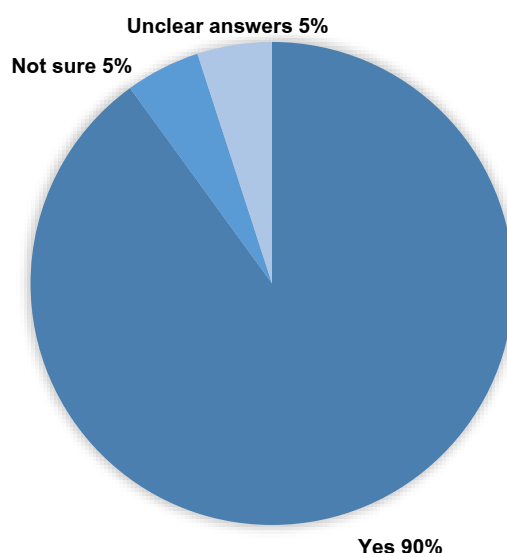

Figure 8 Percentage of Respondents With a Change of Attitude Towards Teaching Climate Change

(**Source:** Sawaddee & Chiravate, 2025h)

Most participants admitted that their attitudes towards teaching climate change in an English classroom had shifted. One response who stated 'unsure' explained that their attitude already aligned with the training's perspective. Only one response was not clear enough to be processed and this was probably due to a language problem. Further details demonstrated that the shift in attitude stemmed from the realization that teaching climate change was not as difficult as anticipated. Sample activities, resources, ideas, and techniques from the training could be readily applied in actual classrooms. Some responses affirmed the possibility of incorporating climate change into supplementary English classes, where teachers have the freedom to select topics and design their own lesson plans. This allows for integrating climate change as a theme or as part of the four skills practice.

Item 4, which is the last part of questionnaire 2, explored the participants' interest in tailored material on climate change. The responses are presented in Figure 9.
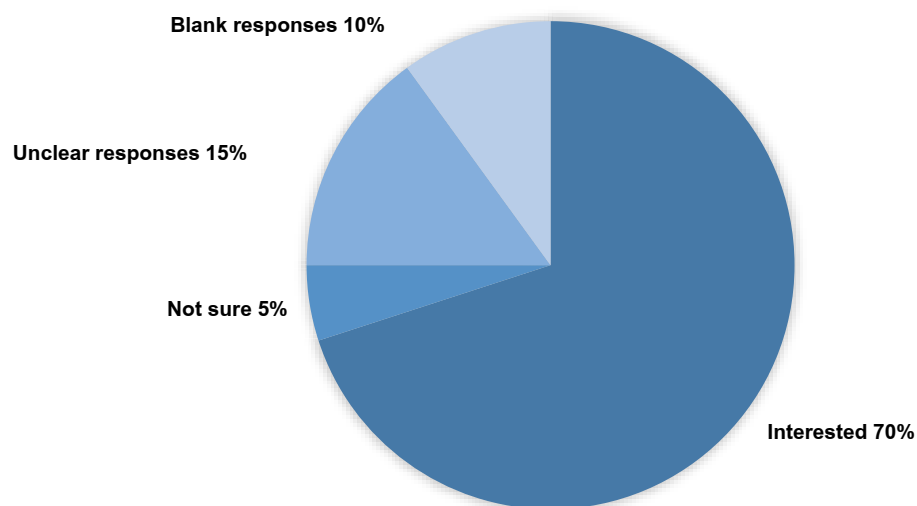

Figure 9 Respondents' Interest in an English for Climate Change Book

(**Source:** Sawaddee & Chiravate, 2025i)

In summary, 14 respondents (70%) expressed an interest in the book, adding that it would ease the burden of teachers and benefit students. The existence of the book itself would confirm the importance of climate change as a definitive topic and not merely part of general environmental problems. It was suggested that the book should be easy to read, suit the level of the students, contain interesting content, and present concrete information and solutions that the public can comprehend. The unsure respondent stated that they would be interested only if the book was provided at no cost.

Evaluation of the Training

25 participants evaluated the 2-day training on a 5-point Likert scale. The training was rated 4.73 for overall satisfaction. The three highest ratings (4.83) belonged to the performance of the speakers, the given opportunities to express opinions and ask questions, and the benefits the training could offer for self-improvement and the communities. The next highest rating (4.8) was that the training was in line with the needs of the community, followed by the knowledge from the training met the participants' expectations (4.76).

When assessing individual development after the training, over half of the participants stated that their level of knowledge had increased to 'very high'. No response stated 'low' or 'very low'. The results are presented in Table 3. Percentages have been rounded to whole numbers for clarity.

Table 3 Participants' Self-Evaluation of Their Level of Knowledge Before and After the Training

Level of Knowledge	Very High (Number of Responses)	High (Number of Responses)	Mid (Number of Responses)	Low (Number of Responses)	Very Low (Number of Responses)
Your knowledge level of the topic <u>before</u> attending the training	16% (4)	4% (1)	36% (9)	36% (9)	8% (2)
Your knowledge level of the topic <u>after</u> attending the training	60% (15)	36% (9)	4% (1)	0% (0)	0% (0)

The results of the evaluation indicated very positive feedback: that this kind of teacher training was useful and could benefit both the teachers and their communities. Additional comments revealed that the topic was beneficial, the sample activities were practical and applicable to real classrooms, and that environment-related topics should be encouraged for future teacher training. This signified a positive reception for the integration of ELT and environmentally-based language teaching and green pedagogy anticipated by Nur et al, (2022). One comment suggested that previous case studies or examples would have been useful for the discussion. However, considering that this training was likely the first of its kind in the region, there had been no previous examples or real classroom problems. The suggestion implied the participant's further interest in the topic that this research proposed.

Interviews

Interviews with selected participants affirmed that, to the best of their knowledge, the Ministry of Education had no direct projects or implementations specifically related to climate change education at school level, as their priority seemed to be the promotion of the nation's moral values for school students. The Ministry of Natural Resources and Environment (MNRE) is currently the primary government agency responsible for building climate change awareness, both for the general public and in schools. An example of MNRE's school-level initiatives is the Eco-School project, which adopts a whole-school approach to foster environmental awareness and local development. This project, involving over 1,400 schools, is managed by the Department of Climate Change and Environment (DCCE) under MNRE. Environmental campaigns, such as school competitions, have often been organized by environment-related agencies, including the Department of Environmental Quality Promotion (DEQP) and the Electricity Generating Authority of Thailand (EGAT). Participation in these competitions or the initiation of independent projects require budgetary and staffing support, which is also largely dependent on the attitudes of school principals and executive committees. Therefore, the current situation of implementing the topic of climate change at school level or even integrating them into existing subjects, largely depends on personal attitudes, individual readiness and willingness, and workload. At classroom level, the knowledge gained from the training could genuinely be applied to real classrooms either as part of a compulsory English class or a supplementary English class. However, this would ultimately depend on individual teachers.

Additional personal interviews revealed that the name of the training which contained the phrase 'climate awareness' sounded intimidating at first because it was an unfamiliar topic. The authors were informed that some potential participants decided not to register because they thought the course would rely heavily on scientific knowledge. Some were not sure what to expect from the training. This highlighted the participants' unfamiliarity with the term 'climate awareness,' which was likely due to insufficient promotion of the concept, especially in the local area, and reflected the misconception that climate change communication is exclusively within the purview of scientific professionals. However, through sample activities, the participants were more open to the fact that climate change was linked to many aspects

of life, and as an English teacher, they could foster climate change awareness in practical and non-scientific ways. Classroom contests, games, pictures, posters, applications, discussions, and projects could be employed using English as the medium of communication to enrich the CCE learning experience. These responses reflect the teachers' willingness to adapt the training content into practical classroom strategies within their own educational settings.

Overall, the findings affirm prior studies that point to gaps in teachers' knowledge and confidence regarding climate change education, particularly in non-science subjects. They also highlight that unfamiliarity with climate-related terminology and a perceived association with scientific expertise may discourage teachers from engaging with the topic. However, the training experience helped reframe climate change as a cross-disciplinary issue, opening new pedagogical possibilities within English instruction. These findings emphasize the importance of targeted support and professional development to empower teachers to approach climate change education with confidence and creativity in their classrooms.

Discussion and Conclusion

By exploring the English teachers' perceptions of climate change, it was found that their level of general knowledge was rated 6.58 out of 10. The teachers almost unanimously agreed that climate change caused severe weather patterns. The majority were aware that climate change led to, a switch to clean energy in some countries, the emergence of new viruses, a change in lifestyle, like eating habits, and the imposition of carbon tax. About half were aware of national CO_2 reduction targets and climate change policies that may present financial benefits to voluntary participants. The teachers displayed the least knowledge of climate change regarding its scientific aspect and foreign regulations. The results suggest that non-science teachers are more aware of climate change when it relates to their home country's policies and their everyday lives, such as the price of consumer goods, potential income from selling carbon credits, and cleaner and cheaper energy resources for their homes and cars. Further assessment of their climate change knowledge confirmed that their perceptions of climate change impacts were quite limited, reflected by their vague, short, and even irrelevant explanations. Climate change was perceived more as part of a general environmental problem, alongside issues like plastic trash, inefficient waste management, and overconsumption. This perception could hinder specific actions or initiatives aimed at addressing and mitigating the impacts of climate change. The assessment of knowledge about five current climate-related key terms clearly revealed that the teachers had very little knowledge of the latest climate change information circulating in the global media. The results showed that the majority were completely unaware of the terms, and the few participants who did exhibit awareness of certain key terms did not fully understand their specific implications.

Nevertheless, the teachers unanimously shared that it is crucial for secondary students to learn about climate change, particularly in English, as much of the relevant information is disseminated in this language. They exhibited a positive attitude towards teaching climate change in classrooms, recognizing it as a global concern that requires awareness, especially among the younger generation who will potentially face and need to solve its devastating repercussions. However, when questioned about the availability of teaching resources, a shortage was evident. Printed materials quickly become outdated and online updates are often difficult to assess for credibility and readability. More than 70% of the teachers expressed interest in a tailored English textbook for climate change education, provided it offers engaging content suitable for students' English proficiency levels.

The feedback on the training was highly positive, receiving a rating of 4.73 on a five-point Likert scale for overall satisfaction. After the training, over half of the participants stated that their level of knowledge increased to 'very high' while no respondent stated 'low' or 'very low'. The last questionnaire revealed that 75% of teachers reported a change

in their attitude towards climate change after participating in the training, perceiving it as a more immediate and pressing issue. This implied that such teacher training can effectively influence the environmental mindset of teachers. Due to the realization that teaching climate change was not as challenging as initially anticipated, as it involved many aspects of life, not just science, 90% of the teachers acknowledged that their attitudes towards teaching climate change in an English classroom had also changed. Activities and ideas from the training were reported as the most useful aspects that could be effectively implemented in real classroom settings. This study contributes to the emerging body of research on climate change education in EFL contexts by offering original data from local Thai teachers and presenting practical, classroom-based strategies that connect environmental issues with English instruction.

Limitations and Future Research

Due to a scheduling conflict and post-COVID hesitation, the training was able to attract a maximum of 25 participants. The topic itself might not have been entirely familiar to the local community at the time, as the research results reported many unanswered items. Additionally, not all participants completed every instrument, which may have introduced response variation or limited the completeness of certain data points. A noticeable pattern emerged in the contrast between the high average urgency rating and the limited ability to define climate change concepts, suggesting that general concern may not be matched by conceptual understanding. Consequently, the participant sample size may not fully represent mid-western English teachers. However, the smaller group size facilitated more intimate and detailed discussions and interviews. Participants benefited from increased interaction, fostering connections among themselves, guest speakers, and researchers, which positively influenced their training experience. Another limitation is that the research questionnaires were developed specifically for this study and were not grounded in an established framework or adapted from existing questionnaires. This reflects the nascent stage of this research area within the field. Therefore, ongoing refinement and adjustments to the research instruments may be necessary.

The findings suggest that future teacher training programs could benefit from more targeted content on scientific terminology, climate impact pathways, and global climate policy frameworks, particularly to address areas where participants demonstrated uncertainty.

It should also be noted that this study focused on secondary teachers in a specific region. Future research could explore how climate education may need to be differentiated across various educational contexts, including rural versus urban schools, different grade levels, and alignment with environmental programs such as the Eco-School Framework.

The research recognized UNESCO's mission and commitment to CCE and the emphasis it places on teachers as key players in this effort. The training was appreciated for its efforts to promote CCE to the local community and pave a way for academic research in this field. Upon the presentation of findings at UNESCO's headquarters in Bangkok, it was kindly suggested that future research may include a follow-up study on the training's outcomes, specifically whether participants successfully implemented the activities in their classrooms and if they encountered any unforeseen challenges. The next phase of research could expand its scope to include curriculum-level analysis, providing a broader understanding of CCE in Thailand. In terms of policy application, closer collaboration between the Ministry of Education and the Ministry of Natural Resources and Environment—particularly through departments such as the Department of Climate Change and Environment (DCCE)—could help strengthen the national-level implementation of climate change education in schools. Such insights could significantly inform policymakers and improve national educational strategies, while also guiding the development of future teacher training programs and materials tailored for English classrooms.

Acknowledgments

References

Beach, R., Share, J., & Webb, A. (2017). *Teaching Climate Change to Adolescents: Reading, Writing, and Making a Difference.* New York: Routledge.

Beckett, G. H., & Slater, T. (2005). The Project Framework: A Tool for Language, Content, and Skills Integration. *ELT Journal,* 59(2), 108-116.

Dal, B., & Others. (2015). An Analysis of the Teachers' Climate Change Awareness. *Athens Journal of Education*, 2(2), 111-122.

Dawson, V. (2012). Science Teachers' Perspectives About Climate Change. *Teaching Science*, 58(3), 8–13.

Chowdhury, M. T. A., & Others. (2021). How Do Teachers' Perceptions of Climate Change Vary in Terms of Importance, Causes, Impacts and Mitigation? A Comparative Study in Bangladesh. *Springer Nature Switzerland*, 174(2021) https://doi.org/10.1007/s43545-021-00194-7

Eckstein, D., Känzel, V., & Schäfer, L. (2021). *Global Climate Risk Index 2021: Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2019 and 2000–2019*. Germany: Germanwatch.

Ehui, S., & Rigaud, K. K. (2022). *Climate Migration — Deepening Our Solutions*. Washington, DC: World Bank.

Ghebreyesus, T. A., Jaber, S. A. A., & Kerry, V. (2023). *We Must Fight One of the World's Biggest Health Threats: Climate Change*. Switzerland: World Health Organization.

International Energy Agency. (2021). *Net Zero by 2050: A Roadmap for the Global Energy Sector*. France: International Energy Agency.

IPCC. (2023). *Climate Change 2023: Synthesis Report — Summary for Policymakers. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Switzerland: Intergovernmental Panel on Climate Change. https://doi.org/10.59327/IPCC/AR6-9789291691647.001

Herman, B. C., Feldman, A., & Vernaza-Hernandez, V. (2017). Florida and Puerto Rico Secondary Science Teachers' Knowledge and Teaching of Climate Change Science. *International Journal of Science and Mathematics Education,* 15(3), 451-471. https://doi.org/10.1007/s10763-015-9706-6

Manosorn, C., & Samiphak, S. (2022). Effect of inquiry instruction and games on students' climate literacy. *Journal of Education Naresuan University*, 24(2), 75-84.

Micalay-Hurtado, M. A., & Poole, R. (2022). Eco-Critical Language Awareness for English Language Teaching (Elt): Promoting Justice, Wellbeing, and Sustainability in the Classroom. *Journal of World Languages*, 8(2), 371-390. https://doi.org/10.1515/jwl-2022-0023

Nunan, D. (2004). *Task-Based Language Teaching*. Cambridge: Cambridge University Press.

Nur, S., Anas, I., & Pilu, R. (2022). The Call for Environmentally-Based Language Teaching and Green Pedagogy: Climate Actions in Language Education. *Elsya: Journal of English Language Studies,* 4(1), 77-85. https://doi.org/10.31849/elsya.v4i1.9526

ONEP. (2015). Climate Change Master Plan 2015–2050. Bangkok: Office of Natural Resources and Environmental Policy and Planning.

Richards, J. C. (2006). *Communicative Language Teaching Today*. Cambridge: Cambridge University Press.

Sawaddee & Chiravate, (2025a). Figure 1 *Responses to Identifying Climate Change Impacts.*

Sawaddee & Chiravate, (2025b). Figure 2 *Respondents' Answers to Whether They Thought They Would Be Affected by Climate Change.*

Sawaddee & Chiravate, (2025c). Figure 3 *Awareness of 5 Selected Key Terms.*

Sawaddee & Chiravate, (2025d). Figure 4 *Percentage of Respondents With Classroom Materials Covering Climate Change.*

Sawaddee & Chiravate, (2025e). Figure 5 *Respondents' Perceptions on the Possibility of Raising Environmental Awareness in the Classroom.*

Sawaddee & Chiravate, (2025f). Figure 6 *Respondents' Perceptions of What Could be Applied to Their Classroom From the Training.*

Sawaddee & Chiravate, (2025g). Figure 7 *Respondents With a Change of Attitude Towards Climate Change.*

Sawaddee & Chiravate, (2025h). Figure 8 *Percentage of Respondents With a Change of Attitude Towards Teaching Climate Change.*

Sawaddee & Chiravate, (2025i). Figure 9 *Respondents' Interest in an English for Climate Change Book.*

Seroussi, D.-E., & Others. (2019). Teachers' knowledge, beliefs, and attitudes about climate change. *International Education Studies*, 12(8), 33-45. https://doi.org/10.5539/ies.v12n8p33

Silvhiany, S., Kurniawan, D., & Safrina, S. (2023). Climate Change Awareness in Elt: Ethnography in Connected Learning and Ecojustice Pedagogy. *Journal of English Language Teaching Innovations and Materials,* 5(2), 91-109.

Stoller, F. L. (2002). Content-Based Instruction: A Shell for Language Teaching or a Framework for Strategic Language and Content Learning?*. TESOL Journal*, 11(1), 36-42.

Supa, P., & Dasa, J. (2024). Development of Climate Change Awareness Measuring Instruments of Upper Secondary School Students. *Journal of Educational Measurement, Mahasarakham University*, 30(1), 124-142.

Titipongvanich, S., Viseshsiri, P., & Siribanpitak, P. (2020). Proposed school management strategies to strengthen the consciousness and practices of students to reduce global warming. *Journal of Education Studies Chulalongkorn University*, 48(3), 32-348.

UNESCO. (2016). *Getting Climate-Ready: A Guide for Schools on Climate Action.* Paris: United Nations Educational, Scientific and Cultural Organization.

UNESCO. (2021a). *Berlin Declaration on Education for Sustainable Development.* Paris: United Nations Educational, Scientific and Cultural Organization.

UNESCO. (2021b). *UNESCO Declares Environmental Education Must Be a Core Curriculum Component by 2025.* Retrieved 15 August 2024, from https://www.unesco.org/en/articles/unesco-declares-environmental-education-must-be-core-curriculum-component-2025

UNESCO. (2021c). *Climate Science Literacy in Asia and the Pacific: Poster Series.* Retrieved 15 August 2024, from https://knowledge.unasiapacific.org/our-work/knowledge-resources/climate-science-literacy-asia-and-pacific

UNESCO. (2023). *Thailand: Climate Change Communication and Education*. Retrieved 9 August 2024, from https://education-profiles.org/eastern-and-south-eastern-asia/thailand/~climate-change-communication-and-education

UNICEF. (2021). *The Climate Crisis Is a Child Rights Crisis: The Impacts of Climate Change Through the Children's Climate Risk Index*. Retrieved 9 August 2024, from https://www.unicef.org/thailand/reports/climate-crisis-child-rights-crisis

UNDP. (2021). *The Peoples' Climate Vote*. Retrieved 9 August 2024, from https://www.undp.org/publications/peoples-climate-vote#modal-publication-download

UNFCCC. (2022). *Thailand's long-term low greenhouse gas emission development strategy (Revised version).* Retrieved 20 August 2024, from https://unfccc.int/sites/default/files/resource/Thailand%20LT-LEDS%20%28Revised%20Version%29_08Nov2022.pdf

UN Treaty Collection. (2016). Chapter XXVII: Environment-7-d: Paris Agreement. Retrieved 4 July 2024, from https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en

U.S. Energy Information Administration (EIA). (2023). International Energy Outlook 2023. Retrieved 12 July 2024, from https://www.eia.gov/outlooks/ieo/narrative/index.php

Winter, V., Kranz, J., & Möller, A. (2022). Climate Change Education Challenges From Two Different Perspectives of Change Agents: Perceptions of School Students and Pre-service Teachers. *Sustainability*, 14(10), 6081.

Wise, S. B. (2010). Climate Change in the Classroom: Patterns, Motivations, and Barriers to Instruction Among Colorado Science Teachers. *Journal of Geoscience Education*, 58(5), 297-309.

Appendix A

Test on knowledge and perceptions of climate change (pre-training)

Based on your current knowledge, please decide if each statement is true (T) or false (F). If you are unsure about an answer, you can leave the item blank.

1. All fossil fuels will run out within this century.
2. Current severe changes in weather patterns are not the result of global warming.
3. Global warming could trigger an emergence of dormant or new viruses.
4. The EU and the U.S. will ban all new combustion engine vehicles by 2035.
5. Thailand has announced that it will achieve net-zero greenhouse gas emission by 2035.
6. Some countries already rely on almost 100% clean and renewable energy.
7. Some countries have already imposed tax on goods that emit CO_2 during production.
8. Eating a plant-based diet cannot reduce global warming.
9. Using electric vehicles (EV) can reduce global warming.
10. You can plant trees and earn credits to exchange for money.

Please state 3 things that you think are the major impacts from climate crisis.

1 _____

2 _____

3 _____

Do you think you will be affected by climate crisis in the future?

☐ Yes   ☐ No

Please explain your answer.

Please define these terms according to your current understanding. You may leave out the items that you do not know the answer.

1. Critical climate threshold
2. Doomsday glacier
3. Carbon Neutrality
4. Paris Agreement
5. SDGs

How urgent is climate crisis for you? Please circle the number according to your feeling.

```
   0   1   2   3   4   5   6   7   8   9   10
Not urgent                              Extremely urgent
```
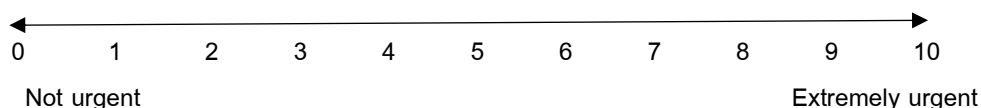
Appendix B

Questionnaire 1 (pre-training)

1. Do you think it is important for secondary students to learn about climate change, especially in English? Please state your reasons?

2. Is there information regarding climate change in the materials that you use in your English classroom? Do you think the information is sufficient?

3. Where do you find information regarding climate change? Please state the resources that you know of use e.g. books or websites.

4. As an English teacher, do you think it is possible to raise environmental awareness in your classroom? Have you done it before?

Appendix C

Questionnaire 2 (post-training)

1. Did you discover anything useful for your classroom? What do you think you could apply to your own classroom?

2. Has your attitude towards climate change changed? If so, in what way?

3. Has your attitude towards teaching climate change in an English classroom changed? If so, in what way?

4. If there were an English teaching book on English for climate change, would you be interested in it as an English teacher?