Exploring Climate Awareness and Anxiety in Teens: An Expert-Driven AI Perspective

Sruthi Viswanathan[1,3], $Omar Mohammed$[2], $Craig Vezina$[3], $and Mia Doces$[4]
1. University of Oxford
2. Independent Researcher
3. The Spaceship Academy
4. Committee for Children

Abstract

Climate awareness and climate anxiety often go hand in hand.The growing awareness of climate change among young people is increasingly shadowed by climate anxiety, a condition marked by profound stress, fear, and a sense of helplessness stemming from overwhelming information on environmental crises and perceived inaction by authorities. Our proposal is an innovative approach using Large Language Model (LLM)-based chatbots to support children and adolescents in fostering climate awareness, managing climate anxiety, and promoting sustainable practices. By collaborating with schools and engaging multidisciplinary experts and the young people themselves, we seek to co-create an impactful educational intervention. Starting with a comprehensive survey of school counsellors to map the current state of climate awareness and anxiety, and to understand their expectations for our AI solution, this project is poised for global scalability, addressing the pressing mental health challenges associated with climate change, particularly in vulnerable and resource-constrained regions.

1 Introduction and Related Work

A significant proportion of children in the UK, specifically 70% of those aged 12–18 years, express concern about the world they will inherit due to climate change [17]. In a study spanning ten countries—including Australia, Brazil, Finland, France, India, Nigeria, the Philippines, Portugal, the UK, and the USA—84% of young people aged 16–25 reported being worried about climate change [10]. The intersection of climate awareness and related worries has become increasingly prominent, particularly among young people who are simultaneously confronted with the realities of environmental crises and the perception of inadequate action by authorities [1]. This dual burden often manifests as climate anxiety, characterised by pervasive stress, fear, and a sense of hopelessness [10]. As young individuals become more informed about the dire consequences of climate change, their mental health is increasingly at risk, necessitating the development of effective coping mechanisms. The discourse surrounding climate anxiety underscores the critical need for community involvement, informed activism, and specialised therapeutic interventions to mitigate the psychological toll of climate-related stress [5, 1, 10].

Recent studies reveal that personal experiences with global warming are significantly shaping public concern, particularly among younger demographics [5]. The *Handbook of Climate Psychology* delves into these psychological impacts, offering strategies to manage the emotional responses triggered by climate change [1]. Additionally, research published in *The Lancet* highlights the prevalence of climate anxiety, especially among youth, and calls for targeted mental health interventions to address this growing concern [10]. Several resources have explored the psychological dimensions of climate anxiety, emphasising the urgent need for both individual and systemic solutions. For instance, Yale

Tackling Climate Change with Machine Learning: workshop at NeurIPS 2024.

experts have explained how climate anxiety functions as a multifaceted response to the perceived threat of climate change, advocating for community engagement and active involvement in climate action as effective coping strategies [18]. Similarly, psychologists have researched the prevalence of climate anxiety across various demographics, suggesting that both individual coping mechanisms and broader systemic changes are necessary to address the underlying causes of climate-related stress [6]. *Mental Health UK* offers practical advice for managing climate anxiety, including the importance of staying informed, participating in environmental activism, and seeking professional support when necessary [20]. Furthermore, the *Harvard Health Blog* discusses the link between climate change and anxiety-related sleep disturbances, proposing management tips that include proactive environmental engagement and maintaining a healthy lifestyle [3]. The *Natural History Museum* has also contributed by suggesting eco-therapy and community support as strategies for dealing with eco-anxiety, reinforcing the therapeutic benefits of nature and active participation in environmental solutions [15]. Technological solutions, such as climate chatbots, as evidenced by platforms such as BBC Climate News [2] and ChatNetZero [4], have also been designed to offer information and demystify concepts related to climate change. The *Earkick* chatbot [7], a mental health AI assistant, also focus on mental health interventions for climate anxiety.

While these tools provide valuable insights, they are predominantly designed for adult users or a general audience, leaving a substantial gap in addressing the unique needs of children and adolescents, who are disproportionately affected by climate anxiety [13]. There is an urgent need to develop solutions specifically tailored to young individuals grappling with the psychological impacts of climate change, as their well-being is crucial for the future of our society. The integration of large language models (LLMs) into chatbots offers a promising avenue for achieving this goal, which are currently being developed to support queer youth [14], monitor digital wellbeing [8], and adolescent cyberbullying education [9]. When developed responsibly, LLM-based chatbots have the potential to deliver natural, empathetic interactions at scale, providing personalised support to youth and helping them navigate their anxiety in a way that feels both authentic and accessible. By harnessing the power of these advanced technologies, we aim to create a new set of tools that not only address the mental health challenges posed by climate change but also empower young people to take informed, responsible actions for a sustainable future.

Through strategic partnerships with schools, we aim to seamlessly integrate our initiative into existing educational frameworks, starting with a comprehensive survey of school counsellors in the Global North to assess the current state of climate awareness and anxiety among students, and to understand their expectations for our AI solution. The project will be meticulously co-designed with input from experts in psychology, climate science, education, AI, and, most importantly, the young people themselves. This collaborative approach ensures that our interventions are scientifically robust and deeply aligned with the lived experiences of the children they are intended to support. Furthermore, by utilising open-source LLMs, with region-specific augmentation, the initiative holds significant potential for scalability across diverse countries, contexts, and languages. By addressing these pressing mental health challenges on a global scale, our project has the potential to foster a resilient, informed generation ready to confront the realities of climate change.

2 Methodology

2.1 Objective, Scope, and Risks

Objective: The primary objective of this project is to develop and implement Large Language Model (LLM)-based chatbots specifically designed to assist children and adolescents in managing climate anxiety. These chatbots aim support youth to channel climate-related worry into constructive, collective actions and promote resilience strategies such as mindfulness, smart-media consumption, and social activities that can transform anxiety into a catalyst for meaningful change.

Scope: Our primary target is teenagers, who are not only highly susceptible to climate anxiety but also possess the agency to influence change within their communities, often referred to as "teen power" [12]. By integrating the chatbot into school environments, this project aims to ensure widespread accessibility and impact, particularly in resource-limited settings where the effects of climate change are most acute.

Risks: We acknowledge the limitations of the chatbot as a supplementary tool, rather than a replacement for systemic climate action or professional counselling. To mitigate risks, the chatbot will

be implemented alongside blended approaches that incorporate human counsellors and/or trained educators. A comprehensive risk assessment framework will address potential issues, including data privacy, bias, hallucinations, emotional impact, and the dissemination of misinformation.

2.2 Phase 1: Needs Assessment

Survey and Interview Design: To gain a clear understanding of the current landscape, we will begin with a comprehensive survey of school counsellors, assessing the prevalence of climate anxiety, levels of climate awareness, and gaps in existing support systems. Following this, we will conduct qualitative focus-group interviews with groups of teenagers to explore their personal experiences with climate anxiety, coping strategies, and expectations for the AI chatbot.

Data Analysis: Quantitative data will be statistically analysed to identify key trends in climate anxiety and awareness. Thematic analysis will be applied to qualitative data from interviews, allowing us to extract common themes and insights that will inform the chatbot's design and functionality.

2.3 Phase 2: Chatbot Design and Development

Co-Design Workshops: With the insights from Phase 1, our multidisciplinary team comprising of psychological experts, climate scientists, educators, AI specialists, and adolescents will engage in a series of interactive workshops to co-design the chatbot's features, ensuring they are scientifically accurate, developmentally appropriate, and user-friendly.

Chatbot Development: Using an iterative agile process, the open-source LLM-based chatbot, initially implemented with LLAMA [19], will provide real-time emotional support, climate education, and promote sustainable behaviours. Key features include accurate information, empathetic responses, good user experience, robust user safety, and data security. To ensure scientific accuracy, the chatbot will integrate localised climate data and peer-reviewed data from trusted organisations, cured by domain experts to ensure cultural relevance and contextual appropriateness. To mitigate bias, hallucinations, misinformation and to check for any other risks in the chatbot's responses, we will perform red-team testing [21] with the assistance of domain experts. Fact-checking mechanisms will be integrated into the chatbot to ensure outputs are limited to verified climate data and resources. Additionally, the model will undergo adversarial training and rigorous security testing to reduce susceptibility to adversarial attacks, enhancing its robustness and reliability. Furthermore, the insights curated from the co-design workshops will be channelled towards creating a robust interaction layer prompt architecture [22], to enhance user experience with proactive, reliable, and personalised exchanges.

Pilot Testing: The pilot phase will focus on evaluating the chatbot's usability, engagement levels, region-specific alignment, and its effectiveness in reducing climate anxiety and increasing climate awareness. Feedback from students and teachers during this phase will be used to make necessary adjustments before broader implementation.

2.4 Phase 3: Implementation and Scaling

Training and Support: Ensuring adoption, school counsellors and teachers will receive training on both the technical aspects of using the chatbot, led by AI researchers in our team, and best practices for addressing climate anxiety within educational settings, led by the psychologists and climate scientists in our team. To prevent harm or the spread of disinformation, real-time monitoring systems will be employed, alongside user feedback loops and pre-defined safety responses. These measures will ensure that potentially harmful interactions are promptly identified and addressed. Transparency will also be prioritised by incorporating explainability features into the chatbot's outputs and maintaining oversight by human moderators during the deployment phase.

Scaling Strategy: After successful pilot testing and initial deployments, we plan to forge partnerships with educational and mental health organisations worldwide, with a special focus on the Global South, where the impacts of climate change are increasingly evident in daily life. Our goal is to refine and deploy our societal resilience solution across diverse languages and contexts. Recognising the potential cultural differences between the Global North and the Global South, the chatbot will be co-designed through region-specific workshops, repeating Phases 1 and 2, involving local experts, educators, and adolescents. This approach ensures cultural relevance and contextual appropriateness.

Regionally tailored datasets will be developed to fine-tune the model for linguistic and cultural sensitivities. Furthermore, iterative pilot testing will be conducted in diverse regions to identify and address mismatches in messaging before scaling.

Evaluation The expected outputs of the chatbot include measurable improvements in climate literacy, reduced anxiety levels, and increased adoption of sustainable behaviours among teenagers. Success will be evaluated using quantitative and qualitative metrics, such as pre- and post-interaction anxiety scores, user satisfaction surveys, Chatbot Usability Questionnaire [11] , Technology Acceptance Model [16] and engagement rates. Alongside longitudinal studies, real-time feedback mechanisms will be implemented to monitor and refine the chatbot's performance continuously.

3 Impact and Conclusion

Our societal resilience project aims to significantly reduce climate anxiety among teenagers by providing responsible, personalised, accessible support through open-source, LLM-based chatbots. This initiative will enhance climate literacy, reduce climate anxiety, foster responsible behaviours, and empower young people to take meaningful actions against climate change. Designed for scalability and adaptability across diverse cultural and linguistic contexts, the chatbot will be a valuable, free resource with global impact, particularly in regions most affected by climate change. By addressing mental health challenges at scale, our project leverages AI to equip the next generation with the resilience and knowledge needed to lead in the fight against climate change.

References

[1] Climate Psychology Alliance. Handbook of climate psychology. https://www.climatepsychologyalliance.org/images/files/handbookofclimatepsychology.pdf, 2023.

[2] BBC. Bbc climate news chatbot. https://www.bbc.co.uk/news/science-environment-47897342, 2023.

[3] Harvard Health Blog. Harvard health blog on climate anxiety. https://www.health.harvard.edu/blog/is-climate-change-keeping-you-up-at-night-you-may-have-climate-anxiety-202206132761, 2023.

[4] ChatNetZero. Chatnetzero ai. https://chatnetzero.ai/, 2023.

[5] Yale Climate Communication. Experience with global warming is changing people's minds about it. https://climatecommunication.yale.edu/publications/experience-with-global-warming-is-changing-peoples-minds-about-it/, 2023.

[6] J. Dodds. The psychology of climate anxiety. *BJPsych Bulletin*, 45(4):222–226, Aug 2021. Erratum in: BJPsych Bull. 2021 Aug;45(4):256. doi: 10.1192/bjb.2021.58.

[7] Earkick. Earkick mental health ai assistant. https://earkick.com/, 2023.

[8] Xiaobo Guo. Leveraging large language models for enhancing well-being in the digital age. https://digitalcommons.dartmouth.edu/dissertations/297, 2024.

[9] Michael A. Hedderich, Natalie N. Bazarova, Wenting Zou, Ryun Shim, Xinda Ma, and Qian Yang. A piece of theatre: Investigating how teachers design llm chatbots to assist adolescent cyberbullying education. In *Proceedings of the CHI Conference on Human Factors in Computing Systems*, CHI '24, New York, NY, USA, 2024. Association for Computing Machinery.

[10] Caroline Hickman, Elizabeth Marks, Panu Pihkala, Susan Clayton, Raphael E Lewandowski, Elouise E Mayall, Britt Wray, Charlene Mellor, and Lise van Susteren. Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey. *Lancet Planetary Health*, 5(12):e863–e873, Dec 2021.

[11] Samuel Holmes, Anne Moorhead, Raymond Bond, Huiru Zheng, Vivien Coates, and Michael McTear. Usability testing of a healthcare chatbot: Can we use conventional methods to assess conversational user interfaces? In Maurice Mulvenna and Raymond Bond, editors, *Proceedings of the 31st European Conference on Cognitive Ergonomics (ECCE 2019)*, pages 207–214, New York, NY, USA, 2019. ACM.

[12] Cindi M Koudelka. Tapping teen power:(re) positioning students for civic action. *Journal of Adolescent & Adult Literacy*, 64(4):389–398, 2021.

[13] T. Léger-Goodes, C. Malboeuf-Hurtubise, T. Mastine, M. Généreux, P.O. Paradis, and C. Camden. Eco-anxiety in children: A scoping review of the mental health impacts of the awareness of climate change. *Frontiers in Psychology*, 13:872544, Jul 2022.

[14] Shir Lissak, Nitay Calderon, Geva Shenkman, Yaakov Ophir, Eyal Fruchter, Anat Brunstein Klomek, and Roi Reichart. The colorful future of llms: Evaluating and improving llms as emotional supporters for queer youth. *arXiv preprint arXiv:2402.11886*, 2024.

[15] Natural History Museum. Nhm on eco-anxiety. `https://www.nhm.ac.uk/discover/how-to-cope-with-eco-anxiety.html`, 2023.

[16] Sung Youl Park. An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Journal of Educational Technology & Society*, 12(3):150–162, 2009. Technology Support for Self-Organized Learners (July 2009).

[17] Save the Children. Survey reveals scale of climate anxiety among british children. `https://www.savethechildren.org.uk/news/media-centre/press-releases/children-to-face-seven-times-more-heatwaves-than-their-grandparents`, 2022. Accessed: 2024-08-27.

[18] Yale Sustainability. Yale experts explain climate anxiety. `https://sustainability.yale.edu/explainers/yale-experts-explain-climate-anxiety`, 2023.

[19] Hugo Touvron, Thibaut Lavril, Gautier Izacard, Xavier Martinet, Marie-Anne Lachaux, Timothée Lacroix, Baptiste Rozière, Naman Goyal, Eric Hambro, Ferhan Azhar, et al. Llama: Open and efficient foundation language models. *arXiv preprint arXiv:2302.13971*, 2023.

[20] Mental Health UK. Mental health uk on climate anxiety. `https://mentalhealth-uk.org/blog/what-is-climate-anxiety-and-what-can-we-do-about-it/`, 2023.

[21] Apurv Verma, Satyapriya Krishna, Sebastian Gehrmann, Madhavan Seshadri, Anu Pradhan, Tom Ault, Leslie Barrett, David Rabinowitz, John Doucette, and NhatHai Phan. Operationalizing a threat model for red-teaming large language models (llms). `https://arxiv.org/abs/2407.14937`, 2024.

[22] Sruthi Viswanathan, Seray Ibrahim, Ravi Shankar, Reuben Binns, Max Van Kleek, and Petr Slovak. The interaction layer: An exploration for co-designing user-llm interactions in parental wellbeing support systems. `https://arxiv.org/abs/2411.01228`, 2024.