

Research Article | Araştırma Makalesi

Artificial Intelligence Enabled Climate Change Communication: The Role of ClimateGPT

Yapay Zekâ Destekli İklim Değişikliği İletişimi: ClimateGPT'nin Rolü

İlknur ZEYDAN (PhD)



Zonguldak Bülent Ecevit University– Oral And Dental
Health Application And Research Center
Zonguldak/Türkiye
ilknur.oral@beun.edu.tr

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Abstract

Climate change is one of the most important environmental problems humanity faces. To combat climate change, it is necessary first to understand the concept of climate change correctly and to know its negative effects and solution methods. Unfortunately, there is a problem in climate change communication between scientists and the public. Artificial intelligence (AI) can overcome this problem. The use of artificial intelligence in climate-related communication contributes to the increase in the effectiveness of communication. This study aims to explain the basic concepts of climate change to the public and students with the help of AI. For this purpose, ClimateGPT, an AI tool developed by Erasmus AI company, was used. ClimateGPT answered a series of questions about climate change, greenhouse effect and greenhouse gases, climate change effects, mitigation and adaptation measures, and finally climate communication. As a result of the study, ClimateGPT has been shown to produce mostly accurate and clear answers that everyone can understand. The AI-generated information can be used to educate the public about climate change. Therefore, this study contributes to the United Nations Sustainable Development Goal number 13: Climate Action.

Keywords: Artificial Intelligence, Climate Change, ClimateGPT, Communication.

Öz

İklim değişikliği insanlığın karşı karşıya olduğu en önemli çevre sorunlarından biridir. İklim değişikliğiyle mücadele edebilmek için öncelikle iklim değişikliği kavramını doğru anlamak, olumsuz etkilerini ve çözüm yöntemlerini bilmek gerekmektedir. Ne yazık ki bilim insanları ile toplum arasında iklim değişikliği iletişimde bir sorun bulunmaktadır. Yapay zekâ bu sorunun üstesinden gelebilir. Yapay zekanın iklimle ilgili iletişimde kullanılması iletişimin etkinliğinin artmasına katkı sağlamaktadır. Bu çalışma iklim değişikliğinin temel kavramlarını Yapay zekâ yardımıyla topluma ve öğrencilere anlatmayı amaçlamaktadır. Bu amaçla Erasmus AI firması tarafından geliştirilen bir yapay zekâ aracı olan ClimateGPT kullanılmıştır. ClimateGPT, iklim değişikliği, sera etkisi ve sera gazları, iklim değişikliğinin etkileri, azaltım ve uyum önlemleri ve son olarak iklim iletişimi konularında bir dizi soruyu yanıtladı. Çalışmanın sonucunda, ClimateGPT'nin herkesin anlayabileceği, büyük ölçüde doğru ve net cevaplar ürettiği görülmüştür. YZ tarafından üretilen bilgiler toplumu iklim değişikliği konusunda eğitmek için kullanılabilir. Bu nedenle bu çalışma Birleşmiş Milletler Sürdürülebilir Kalkınma Hedeflerinden 13 numaralı İklim Eylemi'ne katkıda bulunmaktadır.

Anahtar Kelimeler: Yapay Zekâ, İklim Değişikliği, ClimateGPT, İletişim.



Introduction

Climate change is a slow-motion catastrophe and one of the most important and the most complex environmental problems that humanity has to deal with (Chen et al., 2023; Daugaard et al., 2024; Lee et al., 2024; Ö. Zeydan et al., 2017). Although there has been a huge effort from climate scientists to warn about the impacts of climate change, the public, politicians, and decision-makers lack urgent responses. Obviously, there is a problem in climate change communication. Complex terminology (such as net zero, carbon emissions, etc.), lack of personality (failing to address the emotions of the audience), narrow focus (concentrating only on environmental issues), inadequate communication investment, and misinformation can be listed for reasons communication problems (Lee et al., 2024). Due to its multi-dimensional nature, it is difficult to explain climate change topics to the public or students (Duram, 2021). The communication between climate experts and the public is inadequate since individuals interpret information based on their cultural worldviews and pre-existing beliefs. Highlighting local impacts and community-based solutions can improve climate communication. For better climate communication, scientists should avoid using jargon and use clear and understandable language to explain complex scientific concepts to the general public. Visual aids and storytelling can also be effective tools to convey information (Cook & Overpeck, 2019). Artificial intelligence (AI) is important in terms of creating awareness in climate change communication. Artificial intelligence stands out as a strong supporter in terms of finding solutions to problems caused by climate change. It is possible to transmit information and solution suggestions about climate change to people much faster and more accurately. AI has the potential to increase the effectiveness of climate change communication by providing accurate and personalized information to individuals and communities. AI chatbots can be used to provide information about climate change and its impacts, as well as engage individuals in discussions about climate change and potential solutions (Debnath et al., 2023).

AI can play a crucial role in better climate change communications. There are several artificial intelligence applications for Climate Change. Some of them (ClimateAi - <https://climate.ai/>, ClimateIQ - <https://climateiq.org/>, and Climate Change AI - <https://www.climatechange.ai/>) are developed for business use and not for end users. Large Language Models are designed for question-answer tasks and can be easily applied by end users. Several researchers employed ChatGPT (<https://chatgpt.com/>) in climate change education (Glavinskis, 2023; Griffiths, 2023). ChatClimate (<https://www.chatclimate.ai/>) is another alternative trained by the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (AR6 IPCC) (Vaghefi et al., 2023). They reported that ChatClimate performed better than ChatGPT. This study differs from the cited literature. ClimateGPT (<https://climategpt.ai/>), an AI specifically trained for climate research, was used to create educational materials for effective climate change communication. ClimateGPT is not only trained by AR6 IPCC but also by Sustainable Development Goals (Thulke et al., 2024). The study examines the role of artificial intelligence tools in climate change communication. The purpose of this paper is to answer the following research question: Can AI-provided answers about climate change effectively bridge the gap between complex scientific information and public understanding? This paper explains the concept of climate change, its negative effects, and solution methods for the public and students using an artificial intelligence tool. In the next section, a review of the literature is provided about AI applications in climate change and climate communication. After that, artificial intelligence and large language models are mentioned, and the definition of ClimateGPT is given. In the Methods section, the usage procedure of ClimateGPT is

explained. The findings and analysis part provides prompts and ClimateGPT responses and their analysis. The final section briefly concludes with the study. The results of this study will contribute to climate change communication, to the knowledge level of the public and students, and to academic research on this subject.

1. Literature Review

AI shows the potential to improve and widen the existing insights into climate change, and it may play a crucial role in the effective reduction of the climate crisis. For example, AI can predict future global mean temperature and precipitation changes, foreseen extreme weather events, and other consequences (wildfires, droughts, etc.) of climate change. AI-based solutions can boost production while reducing greenhouse gas emissions in the industry (Cowls et al., 2023). Chen et al. (2023) evaluated the applications of AI in climate change mitigation. They suggested that AI has the potential to optimize energy systems. AI can predict energy demand and improve energy efficiency. The design of energy-efficient buildings, cities, infrastructure, and industrial processes can be achieved with artificial intelligence. Energy efficiency will significantly reduce fossil fuel consumption and greenhouse gas emissions (Chen et al., 2023). Rane et al. (2024) detailly investigated the implementation of ChatGPT in climate change mitigation. They stated that ChatGPT can identify appropriate locations of renewable energy resources and increase the efficiency of renewable energy systems. It may aid farmers in adopting climate-resilient and sustainable farming practices. In addition, ChatGPT may play a role in sustainable land use and forest conservation (Rane et al., 2024). AI can also be used in climate change adaptation such as monitoring meteorological data and developing warning systems for extreme weather events (Leal Filho et al., 2022).

Luccioni et al. (2021) developed an AI climate impact visualization tool to raise public awareness about climate change. This tool creates an image of climate change impact (storm, flood, and wildfire) in a given location. With the aid of this image, it is aimed to allow viewers to render the future climate impacts more easily (Luccioni et al., 2021). Similarly, Ramya et al. (2024) examined the use of AI for climate change visualization by focusing on increasing sea levels, deforestation, urban heat islands, and severe weather events. They mentioned that AI-driven climate change visualizations can raise public awareness so that new policies can be implemented and a sustainable future can be established (Ramya et al., 2024).

Artificial intelligence technology has already altered and has been altering education. AI can assist educators in several ways such as preparing course materials, monitoring the teaching process, evaluating assignments, and reducing the teacher workload. AI can help students in their learning process (Liu et al., 2021). Rane et al. (2024) mentioned that ChatGPT, an advanced language model, may be used to change human behavior by generating educational materials so that public awareness of climate change will increase. Griffiths (2023) used ChatGPT in climate change education. Similarly, another study implemented ChatGPT and reported that it left a lot out (Glavinskis, 2023). Vaghefi et al. (2023) enhanced the capabilities of ChatGPT-4 by utilizing the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR6). This new GPT-4 powered AI, called ChatClimate, provides climate change information accessible to a broader community. They reported that Hybrid ChatClimate and ChatClimate models outperformed ChatGPT (Vaghefi et al., 2023). ClimateGPT is another AI, specifically designed to help decision-makers about climate change. IPCC AR6, United Nations Sustainable Development Goals, and extreme weather events are implemented during

the training stage of ClimateGPT (Şeko, 2024). It can be though that specifically trained AI tools provide better climate change communication. Therefore, the hypothesis of this paper is constructed as follows:

H1: ClimateGPT provides correct and clear answers about climate change that can be easily understood by the public and students.

2. Artificial Intelligence (AI) and Large Language Models (LLMs)

Artificial intelligence is a computer or machine designed to mimic human intelligence and human behaviors such as thinking and feeling. In computer science, artificial intelligence is defined as intelligence demonstrated by a computer that performs human cognitive functions such as problem-solving (Pirim, 2006; İ. Zeydan, 2024a). The goal of artificial intelligence is to imitate human intelligence through computers. Artificial intelligence tries to understand the structure of intelligence by creating computer programs that control machines (Verma et al., 2021). Large Language Models (LLMs), the most advanced discipline of artificial intelligence systems, are groundbreaking systems in the field of artificial intelligence and natural language processing (İ. Zeydan, 2024b). These models use deep learning algorithms with billions of parameters and are trained on huge amounts of text data (He et al., 2021; Zhang & Soh, 2023). Large language models are capable of generating text, solving mathematical problems, answering questions, and programming (Vaghefi et al., 2023). The role of LLMs in the relationship between artificial intelligence and natural language processing is significant. These models have moved beyond previous technologies in understanding and producing human language, taking machine-human interaction to a whole new level. In addition, these models have accelerated AI research, deepened our scientific understanding of language understanding and production, and are seen as an important step toward artificial general intelligence (Keleş & Deniz, 2024; Zhang & Soh, 2023).

The contribution of LLMs to the scientific field is quite significant. The development of LLMs has not only affected academic research, but also transformed industrial applications, allowing companies to implement innovative solutions in areas such as customer service communication, content management, and data analysis. Researchers use LLMs to conduct literature reviews, interpret experimental results, and identify potential research gaps. In the social sciences, they contribute to identifying social trends by conducting large-scale text analyses. These developments accelerate the process of scientific discovery and enable researchers to conduct analyses at a scale and depth that was not previously possible (Thulke et al., 2024).

The role of LLMs in education cannot be underestimated. They are transforming education processes with their ability to provide personalized learning experiences, instant feedback, and detailed explanations on a variety of topics. LLMs can serve as virtual teacher assistants available to students 24/7, simplifying complex topics and allowing students to progress at their own pace. For teachers, LLMs provide support with tasks such as creating lesson plans, assessing student assignments, and preparing educational materials (Hwang et al., 2019; İşler & Kılıç, 2021).

The role of LLMs in communication is to transform communication processes by providing human-like interactions across various communication channels. In customer service, LLMs are used as 24/7 chatbots, understanding and answering complex queries and increasing customer satisfaction. In the business world, they are also used for tasks

such as answering emails, creating meeting summaries, and even facilitating multilingual communication. On social media platforms, LLMs are used to create personalized content. In translation services, they help overcome language barriers by providing context-sensitive and real-time translations. They also facilitate communication for individuals with disabilities, for example, by providing sign language translations or text-to-speech conversions (Vaghefi et al., 2023; Verendel, 2023).

3. ClimateGPT

GPT (Generative Pre-trained Transformer) is a series of natural language processing models developed by OpenAI that have revolutionized the field of LLM. Starting with GPT-1, which was first introduced in 2018, the series continued with GPT-2, GPT-3, and most recently GPT-4. Each new version was larger and more capable than the previous one. GPT models stand out for their ability to perform a wide range of natural language tasks: text generation, translation, summarization, question answering, and even simple coding tasks (Thulke et al., 2024; Urzedo et al., 2024).

ClimateGPT is an artificial intelligence language model focused on climate change. ClimateGPT is freely accessible at <https://climategpt.ai/> website (Figure 1). It was trained by Erasmus.AI. This model was developed to provide information on scientific data, answer questions, and perform specific analyses, especially on climate change, sustainability, and environmental impacts. ClimateGPT can inform researchers, policymakers, and businesspeople about climate change. The Sustainable Development Goals (SDGs) of the United Nations are included in the model. ClimateGPT gets its information from scientific articles. Extreme weather events in the last ten years, El Nino and La Nina effects, and the latest technologies have been added to the model. The verification of the answers given by ClimateGPT has been tested in cooperation with Georgetown University in the USA. The answers are correct by an average of 82% (Şeko, 2024). With the artificial intelligence tool ClimateGPT, it can more effectively explain the effects of climate change, adaptation methods, and climate change mitigation strategies. Therefore, it can tell what climate conditions will be like in the future.

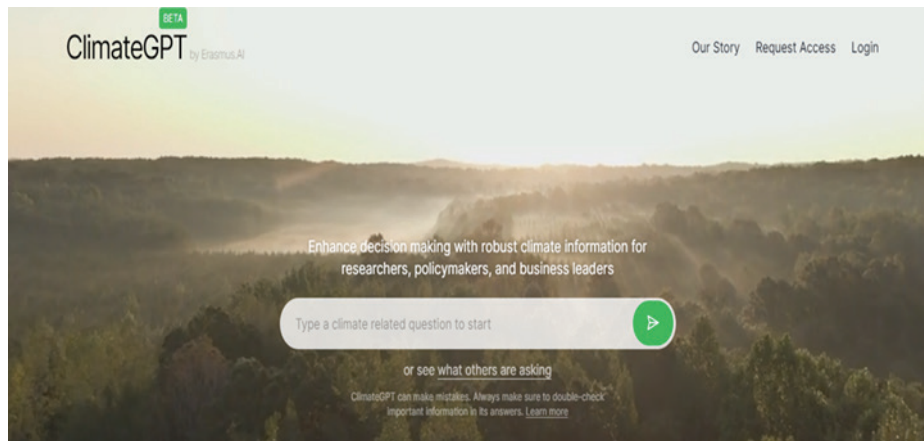


Figure 1. ClimateGPT user interface (<https://climategpt.ai/>).

4. Artificial Intelligence in Climate Communication

With the development of technology, interpersonal communication has been transformed into digital channels via e-mails, text messages, social media interactions, and video conferencing. Today, the introduction of AI presents a new era in communication (Hancock et al., 2020). Effective communication is vital for the success of any climate change

solution (Rane et al., 2024). Artificial intelligence has the potential to offer innovative solutions to current problems in climate communication. AI has the potential to increase the effectiveness of climate change communication in several ways. First, AI can provide individuals and communities with personalized and accurate information that can help build trust and engagement. Second, AI can analyze large amounts of data on climate change and its impacts, which can help identify trends and patterns that can inform climate change communication strategies. Third, AI can be used to engage individuals and communities in discussions about climate change and possible solutions, which can help build support for climate change action (Debnath et al., 2023; Vaghefi et al., 2023). The use of artificial intelligence in climate communication contributes to increasing the effectiveness of communication. Faster and more accurate information can be transferred to the public and students through artificial intelligence. ClimateGPT can provide support to academics in climate change education.

5. Methods

The method of the study is to detail the subject with the question and answer technique (prompts-answers). The effectiveness of analysis in artificial intelligence depends on the quality of the given commands (prompts). Users can get more accurate and faster answers by using correct, clear, and explanatory expressions. The requested information should be clearly stated and detailed information should be included in the inputs. Examples covering the desired results can be presented. In this study, questions were asked with consecutive prompts, and the prompts were renewed according to the given answers. It is important to ask knowledge-controlled questions when entering a prompt. Effective communication with AI allows AI to better understand us and produce appropriate responses (Cook & Overpeck, 2019; Sullivan & Fosso Wamba, 2024; Zhang & Soh, 2023).

ClimateGPT was asked to explain climate change to the public and students. New questions were asked based on the answers given by ClimateGPT and the subject was expanded. In this way, it will be possible to convey the concepts related to climate change accurately and completely. The questions asked are as follows:

1. Can you explain climate change?
2. Can you give information about the greenhouse effect and greenhouse gases?
3. Can you describe the effects of climate change?
4. What are the mitigation methods for climate change?
5. What are the adaptation measures for climate change?
6. What are the effects of climate change on communication?
7. How to develop climate change communication strategies using AI?

6. Findings and Analysis

Prompt-1: Can you explain climate change?

Answer-1: "Climate change is the long-term alteration of temperature and precipitation patterns in the Earth's climate system. It is primarily caused by human activities such as burning fossil fuels, deforestation, and industrial processes that release greenhouse gases into the atmosphere. These gases trap heat and cause the Earth's temperature to rise, leading to a range of environmental and social impacts.

The impacts of climate change are far-reaching and include rising sea levels, extreme weather events, and changes in ecosystems. These impacts can have significant consequences for human health, food security, and economic stability.

Addressing climate change requires a global effort to reduce greenhouse gas emissions and adapt to the impacts that are already occurring. This includes transitioning to renewable energy sources, improving energy efficiency, and implementing policies that promote sustainable development.

There is a growing awareness of the importance of addressing climate change, and many countries have made commitments to reduce their greenhouse gas emissions. However, there is still much work to be done to mitigate the impacts of climate change and build resilience to its effects.”

Prompt-2: Can you give information about the greenhouse effect and greenhouse gases?

Answer-2: “The greenhouse effect is a natural process that occurs in the Earth’s atmosphere. It happens when certain gases, known as greenhouse gases, trap heat from the sun and prevent it from escaping back into space. This trapped heat warms the Earth’s surface and keeps it at a livable temperature. Without greenhouse gases, the Earth would be too cold to support life.

The most common greenhouse gases are carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). These gases are released into the atmosphere by human activities such as burning fossil fuels, deforestation, and agriculture. When these gases build up in the atmosphere, they trap more heat and cause the Earth’s temperature to rise. This is known as global warming.

The effects of global warming are already being felt around the world. Rising temperatures are causing more frequent and severe heat waves, droughts, floods, and storms. These events are disrupting ecosystems, harming wildlife, and threatening human health and safety.

To combat global warming, we need to reduce our emissions of greenhouse gases. This means transitioning to cleaner energy sources, conserving energy, and reducing our reliance on fossil fuels. It also means supporting policies that promote sustainable development and protect our natural resources.

In summary, the greenhouse effect is a natural process that helps keep the Earth warm and livable. However, human activities are causing the concentration of greenhouse gases to rise, leading to global warming and its associated impacts. To address this issue, we need to reduce our emissions of greenhouse gases and transition to cleaner energy sources.”

Prompt-3: Can you describe the effects of climate change?

Answer-3: “Climate change is the long-term alteration of temperature and precipitation patterns, in addition to changes in wind patterns, atmospheric humidity, and other atmospheric conditions that influence weather. Climate change has a wide range of effects on the environment, human health, and the economy.

One of the most noticeable effects of climate change is an increase in global temperatures. This has led to the melting of glaciers and ice caps, which has contributed to rising sea

levels. This, in turn, has led to coastal erosion, flooding, and the loss of habitats for many species.

Another effect of climate change is the alteration of precipitation patterns. Some regions are experiencing more intense and frequent rainfall, while others are experiencing prolonged droughts. This can lead to flooding, landslides, and other natural disasters.

Climate change can also affect human health. For example, rising temperatures can lead to heat-related illnesses, such as heatstroke and dehydration. Additionally, climate change can exacerbate existing health problems, such as respiratory illnesses and cardiovascular disease.

The economy is also affected by climate change. For example, extreme weather events can damage infrastructure, such as roads, bridges, and buildings. This can lead to increased costs for repairs and reconstruction. Additionally, climate change can affect agriculture, which can lead to food shortages and higher food prices.

In conclusion, climate change has a wide range of effects on the environment, human health, and the economy. It is important to take action to mitigate the effects of climate change, such as reducing greenhouse gas emissions and implementing sustainable practices.”

Prompt-4: What are the mitigation methods for climate change?

Answer-4: “Mitigation refers to the process of reducing or preventing the release of greenhouse gases into the atmosphere to limit the effects of climate change. There are several mitigation methods that can be used to combat climate change, including:

- Reducing energy consumption: This can be done by increasing energy efficiency, switching to renewable energy sources, and reducing the use of fossil fuels.
- Reforestation and afforestation: Planting trees and restoring forests can help to absorb carbon dioxide from the atmosphere.
- Improving agricultural practices: Improving agricultural practices can reduce greenhouse gas emissions and increase carbon sequestration.
- Implementing carbon pricing: This involves putting a price on carbon emissions to encourage individuals and businesses to reduce their carbon footprint.
- Developing low-carbon technologies: Developing low-carbon technologies such as electric vehicles, renewable energy sources, and energy-efficient buildings can help to reduce greenhouse gas emissions.
- Promoting sustainable land use: Promoting sustainable land use practices such as reforestation, afforestation, and sustainable agriculture can help to reduce greenhouse gas emissions and increase carbon sequestration.

These are just a few examples of the many mitigation methods that can be used to combat climate change. It is important to note that mitigation efforts must be combined with adaptation efforts to ensure that communities are prepared for the impacts of climate change.”

Prompt-5: What are the adaptation measures for climate change?

Answer-5: "Adaptation measures are actions taken to reduce the negative impacts of climate change. These measures can include a range of strategies, such as changing farming practices, building resilient infrastructure, and developing early warning systems.

For example, farmers may adapt by planting drought-tolerant crops, using efficient irrigation systems, and diversifying their crops. Governments may adapt by investing in resilient infrastructure, such as flood defenses and coastal protection. And communities may adapt by developing early warning systems for extreme weather events.

Adaptation measures are important because they help us to cope with the impacts of climate change, such as rising sea levels, extreme weather events, and food and water scarcity. Without adaptation measures, the negative impacts of climate change are expected to worsen over time.

There are many different types of adaptation measures, and they can be implemented at different scales, from individual farms to entire countries. Some adaptation measures are more effective than others, and the most effective measures will depend on the specific context and the needs of the community or region.

Overall, adaptation measures are essential for building resilience to climate change and reducing the negative impacts on people, ecosystems, and economies."

Prompt-6: What are the effects of climate change on communication?

Answer-6: "Climate change can have significant effects on communication, both in terms of the content of the messages and the channels used to deliver them. Here are some of the key effects:

- Increased urgency: Climate change is a long-term problem with short-term consequences. This creates a sense of urgency that can make it difficult to communicate complex information in a way that is easily understood.
- Changing audiences: As climate change impacts more people, the audience for climate change communication is becoming more diverse. This means that messages need to be tailored to different groups and may need to be delivered in different ways.
- Disbelief and skepticism: Climate change is a complex issue with scientific evidence that is often difficult to understand. This can lead to skepticism and disbelief, which can make it difficult to communicate effectively.
- Political polarization: Climate change is a highly politicized issue, which can make it difficult to communicate across political lines.
- Increased competition for attention: With so many messages competing for attention, it can be difficult to get people to pay attention to climate change messages.

Overall, climate change presents significant challenges to effective communication. However, there are strategies that can be used to overcome these challenges and communicate effectively about climate change."

Prompt-7: How to develop climate change communication strategies using AI?

Answer-7: "Developing climate change communication strategies using artificial intelligence (AI) involves several steps and considerations. Firstly, it is important to understand the target audience and their needs, as well as the goals of the communication strategy. AI can be used to analyze large amounts of data and provide insights into

audience behavior and preferences. Secondly, AI can be used to create personalized messages and content that are tailored to the specific needs and interests of the audience. For example, AI-powered chatbots can be used to provide real-time information and answer questions about climate change. Thirdly, AI can be used to enhance the credibility and trustworthiness of climate change information by providing accurate and up-to-date data and analysis. Finally, AI can be used to measure the effectiveness of climate change communication strategies and make adjustments.”

In the first answer, ClimateGPT provided the physical basis of climate change. It mentioned the greenhouse gas emissions that trap the heat, and the Earth is warming. ClimateGPT also stated the consequences of climate change, reduction, and adaptation measures. Therefore, in the second question, the greenhouse effect and gases are asked. ClimateGPT produced only wrong information about the source of trapped heat. A similar false result was also reported by Glavinskas (2023). ClimateGPT produced only wrong information about the source of trapped heat. A similar false result was also reported by Glavinskas (2023). In the following questions, the impacts of climate change, mitigation, and adaptation methods are asked. The last prompt was about the effects of climate change on communication. ClimateGPT has been shown to produce mostly accurate and clear answers. The answers are provided in simple language so that everyone can understand. Therefore, H1 is accepted. It is obvious that ClimateGPT can provide support to academics and students in climate change education. Checking results before using them is advisable since no artificial intelligence produces 100% correct answers. Item 13 of the Sustainable Development Goals is about “Climate Action”. Sustainable Development Goal target 13.3 states that “Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning”. The AI-generated information in this study can be used to educate the public about climate change. Therefore, this paper contributes to SDG number 13.

Conclusion

Artificial intelligence is changing the world in ways never seen before. The literature has shown that AI has been used in climate change-related research. AI can help improve climate change communication by making it more personal and engaging. For example, AI-powered personalization algorithms can analyze a user’s behavior and preferences to provide them with information that is relevant to them. Additionally, AI-generated images and videos can make climate change information more visually appealing and engaging. AI can also help improve communication by making it more accessible. For example, AI-powered translation tools can make climate change information available in multiple languages, making it more accessible to people around the world.

This study used ClimateGPT, an artificial intelligence tool, to make complex concepts related to climate change understandable to everyone. Artificial intelligence has the potential to revolutionize climate communication by making complex information more understandable and accessible. ClimateGPT has contributed to climate communication by answering questions about climate change and explaining them in a simple way to the public and students. ClimateGPT has been trained with up-to-date information on climate change and continues to be trained with even more information. This information is then used to contribute to climate policy and informed decision-making processes. By using AI in communication, we can build a more sustainable and climate-resilient future. Ultimately, using AI in climate communication can help address the challenges and urgency of communicating complex scientific information. At the same time, by harnessing

the power of AI, we can improve the accuracy, personalization, and accessibility of climate change information, making it more effective in educating people about the issue and inspiring them to act. This study contributes to the Sustainable Development Goal number 13: The Climate Action.

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Artificial Intelligence Enabled Climate Change Communication: The Role of ClimateGPT

İlknur ZEYDAN (PhD)

Extended Abstract

Climate change is one of the most important environmental problems humanity faces. To combat climate change, it is necessary first to understand the concept of climate change correctly and to know its negative effects and solution methods. Although there has been a huge effort from climate scientists to warn about the impacts of climate change, the public, politicians, and decision-makers lack urgent responses. Unfortunately, there is a problem in climate change communication between scientists and the public. Complex terminology (such as net zero, carbon emissions, etc.), lack of personality (failing to address the emotions of the audience), narrow focus (concentrating only on environmental issues), inadequate communication investment, and misinformation can be listed for reasons communication problems. Artificial intelligence (AI) can overcome this problem. AI has the potential to increase the effectiveness of climate change communication by providing accurate and personalized information to individuals and communities. The use of artificial intelligence in climate-related communication contributes to the increase in the effectiveness of communication.

AI shows the potential to improve and widen the existing insights into climate change, and it may play a crucial role in the effective reduction of the climate crisis. For example, AI can predict future global mean temperature and precipitation changes, foreseen extreme weather events, and other consequences (wildfires, droughts, etc.) of climate change. AI-based solutions can boost production while reducing greenhouse gas emissions in the industry. AI has the potential to optimize energy systems. AI can predict energy demand and improve energy efficiency. The design of energy-efficient buildings, cities, infrastructure, and industrial processes can be achieved with artificial intelligence. Energy efficiency will significantly reduce fossil fuel consumption and greenhouse gas emissions. AI can identify appropriate locations of renewable energy resources and increase the efficiency of renewable energy systems. It may aid farmers in adopting climate-resilient and sustainable farming practices. AI can also be used in climate change adaptation such as monitoring meteorological data and developing warning systems for extreme weather events. AI-driven climate change visualizations can raise public awareness so that new policies can be implemented, and a sustainable future can be established.

Artificial intelligence is a computer or machine designed to mimic human intelligence and human behaviors such as thinking and feeling. In computer science, artificial intelligence is defined as intelligence demonstrated by a computer that performs human cognitive functions. Large Language Models (LLMs), the most advanced discipline of artificial intelligence systems, are groundbreaking systems in the field of artificial intelligence and natural language processing. These models use deep learning algorithms with billions of parameters and are trained on huge amounts of text data. Large language models are capable of generating text, solving mathematical problems, answering questions, and programming. Researchers use LLMs to conduct literature reviews, interpret experimental results, and identify potential research gaps. In the social sciences, they contribute to identifying social trends by conducting large-scale text analyses. The role of LLMs in education

cannot be underestimated. They are transforming education processes with their ability to provide personalized learning experiences, instant feedback, and detailed explanations on a variety of topics. LLMs can serve as virtual teacher assistants available to students 24/7, simplifying complex topics and allowing students to progress at their own pace. For teachers, LLMs provide support with tasks such as creating lesson plans, assessing student assignments, and preparing educational materials. The role of LLMs in communication is to transform communication processes by providing human-like interactions across various communication channels. Today, the introduction of AI presents a new era in communication. AI has the potential to increase the effectiveness of climate change communication in several ways. First, AI can provide individuals and communities with personalized and accurate information that can help build trust and engagement. Second, AI can analyze large amounts of data on climate change and its impacts, which can help identify trends and patterns that can inform climate change communication strategies. Third, AI can be used to engage individuals and communities in discussions about climate change and possible solutions, which can help build support for climate change action.

This study aims to explain the basic concepts of climate change to the public and students with the help of AI. For this purpose, ClimateGPT, an AI tool developed by Erasmus AI company, was used. ClimateGPT was developed to provide information on scientific data, answer questions, and perform specific analyses, especially on climate change, sustainability, and environmental impacts. It can be thought that specifically trained AI tools provide better climate change communication. Therefore, the hypothesis of this paper is constructed as follows:

H_1 : ClimateGPT provides correct and clear answers about climate change that can be easily understood by the public and students.

ClimateGPT answered a series of questions about climate change, greenhouse effect and greenhouse gases, climate change effects, mitigation and adaptation measures, climate communication, and finally communication strategies. ClimateGPT has been shown to produce mostly accurate and clear answers. The answers are provided in simple language. The expert indicated that ClimateGPT produced only one wrong answer, and the majority of the answers were correct. Checking results before using them is advisable since no artificial intelligence produces 100% correct answers. As a result of the study, ClimateGPT has been shown to produce mostly accurate and clear answers that everyone can understand. Therefore, H_1 is accepted. The AI-generated information can be used to educate the public about climate change. Sustainable Development Goal target 13.3 states that "Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning". The AI-generated information in this study can be used to educate the public about climate change. Therefore, this paper contributes to SDG number 13.

Keywords: Artificial Intelligence, Climate Change, ClimateGPT, Communication.

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In this study, the rules stated in the “**Higher Education Institutions Scientific Research and Publication Ethics Directive**” were followed.

Araştırma tek bir yazar tarafından yürütülmüştür.

The research was conducted by a single author.

Çalışma kapsamında herhangi bir kurum veya kişi ile **çıkar çatışması** bulunmamaktadır.

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