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CONTRIBUTIONS OF CHAT GPT TO SOLVING PROBLEMS IN EDUCATION

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Abstract: The main objective of this work is to investigate the role that GPT Chat technology plays in this third decade of the 21st century, as well as the aforementioned processes of divinization and demonization (ode and phobia) faced by it. It also consists of trying to point out ethically edifying ways for its use. Other objectives of this work are the following: Establish an adequate conceptualization of Chat GPT; reflect on the limitations and potential of Chat GPT, as well as on the best ways to undertake its pedagogical use; and investigate the reasons for acceptance and rejection of Chat GPT in Education. We hope that this work will be a way of contributing to educators to further improve their pedagogical practices.

Keywords: GPT Chat, problem solving, education

INTRODUCTION

With the advent of so-called modern science, humanity was able to witness an extraordinary technological development, largely based on discoveries made in the 19th century, which culminated in an unprecedented technological revolution in the 20th century. Scientific-technological progress was followed by an improvement in human dominance over nature, which often resulted in flagrant ethical setbacks such as: the mass extermination of human beings in two world wars and several other wars, civil or international; the use of atomic bombs with extremely high destructive power against civilian populations; the progressive destruction of the environment, causing the extinction of several animal and plant species, among other things.

The 20th century experienced emphatic ups and downs, such as the pessimism experienced during the second war and the immediate post-war period and the medium-term optimism in the post-war period, when

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the recovery of the countries most affected by it proved possible. And since the technological development of the 20th century was unprecedented, there is no way to separate it from both the optimism and pessimism experienced throughout this century. We then found the existence of two antagonistic processes, however, sometimes simultaneous: the unlimited trust (or even deification) of technology (and also of science), as well as its demonization. Finally, bringing this to the context of education, new technologies enter the educational environment allowing the development of innovative methodologies with the aim of facilitating teaching and learning, without also leaving aside some losses in learning that these technologies can generate (Souza and Dourado, 2015).

Taking these aforementioned premises into account, innovative methodologies in education seek to transform the way students learn and relate to knowledge. These methodologies aim to make the learning process more dynamic, interactive and meaningful for students. With these methodologies in mind, below we will mention some types of innovative methodologies that seek to improve the teaching/learning issue (Evaristo and Terçarol, 2019), (New Students, 2023).

One of the most popular innovative methodologies is project-based learning. In this approach, students work as a team to solve a real problem or challenge. They are encouraged to research, plan and execute a project that has an impact on the community or society around them. At the end of this project, students must build a product with these premises (Lyceum, 2019).

Another innovative methodology is the flipped classroom. In this approach, students have access to study materials before class and use class time to discuss and apply what they have learned. This allows teachers to dedicate more time to interacting with students and answering questions (Bacich and Moran, 2018).

Gamification is another innovative methodology that has gained popularity in education. It uses gaming elements to make the learning process more fun and engaging. Students can earn points, level up, and compete with their peers as they learn (Ludos Pro, 2023).

These are just some of the many innovative methodologies being used in education. The important thing is to find one or more approaches that work for students and help them develop important skills such as critical thinking, creativity, and collaboration.

This paper aims to focus on the contributions of Chat GPT to solving problems in education. To this end, we have structured this work in the following format. We start by briefly explaining what Chat GPT is, how it is trained and why it is not intelligent. Next, we explain the contribution of Chat GPT to problem-solving pedagogy and cite two examples. Later we show the role of the teacher in this context of connection between Chat GPT and problem-solving pedagogy and the downside of using this artificial intelligence technology in education. And finally, we close with our conclusions.

WHAT IS CHAT GPT?

Chat GPT (chat, from English, means conversation and GPT is the abbreviation for Generative Pre-trained Transformer; The term Generative indicates that the model is capable of generating an original text and the term Pre-Trained means that this model was trained on a wide variety of language tasks before being made available for use) is a term used to describe the use of language processing algorithms to generate virtual conversations with a computer. It is an AI (Artificial Intelligence)-based tool that

helps make content creation faster, easier and more efficient. It is a chatbot developed by OpenAI based on GPT-3.5 (GPT-3.5 is the publicly accessible version that has 175 billion parameters. It is designed to perform various natural language processing tasks for humans such as answering questions, generate cohesive text, create programming code, among others). It is able to understand and answer questions and commands, as well as maintain a conversation with the user (Júnior, 2023).

Chat GPT is, basically, a virtual robot (chatbot) that answers a variety of questions, performs written tasks, chats fluently and even gives advice on personal problems (Suzuki, 2023). The possibilities for generating content are immense. He can, for example, teach you how to prepare stroganoff — and with a different twist on the recipe, if you specify —, give tips for getting a job, writing poetry, academic papers or a model of legal power of attorney and also writing a letter of reconciliation for a friend from whom you have distanced yourself (Ibid.).

The system was developed by OpenAI, a company founded in 2015 in the USA by Sam Altman (today its main figure) and Elon Musk (who left it in 2018 because he considered there was a conflict of interest with his main venture, the automotive company Tesla) (Suzuki, 2023).

Chat GPT is an algorithm based on artificial intelligence. It was created by a US artificial intelligence research laboratory called OpenAI, based in San Francisco in the United States. The name Chat GPT is an acronym for "Generative Pre-Trained Transformer" – something like "Generative pre-trained transformer" (Landim, 2023). The Chat GPT algorithm was developed based on neural networks and machine learning, having been created with a focus on virtual dialogues. The idea is that it could improve the experience and features offered by virtual assistants, such as Alexa or Google Assistant (Ibid.).

Chat GPT's architecture is based on a neural network called Transformer, designed especially to handle texts. The artificial intelligence model has several layers that allow the platform to pay attention to keywords, context, and the different meanings words can have. This is an extremely advanced text generation model (Ibidem.).

HOW IS CHAT GPT TRAINED?

Chat GPT is trained using an algorithm based on neural networks, which are trained on large sets of text data to learn patterns in language. The model is trained on a specific task of 'next word prediction', i.e., given a sequence of words, the model tries to predict the next word. Chat GPT was trained using a technique called Reinforcement Learning with Human Feedback (RLHF). The model is refined in a step called fine-tuning, and the last step is generation of responses (Silva, 2023).

The Chat PT training process starts with collecting large sets of text data. This data is used to train the model on patterns in human language. The goal is for the model to be able to understand and generate human-like text. To do this, the model is trained on a specific 'next word prediction' task. This means that, given a sequence of words, the model tries to predict what the next word will be, as mentioned above (Ibid.).

Chat GPT was trained using a technique called reinforcement learning with human feedback. This means that the model receives human feedback during the training process. This feedback helps the model better understand how to generate more human-like responses (Silva, 2023).

After initial training, the model goes through a step called fine-tuning. At this stage, the model is refined to improve its ability to generate human-like responses. This is done

by adjusting the model parameters so that it can generate responses more accurate (Ibid.).

The last step in the Chat GPT training process is generating responses. At this stage, the model uses all the knowledge acquired during the training process to generate human-like responses. This allows Chat GPT to maintain conversations with users and respond to questions and commands (Ibidem.).

WHY IS GPT CHAT NOT SMART?

Chat GPT is a tool based on artificial intelligence, but that does not mean that it is 'intelligent' in the human sense of the word. Human intelligence involves abilities such as reasoning, problem solving, creativity and emotional understanding. Chat GPT, on the other hand, is a computer program that has been trained to generate responses from patterns in large sets of text data (Bogost, 2022).

While GPT Chat can generate human-like responses and hold conversations with users, it does not have the ability to reason or solve problems independently. He is able to generate responses based on the patterns he learned during training, but he does not have the ability to understand the context or emotions behind the words (Ibid.).

Furthermore, Chat GPT lacks creativity in the human sense of the word. He can generate creative responses based on the patterns he learned during training, but he does not have the ability to create something completely new or original. He is able to combine information in new and interesting ways, but always within the limits of what he was trained to do (Ibid.).

Another reason GPT Chat is not considered 'intelligent' in the human sense of the word is that it does not possess consciousness or self-awareness. It is a computer program that is designed to generate answers from patterns in large sets of text data. He does not have the ability to reflect on himself or the world around him (Bogost, 2022).

In short, Chat GPT is a powerful tool based on artificial intelligence, but that doesn't mean it's 'smart' in the human sense of the word. It is capable of generating human-like responses and holding conversations with users, but it lacks the cognitive and emotional abilities that are characteristic of human intelligence (Ibid.).

From now on, we will show a brief discussion about problem-solving pedagogy to relate it to GPT Chat and show some suggestions for application examples among these. Soon after, we will show the role of the teacher in this type of pedagogical technique related to Chat GPT, the bad side of this relationship for student learning and our conclusions.

PROBLEM-SOLVING PEDAGOGY

Problem-solving pedagogy is an educational approach that emphasizes the importance of developing problem-solving skills in students. Polya (1995) structures this pedagogy based on the following premises: 1. It is necessary to understand the problem; 2. After understanding this, it is necessary to draw up a plan; 3. Execute the plan; 4. Review your work and consider whether it is still possible to improve it. There are some scientific works on the application of this pedagogical practice in (Onuchic et al, 2019), (Onuchic et al, 2017), (Onuchic and Allevato, 2011).

This approach assumes that learning is more effective when students are challenged to solve real and relevant problems (Souza and Dourado, 2015).

IN PROBLEM-SOLVING PEDAGOGY

Students are encouraged to explore, experiment and test different solutions to the problems presented. They are encouraged to work in teams and use critical and creative

thinking to find innovative solutions. Problem-solving pedagogy subtly differs from project pedagogy in the sense that the latter needs to have a product as a result, whereas resolution pedagogy does not need to have this product (Saraiva Educação, 2021).

This approach also emphasizes the importance of the problem-solving process rather than just focusing on the outcome. Students are encouraged to reflect on their strategies and learn from their mistakes (Evaristo and Terçariol, 2019).

Problem-solving pedagogy, in a way, can be seen as an adaptation of the scientific method in education. This method basically assumes the resolution of a given problem through experimentation with pre-elaborated hypotheses. Within this experimentation process, error is part of this analysis, gross errors are discarded. At the end of this study, the scientist may or may not find the solution to a given problem. When he doesn't find it, this work can be very useful in the sense that new work will no longer need to use this specific methodology, which results in something wrong. In other words, it is a way of reflecting on the strategies used and learning from mistakes (Roitman, 1979).

Problem-solving pedagogy can be applied to diverse areas of knowledge, from mathematics and science to arts and humanities. It helps students develop important skills like critical thinking, creativity, and collaboration.

GPT CHAT AS AN INNOVATIVE METHODOLOGY IN EDUCATION,

USING PROBLEM-SOLVING PEDAGOGY

Chat GPT is an artificial intelligence platform created by OpenAI that is capable of preparing argumentative texts, solving mathematical problems and generating text summaries (Starse, 2023). It can be used as a tool to support problem-solving pedagogy in education. In problem-solving pedagogy, students are encouraged to explore, experiment, and test different solutions to the problems presented (Lima, 2023).

GPT Chat can be used to provide information and suggestions to students as they work to solve problems. It can help them search for relevant information and generate ideas for innovative solutions (Ibid.).

Additionally, GPT Chat can be used to provide immediate feedback to students about their solutions. It can help them identify errors and refine their strategies. This allows students to learn from their mistakes and improve their problem-solving skills. In summary, Chat GPT can be an innovative methodology in education when used as a tool to support problem-solving pedagogy. It can help students develop important 21st century skills such as critical thinking, creativity, and collaboration.

TWO EXAMPLES OF USING GPT CHAT IN PROBLEM SOLVING PEDAGOGY AS AN INNOVATIVE METHODOLOGY

So far, we have briefly shown the reader what Chat GPT is and the pedagogy of problem solving. Now we will cite two suggestions for examples of associations between these two aspects for the reader's appreciation.

FIRST EXAMPLE

Imagine a science class where students are challenged to find solutions to reduce air pollution in their city. They are divided into teams and each team must research information about the causes of air pollution and possible solutions (Pimentel, 2023).

In this scenario, Chat GPT can be used as a tool to help students with their research. They can ask GPT Chat questions about the causes of air pollution and receive answers based on

reliable information. They can also ask Chat GPT for suggestions on possible solutions to reduce air pollution (Ibid.).

Additionally, GPT Chat can be used to provide students with immediate feedback on their solutions. For example, if a team proposes planting more trees as a solution to reducing air pollution, they can ask GPT Chat about the effectiveness of that solution. Chat GPT can provide information about studies that show how planting trees can help reduce air pollution (Ibid.).

In summary, this is a practical example of how Chat GPT can be used in problem-solving pedagogy as an innovative methodology. It can help students research relevant information, generate ideas for innovative solutions, and receive immediate feedback on their solutions.

SECOND EXAMPLE

Another example of the pedagogical practice of Chat GPT as an innovative methodology would be in the teaching of physical disciplines. We can cite an example of an innovative practical problem-solving activity using Chat GPT. This activity would have the following structure:

Let's assume a physics class where students are challenged to design a simple machine to lift a heavy object. Students are divided into teams and each team must research information about simple machines and their principles.

In this scenario, Chat GPT can be used as a tool to assist students in their research. They can ask GPT Chat questions about the principles of simple machines and receive answers based on reliable information. They can also ask GPT Chat for suggestions about possible designs for their simple machine (Pimentel, 2023).

Additionally, GPT Chat can be used to provide students with immediate feedback on their projects. For example, if a team proposes

to use a lever as their simple machine, they can ask Chat GPT about the effectiveness of this solution.

GPT Chat can provide information about studies that show how levers can be used to lift heavy objects (Ibid.).

In summary, this is a practical example of how Chat GPT can be used in problem-solving pedagogy as an innovative methodology. It can help students search for relevant information, generate ideas for innovative solutions, and receive immediate feedback on their solutions.

THE TEACHER'S ROLE IN USING PROBLEM SOLVING PEDAGOGY

USING GPT CHAT

The role of the teacher is crucial in the successful implementation of innovative educational methodologies using GPT Chat. The teacher must be familiar with the capabilities and limitations of GPT Chat and be able to effectively integrate it into theirteaching practice (Fundação Telefônica Vivo, 2023).

One way that teachers can use Chat GPT in their teaching is by incorporating it into problem-solving pedagogy. In this approach, students are encouraged to explore, experiment and test different solutions to problems presented to them. GPT Chat can be used to provide information and suggestions to students as they work on problem solving (Ibid.).

The teacher can also use GPT Chat to provide immediate answers to students about their solutions. For example, if a student proposes a solution to a problem, the teacher can use GPT Chat to quickly check the validity of the solution.

solution and provide an answer to the student (Fundação Telefônica Vivo, 2023).

Additionally, the teacher can use GPT Chat to generate ideas for class discussions

and activities. For example, the teacher can use GPT Chat to generate a list of questions or prompts (prompts are specific instructions or examples provided to an Artificial Intelligence model to guide its response or text generation) for a class discussion (Ibid.).

Thus, the teacher's role in using innovative educational methodologies using Chat GPT is to effectively integrate the tool into their teaching practice and use it to improve student learning. The teacher must be familiar with the capabilities and limitations of GPT Chat and be able to use it in a way that supports student learning and engagement.

THE BAD SIDE OF GPT CHAT IN THE DEVELOPMENT OF INNOVATIVE METHODOLOGIES IN EDUCATION

While GPT Chat can be a powerful tool for supporting innovative educational methodologies, it is important to consider its limitations and potential drawbacks. A possible drawback is that GPT Chat is not able to understand the context or nuances of a given situation. This means that it may provide information or suggestions that are not appropriate or relevant to the specific needs of the students or the learning environment (Souza, 2023).

Another possible drawback is that excessive reliance on GPT Chat can lead to a lack of critical thinking and creativity among students. If students rely heavily on GPT Chat to provide information and solutions, they may not develop the skills necessary to think critically and creatively about problems (Ibid.).

Additionally, there is a risk that Chat GPT perpetuates bias and misinformation. As an AI tool, GPT Chat generates responses based on the data it was trained on. If this data contains biases or misinformation, GPT Chat may inadvertently perpetuate these biases in

its responses (Souza, 2023).

In summary, while GPT Chat can be a valuable tool to support innovative educational methodologies, it is important to use it prudently and with awareness of its limitations and possible inconveniences. Teachers must be aware of these potential problems and take steps to mitigate them in your use of the GPT chat in the classroom.

BY WAY OF CONCLUSION

The use of Chat GPT in the development of innovative methodologies in education has the potential to revolutionize the way students learn and interact with knowledge. As AI technology advances, GPT Chat is likely to become even more sophisticated and capable of providing more personalized and relevant support to students.

A possible future development is the integration of GPT Chat with other educational technologies such as virtual and augmented reality. This could enable the creation of immersive and interactive learning experiences that engage students in new and exciting ways.

Another possible development is the use of GPT Chat to support personalized learning. By analyzing data about students' learning performance and preferences, Chat GPT could provide personalized suggestions and responses to help each student reach their full potential.

Furthermore, GPT Chat could be used to support collaborative learning by facilitating communication and collaboration between students. For example, GPT Chat could be used to generate discussion prompts or facilitate group brainstorming sessions (brainstorming is a group technique used to generate creative ideas and solutions to a specific problem. It is a collaborative practice that encourages participants to express freely their ideas without criticism or judgment,

with the aim of promoting creativity and the exploration of different approaches).

Therefore, the future holds many exciting possibilities for using Chat GPT in developing innovative methodologies in education. As AI technology advances, GPT Chat is likely to play an increasingly important role in supporting student learning and engagement.

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