Use of ChatGPT in ESP Teaching Process

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Abstract— **The emergence of ChatGPT, a chatbot launched by OpenAI in November 2022, opened a large amount of opportunities for using the artificial intelligence (AI) for dealing with creation and processing of textual materials, including the use in teaching and learning of foreign languages at all educational and age levels. In terms of the teaching process regarding English for Specific Purposes (ESP), Chat GPT can be used as an effective and time-saving tool for various aspects of preparation and implementation of teaching units and evaluation of students' written assignments, and that is the topic that will be presented end elaborated in the central part of the paper. Before that, an introduction regarding AI, its use in education and language teaching and learning, ESP and ChatGPT will be made. The final part of the paper will contain the conclusions relating the overall use of this AI tool in teaching ESP.**

Keywords - English for Specific Purposes (ESP), ChatGPT, artificial intelligence (AI), teaching process, text.

I. INTRODUCTION

John McCarthy, the person who coined the term "artificial intelligence" (AI) in 1955, describes it as machines that "… use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves" [1]. Since that time, the development of AI as a branch of computer science has started, so that the proper and more precise definition would be the one which describes AI as a broad field of computer science that is involved in the creation of smart machines and technologies which have the capacity to performing tasks that typically require human intelligence [2]. In other words, AI technologies represent the models of human thinking and action [3].

During time, the divergence occurred within the studies, implementations, and developments of AI, so that the results, contributions and discussions came from researchers and scholars from different areas of human activity and interest, not only those related exclusively to computer science and engineering [3], leading consequently, among other issues, to different applications of AI in education.

The application of artificial intelligence in education investigates learning wherever it occurs, in traditional classrooms, at homes or in workplaces, aiming at the support of both formal education and lifelong learning. It connects AI, which is intrinsically interdisciplinary, with different the learning sciences (such as psychology, neuroscience, sociology, anthropology, and linguistics) to promote and contribute the development of adaptive learning environments and other AI tools that are flexible, inclusive, personalised, engaging, and effective [4]. In its essence, AI used in education involves computer software that has been programmed to interact with the world in ways similar to the way human intelligence would do, implying that it depends both on overall knowledge about the world, and the algorithms which make the intelligent processing of that knowledge possible.

Regarding the use of AI in language teaching and learning, as a component of education, it can be observed as a part of the evolution and development of the use of computer technology, both in the language classroom and in the world in general. Sumakul, Hamied, & Sukyadi give an overview of the use of AI technologies in language classroom from the 1960 to the present day, with references to the relevant literature and the arguments causing the ambivalent opinions and attitudes of researchers regarding the use of AI technologies in the language classroom [3]. In [2], some of the key AI technologies relevant to language education have been identified together with the examples of their use. Thus, natural language processing (NLP) (i.e., textual AI) and machine learning (i.e., visual AI) have been leveraged to augment learning across settings and scenarios, while automated writing evaluation applications have been designed and implemented to help learners in the improvement of their writing via the mechanism of corrective feedback. Similarly, in the context of language skill development, AI-enabled chatbots have been used as conversational agents to help learners read and speak in a flexible manner. Finally, AI-enabled, personalized, adaptive learning systems have been constructed to facilitate the learning of foreign languages.

The same authors also conclude that the "efforts to embed AI in mobile technologies have yielded particularly exciting results", and emphasise that, in order to "address the current language learning situation, there is a strong demand to explore new AI applications that are effective in informal contexts", supporting the design and use of adaptive technologies, through which "learners can choose their own learning content and methods and receive immediate feedback", so that their learning becomes more student-centred and customised.

In the context of English for Specific Purposes, defined as an "approach to language teaching that targets the current and/or future academic or occupational needs of learners, focuses on the necessary language, genres, and skills to address these needs, and assists learners in meeting these needs through

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the use of general and/or discipline-specific teaching materials and methods" [5], similar AI technologies can be very useful teaching and learning tool as well. Istrate notices that there is a future trend in ESP which refers to the adaptability of e-learning programs to the students' level of knowledge, so that, if universities manage to develop artificially intelligent e-learning platforms, adapted to the level of knowledge of the enrolled students, through the incorporated e-learning chat bots, a new trend and useful tool for teaching ESP will be developed, which will focus on the individual accomplishments and offer more opportunities for success in language acquisition. She also expresses the opinion that the new trends in AI, primarily the incorporation of chat bot technology in the particular case of ESP at academic level, would be the next step towards a virtual assistant which could, to a certain level, replace the human teacher, creating an interactive learning experience for the student, similar to the one-to-one classroom lessons with the teacher [6].

The emergence of ChatGPT, a chatbot launched by OpenAI in November 2022, presents a giant step towards the mentioned, offering a large number of opportunities for using the artificial intelligence (AI) for the creation and processing of textual materials and thus contributing to different aspects of ESP teaching and learning.

II. CHATGPT

ChatGPT presents an artificial intelligence chatbot which has been developed by OpenAI. It is designed to converse with humans in a natural, intuitive way, by using advanced machine learning techniques to generate human-like responses to text input. It has been in the development phase for several years and has undergone numerous updates and improvements which made it one of the most advanced chatbots available today.

The origins of ChatGPT can be traced back to the development of GPT (Generative Pre-training Transformer), an AI language model which was created by OpenAI in 2018. GPT was designed to predict the next word in a given sequence of words, using a large dataset of human-generated text to learn about language structure and style. This technology proved to be extremely successful and was quickly integrated into a variety of applications, including machine translation, language generation, and even music composition.

On the basis of the features and success of GPT, OpenAI managed to create a chatbot that could hold natural conversations with humans. This led to the development of ChatGPT, which was initially released in early 2020. It has been trained on a massive dataset of hundreds of billions of words, allowing it to generate high-quality language and perform a wide range of NLP tasks, from text completion and translation to question answering and summarization. Also, it has been fine-tuned for conversational language and can be used to generate responses in a conversational context, such as in a chatbot or virtual assistant, due to ability to generate human-like responses to text input. By using advanced machine learning techniques, ChatGPT is able to analyse the context and content of a conversation, and generate appropriate responses based on this analysis. This allows it to hold natural, flowing conversations with humans, rather than simply providing pre-written responses to specific keywords or phrases. Another significant feature of ChatGPT is its large knowledge base. Namely, it has access to a vast dataset of human-generated text, which it uses to learn about language, culture, and a wide range of topics. This allows ChatGPT to provide accurate and detailed responses to a wide range of questions.

All that makes it useful for a range of NLP tasks, including but not limited to text generation, question answering, and text classification [7].

III. USE OF CHATGPT IN ESP TEACHING PROCESS

By leveraging the flexibility and generative capabilities of ChatGPT, teachers and educators can create engaging and personalized learning experiences for students which attend the lessons in English for Specific Purposes, helping them to acquire the language skills they need to succeed in their specific field. In that sense, ChatGPT can be used for the creation of ESP teaching materials in various ways.

A. Text Generation

One of such ways is to fine-tune it to generate text in a specific domain, such as technical, medical, or business English, and in that way provide examples of the type of language students need to learn in their specific field. Such a fine-tuning involves several steps.

The process starts with the collecting of a large dataset of texts that are relevant to the target domain. This data can be sourced from websites, books, articles, or any other source that contains the type of language that is to be generated. Next, the data needs to be preprocessed to remove any irrelevant information and cleaned up for training. This may involve the removal punctuation, stop words, or any other elements that are not relevant to the target domain.

Once the data is prepared, the pre-trained ChatGPT model can be fine-tuned on this domain-specific data. This is typically done by using the transfer learning approach, where the pre-trained weights of the model are kept and only the last layer or a few layers of the model are trained to adapt it to the target domain. After fine-tuning, the model's performance in generating text in the target domain needs to be evaluated by comparing the generated text to the ground truth data and by using the metrics such as accuracy, F1 score, or perplexity. Depending on the evaluation results, any necessary adjustments to the model's architecture or the training process can be made and the fine-tuning and evaluation steps can be repeated until the desired level of performance is achieved. It is important to note that the fine-tuning process can be time-consuming and requires a large amount of computational resources, so it is advisable to have access to a fast and resourceful computer for the training.

B. Generation of Vocabulary and Grammar Exercises

Additionally, ChatGPT can be used to generate personalized vocabulary and grammar exercises for ESP students, as it can be trained to generate questions and answers based on specific grammar rules or vocabulary words. It is

performed by fine-tuning the language model on a specific English as a Second Language (ESL) dataset. The fine-tuning of the language model for this purpose involves a few steps. Firstly, it is necessary collect a large dataset of ESL sentences or exercises that reflect the target grammar structures and vocabulary on which the focus should be. Then, the data have to be cleaned and preprocessed by removing any irrelevant information and formatting it in a way that can be fed into the model. Next, as a starting point, a pre-trained language model has to be chosen and fine-tuned by using the collected and preprocessed data. This involves the training of the model on the new data by using a supervised learning approach, where the model is given input and expected output pairs and updates its parameters to minimize the difference between its predictions and the actual outputs. The fine-tuned model should be evaluated on a held-out validation set to see how well it is able to generate exercises that match the target grammar structures and vocabulary.

Finally, the fine-tuned model can be used to generate exercises for each student or groups of students by providing a prompt or a partial sentence and having the model complete it in a grammatically correct way, focusing on the target vocabulary and grammar structures. The generated exercises can be customized based on the student's proficiency level, language background, and specific needs. They can be used as additional practice material for the students, helping them to improve their language skills. It is important to keep in mind that fine-tuning a language model requires a lot of computational resources and can take several hours or even days to complete, depending on the size of the dataset and the complexity of the model.

C. Generation of Virtual Tutors or Chatbots

Another use for ChatGPT can be the creation of virtual tutors or chatbots that can engage in natural language conversations with students, providing them with the opportunity to practice speaking and listening skills in a simulated, yet personalized and interactive environment. That is done in a few steps, first of which is the (already described) fine-tuning of the pre-trained ChatGPT model on a large dataset of ESL conversations or questions and answers related to the target vocabulary and grammar structures. Then, a dialogue management system that can handle the conversation flow and determine the next action of the chatbot based on the user's input should be implemented. The system can use various techniques such as rule-based matching, intent classification, and response generation to guide the conversation and provide relevant responses to the user's questions. Additionally, the chatbot's responses should be personalized by using user-specific information, such as proficiency level, language background, and specific needs, to make them more relevant to the student's needs. Finally, the chatbot's performance should be evaluated on a held-out test set to see how well it can handle various conversation scenarios and to which degree it can provide helpful responses to the students.

D. Integration into Interactive Learning Materials

ChatGPT can also be integrated into interactive learning materials, such as quizzes or games, which can be adjusted for each student based on their language level and needs, and thus provide personalized and engaging language learning experiences for students. To achieve this integration, ChatGPT can be used as a source of questions and answers, or as a tool for generating personalized feedback and recommendations.

One way to integrate ChatGPT into interactive learning materials is by fine-tuning it on a large dataset of ESL questions and answers. The model can then generate new questions that target specific grammar structures and vocabulary. These generated questions can be used in quizzes, games, or other interactive learning materials to provide personalized practice for the students. In this way, the learning materials can become more dynamic, with the questions changing based on the students' progress and proficiency level.

Another way in which ChatGPT can be used within interactive learning materials is as a tool for generating personalized feedback for the students on the basis of their answers to the questions. The model can be fine-tuned on a dataset of feedback and correction examples to generate relevant feedback on grammar, vocabulary, or pronunciation errors. It can also suggest the ways to improve, depending on the students' performance.

In addition to question and feedback generation, ChatGPT can also be used to generate recommendations for the students. For example, the model can suggest reading materials, videos, or other resources that can help the students improve their language skills. The recommendations can be generated with regards to the students' interests and language proficiency level, making the learning experience more personalized and tailored to their needs.

An example for what has been stated in the previous paragraphs could be the integration of ChatGPT into interactive learning materials for technical English. It can be performed by creating a conversational interface where individual learners can practice their technical English by interacting with ChatGPT. The conversational interface can have prompts for the learner to ask engineering-related questions, and ChatGPT can respond with appropriate answers, feedback, and explanations. For instance, the learner can type a question such as "What is the difference between a transistor and a diode?" and ChatGPT can respond with "A transistor is a three-terminal electronic device used for amplification and switching, while a diode is a two-terminal device used for rectification and voltage regulation."

In addition to this, ChatGPT can also provide sample dialogues between engineers and clients, and correct the students' grammar and pronunciation, thus acting a conversational partner that provides students with instant feedback and personalized language learning experiences.

E. Providing of Instant Feedback and Evaluation

Finally, ChatGPT can be used to provide instant feedback and evaluation to ESP students on their language skills, helping them to identify areas for improvement. It can be done by fine-

tuning the model on a large dataset of feedback and correction examples.

The first step in this process, is, again, the collecting of a large dataset of feedback and correction examples that pertain to grammar, vocabulary, and pronunciation errors in the context of ESP learning. Once this data is collected, it should be preprocessed for the purpose of removing any irrelevant information and standardizing the format, and then split into two parts: input and target. The input is the text containing the error and the target is the corresponding feedback or correction. The pre-trained ChatGPT model can then be fine-tuned on this data by using various deep learning frameworks, such as TensorFlow or PyTorch. During the fine-tuning process, the model makes predictions on the input data and updates its parameters to minimize the difference between its predictions and the target feedback or correction. This is achieved by measuring the difference between the model's predictions and the target feedback or correction by using a loss function, and then by using backpropagation to update the model's parameters.

Here is an example of the fine-tuning process. If, for example, there is a sentence "I goed to the store", which contains a grammatical error, the task is to fine-tune the pre-trained ChatGPT model to predict the correct form of the sentence, which should be "I went to the store". To do this, the dataset should be split into input and target data, where the input is the sentence with the grammar error, and the target is the correct form of the sentence. Then this dataset can be loaded into a deep learning framework and the predictions on the input data can be made by using the pre-trained ChatGPT model. The predictions will then be compared to the target data by using a loss function, which measures the difference between the predictions and the target data. The backpropagation algorithm is then used to make predictions on the input data and update the model's parameters to minimize the loss function. The process will repeat for each sentence in the dataset until the model is able to accurately predict the correct form of sentences with grammar errors.

Once the fine-tuning process is complete, the model should be evaluated on a held-out test set to determine its accuracy, recall, and precision in generating relevant and appropriate feedback and corrections.

After the model has been fine-tuned and evaluated, it can be deployed in a web or mobile application to provide instant feedback and evaluation to the students on their language skills. The students can input their text, and the model will generate feedback and corrections in real-time, allowing the students to improve their language skills quickly and efficiently. If the fine-tuning has been performed appropriately and thoroughly, on a relevant dataset of feedback and correction examples, the model can learn to generate precise, accurate and appropriate feedback and corrections for ESP students, providing them with instant and personalized feedback and evaluation regarding their language skills.

The example of this use can be the integration of ChatGPT into a technical English course to improve students' technical writing skills by providing instant feedback and evaluation on their writing assignments. Namely, after students submit their written assignments, ChatGPT can evaluate their work based on various criteria such as grammar, vocabulary, sentence structure, and technical accuracy, and then provide them with instant feedback on their strengths and weaknesses and suggest ways to improve their writing skills.

For example, if a learner writes a sentence that is technically inaccurate or unclear, ChatGPT can highlight the error and suggest a correction, but it can also provide explanations and examples to help the learner understand the mistake and how to avoid it in the future.

Moreover, ChatGPT can keep track of students' progress and provide them with customized learning paths based on their strengths and weaknesses. For instance, if a student consistently struggles with technical accuracy, ChatGPT can provide him/her with additional exercises and resources to improve his/her technical vocabulary and understanding.

IV. Conclusions

ChatGPT can be a powerful tool for teachers and educators to create personalized and engaging learning experiences for students studying English for Specific Purposes (ESP). With its flexibility and generative capabilities, it provides a wealth of opportunities for teachers and educators to create personalized and engaging learning experiences for English for Specific Purposes students.

The flexibility and generative capabilities of the model can be leveraged in several ways, including the fine-tuning which enables the generation of text in specific domains, creation of personalized vocabulary and grammar exercises, virtual tutors or chatbots, and integration into interactive learning materials such as quizzes or games.

However, it is important to note that, in order to utilize ChatGPT in ESP teaching process, certain computer knowledge is required. It includes the understanding of basic computer operations such as how to install and use software, as well as how to navigate the Internet and use web-based tools. Additionally, knowledge of text-based programming languages, such as HTML, Markdown, Python and JavaScript can be helpful when customizing or integrating ChatGPT into existing learning platforms. Familiarity with machine learning concepts and natural language processing techniques is also beneficial for those looking to fully understand how ChatGPT works and how to effectively use it in a teaching context. If the language teacher does not have the stated computer skills, it is necessary to work together with an IT professional to obtain the desired goals and results relating to the use of ChatGPT in ESP teaching process.

Another issue worth mentioning is the fact that the fine-tuning process can be time-consuming and requires a significant amount of computational resources. Nonetheless, the benefits of a fine-tuned ChatGPT model, in terms of providing students with tailored and effective language learning experiences, make the resource and time investment well worth it.

Generally, it can be said that, by using ChatGPT in the ESP classroom, teachers and educators can help their students

acquire the language skills they need to succeed in their specific fields and reach their full potential.

Overall, the flexibility and generative capabilities of ChatGPT make it a valuable tool for creating engaging and personalized teaching materials for English for Specific Purposes.

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