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How will ChatGPT affect several business sectors in the future?

A Perspective from the Education Sector

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Resumo

O Chat "Generative Pre-Trained Transformer" é um chatbot desenvolvido pela OpenAI e lançado em novembro de 2022, baseado em Inteligência Artificial, que usa a técnica de transformador pré-treinado generativo, para fornecer respostas contextuais em linguagem natural. Este chatbot é baseado na arquitetura "Generative Pre-Trained Transformer", que permite treinar uma rede profunda de dados numa variedade de textos que são encontrados na internet. Desta forma, este modelo consegue aprender as estruturas e padrões da linguagem humana com este treino prévio. O ChatGPT é projetado para construir conversas naturais e relevantes e esta é uma das características que o distingue de chatbots mais tradicionais. Com base nos pedidos que recebe, ele consegue gerar respostas relativamente humanas. Para além disso, a OpenAI modificou o ChatGPT usando uma abordagem conhecida como "Reinforcement Learning from Human Feedback". Isto inclui treinar o modelo com feedback humano para que funcione melhor e produza respostas significativamente mais precisas e relevantes.

O presente estudo examina o papel do ChatGPT, um modelo de linguagem avançado, no setor educacional. Inicia-se com uma revisão completa da literatura sobre o uso de Inteligência Artificial na educação e enfatiza alguns campos em que o chatbot provou ser eficaz. Esses campos incluem a criação de conteúdo educacional, atendimento de dúvidas a estudantes e até mesmo a criação de material de avaliação para os professores. Para além disso, analisa como educadores e alunos usam o ChatGPT, destacando os sucessos e os possíveis problemas.

Esta tese discute também questões éticas relacionados com a utilização do ChatGPT na educação. Isto inclui questões de privacidade e confiabilidade e

como podem afetar a motivação dos alunos e o seu espírito crítico e aprendizagem.

Conclui-se que políticas educacionais éticas e adaptativas são essenciais para direcionar o uso responsável do ChatGPT e outras tecnologias num ambiente educacional em constante mudança. Os resultados obtidos aumentam o debate constante sobre a integração responsável da Inteligência Artificial nas práticas educativas.

Palavras-chave: Inteligência artificial, Educação, Ética, Aprendizagem.

Número de palavras: 9965

Abstract

ChatGPT is a chatbot developed by OpenAI and launched in November 2022, based on Artificial Intelligence that utilizes the technique of pre-trained generative transformer to provide contextual responses in natural language. This chatbot is built on the "Generative Pre-Trained Transformer" architecture, enabling training a deep network of data from a variety of texts found on the internet. Thus, this model can learn the structures and patterns of human language through this pre-training. ChatGPT is designed to construct natural and relevant conversations, setting it apart from more traditional chatbots. Based on the requests it receives, it can generate responses that are relatively human-like. Furthermore, OpenAI modified ChatGPT using an approach known as "Reinforcement Learning from Human Feedback". This involves training the model with human feedback to enhance its performance and produce significantly more accurate and relevant responses.

This study examines the role of ChatGPT, an advanced language model, in the educational sector. It begins with a comprehensive literature review on the use of Artificial Intelligence in education, emphasizing some areas where the chatbot has proven to be effective. These areas include creating educational content, addressing student queries, and even generating assessment material for teachers. Additionally, it analyzes how educators and students utilize ChatGPT, highlighting successes and potential issues. This thesis also discusses ethical issues related to the use of ChatGPT in education, encompassing privacy and reliability concerns and how they may impact student motivation, critical thinking, and learning.

In conclusion, ethical and adaptive educational policies are crucial to guide the responsible use of ChatGPT and other technologies in an ever-changing educational environment. The findings contribute to the ongoing discourse about the responsible integration of Artificial Intelligence into educational practices.

Keywords: Artificial Intelligence, Education, Ethics, Learning.

Number of words: 9965

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Chapter 1- Introduction

1.1. General Framework

This section covers the general framework of the dissertation topic, outlining its definition and justification. The macrostructure of this study, the research aims, and the development methods are also described.

In recent years, the intersection of education and artificial intelligence (AI) and education has given rise to enormous possibilities, challenging traditional paradigms of teaching and learning. A prominent invention among the multitude of AI applications is Chat Generative Pre-Trained Transformer (ChatGPT) an advanced language model created by OpenAI. ChatGPT was released with the goal to interact with users through natural language dialogues. Since then, it has gathered significant interest and generated discussions over its possible implications for several industries, including education. For instance, AI applications can be used in education to enhance administrative services and academic support (Lo, 2023). The impact of ChatGPT on the field of education has been the subject of much discussion since its beta release in November 2022. While many experts (McMinn, 2023) acknowledge its potential as a tool to assist education and its possible benefits as a disruptor of the status quo, others draw attention to its risks and downsides (Kohnke et al., 2023). Nevertheless, the ability of artificial intelligence (AI) to address learning issues, such as enhancing the transfer of knowledge, clarifying misconceptions and encouraging students to develop critical thinking abilities, is one of the primary advantages of ChatGPT (Perera & Lankathilaka, 2023).

The possibilities, drawbacks, and integrations of ChatGPT with educational frameworks will be covered in the upcoming chapters. In addition, it carefully examines the moral implications of using AI, especially language models like ChatGPT, in teaching settings. This dissertation aims to contribute to a nuanced understanding of the changing interaction between AI technology and education, by critically analyzing ChatGPT's advantages and disadvantages. Due to its importance, since its creation, it has been a topic of study by different authors.

1.2. Objectives and Research Methodology

Education has seen a paradigm shift as a result of the arrival of AI, specifically ChatGPT, in the field of evolving technology. This thesis uses a variety of approaches to investigate ChatGPT's effects on the education sector.

The main goals are to determine whether ChatGPT is effective in improving the learning process, how it affects students' academic performance, whether it can help teachers and how helpful it is for academic writing and research support.
To address these objectives, the study will pose critical research questions. First, it will investigate if ChatGPT's incorporation into online learning environments improves the quality of instruction by producing interactive learning materials and instantaneous answers. Second, a close examination of the moral issues related to students using ChatGPT for research and academic writing will take place. Lastly, the study will investigate how much ChatGPT may be customized to help students narrow down their research questions and locate pertinent sources.
The study sets considerable emphasis on human verification and accountability while acknowledging the gaps in current research and highlighting the necessity of reviewing and correcting factual errors. Additionally, it will highlight how

crucial it is to recognize the limitations of AI and frame ChatGPT as an aid rather than a substitute for human abilities. To ensure the responsible use of AI tools, the study will also concentrate on evaluating potential misuse and loopholes, particularly in an educational context.

1.3. Macrostructure

Five chapters make up this dissertation. The research topic, goal, research methodology, and macrostructure are all introduced in the introduction.
Furthermore, to comprehend the advancements made thus far on this subject and the identified research gaps, the second chapter reviews the literature. The research problem and questions are defined in the third chapter, as well as, the study's procedures, input, outputs and performance measures, which are used to assess each technique's accuracy. The fourth chapter covers the discussion of the outcomes of the research. The study's primary findings and potential directions for further research are included in the fifth chapter. The bibliographic references utilized to bolster the thesis' arguments, ideas and theoretical underpinnings are included in the final part.

Chapter 2- Literature Review

This section presents the theoretical concepts of ChatGPT and its impacts on the education sector. The history of artificial intelligence, a few ethical concerns, and the results and recommendations of several investigations are also presented.

2.1. Artificial Intelligence and the Beginning of ChatGPT

What is Artificial Intelligence? To put it simply, it is the science of creating machines with human-like thought processes. AI is capable of actions deemed "smart." Unlike humans, AI technology can process enormous amounts of data in many ways. This process wants to be able to do tasks like pattern recognition, decision-making, and human-like judgment. Undoubtedly, the "artificial" aspect of artificial intelligence stems from its production process, which involves human creativity and invention rather than natural (particularly biological) influences. According to John McCarthy, the inventor of artificial intelligence, it is "the science and engineering of creating intelligent machines, particularly clever computer programs" (Tutorials Point, 2020). The process of teaching a computer, a robot under computer control, or software to think intelligently in the same way as intelligent humans is known as artificial intelligence. Understanding the human brain and how individuals learn, make decisions, and solve problems is the first step toward creating AI. (Chinonso et al., 2023).

In recent years, AI has grown quickly, resulting in a wide range of applications across several fields, including education. With a wide range of data, AI systems can be trained to mimic the functioning of the human brain and do repetitive tasks. The application of AI in education has significantly enhanced academic support and administrative services. An illustrative example is the utilization of

Intelligent Tutoring Systems (ITS), which simulate personalized, one-on-one tutoring experiences. A meta-analysis's findings showed that ITS typically had a somewhat favorable impact on college students' academic performance (Lo, 2023). The application of information and communication technology as a means of enhancing instruction and student learning has led to the development of artificial intelligence in the field of education. By offering tailored learning experiences, automating tedious chores, and freeing up teachers to concentrate on more crucial responsibilities like giving each student individual attention, machine intelligence has the potential to completely transform the educational landscape (Chinonso et al., 2023).

The AI and research company OpenAI is the creator of ChatGPT. ChatGPT was unveiled by the corporation on November 30, 2022. With ChatGPT, an AI-powered natural language processing tool, you may converse with the chatbot in a manner akin to that of a human and accomplish a lot more. The language model can provide answers to your queries and help you with tasks like writing code, articles, and emails. This model can comprehend and produce writing that is nearly human-like with astonishing accuracy because it has been trained on a vast amount of data. Enhancing natural language processing (NLP) and natural language understanding (NLU) in a variety of applications is one of ChatGPT-3's most intriguing potential uses (Aljanabi et al., 2023).

2.2. ChatGPT in Education

According to Simone Grassini, due mostly to technological improvements, the world's educational methods have seen rapid change during the past ten years. Perhaps the most significant of these technologies has been AI (Grassini, 2023). Nevertheless, the best educational practices can only be provided in an environment where instructors are present. As such, teachers have a crucial role in the educational system, but their position has changed with the emergence of AI. As its solutions develop, they help uncover gaps in instruction and boost student proficiency. AI can offer efficiency, customization, and streamlined tasks, allowing educators the time and freedom to impart knowledge and adaptability—qualities that are uniquely human and cannot be replicated by computers.

OpenAI has provided ChatGPT users with features such as natural language understanding, which allows it to comprehend and generate human-like text based on the input it receives; conversational abilities, being able to respond contextually to a series of prompts, ChatGPT is designed to engage in dynamic and coherent conversations; task flexibility, from language translation and summarization to code generation and answering questions; creative writing, such as poetry, stories and others; complex problem solving, by providing step-by-step instructions and explanations; question-answering, since the program is proficient in providing answers to questions based on the information available in its training data.

These features highlight ChaGPT´s adaptability as a helpful resource for educators across a range of educational duties. It offers support for content production, communication and assessment in educational settings by fusing creative generation with natural language understanding. However, as AI models may provide findings that require human evaluation and context

awareness, instructors must continue to have an active part in validating and improving the outputs.

Teachers have a compelling opportunity to improve pedagogical practices by creating and implementing interactive classroom activities with ChatGPT's advanced features. Many studies have found that ChatGPT can serve to both teachers and students.

Once again stating what Simone Grassini found, that there are five major capabilities that ChatGPT provides to instructors: generating course materials, providing suggestions, performing language translation, generating assessment tasks and evaluating student performance. Teachers need to stay current on knowledge and skills so they can use new digital tools and resources to help students accomplish rigorous academic expectations (Chinonso et al., 2023). Beyond evaluation and grading, AI techniques can be used to translate educational materials and create dynamic and adaptable learning environments. As such, another area where AI proves to be quite useful is in the field of personalized tutoring. The teaching strategy could be modified by the AI systems to accommodate each student's distinct learning preferences and development (Grassini, 2023).

This could mean, as well, the possibility of exploring the field of gifted education. Gifted students need customized program services since they frequently have distinct learning qualities. Advanced material, individualized instruction, problem-solving and critical thinking and cutting-edge technology can all be obtained through the employment of AI. This can all be addressed with ChatGPT. While there are inevitably some drawbacks associated with AI, the realm of gifted education stands to gain significant benefits from the judicious application of technology to meet the unique demands of students (Siegle, 2023).

However, according to Balanskat, Blamire, and Kefala (2006), teachers continue to have difficulties integrating new technologies into their instruction. In the future, AI will have an impact on almost every element of our lives. Of those, the education sector will be most affected because learning and teaching are such significant parts of life, and the current educational system is far from ideal. Education in the past was not as flexible as it would be in the future thanks to artificial intelligence.

The most important role in the educational system is played by teachers and in some countries, they are undervalued and overworked. AI can help each person on an individual basis by offering courses that are tailored to their interests and ability levels (Chinonso et al., 2023). This means that artificial intelligence can decrease the lecturer's current workload and therefore promote more research and development of learning activities. The need to employ AI grows along with the workload, previously mentioned, and the competitiveness in academia. This chatbot offers options for quicker work completion for a variety of users, allowing researchers, for instance, to focus on novel experimental designs because results can be published faster. This has the potential to greatly speed up invention and result in breakthroughs in a variety of fields (Van Dis et al., n.d.). Consequently, academics must discuss the trade-offs between the possible acceleration of knowledge generations that comes with the use of AI and the possible loss of human potential and autonomy during the research process. For performing crucial and cutting-edge research, people's originality and creativity, education and training will always be necessary.

2.3. Ethical Limitations

ChatGPT has several limitations, which include the training data's inherent biases and its inability to distinguish between factual accuracy and incomplete or outdated knowledge. Contextual awareness, ethical reasoning, conversational context and producing visual material are other issues that the model must overcome. Additionally, ChatGPT could have trouble responding to requests that aren´t acceptable, adjusting to user skill levels, and giving tailored feedback. Other obstacles include issues with nonliteral language, originality, consistency in quality and multilingual queries (Ray, 2023). There are many benefits to integrating ChatGPT and other AI technologies into education, but it´s important to consider the moral ramifications and disadvantages of doing so.

Possible bias reinforcement is one major problem. ChatGPT is trained on a variety of datasets, and if these datasets have biases, the AI may unintentionally reinforce those views. This creates a risk for education, as skewed viewpoints or the reinforcement of stereotypes could hurt students. In other words, due to ChatGPT's training on a substantial body of unprocessed, raw data, significant errors have been discovered, raising doubts about its objectivity. The caliber and variety of the data used to train generative models determines how effective they are.

Furthermore, attention must be taken to ensure that the data produced is accurate and of high quality. Although this chatbot is good at producing answers, it cannot ensure that the data is reliable. Before providing materials to students, educators should critically assess them, especially in industries that change swiftly, and information gets antiquated quickly. Stressing the value of accountability will become increasingly critical to avoid human automation bias, or an excessive dependence on automated technology. (Van Dis et al., 2023).

Thorp (2023) argued that since AI is incapable of feeling real emotions or understanding, learning could become more impersonal. An over-reliance on AI

could jeopardize the emotional components of student relationships in education, where empathy is essential. Although merely tools, machines play a significant role in the formulation of hypotheses, the planning of experiments, and the interpretation of findings. However, the final product must come from "the wonderful computer in our heads".

Another potential issue is in regard with privacy and security considerations. Vulnerabilities in AI systems or improper use of data could jeopardize student privacy. It is crucial to provide strong security protocols and obedience to data protection laws.

Due to its sensitive and private nature, student data is more vulnerable to data breaches, illegal access and possible misuse for purposes other than education. Using OpenAI's ChatGPT as an example, Tlili and colleagues (2023) draw attention to the misunderstanding that arises from these concerns. The official webpage of OpenAI states that communication with ChatGPT is recorded and examined to enhance the model's functionality. However, it is unclear how these conversations are stored and utilized. Surprisingly, this information was denied by ChatGPT, contradicting the official webpage of the company, stating that it does not keep any chat data.

On the other hand, students' ethical use of this chatbot and other AI programs is important to consider because there have been many academics that have noted that students may utilize them, improperly, for plagiarism (Crawford et al., 2023). While there are many different factors contributing to the rise in plagiarism and academic misconduct, some researchers argue that the availability of technology and the growing pressure on students to perform well academically, make academic transgressions much more common (Jereb et al., 2018; Surahman & Wang, 2022).

Rather than taking an adverse position towards ChatGPT, many authors prefer to discuss several potential solutions, that could enhance students' access to greater-impact learning opportunities. That is, there is a way to teach students

how to use these gadgets ethically by integrating AI into topics and courses. Ethical AI integration requires defining precise ethical standards for AI use in education and teaching students about responsible behavior. Some tactics focused on identifying institutional policy aspects and AI authoring. However, future-proofing courses and degrees require more work. Although AI can support learning, it cannot replace it for pupils. It does, nonetheless, offer a different route for learning. Academics can use the chatbot to provide mild types of support to promote student's adaptation. ChatGPT may provide comments on the early assessment, and the caliber of the student's prompts may be evaluated (Crawford et al., 2023).

Moreover, according to Szabo (2023), texts generated by ChatGPT could not be recognized by traditional plagiarism detectors, but they could be recognized by AI detectors. In other words, to find occurrences of plagiarism in student work, several plagiarism detection technologies are available. These algorithms can assist in identifying instances of plagiarism that a human reader might miss by analyzing written work for a text that matches preexisting sources. Academic staff members might also think about making an investment in cutting-edge tools and methods for spotting the usage of AI language models. For instance, they might analyze the language and style of work that has been submitted using natural language processing algorithms, looking for any abnormalities that might point to the usage of ChatGPT (Cotton et al., 2023).

In addition, it is important to supervise student work. When employing tools like GPT-3, which can produce language that is realistic and coherent, it is extremely crucial to keep an attentive eye on their work. This could entail carefully reviewing student work, and requesting that students present their work in class, for example.

Furthermore, if instructors are looking to find out if a student has used ChatGPT, the program's potential inability to produce an accurate reference list can be a telltale sign. Researchers have emphasized the significance of creating anti-

plagiarism guidelines and teaching students about academic integrity in addition to identifying instances of student plagiarism. In addition, educators must receive training on ChatGPT's useful features and how to detect plagiarism in student work.

While AI tools like ChatGPT offer transformative possibilities in education, addressing these ethical considerations is paramount. A more morally sound integration of AI in education will be facilitated by establishing guidelines, encouraging responsible use of AI and being aware of any potential negative effects.

This integration must focus on many pivotal roles, one of them being citing and referencing. Stressing the value of appropriate citation practices becomes even more crucial when sophisticated AI models like ChatGPT are used more frequently in academic settings. Despite the chatbot's ability to produce writing that is strikingly human-like, it is incapable of recognizing the source of the data it creates. As a result, users, especially students, need to be aware of how to properly credit the sources the model learns from.

It demonstrates a dedication to in-depth study, a grasp of the larger scholarly discourse, and respect for other people´s intellectual property. Accurate citation promotes accountability and transparency in scholarly discourse by making it possible for readers and evaluators to track the sources of concepts, theories or results (Chinonso et al., 2023).

Chapter 3- Research Methods

3.1. Research Approach

Building on the work completed on my study proposal, the research methodology will be provided in this chapter.

The research questions of this dissertation are how the integration of ChatGPT in education will enhance the learning experience, what ethical considerations arise when students use the chatbot in academic writing and to what extent can ChatGPT be personalized to support students. To answer these questions, both qualitative research and quantitative research will be conducted.

Research Questions	Objectives
How the integration of ChatGPT in education will enhance the learning experience?	To assess and comprehend the effects of incorporating ChatGPT into educational environments with an emphasis on improving students' overall learning experiences.
What ethical considerations arise when students use the chatbot in academic writing?	To uncover, assess and provide insights into the ethical aspects related to ChatGPT for academic writing, ensuring a full awareness of potential and ethical dilemmas.
To what extent can ChatGPT be personalized to support students?	To investigate the viability and efficacy of customizing ChatGPT to meet the distinct requirements and learning preferences of every student,

	emphasizing the idea of individualized support and guidance.

Table 1: Research Questions and Objectives

In the social sciences and other domains, qualitative research is a methodological technique that aims to comprehend and analyze the intricacies of social phenomena, human behavior and experiences. Denzin and Lincoln (Handb. Qual. Res., 1994) use the term qualitative research, which frequently uses open-ended questions, interviews, observations and the study of non-numerical data, to focus on the richness and depth of data in contrast to quantitative research, which deals with measurable variables and statistical analysis.

Qualitative data can therefore *"be defined as empirical information about the world, not in the form of numbers"* (Punch, 2008).

Instead of attempting to generalize from sample to population, qualitative research is concerned with making meaning of lived, witnessed phenomena in a particular environment with specifically chosen individuals (Johnson et al., 2020). In academic fields, direct observation techniques, textual/document analysis and interviews are common ways to get qualitative data. Nevertheless, since the material the researcher is gathering is distinct and frequently extremely sensitive, trustworthiness is a crucial aspect of the participant-researcher association.

Robust, informed and extensively documented qualitative research is a hallmark of good research. Similar to quantitative research, qualitative research is interpretive and naturalistic, but it is also methodical, requiring a rigorous procedure of problem identification, data collection, analysis, explanation, evaluation and interpretation.

Therefore, it is crucial to guarantee the rigor and quality of qualitative research when conducting it. Instead of attempting to explain and control variables, it aims to comprehend and investigate. This analysis focuses more on the patterns

of development of the process than the final result or output of the study. (Nassaji, 2020). Many qualitative researchers have acknowledged and valued the four trustworthiness principles that Lincoln and Guba outlined. These concepts, which have been viewed as parallel replacements for the traditional ideas of internal validity, external validity, reliability and objectivity employed in quantitative research, include credibility, transferability, dependability, and confirmability.

The above seems to be the most appropriate approach given that the goal of the research is to comprehend how AI and ChatGPT have changed and will change and determine whether they will have a positive or negative impact on the education sector in the future. Therefore, to answer the research questions previously presented, interviews have been implemented and a discussion on their answers is conducted.

Interviews can be used to investigate each participant's opinions, backgrounds, convictions and driving forces. There are three main categories of research interviews: structured, semi-structured and unstructured.

In a nutshell, structured interviews are verbally delivered surveys consisting of a preset list of questions with little to no variation and no window for follow-up inquiries regarding responses that demand more clarification. On the other hand, unstructured interviews are conducted with little to no organization and do not represent any prior notions or concepts. Therefore, their employment is typically only taken into consideration when a great deal of "depth" is necessary or when almost nothing is known about the subject. Finally, a semi-structured interview consists of a few essential questions that help define the areas to be examined, but it also gives the interviewer the freedom to veer off-topic to delve deeper into an idea or response (Gill et al., 2008). With this being said, the implemented interviews followed a structured approach to clarify certain requests of this study.

Source	Details	Use in analysis
Interviews	The primary method for collecting data, allowing to delve into participant's perspectives and opinions.	Give rich and detailed data, provide a deeper understanding of the context and a more holistic view of the research topic.

Table 2: Interviews

On the other hand, quantitative research "*encompasses a range of methods concerned with the systematic investigation of social phenomena, using statistical or numerical data"* (Nugroho, 2015). As a result, quantitative research relies on measurement and the assumption that the object of study is measurable.

The goals of quantitative research are to collect data through measurement, analyze the data to look for patterns and relationships and validate the measurements that are taken. Numerical data is gathered and analyzed as part of this research approach to make statistical conclusions and extrapolate results to a larger population. Moreover, the focus on objectivity and accuracy are the main characteristics of quantitative research. It makes use of standardized tools and measurements to guarantee uniformity in data gathering. Because of its precision, the results are more reliable, allowing for accurate comparisons and replication of studies.

Quantitative research often involves large sample sizes. This improves the possibility of collecting representative data and enables more reliable statistical analyses, therefore, the results are trustworthy and broadly applicable. In this approach, data is usually collected in an organized and objective manner. The collection method can be made more uniform by using controlled observations, experiments, or standardized surveys. This reduces subjectivity and bias, enhancing the study's dependability.

A strong methodological strategy that combines the advantages of both quantitative and qualitative research approaches is the integration of

quantitative analysis and interviews. By gathering both numerical data and rich, contextual insights from interviews, this mixed-methods technique offers a more thorough grasp of the study subject.

Researchers can collect numerical data using quantitative analysis, which enables methodical investigation and statistical scrutiny.

By finding patterns, correlations and trends within a particular dataset, this technique adds objectivity to the study. But contextual depth and nuanced insights, which are frequently essential for a thorough comprehension of complicated phenomena, might be absent from quantitative analysis.

This constraint is addressed by including interviews in the study. Participants can share viewpoints, experiences, and complexities during interviews that may not be fully reflected by quantitative metrics alone. Additionally, the use of quantitative analysis with qualitative data can also take the form of coding, in which qualitative themes are given numerical codes. This quantitative processing of qualitative data makes it more suited for statistical examination and allows for a more systematic analysis of the subject of study, in this case, the impact of ChatGPT in the education sector.

Therefore, alongside everything that was previously mentioned, this study aims to analyze the information available about new technologies and artificial intelligence, to understand its impact in the future. By combining both approaches of analysis, it intends to compare the information available in secondary data sources with the information accessible by interviewing directly with professionals in the academic field.

3.2. Data Collection

Social scientists employ a variety of data collection techniques to get information. Primary data is gathered using the methods most appropriate for the particular research problem at hand. Every time primary data is collected, it adds new information to the body of knowledge already in existence. Secondary data refers to the information produced by other researchers that is increasingly made available for use by the broader research community (Gill et al., 2008). In every study project, collecting data is crucial and in analyzing ChatGPT's effects on education, interviews appear to be an effective way to delve into the complex interactions between technology and learning.

The primary method of data collecting that is chosen is interviewing, due to its capacity to capture complex perspectives, ideas and experiences. Interviews provide a direct means of communication with participants in the context of examining ChatGPT's educational impact, which facilitates a deeper comprehension of their viewpoints regarding the integration of this technology in academia. Moreover, the participants selected for these interviews were teachers. This ensures a comprehensive view of how ChatGPT is perceived and utilized inside the classroom, and it helps to analyze the research questions from a more specific point of view.

Additionally, respecting ethical guidelines is paramount. All participants are aware of the study´s objectives and the intended use of their data. Anonymity and confidentiality are guaranteed, fostering an environment where participants feel secure and comfortable sharing their viewpoints.

The information collected in these interviews is compared with information from scholarly publications, books, articles, conference papers, journals and others, to

increase the validity and dependability of the results. This multi-method approach guarantees a thorough investigation of ChatGPT's effects in education.

Secondary data	
Academic journals	Published research articles in various academic disciplines concerning the topic of AI and the impact of ChatGPT in the education sector.
Books	Textbooks or reference books that contain relevant information on the research topic.
Journals	Include articles, surveys or analyses related to the subject.

Table 3: Secondary data and its use in research

Although there are some drawbacks to using secondary data, there are several benefits as well. Since secondary data has already been gathered, it may be assessed before being used, allowing for the rejection of inappropriate data and a longer period spent on data analysis and interpretation. Furthermore, a single researcher would not be able to gather as much data as by using secondary data, both in terms of volume and reach. Lastly, by reanalyzing the data, it can reveal previously undiscovered information (Saunders et al., 2019). Moreover, conducting a thorough systematic review can take several months or even years. It makes it difficult to keep up with how quickly artificial intelligence is changing and, therefore, ChatGPT. Consequently, it was adopted a brief review methodology. A rapid review is a type of knowledge synthesis in which components of the systematic review process are simplified or omitted to produce information in a short period of time (Tricco et al., 2015) and it enables an overview of recently published articles and their key findings (Lo, 2023).

Chapter 4- Findings and Discussion

4.1. Descriptive Analysis

According to Lingard and Kennedy, the goal of descriptive research is to expand one's qualitative comprehension of viewpoints, observations, experiences, or events that are demonstrated by the actions or outcomes of people and groups in specific situations. The conclusions drawn from research findings ought to improve the conceptual framework or aid in the creation of a new theory or model (Johnson et al., 2020).

The main goal of the research is to understand how AI, more particularly, ChatGPT, will impact the education sector in the future. The innovative AI language model ChatGPT, created by OpenAI in 2022, has shown promise as a tool that could change the way that education is delivered. With this being said, 25 interviews were conducted, with a sample of only teachers, to understand their perspectives and opinions about the inevitable change that AI will create in the dynamics of teaching and learning.

As stated above, 25 teachers make up the cohort under investigation, carefully chosen to guarantee a wide range of teaching specialties and experiences. A key component to obtain was diversity. Among the participants are educators in the fields of music, physical education, and mathematics, as well as language instruction. With this deliberate choice, the research seeks to represent a wide range of perspectives that reflect the complexity of the educational environment. During the interviews, it was asked a few demographic questions to achieve a better understanding of the dynamic of the group.

As seen in Figure 1, 52% said they were between the ages of 45 to 54 years old and 36% were between 55 and 64 years old. Nevertheless, 8% stated they were between 35 and 44 years old.

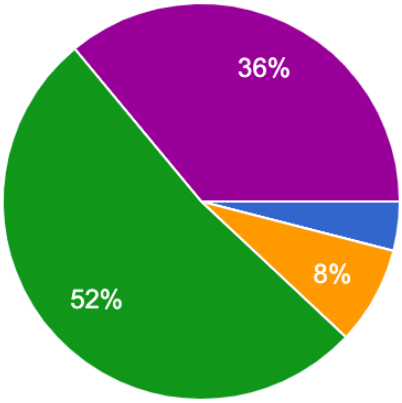

Figure 1: Age of the cohort in percentage

As shown in Figure 2, 84% are female and 16% male.

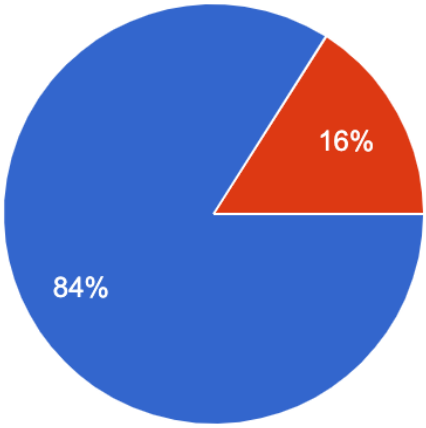

Figure 2: Gender of the cohort in percentage

As seen in Figure 3, 84% of the interviewees have a bachelor's degree, and 16% have a master's degree.

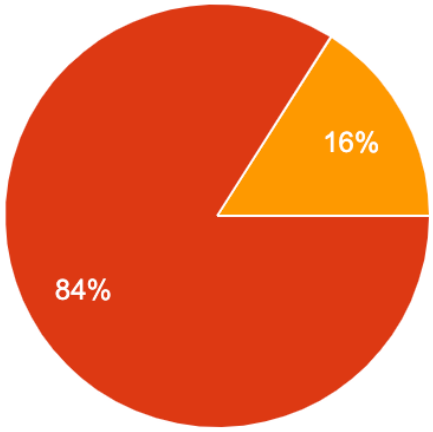

Figure 3: Level of Scholarship in Percentage

The entirety of the sample is Portuguese but only 36% live in the district of Aveiro, while the other 64% are from Porto.

As Shown in Figure 4, when questioned about their familiarity with the study's subject, 36% reported a moderate level of knowledge, 24% indicated a considerable understanding, and 16% claimed to possess a good grasp of the topic. Only 8% consider their knowledge on this subject limited and 12% said they understood the minimum of AI and ChatGPT.

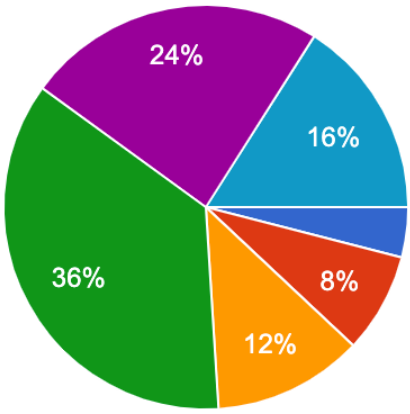

Figure 4: Knowledge regarding the topic of study in Percentage

To gain a deeper understanding of the group dynamics, we inquired about each individual's department of study.

- 32% are from Mathematics;
- 28% belong to Language and Literature;
- 16% of the teachers studied Physical Education;
- 12% teach Science;
- 8% are from the Department of Chemistry;
- 4% are Music teachers.

Finally, in this section of the interviews, they were asked about their knowledge of Universidade Católica Portuguesa. These were their answers:

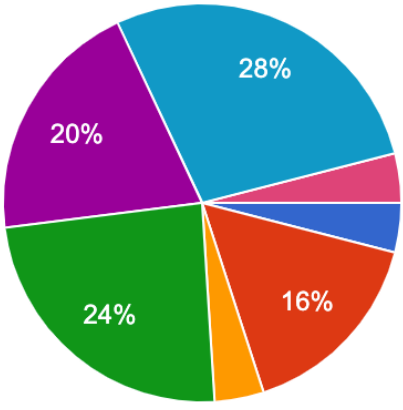

Figure 5: Knowledge regarding UCP

28% stated it was good, 24% said it was moderate, 20% said it was considerable and 16% have limited knowledge of this university.

The study posed several insightful questions to better comprehend ChatGPT's possible effects on schooling. These inquiries sought to reveal the complex viewpoints of educators and ranged from ChatGPT incorporation in the classroom to ethical issues concerning its use.

After the demographic section, 22 questions were asked to each interviewee regarding the topic in discussion. Each person from the sample was required to state if they agreed or not with the following questions.

First, "Do you believe that AI would improve the teacher's performance, in the education sector in the future?"
As shown in Figure 6, 40% agree with this statement, while 28% neither agree nor disagree and both 12% disagree and slightly agree.

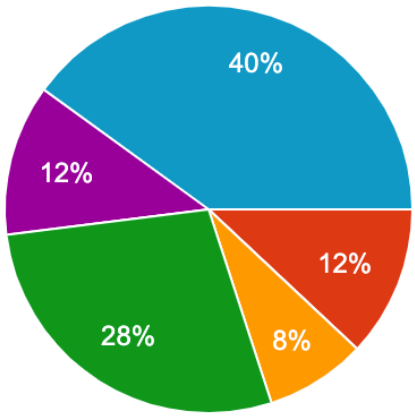

Figure 6: The cohort was asked if they believed that AI would improve the teacher's performance

Second, "Do you believe that the use of AI in education would improve the performance of the student in the classroom?"

As seen in Figure 7, it was understood that 28% of them agreed with the statement, while 24% only slightly agreed. 20% disagreed and 16% slightly disagreed. 4% fully disagreed and 8% neither agreed

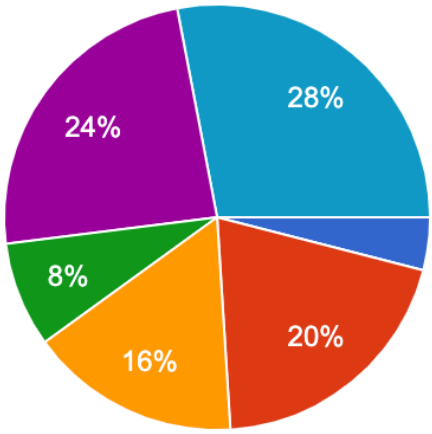

Figure 7: They were asked if they believed that the use of AI in education would improve the performance of the students in the classroom.

Then, "Do you believe that AI would improve the student's performance outside of the classroom?" As shown in Figure 8, 36% agreed while 32% slightly agreed; 12% both disagreed and slightly disagreed.

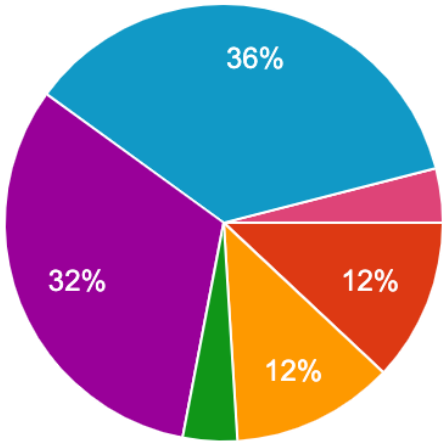

Figure 8: The cohort was asked if they thought AI would improve the student's performance outside of the classroom

"Do you believe that the use of AI in academia would eventually ease teachers' workload?". As seen in Figure 9, 40% agreed and 8% fully agreed; 12% slightly disagreed while the other 12% slightly agreed; 20% neither agreed nor disagreed.

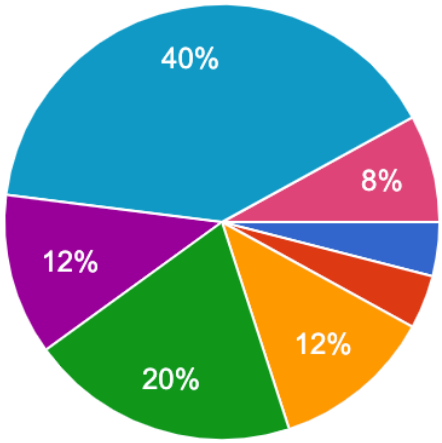

Figure 9: They were asked if they believed that the use of AI in academia would eventually ease their workload.

To have a closer perception of the relation between the sample and the use of ChatGPT and the understanding of AI, the following questions were asked:

"Do you think that learning to use AI and ChaGPT is simple?"
As seen in Figure 10, 44% agreed while 16% only slightly agreed; 12% fully agreed and 8% disagreed; 12% neither agreed nor disagreed.

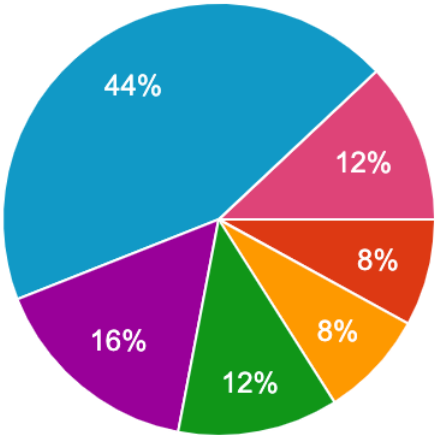

Figure 10: "Learning to use AI and ChaGPT is simple for me."

“Do you think ChatGPT is easy to navigate?”

As seen in Figure 11, 44% agreed, 12% fully agreed and 20% neither agreed nor disagreed; 16% slightly agreed.

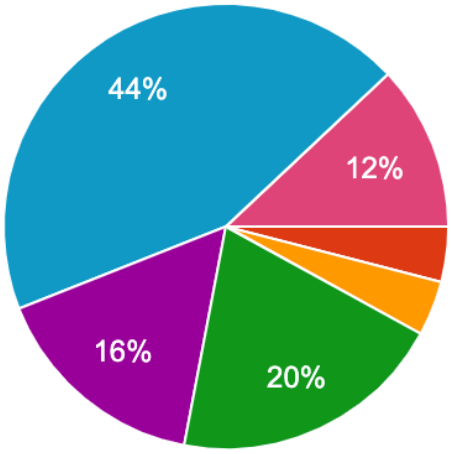

Figure 11: "ChatGPT is easy to navigate."

“Do you think learning new technologies in general is simple for me?”

As seen in Figure 12, 52% agreed and 24% slightly agreed; 16% fully agreed and 8% slightly disagreed.

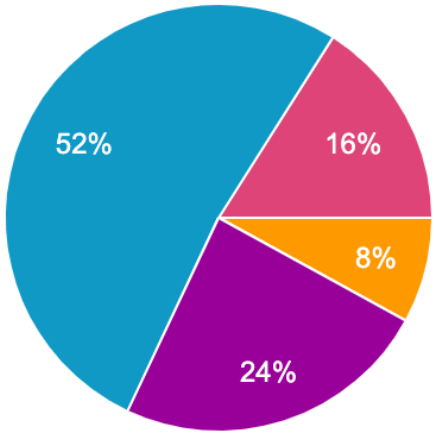

Figure 12: "Learning new technologies in general is simple for me."

After these questions, the interviewees were asked if they would recommend the use of AI in the classroom and outside of it, by both teachers and students.
As seen in Figure 13, 32% of them slightly agreed while 24% neither agreed nor disagreed; 20% agreed and 12% slightly disagreed; 8% disagreed.

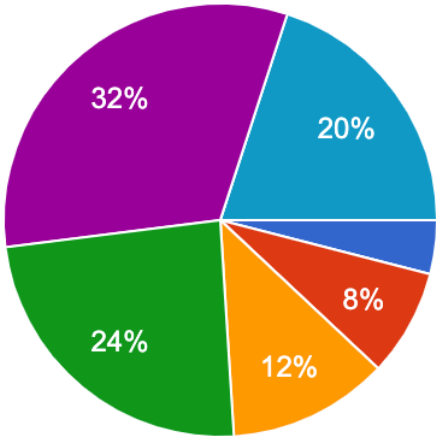

Figure 13: The interviewees were asked if they would recommend the use of AI in the classroom and outside of it, by both teachers and students.

To perceive their use of others' opinions regarding this subject, they were asked if they agreed that people with influence in this area would recommend the use of AI in the classroom. As seen in figure 14, 32% disagreed and 28% neither agreed nor disagreed; 16% slightly disagreed; 12% both agreed and slightly agreed.

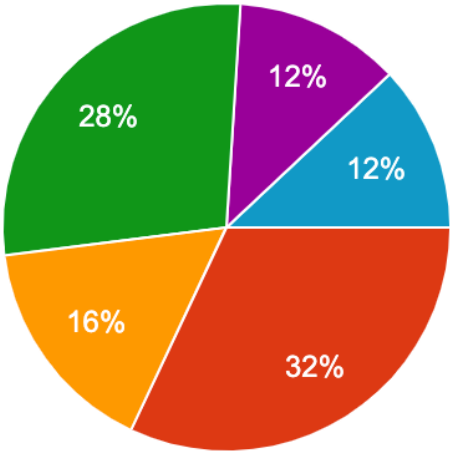

Figure 14: They agreed that people with influence in this area would recommend the use of AI in the classroom.

This research topic is of great importance however, it should be an equal concern to understand if there are the appropriate tools to use. In this regard, they were asked if they had the necessary resources to use ChatGPT in and outside the classroom. As shown in Figure 15, 28% disagreed with this statement, while 16% both agreed and fully agreed; 12% slightly disagreed and the other 12% slightly agreed; 12% neither agreed nor disagreed.

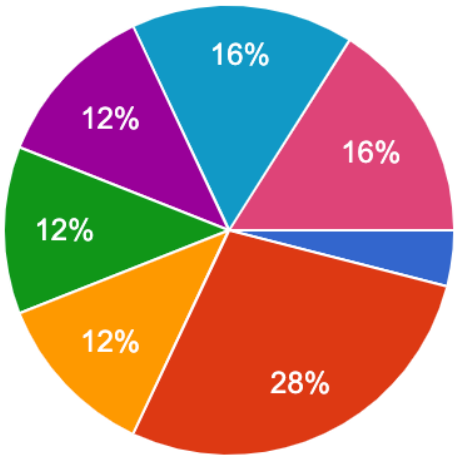

Figure 15: They were asked if they have the necessary resources to use ChatGPT

Additionally, it was asked if they believed their students had the required resources to use ChatGPT in and outside the classroom.

As seen in Figure 16, 32% disagreed and 24% slightly agreed; 16% slightly disagreed and 8% agreed and fully agreed.

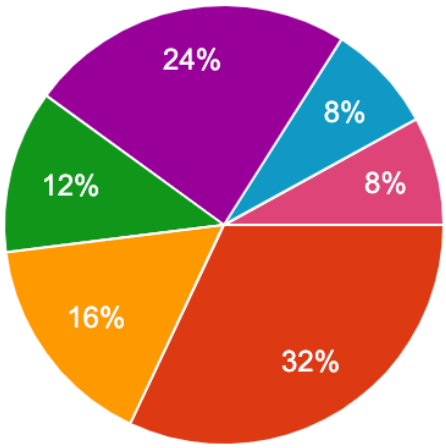

Figure 16: They were asked if they believed their students have the necessary resources to use ChatGPT

Then the interviewees were asked if they thought they had the required knowledge to teach how to use ChatGPT. As seen in Figure 17, 32% slightly agreed and 24% disagreed; 12% agreed and the other 12% slightly disagreed; 8% fully agreed and the other 8% neither agreed nor disagreed.

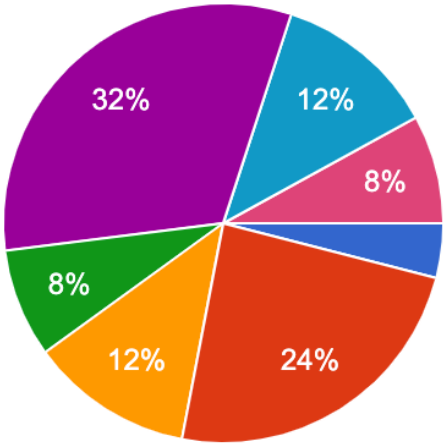

Figure 17: They were asked if they thought they had the required knowledge to teach how to use ChatGPT

To perceive their intentions with ChatGPT, they were asked the following questions:

"Do you plan to use AI in critical academic situations?"

As seen in Figure 18, 36% said they slightly agreed, 24% agreed and 20% disagreed; 16% neither agreed nor disagreed; 4% of the participants fully disagreed.

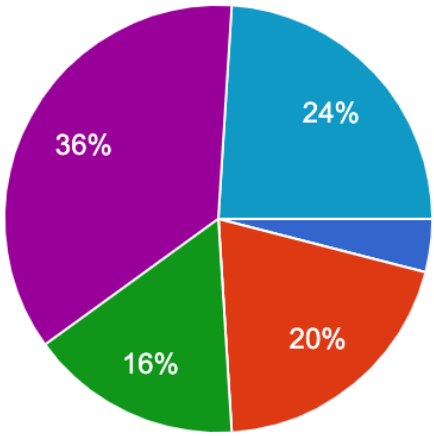

Figure 18: "I plan to use AI in critical academic situations."

“Would you integrate AI in your daily activities, in and outside the classroom?”
As seen in Figure 19, 28% slightly agreed, 24% slightly disagreed; 20% agreed and 12% disagreed; 16% neither agreed nor disagreed.

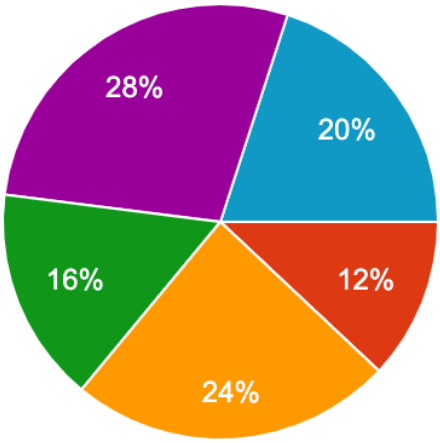

Figure 19 "I would integrate AI in my daily activities, in and outside the classroom."

“Do you believe AI will be used in the future, in the education sector, much more frequently?”
As seen in Figure 20, 52% agreed and 20% slightly disagreed; 16% slightly agreed and 12% neither agreed nor disagreed.

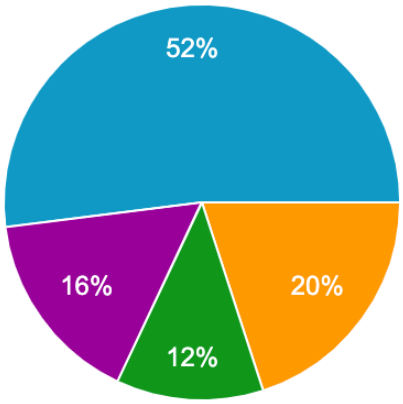

Figure 20: “I believe AI will be used in the future, in the education sector, much more frequently."

After this part of the interviews, the focus redirected to some possible limitations regarding the use of AI in academia. This purpose aimed to understand their perceptions concerning ethical limitations and their impact on students.

First, they were asked if they agreed that the incorporation of AI in the classroom would lead to plagiarism and the reduction of students' critical thinking capabilities.

As seen in Figure 21, 44% fully agreed with this statement 44% agreed; 8% slightly agreed and 4% slightly disagreed.

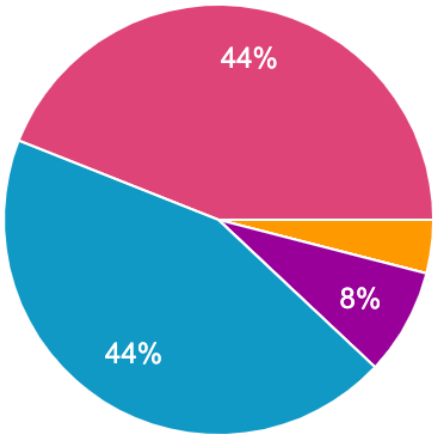

Figure 21: They were asked if they agreed that the incorporation of AI in the classroom would lead to plagiarism and the reduction of students' critical thinking capabilities.

Later, they were asked if they thought that the incorporation of AI in the classroom would take time and effort, to perceive if they were willing to do it or not.

As shown in Figure 22, 40% agreed and 28% slightly agreed; 16% slightly disagreed and 12% fully agreed.

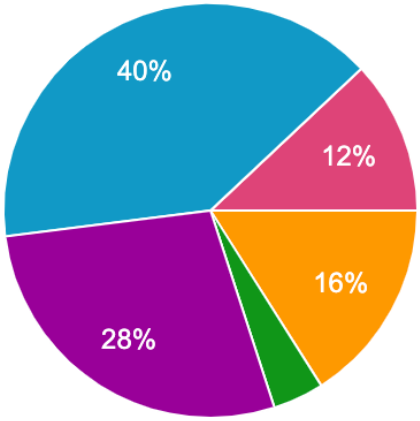

Figure 22: They were asked if they thought that the incorporation of AI in the classroom would take time and effort.

Furthermore, the cohort was asked if they believed that the plagiarism that may arise from incorporating AI into the classroom cannot be reduced through prevention methods. As seen in Figure 23, 36% agreed and 20% neither agreed nor disagreed; 16% disagreed and 12% slightly disagreed; 8% both fully agreed and slightly agreed.

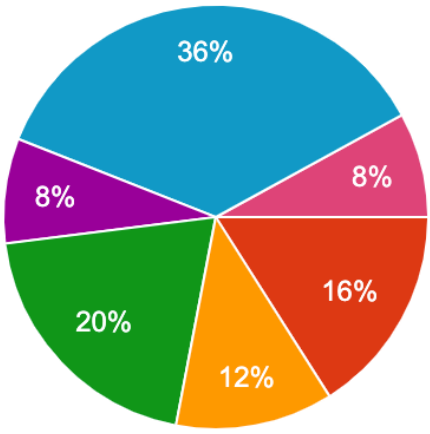

Figure 23: The cohort was asked if they believed that the plagiarism that may arise from incorporating AI into the classroom could not be reduced through prevention methods.

In the same section, they were asked if they believed that the plagiarism that may arise from incorporating AI into the classroom could not be reduced through detection methods.

As seen in Figure 24, 36% disagreed and 20% neither agreed nor disagreed; 24% agreed and 12% slightly agreed.

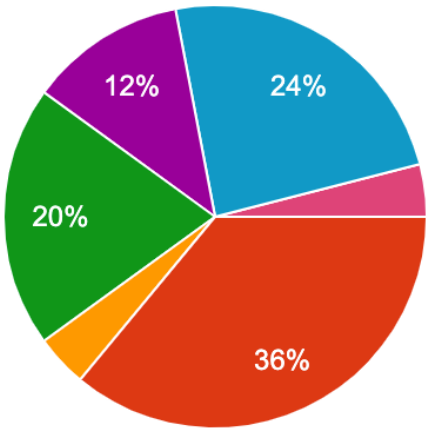

Figure 24: They were asked if they believed that the plagiarism that may arise from incorporating AI into the classroom cannot be reduced through detection methods.

Additionally, they were required to say if they believed that learning correct citation and referencing methods can reduce the possibility of plagiarism.

As seen in Figure 25, 44% agreed and 28% slightly agreed; 12% fully agreed while 12% neither agreed nor disagreed; 4% of the teachers disagreed with this statement.

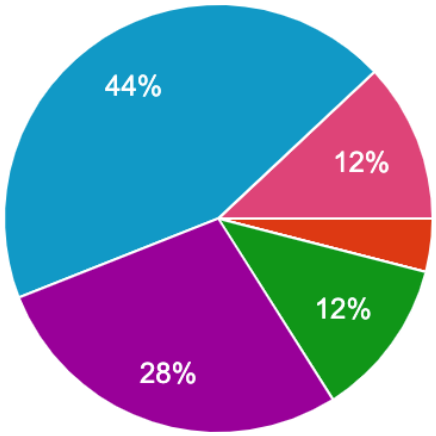

Figure 25: They said if they believed that learning correct citation and referencing methods can reduce the possibility of plagiarism.

Later, they were asked if they thought that engaging with education-related technologies may disrupt their daily routine or activities.

As shown in Figure 26, 40% disagreed while 16% slightly disagreed; 12% slightly agreed and 8% agreed. The other 16% neither agreed nor disagreed.

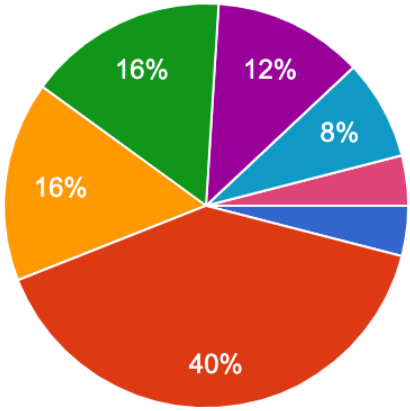

Figure 26: They were asked if they thought that engaging with education-related technologies may disrupt their daily routine or activities.

The following question focuses on understanding if, considering that there are measures to prevent plagiarism, the teachers would strive to educate their students with the correct methods of using AI.

As seen in Figure 27, 60% said they agreed with the statement and 24% fully agreed; 8% slightly agreed with the statement; 4% both disagreed and slightly disagreed.

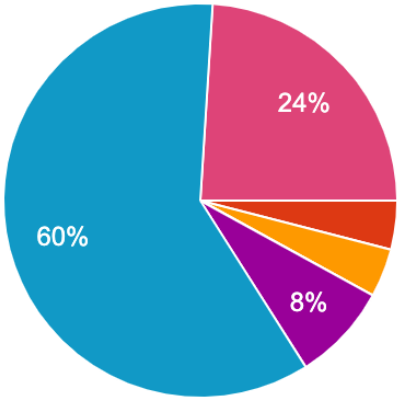

Figure 27: They were asked if they would strive to educate their students with the correct methods of using AI.

4.2. Findings

This chapter addresses the research questions initially proposed through the gaps found in the literature and the dual research approaches conducted. The literature review highlights the revolutionary possibilities and ethical considerations of AI in education while revealing the broader landscape of the technology. In addition, the interviews provide firsthand perspectives and insightful qualitative information to enhance the corpus of current knowledge.
Understanding how ChatGPT may improve the learning process, the ethical issues it raises for academic writing and research, and its ability to provide individualized assistance in sharpening study themes are the main questions addressed in this chapter.

First, **"How will the integrations of ChatGPT in education enhance the learning experience?".**

Regarding the use of AI in the classroom, only 28% of the cohort (7 teachers) expressed optimism about the potential improvement of students' performance. On the other hand, 5 teachers disagreed with this possibility, conveying skepticism about the effectiveness of ChatGPT in enhancing the learning experience. There were concerns expressed about the over-reliance on AI, the possibility of students' disengagement, and ChatGPT's incapacity to understand the complex facets of instructions.

The range of answers highlights the importance of giving serious consideration to the use of AI tools in the classroom. This data will be crucial for formulating plans that both address concerns and leverage the alleged benefit, guaranteeing a balanced and successful introduction of ChatGPT into classroom environments. Together, the literature review and the interviews provide insight into how integrating ChatGPT could improve the educational experience. Teachers and academics agree that AI, and ChatGPT in particular, have the potential to deliver

individualized learning experiences, respond to inquiries, produce dynamic information, and support a range of educational tasks. 70% of teachers who participated in the interviews expressed optimism about ChatGPT's potential to improve student learning. This is consistent with the research, which highlights ChatGPT's potential to revolutionize education through personalized support and freeing up teachers for different tasks.

Second, **"What ethical considerations arise when students use ChatGPT for academic writing and research?".**

Among the teachers interviewed, 44% expressed concerns that the use of ChatGPT may result in plagiarism and a decline in critical thinking abilities. They underlined the danger of pupils being overly dependent on the tool, which would undermine their ability to think independently and be creative. Moreover, 36% of educators contended that it could be difficult to reduce the problems connected to ChatGPT's influence on critical thinking and academic integrity through preventative measures. This group brought attention to how complicated academic ethics may be and argued that taking preventative action might not completely resolve any possible problems.

These viewpoints draw attention to the convoluted moral terrain that surrounds ChatGPT in the classroom. It emphasizes the value of complex ethical standards, instructional techniques, and maybe, further research to create practical safeguards against potential moral dilemmas brought on by the usage of AI in academia. Both the research and the interviews centered heavily on the ethical issues regarding ChatGPT in the classroom. Concerns regarding privacy and security were raised, along with the possible biases in the training data and the model's incapacity to discern between factual and partial knowledge.

Finally, **"To what extent can ChatGPT be personalized to support students in refining research topics and finding relevant sources?".**

Among the teachers interviewed, 40% expressed reservations regarding the integration of AI in the classroom, pointing out that successful implementation would take time and effort. This group emphasized that to fully utilize ChatGPT for individualized student support, extensive training and support systems and required.

Conversely, 32% of educators stated that students' resource constraints prevented them from using ChatGPT in their research procedures. They highlighted how crucial it is to guarantee that all students have equal access to technology to avoid any potential differences in students' abilities to leverage AI tools. Furthermore, according to 28% of educators, they did not have the tools necessary to properly incorporate ChatGPT into the learning environment, either within or outside of the classroom.

These answers shed light on the complex issues involved in customizing ChatGPT to assist students with their studies. Crucial factors include the requirement for in-depth teacher preparation, resolving student resource inequities, and giving educators access to sufficient resources. While educational establishments consider using AI technologies such as ChatGPT, approaches need to be developed to get beyond these obstacles and guarantee fair access and efficient use in a variety of learning environments. To what extent can ChatGPT be personalized to support students in refining research topics and finding relevant sources?

The interviews with 25 teachers provided insight into several areas related to incorporating ChatGPT into the classroom environment. The results show a complex picture that strikes a balance between optimism and worry. These revelations highlight the difficulties in implementing AI technologies, such as ChatGPT, in the classroom and the significance of comprehending and resolving teachers' concerns. The results serve as a foundation for further research, guiding the development of strategies to harness the benefits of AI while mitigating potential challenges.

The subsequent phase which involves data mining from scholarly articles, should supplement these findings and provide a more thorough knowledge of ChatGPT's effects on education.

During the quantitative portion of our study, using a systematic data mining approach, it was examined 35 carefully chosen scholarly publications. This methodological decision was made to offer a thorough grasp of the larger context surrounding ChatGPT's influence on education. Through the process of integrating knowledge from several academic sources, the aim was to identify significant patterns, trends, and viewpoints that would not be discernible from separate investigations.

By compiling data from the larger academic debate, the quantitative analysis enhances the understanding of the subject and supports the qualitative insights gained from teacher interviews. This dual-method approach, which combines quantitative analysis from a large body of academic literature with qualitative insights from teacher interviews, enables a thorough and nuanced examination of the many effects of ChatGPT in education.

Three critical dimensions were examined in this quantitative analysis. This was, it was possible to obtain insights on the global involvement, disciplinary affiliations, and historical growth of the academic debate surrounding ChatGPT and its effects on education.

First, the date of publication of the articles selected. It acts as a critical lens through which we evaluate the advancement of intellectual contributions across time. It is possible to follow the progression of academic interest and ChatGPT interaction within the educational setting due to this temporal component.

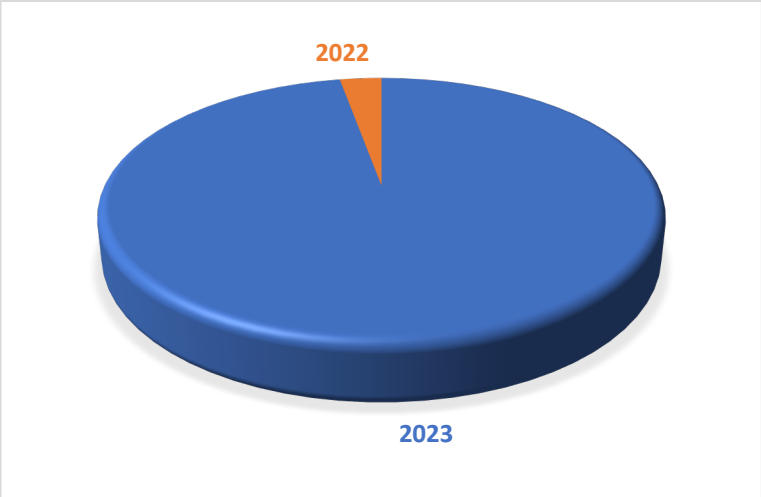

Figure 28: Date of publication of the articles selected

As seen in Figure 28, 97% of the papers under evaluation were published in 2023, indicating that a significant focus on recent advancements was identified by this analysis. This focus reflects how current and relevant the scholarly discussion over ChatGPT's effects on education is. Most contributions are from the past year, which emphasizes the emerging character of this topic. By comparison, only 3% of the papers were from 2022. Despite being in the minority, these pieces provide information on early debates, fundamental viewpoints, and breakthroughs that prepared the way for a larger body of work in the following year. By comparing these 2 years, a temporal continuum is created that makes it possible to analyze how conversations about ChatGPT in the classroom have changed in this short but active period.

Second, the focus shifted to the department of study of the authors. Examining the writers' academic specializations offers important insights into the discourse's multidisciplinary structure. It enables us to figure out whether the influence of ChatGPT is mostly studied in particular academic subjects or whether viewpoints from a variety of fields are convergent.

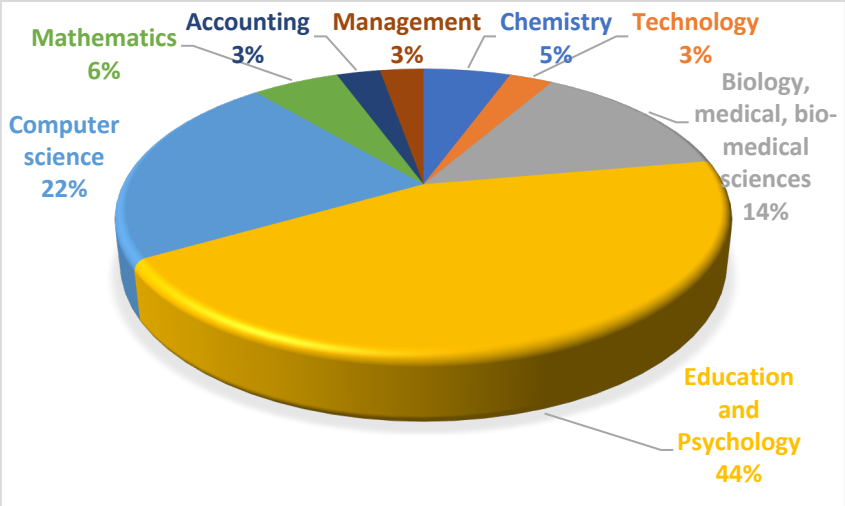

Figure 29: Department of Study of the authors

As shown in Figure 29, the departmental distribution analysis of the chosen papers shows a wide range of scholarly viewpoints regarding ChatGPT's influence on education. The majority, 44% of the papers, were from Education and Psychology. This significant representation highlights the deep interest and involvement of academics who are interested in the behavioral and cognitive aspects of incorporating AI technologies into learning environments. Very closely behind, 22% of the publications came from the computer science field. This demonstrates the crucial role that technology professionals have in influencing the conversation about the technical aspects and real-world applications of using ChatGPT in educational settings. The articles from different scientific disciplines further emphasize the transdisciplinary nature of these debates. Biology makes up 14% of the publications, which indicates that the biological and life sciences community is becoming more interested in the possible effects of AI on teaching approaches. Furthermore, contributions from the fields of technology, accounting, chemistry, management, and mathematics together account for 22% of the articles, demonstrating the cross-disciplinary nature of the discussion.

The wide-ranging effects of ChatGPT in education, echoing across domains that have so far been unrelated to artificial intelligence, are demonstrated by this distribution among academic disciplines. Diverse disciplines offer distinct

viewpoints that enhance our comprehension of the complex effects of artificial intelligence in educational environments.

Finally, the authors' geographical dispersion provides insight into the discourse's global participation. Looking into the nations of origin of the writers allows us to identify any regional trends, differences, or viewpoints on ChatGPT and its effects on education. This feature deepens the comprehension of global interest and participation in the field.

With 17% of the articles coming from American academics, the US stands out as a major contributor. With its robust technical landscape and sophisticated academic research infrastructure, the U.S. has a significant influence in shaping discussions surrounding the integration of AI in education, as seen by its dominance.

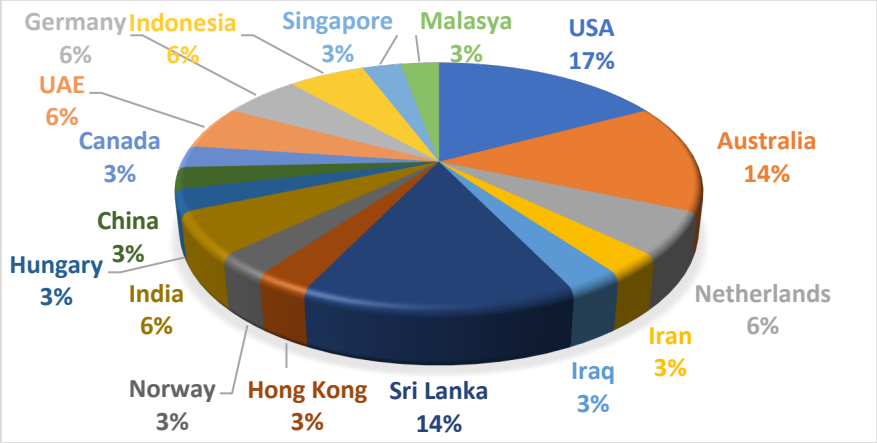

Figure 30: Country of authors

As seen in Figure 30, Australia comes in second place with 14% of the articles. This illustrates how actively the Australian academic community has been investigating the potential applications of AI technologies in the classroom. Six percent of the articles come from Germany, the United Arab Emirates, the Netherlands, Sri Lanka, and India, representing a wide variety of viewpoints from around the globe.

The fact that publications from Indonesia (6%), Singapore (3%), and Iran (3%) are included emphasizes more how international the conversation is. The debates are enhanced by the distinct cultural, institutional, and regional viewpoints that these contributions from various geographic locations offer to the adoption of ChatGPT in educational settings.

In short, the fact that these pieces are distributed throughout the world shows how universal the issues are when it comes to integrating AI into education. It draws attention to the necessity of teamwork and globally aware strategies for maximizing ChatGPT's advantages while resolving potential issues and moral dilemmas in various educational contexts.

4.3. Discussion

A diverse sample of 25 teachers participated in qualitative interviews in this study, which explored subtle topics such as perceived improvement in the learning process, moral dilemmas, and customizing ChatGPT to help students. The replies showed a range of viewpoints and provided insightful information on the challenges associated with implementing AI in education. Teachers' opinions on ChatGPT's possible advantages and disadvantages were diverse, which reflected the topic's complexity.

Conversely, 35 academic articles were systematically examined as part of the quantitative analysis. We were able to extract patterns and trends from a larger body of scholarly literature using this method. Important details including the publication date, the authors' departmental connections, and the research's geographic dispersion were carefully examined. Using a quantitative lens, a macroscopic picture was made possible, revealing recurrent themes, favored fields of study, and the distribution of scholarly contributions worldwide. The goal of combining these methods was to obtain a more thorough grasp of the state of ChatGPT in education by triangulating results.

The quantitative research revealed broad themes, to which the qualitative observations from teachers gave context and more detail:

Quantitative Exploration: The quantitative research phase unearthed overachieving themes, providing a statistical foundation that laid the groundwork for a deeper understanding of the educational landscape.

Qualitative Enrichment: Complementing the quantitative findings, qualitative observations gathered from teachers added a layer of context and intricate details. This qualitative dimension not only contextualized the numerical results but also offered valuable insights into the practical implications within the educational setting.

Holistic Interpretation: The combination of quantitative and qualitative methods facilitated a holistic interpretation of the research findings. This approach ensured a more comprehensive and nuanced understanding by merging the statistical trends with the real-world experiences and perspectives of educators.

When incorporating AI technologies such as ChatGPT into educational environments, it is critical to emphasize the need to build a thorough strategic plan that outlines particular educational goals. This strategic plan should explain clear key objectives that outline the desired outcomes and advantages of using these tools in the field of education. An example of this is provided below:

Strategic Plan:

Objective: improving student engagement and learning outcomes.

Goal: Using ChatGPT as a supplement in language arts classrooms to encourage interactive writing tasks and build critical thinking abilities in students. By the conclusion of the academic year, there should be a 20% increase in student involvement and a 15% improvement in writing competence results.

Educational Goal:

Objective: Integrating ChatGPT into group discussions and projects across topics to promote collaborative learning and peer interaction. By the conclusion of the semester, there should be a 30% increase in student-led discussions and a 25% increase in peer-to-peer feedback exchange, showing greater engagement and richer learning experiences.

The following issues should also be considered when developing a strategic plan that ensures the effective and ethical integration of ChatGPT within educational environments:

- Comprehensive Insight: Ensuring a thorough understanding of the diverse implications associated with integrating ChatGPT into educational settings, encompassing various facets and potential outcomes.
- Adaptability Assessment: Evaluating the versatility and suitability of ChatGPT across different educational contexts, considering factors such as grade levels, subjects, and teaching methodologies.
- Ethical Considerations: Examining ethical considerations pertinent to the integration of ChatGPT in education, including privacy concerns, potential biases, and the responsible deployment of AI technologies.
- Pedagogical Integration: Developing strategies for the seamless integration of ChatGPT into pedagogical practices, focusing on its potential to support teaching methods, facilitate curriculum development, and enhance personalized learning experiences.

4.3.1. Interpreting the results from a managerial perspective

Perspective	Possible Decision
Managers should view the integration of ChatGPT as part of a strategic plan for advancing education.	Development of a strategic plan that outlines how ChatGPT aligns with broader educational goals, emphasizing both positive advancements and ethical considerations.
The allocation of resources must be informed by the dual nature of ChatGPT's impact on education, both positive features and potential challenges.	Allocation of resources for training, implementation, and ongoing support, considering the need for addressing biases, ensuring privacy, and managing potential misuse.
Recognize the ethical implications of AI integration and the need for comprehensive guidelines.	Establishment of clear ethical guidelines for the use of ChatGPT in education, emphasizing responsible AI practices and addressing issues such as bias, privacy, and academic integrity.
Acknowledge the importance of educators' experiences and insights in AI integration.	Investment in professional development programs to empower educators with the necessary skills and knowledge for effectively utilizing for effectively utilizing ChatGPT, while also addressing any

	concerns or challenges raised during the study.
Acknowledge that AI models, including ChatGPT, can evolve and improve over time.	Encourage a culture of continuous improvement by staying updated on advancements in AI technology, participating in updates and improvements, and implementing changes as necessary to enhance the educational experience.
Recognize the importance of monitoring the changing dynamics of AI integration over time.	Investment in and support of longitudinal studies to gain deeper insights into the long-term effects of ChatGPT in academics, allowing for adaptive strategies based on evolving circumstances.

Table 4: Managerial Implications of the results found

Chapter 5- Conclusions and Further Work

Through this study, the transformative potential and complex obstacles of integrating ChatGPT, an advanced artificial intelligence language model, into the educational setting have been explored. The promising prospects of AI and the moral issues necessary for its responsible usage interact dynamically at the center of this investigation. AI is becoming more and more prevalent in many areas of life, and the educational system is no exception. OpenAI's ChatGPT opened new possibilities by providing a tool that can completely change how teachers and students interact with information and educational resources. But this innovation wave also raised ethical questions, which call for further investigation.

The option to investigate ChatGPT's effects on education resulted from realizing how important technology is to the development of contemporary pedagogy. The dynamic character of AI, particularly its conversational capabilities as exhibited by ChatGPT, offered a distinctive perspective for analyzing the careful balancing act between technical progress and moral issues in the fields of education.

Additionally, the decision to use a mixed-methods approach was chosen deliberately, integrating quantitative analysis through data mining of academic publications with qualitative insights from teacher interviews. The objective of this dual viewpoint was to encompass the complex, practical experiences of educators as well as the more general trends and viewpoints found in scholarly works.

The results confirmed the dual character of integrating ChatGPT in education. On the one hand, ChatGPT demonstrated sophisticated features, including the ability to create instructional materials and offer tailored feedback. However, issues have surfaced, ranging from a model-wide bias to moral questions about student privacy and the possible misuse of AI for plagiarism. These issues should be acknowledged and addressed promptly to ensure the responsible use of ChatGPT in education.

Moreover, even though ChatGPT has the potential to improve teaching and learning, ethical issues need to be considered. It should be important to prioritize ethical considerations in decision-making processes related to the integration of ChatGPT, to ensure responsible and morally sound practices.

With that in mind, this study proposes several possibilities for more investigation. Further research is needed in the areas of developing comprehensive ethical guidelines for AI usage in education, encouraging responsible AI use among students, and continuously improving AI models to reduce biases. Additionally, further significant insights into the long-term effects can come from longitudinal studies that monitor the changing dynamics of AI integration in academia.

The current research marks a milestone in the ongoing narrative of AI's integration into education. The topic is not about technology taking the place of human knowledge, but rather about a mutually beneficial partnership where technology enhances human potential. In addition to technological developments, the path ahead calls for the establishment of a mentality that guarantees AI functions as an instrument for empowerment, creating a setting in which both instructors and students may properly and morally utilize AI's advantages.

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Appendices

Appendix A: Questionnaire

The questionnaire employed during the interviews for data collection in this study comprises the following inquiries:

Questions / *Questões*:
1. I believe that AI in the education sector would improve the teacher's performance in the classroom. / *Acredito que a Inteligência Artificial (AI) na área da educação melhoraria a performance do professor na sala de aula.*
2. I believe that the use of AI in the education sector, would improve the performance of the student in the classroom. / *Acredito que a utilização de AI na área da educação melhoraria a performance do aluno em sala de aula.*
3. I believe that the use of AI in education would improve student performance outside the classroom. / *Acredito que a utilização de AI na área da educação melhoraria a performance do aluno fora da sala de aula.*
4. The use of AI in an academic environment can ease teachers' workload. / *A utilização de AI em ambiente académico pode vir a facilitar a carga de trabalho dos professores.*
5. Learning how to use AI and ChatGPT would be simple for me. / *Aprender a usar AI e o ChatGPT seria simples para mim.*
6. AI and ChatGPT are both easy to navigate. / *AI e o ChatGPT são ambos fáceis de navegar.*
7. Learning to use new technology in general is simple for me. / *Aprender a usar novas tecnologias em geral é simples para mim.*

8. I would recommend the use of AI in the classroom and beyond, by students and teachers. / *Recomendaria o uso de AI na sala de aula e fora dela, pelos alunos e pelos professores.*
9. People with influence in the field of education recommend the use of AI in the classroom. / *Pessoas com influência na área da educação recomendam o uso de AI na sala de aula.*
10. I have the resources needed to use ChatGPT inside and outside the classroom. / *Tenho os recursos necessários para usar o ChatGPT dentro e fora da sala de aula.*
11. I believe that my students have the necessary conditions to use ChatGPT inside and outside the classroom. / *Acredito que os meus alunos têm as condições necessárias para usar o ChatGPT dentro e fora da sala de aula.*
12. I have the necessary knowledge to teach how to use ChatGPT. / *Tenho os conhecimentos necessários para ensinar como se utiliza o ChatGPT.*
13. I plan to use AI in critical academic situations. / *Planeio usar AI em situações académicas críticas.*
14. I would integrate AI into my routine activities in the classroom and outside of it. / *Integraria AI nas minhas atividades rotineiras em sala de aula e fora dela.*
15. I think AI will be used in the education sector more frequently in the future. / *Acho que AI vai ser utilizada no futuro no setor da educação, mais frequentemente.*
16. Incorporating AI into the classroom can lead to plagiarism and reduced critical thinking among students. / *A incorporação de AI na sala de aula pode levar a plágio e redução do espírito crítico dos alunos.*
17. Incorporating AI into the classroom can take time and effort. / *A incorporação de AI na sala de aula pode ocupar tempo e esforço.*

18. The plagiarism that may arise from incorporating AI into the classroom cannot be reduced through prevention methods. / *O plágio que pode advir da incorporação da AI na sala de aula não pode ser reduzido através de métodos de prevenção.*
19. The plagiarism that may arise from incorporating AI into the classroom cannot be reduced through detection methods. / *O plágio que pode advir da incorporação da AI na sala de aula não pode ser reduzido através de métodos de deteção.*
20. Learning correct citation and referencing methods can reduce the possibility of plagiarism. / *A aprendizagem de formas de citação e referenciação corretas pode reduzir a possibilidade de plágio.*
21. Engaging with education-related technologies may disrupt my daily routine or activities. / *O envolvimento com tecnologias relacionadas com a educação pode causar disrupção na minha rotina diária ou atividades.*
22. Considering that there are measures to prevent plagiarism, I would strive to teach correct methods of using AI to my students. / *Considerando que existem medidas para prevenir o plágio, ia-me esforçar para ensinar métodos corretos de utilização de AI aos meus alunos.*

Table 4: Questions of the interviews

Appendix B: Data Mining Process

In order to conduct the quantitative review, 35 papers were selected based on the year of publication and topic of research, and the used coding is detailed after the table.

Articles	Features				
	Year	Country	Discipline and Department	Journal	Theme
"ChatGPT is fun, but not an author"	2	1	1	1	1 and 2
"A Chat(GPT) about the future of scientific publishing"	2	2	3	2	2
"ChatGPT: evolution or revolution?"	2	6	1	3	1
"ChatGPT: five priorities for research "	2	6	4	4	1
"The Brilliance And Weirdness Of ChatGPT"	1	1	2	5	1
"ChatGpt: Open Possibilities"	2	5	5	6	3
"ChatGPT and Publication Ethics"	2	2 and 3	3	7	1
"A role for chatgpt and AI in gifted education"	2	1	4	8	1 and 3
ChatGPT for Teaching, Learning and Research: Prospects and Challenges	2	4	4	9	3
AI in Higher Education: A Literature Review of ChatGPT and Guidelines for Responsible Implementation	2	7 and 2	3	10	1 and 3
What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature	2	8	6	11	1 and 3
Shaping the Future of Education: Exploring the Potential and Consequences of AI and ChatGPT in Educational Settings	2	9	4	11	1
Leadership is needed for ethical ChatGPT: Character, assessment, and learning using artifificial intelligence (AI)	2	2	4	12	1 and 3
ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope	2	10	5	13	1
ChatGPT is a Breakthrough in Science and Education but Fails a Test in Sports and Exercise Psychology	2	11	4	14	2
The Benefits and Challenges of ChatGPT: An Overview	2	12	5	15	1
Chatting and cheating: Ensuring academic integrity in the era of ChatGPT	2	4	3	16	1
ChatGPT User Experience: Implications for Education	2	1	6	17	1
Privacy and Data Protection in ChatGPT and Other AI Chatbots: Strategies for Securing User Information	2	1	5	17	1
Open artificial intelligence platforms in nursing education: Tools for academic progress or abuse?	2	4	3	18	1

Education in the Era of Generative Artificial Intelligence (AI): Understanding the Potential Benefits of ChatGPT in Promoting Teaching and Learning	2	13	5	17	1 and 3
The impact of ChatGPT on higher education	2	14	7	19	1 and 3
ChatGPT for good? On opportunities and challenges of large language models for education	2	15	4	20	3
ChatGPT and higher education assessments : More opportunities than concerns ?	2	4	4	21	1 and 3
ChatGPT in higher education learning: Acceptance and use	2	16	4	22	2 and 3
ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?	2	17	8	21	1
Challenges and Opportunities of Generative AI for Higher Education as Explained by ChatGPT	2	4	4	11	3
'We Need To Talk About ChatGPT': The Future of AI and Higher Education	2	15	4 and 5		3
Analysing the Role of ChatGPT in Improving Student Productivity in Higher Education	2		4 and 5	23	3
ChatGPT in higher education: Considerations for academic integrity and student learning	2	2	4	21	3
Exploring the Implications of ChatGPT for Language Learning in Higher Education	2	16	4	24	1 and 3
Using ChatGPT in academic writing is (not) a form of plagiarism: What does the literature say?	2	14	4	25	1 and 2
ChatGPT and large language models in academia: opportunities and challenges	2	1	4 and 5	26	2
Use of ChatGPT in academia: Academic integrity hangs in the balance	2	18	7	27	2
ChatGPT is not capable of serving as an author: ethical concerns and challenges of large language models in education	2	10	4	28	1 and 3

Table 5: Paper Research and Selection

Years

1: 2022

2: 2023

Countries

1: USA

2: Australia

3: Iran

4: England

5: Iraq

6: Netherlands

7: Sri Lanka

8: Hong Kong

9: Norway

10: India

11: Hungary

12: China

13: Canada

14: UAE

15: Germany

16: Indonesia

17: Singapore

18: Malasya

Disciplines and Departments

1: Chemistry

2: Technology journalist

3: Biology, medical, bio-medical sciences

4: Education and Psychology

5: Computer science

6: Mathematics

7: Accounting

8: Management

Journals

1: Science

2: Brain Behaviour and Immunity

3: Medicine, Health Care, and Philosophy

4: Nature

5: The New York Times

6: Iraqi Journal for Computer Science and Mathematics

7: Archives of Medical Research

8: Gifted Child Today

9: Global Academic Journal of Humanities and Social Sciences

10: International Journal of Research and Innovation in Social Science

11: Education Sciences

12: Journal of University Teaching and Learning Practice

13: Internet of Things and Cyber-Physical Systems

14: Baltic Journal of Sport & Health Sciences

15: Frontiers in Computing and Intelligent Systems

16: Innovations in Education and Teaching International

17: Social Science Research network

18: Nurse education in practice

19: Frontiers in education

20: learning and individual differences

21: Journal of Applied Learning & Teaching

22: Computers and Education: Artificial Intelligence

23: Journal on education

24: Indonesian Journal of English Language Teaching and Applied Linguistics

25: Online Journal of Communication and Media Technologies

26: Biodata Mining

27: Technology in Society

28: International Research Journal of Modernization in Engineering Technology and Science

Themes

1: There are concerns, misuse, and ethical issues in the use of AI by students, researchers, and teachers.

So, AI needs to be used with critical evaluation, accountability, and responsibility.

2: AI will not substitute humans and it is just a useful tool.

3: There are more potentials and possibilities for using AI in education. AI's potential use in education should be maximized.