EDUCATION AND CHATBOTS: EXPLORING LEARNING DYNAMICS AND RHIZOMATIC TRENDS IN THE ERA OF WEB 4.0[1][2]

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ABSTRACT: This article addresses the use of chatbots in learning processes and seeks to answer the following question: based on published studies, what pedagogical activities can be proposed to incorporate chatbots into school reality positively, leading learners to use Artificial Intelligence in their learning constructively? Based on Gilles Deleuze and Félix Guattari's studies, as well as Hugo Assmann and other scholars, the aim of this qualitative, exploratory, and descriptive basic research is to reflect on the rhizomatic production of knowledge in the face of advances in collective intelligence, which involve interaction between human beings and artificial intelligence. As a result, a proposal is presented on how to integrate ChatGPT into the teaching of the academic abstract genre to higher education students in the Portuguese Language curricular component. The proposal outlines how teachers can insert Artificial Intelligence into daily academic life and increasingly move towards transdisciplinary, transverse interactions.

KEYWORDS: Artificial Intelligence; ChatGPT; Higher Education.

EDUCAÇÃO E CHATBOTS: APRENDÊNCIA E MOVIMENTOS RIZOMÁTICOS EM TEMPOS DE WEB 4.0

RESUMO: Este artigo tem como tema o uso de chatbots nos processos de aprendência e busca responder à seguinte pergunta: a partir de pesquisas já publicadas, que experiências pedagógicas podem ser propostas de modo a agregar positivamente os chatbots à realidade escolar, levando os aprendentes a utilizarem de forma construtiva a inteligência artificial em seu aprendizado? Pautando-se nos estudos de Gilles Deleuze e Félix Guattari, além de Hugo Assmann e outros teóricos, objetiva-se, nessa pesquisa qualitativa, exploratória e descritiva, de natureza básica, refletir sobre a produção rizomática do conhecimento frente aos avanços de inteligências coletivas que envolvem a interação entre seres humanos e inteligência artificial. Como resultado, apresenta-se uma proposta de como integrar o ChatGPT ao ensino do gênero resumo acadêmico a estudantes do ensino superior, componente curricular de Língua Portuguesa, traçando linhas de como o docente pode inserir a IA no cotidiano escolar e caminhar cada vez mais para interações transdisciplinares, transversais.

PALAVRAS-CHAVE: Inteligência Artificial; ChatGPT; Ensino Superior.

1 INTRODUCTION

The globalized world is increasingly dealing with complex issues. This complexity stems from rhizomatic interactions (Deleuze; Guattari, 2011) and the connections humans intensely establish with other beings, animate or inanimate, or machines.

With the rise of Artificial Intelligence, henceforth AI, thinking machines eventually connected themselves (Deleuze; Guattari, 2011) to various areas of society, if not all of them. Among these is the field of education. Education has long been one of the first fields to raise emerging issues that collective interactions are experiencing. Such issues are presented through students that, in the current generation, establish connections with everything and everyone easily and resourcefully.

Thus, this study seeks to present and foster possibilities of how AI, through ChatGPT, can collaborate in the learning process (Assmann, 2012). To this end, the paper adopted the concept of knowledge as a rhizome (Deleuze; Guattari, 2011) through transdisciplinary interactions with AI (Assmann, 2012) so that regular education teachers can integrate this technology in their classes, using it as a tool that enhances the educational process and not as its enemy.

2 LITERATURE REVIEW

The popularization of smartphones is a recent phenomenon in Brazilian society. If we look back ten years ago, it was uncommon to see everyone using these devices as if they were indispensable for survival. In fact, in the interaction between these two agents, there is a web of involvement that causes multiplicity due to the various connections that are established (Deleuze; Guattari, 2011). Apparently, seeing someone using a smartphone can evoke shallow ideas, but we have to go deeper and visualize the multiplicity, without beginning or end, that opens up

> [...] reality as multiplicity, as metamorphosis, a process that takes place in various dimensions which go beyond the separation between subject and object. In this line of thought, a reductionist and fragmented stance becomes untenable, as knowledge is understood as a network of articulations[3] (Abreu Jr., 1996, p. 33 *apud* Assmann, 2012, p. 79-80, translated by CETRO).

Data (Lopes, 2023) reveals that Brazil has around 118 million smartphone users. However, the device's penetration rate in Brazilian society is 55.4%. This means that not everyone has this device that can interconnect people and objects and evoke these articulations in the form of a network, of a rhizome, to establish knowledge, if that is the case.

In parallel, the development of new technologies, or hypertechnologies (Teixeira, 2018), was and still is taking place. Such technologies would further revolutionize interactions between humans, between machines or non-human beings, and between humans and non-human beings. Then emerged AI and robotics, which revealed a potential that was still little-known but which has been gaining unimaginable proportions in recent decades.

Regarding AI, it can be understood as a technology that aims to "develop devices to perform mental operations and solve complex problems automatically. In other words, artificial intelligence [...] aims to build machines that solve problems whose solution requires intelligence"[4] (Teixeira, 2018, p. 14, translated by CETRO). Assmann (2012) also attributes the possibility of computers having their own intelligence to AI and even mentions the concept of strong AI and weak AI. According to him, experts in the field envision "reaching or even surpassing natural intelligence, or admitting that it is only a matter of imitating some

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[3] In Portuguese: "[...] a realidade como multiplicidade, como metamorfose, um processo que acontece em n dimensões que ultrapassam a cisão entre sujeito e objeto. Torna-se insustentável, nessa linha de argumentação, uma postura reducionista e fragmentária, pois se entende o conhecimento como uma rede de articulações" (Abreu Jr., 1996, p. 33 *apud* Assmann, 2012, p. 79-80).
[4] In Portuguese: "desenvolver dispositivos para realizar operações mentais e resolver problemas complexos de forma automática. Em outras palavras, a inteligência artificial [...] visa construir máquinas que resolvam problemas, cuja solução requer inteligência" (Teixeira, 2018, p. 14).
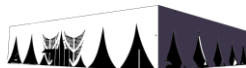
of its aspects"[5] (Assmann, 2012, p. 159-160, translated by CETRO). Furthermore, the author introduces the concept of AI developed by Maria Lúcia de Azevedo Botelho, who holds a Ph.D. in Electrical Engineering from the State University of Campinas (Unicamp). She compares the processes that AI aims to achieve to the human brain's potential:

> Artificial intelligence (AI), as its name implies, is a set of techniques that actually enables computers to think. By simplifying the way programs are developed, AI imitates the basic human learning process in which new information is assimilated and becomes available for future reference. The human mind can incorporate new knowledge without altering its operation and without disturbing all the other information that is already stored in the brain. An AI program works almost the same way. Similarly, program development techniques employing AI resources allow that once a part of the program that was previously considered to be true is challenged, it can be easily modified without affecting the structure of the entire program[6] (Assmann, 2012, p. 160, translated by CETRO).

In this process of thinking, the "lines of segmentarity" (Deleuze; Guattari, 2011, p. 25) in which the brain and AI are involved need to be considered. This network has processes of stratification, territorialization, organization, and signification, just as Deleuze and Guattari (2011) infer about the rhizome. Processes of deterritorialization are also observed, finding lines of flight from the stimuli that are made, remade, revisited, in constant disruption, whether in the human mind or in the process of intelligent machines thinking, in a unique process of mimicry, perhaps?

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[5] In Portuguese: "Alcançar ou até superar a inteligência natural, ou admitir que se trata apenas de imitar-lhe alguns aspectos" (Assmann, 2012, p. 159-160).

[6] In Portuguese: "A Inteligência artificial (IA), como o próprio nome indica, é um conjunto de técnicas que realmente permite que o computador pense. Simplificando a maneira como os programas são formados, a IA imita o processo básico do aprendizado humano por meio do qual novas informações são absorvidas e se tornam disponíveis para referências futuras. A mente humana pode incorporar novos conhecimentos sem alterar seu funcionamento e sem atrapalhar todos os outros fatos que já estão armazenados no cérebro. Um programa de IA funciona quase do mesmo modo. Da mesma forma, as técnicas de construção de programas empregando recursos de IA permitem que, uma vez contestada uma parte até então considerada como verdadeira, ela pode ser modificada facilmente sem afetar a estrutura do programa inteiro" (Assmann, 2012, p. 160).

The field of Computer Science has made contributions that are proportionally splendid and worrying, since there are several areas and subareas of AI. Of particular note is the self-improvement of artificial intelligence, mentioned in the previous excerpt, which is the machine's ability to improve itself based on the inputs it receives and to use them as future references: the so-called machine learning.

To understand this concept, albeit briefly, Domingos (2015) first clarifies the concept of algorithm. In simple terms, an algorithm is a sequence of instructions created to solve problems. This process involves the input and output of data (Domingos, 2015): the user enters the data into the machine, which processes it (through logical sequences - the algorithm) and returns the results. In machine learning, there is an inverse process: "in goes the data and the desired result and out comes the algorithm that turns one into the other. Learning algorithms – also known as learners – are algorithms that make other algorithms" (Domingos, 2015, p. 22-23). The source of this data would be limited to the users' input history, which could be a little or a lot. Then, how to provide a broad, reliable history (reliability can be questioned here) with multiple opinions/views/perspectives that collaborate in the machine processing to generate the data? The answer is: by connecting it to the "nectar of the gods" of contemporaneity, one of the greatest rhizomes we have and sometimes do not realize: the internet.

> Intelligence will become a commodity in the form of a data stream provided by some companies, as is already the case with water, electricity and telephone services. Such as the Internet, it will be simultaneously everywhere and nowhere. The development of the new AI will also include the collaborative effort, often involuntary, of everyone who uses the Internet. In this new structure, we will be part of a collectively created intelligence, in which each person will constantly add new information, helping it to expand and stay current. The new AI is dynamic and interactive[7] (Teixeira, 2018, p. 15, translated by CETRO).

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[7] In Portuguese: "A inteligência será uma commodity na forma de um fluxo de dados fornecido por algumas empresas, como já ocorre com a água, a energia elétrica e os serviços de telefonia. Como a internet, ela estará em toda parte e em nenhuma parte. O desenvolvimento da nova IA incluirá, também, o esforço colaborativo, muitas vezes involuntário, de todos que utilizam a internet. Nessa nova arquitetura, seremos parte de uma inteligência criada coletivamente, na qual cada ser humano agregará constantemente novas

Considering the transversal construction of knowledge (Assmann, 2012) or the interrelationships that such knowledge establishes in its various vanishing points (Deleuze; Guattari, 2011), the concept of Web 4.0 is allied to the provocations and reflections presented. For some scholars, describing the current generation as already having entered Web 4.0 may be hasty. Nevertheless, given the advances which are already undergoing, if we are not yet entirely in the Web 4.0 paradigm, we are in the final stages of transition. To understand Web 4.0, the concept of its predecessor, Web 3.0, needs to be clarified. According to Aghaei, Nematbakhsh and Farsani (2012),

> Web 3.0 or semantic web desires to decrease human's tasks and decisions and leave them to machines by providing machine-readable contents on the web [12]. In General, web 3.0 is included two main platforms, semantic technologies and social computing environment. The semantic technologies represent open standards that can be applied on the top of the web. The social computing environment allows human-machine co-operations and organizing a large number of the social web communities [6] (Aghaei; Nematbakhsh; Farsani, 2012, p. 2).

According to this concept presented by the authors, there is the idea of the Social Semantic Web, which would be the main characteristic of Web 3.0: the possibility of offering interaction between users on a network in a way that computers can also understand such interaction (Aghaei; Nematbakhsh; Farsani, 2012) and store it to improve machine learning. In other words, "the information created by a group of people can generate 'knowledge' that will be used by other people and by intelligent systems to facilitate the production of more knowledge" (Isotani *et al.*, 2008, p. 792).

However, in Web 4.0, this notion would be overcome and the focus would be expanding machine learning. In 2012, regarding the new paradigm, the authors wrote that

informações, contribuindo para que ela se expanda e se mantenha sempre atualizada. A nova IA é dinâmica e interativa" (Teixeira, 2018, p. 15).

> Web 4.0 is still an underground idea in progress and there is no exact definition of how it would be. Web 4.0 is also known as symbiotic web. The dream behind the symbiotic web is interaction between humans and machines in symbiosis. It will be possible to build more powerful interfaces such as mind controlled interfaces using web 4.0. In simple words, machines would be clever on reading the contents of the web, and react in the form of executing and deciding what to execute first to load the websites fast with superior quality and performance and build more commanding interfaces [21] (Aghaei; Nematbakhsh; Farsani, 2012, p. 8).

Related to the notion of symbiosis is the most widely used concept today: ubiquitous computing. Davis (2008 *apud* Isotani *et al.*, 2008) already presented this concept in his studies, associating the idea of the web connecting various intelligences such as "agent webs that know, learn and reason as humans do" (Davis, 2008 *apud* Isotani *et al.*, 2008, p. 792). Basically, the rhizomatic connection between the internet, humans, devices, artificial intelligence, and robots becomes something natural and omnipresent in people's daily lives, in environments such as home, school, work etc. This is what Assmann (2012) presents as a transdisciplinary and transversal artificial intelligence, or a collective intelligence: "Not only new links are being established between technical and human subjects, psychology, logic, mathematics, engineering, programming, but also new academic and professional combinations are being developed, forming complex research teams in collaborative networks"[8] (Buxó; Rex, 1997 *apud* Assmann, 2012, p. 100, translated by CETRO). Still, we would add daily and personal connections to this web of interactions that AI enables us to form.

The concept of Web 4.0 is also associated with the idea of developing more collaborative and interactive approaches with users (District, 2022), so that "Brain-Computer Interfaces (BCIs) [...], The Metaverse [...], Artificial Intelligence [and] The Internet Of Things" (District, 2022) are increasingly present in everyday life. Once again, we can associate the

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[8] In Portuguese: "Não somente se estabelecem novas vinculações entre disciplinas técnicas e humanas, psicologia, lógica, matemáticas, engenharia, programação, mas desenvolvem também novas combinações acadêmicas e profissionais formando equipes complexas de pesquisa em redes colaborativas" (Buxó; Rex, 1997 *apud* Assmann, 2012, p. 100).

Web 4.0 paradigm with the rhizomatic paradigm: several interconnected points that may or may not have the same nature (Deleuze; Guattari, 2011).

In this new era of multiple connectivity, or hypertechnologies (Teixeira, 2018), with the widespread use of smartphones and the several applications to enhance their use, the relationship between these devices and education has gone through a few stages. At the beginning of its popularization, for example, there was a total prohibition of the use of the device in the classroom. This issue, although it seems to have been overcome, still continues, especially in conservative schools, which avoid including digital technologies in their teaching. There was also the issue of the exclusive use of cell phones to attend virtual classes, as occurred during the coronavirus pandemic.

It is worth pointing out that the process of denying or rejecting what is new is an inherent aspect of society, which has occurred in the various insertion processes of the technologies we have today. For example, Dudeney, Hockly, and Pegrum (2016) recount how the technology known as "writing" affected thinkers such as Socrates, as there were questions in his time about the future implications of this technology, which could collapse the paradigm of rhetoric and memorization present at the time. The authors also use the biblical historical records as an example, presenting the book, the writing, as a fateful advance: "Of making many books there is no end" (Ecclesiastes 12:12 *apud* Dudeney; Hockly; Pegrum, 2013, p. 1). However, as mentioned before, it is not necessary to look to such a distant past to find questions regarding the insertion of technologies that will change the current paradigm. Smartphones have been, and in some places still is, a smart device associated with the depravity of thought, limited use of the mind, excessive mental stimuli, reduced human interactions etc. It is as if there is always an attempt to outline what is a smartphone, what is learning, and what is knowledge, as if these concepts do not change.

> Like all past communications technologies, our new digital tools will be associated with changes in language, literacy, education and society. Indeed, they already are. Some observers perceive losses, such as a decline in more linear approaches to reading or more reflective approaches to writing. But others perceive gains, such as education through personal

learning networks (PLNs), or collaborative projects based on collective intelligence. Eventually, the day will come when our new tools are so enmeshed in our routine language and literacy practices that we'll barely notice them any more. But that day is still some way off (Dudeney; Hockly; Pegrum, 2013, p. 2).

These changes are already very present today, and contrary to what the authors mentioned, they emerged earlier than anticipated. However, with the advancement of AI's capabilities for ordinary users and its integration into smartphones and computers, when thinking about the field of education in the last two years, new challenges have joined the existing ones. For example, if previously there was concern about students copying information from the web and presenting it as their own, now there is an aggravating factor related to the expansion of machine learning: the use of chatbots to produce content. Unexpectedly, the rhizome established new lines of flight, deterritorializing knowledge, causing everyone to question themselves and become restless because the line through which it was connected changed the nature of things and challenged the current paradigm.

However, to understand such concern, it is relevant to clarify the concept of a chatbot:

> A chatbot is an artificial intelligence program and a Human-computer Interaction (HCI) model (Bansal & Khan, 2018). According to the dictionary, a chatbot is "A computer program designed to simulate conversation with human users, especially over the Internet" (Chatbot | Definition of chatbot in English by Lexico Dictionaries, 2019). It uses Natural Language Processing (NLP) and sentiment analysis to communicate in human language by text or oral speech with humans or other chatbots (Khanna *et al.*, 2015). Artificial conversation entities, interactive agents, smart bots, and digital assistants are also known as chatbots (Adamopoulou; Moussiades, 2020, p. 1).

Probably almost everyone has already had contact with chatbots. For instance, when calling a telephone provider, one interacted with an "intelligent" robot that provided information and options for the service; when sending a message to the bank via its chat, one came across a virtual assistant that asked several questions before directing the user to a human attendant; or when someone said out loud "Hey Siri, what time is it?" and received an intelligent response telling the exact time in a very human-like voice.
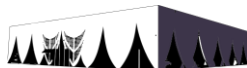
The issue is that with AI, the capability of chatbots has evolved considerably, and so have the possibilities of what they can do. Below, some chatbots that are currently accessible through browsers or their smartphone apps are presented:

Box 1 – Some chatbots that integrate AI

Chatbot	Description
Bard	"Google's Bard is an artificial intelligence chatbot that competes with OpenAI's ChatGPT. Launched in Brazil in July 2023, the tool can create natural texts, as if they were written by humans, and can also allow you to create lists, structure spreadsheets, schedule meetings, and more. Available only in the browser but integrated with other Google services, the AI promises to improve the virtual assistance experience for users. However, according to the company, the bot is currently in the experimental phase and its capacity is limited"[9] (Villarinho, 2023, translated by CETRO)
Bing	"The new Bing is an improved version of Microsoft's search engine, combined with a language model similar to that of ChatGPT, OpenAI's intelligent chatbot. The announcement was made by Microsoft last Tuesday (7)*, just a day after Google launched Bard, its own chatbot that will be integrated into the search. With the improvement, Bing promises to optimize the search engine, providing more interactive and contextualized responses, as well as a new chat experience"[10] (Silvestre; Neri, 2023, translated by CETRO).
ChatGPT	"It is a robot developed by OpenAI that uses artificial intelligence (AI) to interact with users. The technology functions similarly to Alexa, except that it responds by text and has a greater variety of answers. The OpenAI chatbot is capable of chatting about various topics, as well as solving math problems, giving love advice, and more. In May 2023, its official app for iPhone (iOS) was launched, which can be downloaded for free from the App Store"[11] (Chatgpt [...], [s.d.], translated by CETRO).

[9] In Portuguese: "O Bard do Google é um chatbot de inteligência artificial que compete com o ChatGPT da OpenAI. Lançado no Brasil em julho de 2023, a ferramenta é capaz de criar textos naturais, como se fossem escritos por humanos, e também permite criar listas, estruturar planilhas, agendar reuniões e mais. Disponível apenas no navegador, mas integrada a outros serviços do Google, a IA promete aprimorar a experiência de assistência virtual para os usuários. Porém, de acordo com a empresa, o bot ainda está em fase experimental, e sua capacidade é limitada" (Villarinho, 2023).

[10] In Portuguese: "O novo Bing é uma versão aprimorada do buscador da Microsoft e integrada a um modelo de linguagem semelhante ao do ChatGPT, chatbot inteligente da OpenAI. O anúncio da novidade foi feito pela Microsoft na última terça-feira (7)*, apenas um dia após o Google revelar o "Bard", chatbot próprio que será integrado à pesquisa. Com a melhoria, o Bing promete otimizar o mecanismo de busca, fornecendo respostas mais interativas e contextualizadas, além de uma nova experiência de bate-papo" (Silvestre; Neri, 2023).

[11] In Portuguese: "É um robô desenvolvido pela OpenAI que usa inteligência artificial (IA) para interagir com os usuários. A tecnologia tem funcionamento semelhante ao da Alexa, com a diferença de que responde por texto e possui uma variedade maior de respostas. O chatbot da OpenAI é capaz de conversar sobre diversos temas, além de resolver problemas matemáticos, dar conselhos amorosos e muito mais. Em maio de 2023,

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ChatSonic	"ChatSonic is one of the main alternatives to ChatGPT. Created by the technology company Mycroft AI, the chatbot presents itself as 'ChatGPT with superpowers'. Not only does it offer the same features as its competitor, but the bot also has functions such as generating images from textual descriptions – in the style of Dall-E 2 – and voice command recognition. Another distinguishing feature of ChatSonic is that it is integrated with the Internet and Google and can therefore access more up-to-date information than ChatGPT, which has limited knowledge of events beyond 2021"[12] (Fernandes, 2023, translated by CETRO)

*Refers to 07/02/2023.
Source: organized by the author

Bart, Bing, ChatGTP, ChatSonic are some chatbots available nowadays, but several others can be used. As they were developed, access to AI-integrated chatbots became easier for ordinary users, which caused, and has caused, a frenzy in several areas of society, especially education. In this field, it has been questioned, discussed, and inquired how users - in this case, students - can properly use these chatbots so as not to outsource the learner's research work to the machine without reflecting on the result that the machine provided. This issue causes discomfort because it challenges society's accepted paradigm regarding what education is, what the process of teaching and learning is, what learning processes are etc. There was barely any time to acclimate to the presence of smartphones in the classroom, and now there is the possibility of learners having cell phones that have apps with super-intelligent chatbots that respond exactly to what is expected through inputs provided by the user.

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ele ganhou um aplicativo oficial para iPhone (iOS), que pode ser baixado gratuitamente pela App Store" (Chatgpt [...], [*s. d.*]).
[12] In Portuguese: "O ChatSonic é uma das principais alternativas ao ChatGPT. Criado pela empresa de tecnologia Mycroft AI, o chatbot se apresenta como o 'ChatGPT com superpoderes'. Isso porque, além de oferecer os mesmos recursos do concorrente, o bot traz funções como gerador de imagens a partir de descrições textuais – ao estilo do Dall-E 2 – e reconhecimento por comando de voz. Outro diferencial do ChatSonic é que ele é integrado à Internet e ao Google e, portanto, pode acessar informações mais atualizadas que o ChatGPT, que tem conhecimento limitado sobre eventos após 2021" (Fernandes, 2023).
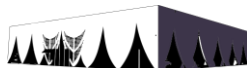
3 METHODOLOGY

This qualitative, exploratory, and descriptive study of a basic nature adopts bibliographical research as its technical procedure and seeks to answer the following question: based on published research, what pedagogical activities can be proposed to add chatbots to the school reality positively, leading learners to use artificial intelligence in their learning constructively?

To this end, as it is a topic with recent publications, three scientific articles published in 2023 were selected. They sought to address, in a theoretical or practical way, the integration of chatbots into classes or to present possible consequences of such use by students. The articles were chosen randomly, but considering the degree of relevance categorized by Google Scholar, the search engine used to find the articles.

The following results were obtained:

1. Digital media in the educational field: a look at ChatGPT applications in education (Guimarães *et al.*, 2023);
2. ChatGPT as a support tool in the teaching of mathematics (Santos; Sant'ana; Sant'ana, 2023);
3. How ChatGPT affects education and university development (Lima, 2023);

Although exploratory and bibliographical research on the subject was found, it should be noted that there still is little scientific production on practices involving AI and teaching. This leads to the hypothesis that inserting chatbots in classrooms is a very recent experience. The few reports found may indicate that such pedagogical experimentation raises doubts among teachers or that they do not know exactly how to involve such hypertechnologies in their teaching practices.

The following section presents relevant information on the subject found in the analyzed articles. The section also discusses the potential of involving AI in the classroom, thus suggesting ways of integrating such tools into teaching.

4 DISCUSSIONS

In the first article, "Digital media in the educational field: a look at ChatGPT applications in education" by Guimarães *et al.* (2023), the authors carried out a bibliographical survey to reflect more generally on how the various players in education have behaved in this context of social technological idiosyncrasy.

Guimarães *et al.* (2023) highlight a recurring fact in studies in the area: schools need to prepare students so they learn how to deal with the knowledge they can come in contact with using digital tools connected to the internet. Thus, the teacher emerges as the mediator in the learning process (Assmann, 2012), seeking to teach students critically so that they can discern and question everything they access online. Although, nowadays, children and teenagers are born into this connected society, teaching them how to use apps as tools for building their knowledge, whether on a cellphone or computer, is already a way of rediscovering the potential of education allied to technology.

Guimarães *et al.* (2023) also present, theoretically, possibilities for integrating ChatGPT into teaching. Among these possibilities was using the bot to correct essays, to help with active methodologies, such as the flipped classroom, and to help the teacher resolve doubts. The authors also presented ways ChatGPT can collaborate with teachers, such as assisting them in preparing lessons and interacting in distance learning classes.

Finally, the article points to the growth of public policies that seek to equip schools adequately so that teachers and students have all the appropriate technological apparatus at their disposal, combined with training, to benefit from the potential offered by the bot and digital technology in general.

In the second article, entitled "ChatGPT as a support tool in the teaching of mathematics", Santos, Sant'Ana, and Sant'Ana (2023) present a study on how ChatGPT can be used for mathematics education. Firstly, there is a theoretical overview of the journey from human intelligence to AI and a brief description of this bot.

Regarding methodology, it was an exploratory-descriptive study. The authors conducted some tests with the bot, analyzed the responses obtained, and presented the possibilities of using it in the school routine.

The researchers asked the bot to solve exercises involving logarithms, parabolas, and financial mathematics. It made a coherent and detailed resolution of what was asked. However, there were errors in the resolution of more complex questions, momentarily presenting a limitation of the free version of ChatGPT.

Santos, Sant'Ana, and Sant'Ana (2023) suggest that students use the bot as a study tool, such as to help correct exercises, resolve doubts about mathematical concepts, etc. However, the authors did not dismiss that it can be used only to solve problems without critical reflection from the users - a skill that needs to be encouraged in education.

Regarding the teaching routine, the researchers highlighted that the bot can help create exercises, and they even requested the production of a lesson plan on integers. Thus, the bot presented a coherent plan but without the references on which it was based.

Finally, Santos, Sant'Ana, and Sant'Ana (2023) highlighted that ChatGPT can help teach mathematical content more dynamically, therefore overcoming what they call mathematical formalism. For example, they presented a video script prepared by the bot for teaching mathematical content.

In the third article, entitled "How ChatGPT affects education and university development", Lima (2023) conducts a literature review on ChatGPT but also presents the results of a semi-structured questionnaire applied to higher education students.

The author first discusses what ChatGPT is and its functionalities. Then, based on previous studies, she reflects on how the tool has increasingly changed how higher education students carry out their research studies and write texts. According to Lima (2023), some teachers are already trying to implement the bot in their academic lives. However, others are afraid to do so, mainly because they are concerned about plagiarism, user dependence on the tool, and, above all, the lack of encouragement for critical analysis

and creativity. In addition, the author raised a very relevant question, which addresses how AI will affect jobs in the future.

Furthermore, Lima (2023) pointed out what some scholars have revealed about ChatGPT: since the tool is based on information available on the internet and formulates responses based on statistical data of the most recurrent terms found, the reliability of the result is questionable. It is, therefore, suggested that higher education students validate the information obtained before using it in academic work and use the bot as a tutor to help in the learning process, resolve doubts, or even indicate points that need improvement in text production, for example.

Finally, the author presents the results of a survey with 20 students on the Business Communication course at The Porto Accounting and Business School (ISCAP/Portugal). Among the data presented is the fact that all the students participating in the survey are familiar with AI and that three of them have already produced academic work using only information from the bot, while the others also seek to base their work on other sources.

Considering the three analyzed articles it was possible to observe how the learning process between students and AI is an aspect often mentioned by the authors. None of the articles present the results of proposals applied to teaching, but they outline how teachers can implement the bot in their classes, whether to improve the methodology in the classroom or to improve the teacher's own pedagogical process. In this context, there is the presentation of what Assmann (2012) calls collective intelligence since there is the "virtualization of intelligence"[13] (Assmann, 2012, p. 160, translated by CETRO), which helps the rhizomatic entanglement of knowledge to permeate these interactions to stimulate knowledge.

Having ChatGPT as a kind of tutor, for distance learning students or not, is a fact that has been implemented through internet search engines (such as Google, Bing etc.), but it has now been improved. Through this AI, students can simply enter their questions, such as the explanation of a given term, and, based statistically on the data available on the internet,

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[13] In Portuguese: "Virtualização da inteligência" (Assmann, 2012, p. 160).
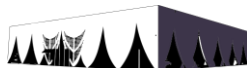
the answer will be presented in a personalized way. Furthermore, the response will be written similarly to a human response.

In order to align the perspectives outlined in the articles and the proposal of this article, we resent below an initial proposal on how to use ChatGPT in the classroom to stimulate students' critical thinking, enabling them to compare the data obtained through the bot and to improve their studies. In this suggestion, the concept of rhizome is circumscribed. In the symbolism of arborescent knowledge, the trunk, which in this case is the teacher, would be the one who would lead the leaves, i.e., the students, to reflect and have contact with the source of knowledge. In the rhizomatic model, on the other hand, there are multiple ways to obtain information, and the teacher is not the only source. For this suggestion, this article sought to focus on first-year students of a higher education course, the Portuguese Language as a curriculum component, the content of academic genres, and the academic abstract genre as the object of study.

In the pedagogical proposal, the professor, initially, will inform the students about the topic they will study: academic genres, more specifically the academic abstract. First, however, using the active methodology of the flipped classroom, the teacher will ask the students to search ChatGPT to find which elements need to be considered when writing an academic abstract.

Then, the students will present their findings in class. Based on such findings, the teacher will correlate the theoretical information about the genre abstract that is usually included in scientific articles and monographs, dissertations and theses, and the essential elements usually present in the academic abstract (such as theme, research question, objective, theoretical basis, methodology/corpus/research subjects, and results). During this interaction, the professor can point out shortcomings the bot sometimes has when providing very generalized responses.

Next, the professor will present real examples of published articles in which the students will be asked to analyze whether the elements that should be included in a good abstract are present in the abstracts of the analyzed articles or not.
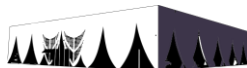
Afterward, using ChatGPT, the professor will instruct the students to ask the bot to produce an academic abstract on the same theme as one of the analyzed abstracts. There would be an indication of the basic elements of the abstract so that the AI could process the information with sufficient data to produce the abstract.

Finally, there will be a moment to compare the information and to visualize how the abstract produced by the bot manages to integrate the elements of an academic abstract and which elements would require improvement and rewriting.

Through this activity, the professor will try to get the students to reflect on how the AI behaved based on the experiment and whether there was an improvement in the abstract produced by the bot compared to the published abstract produced by human beings. Overall, there would be a process of blended learning, according to Assmann (2012), in which human beings and learning machines interact and collaborate in the production of knowledge.

Since this article has outlined how to integrate AI into everyday school life, it is worth mentioning, although it is somewhat implicit, that teachers can consider other strategies to improve the process of conscious and fruitful use of artificial intelligence.

5 FINAL CONSIDERATIONS

This study presented some reflections involving artificial intelligence through chatbots and teaching. The purpose of the present paper was neither to draw inflexible lines nor to suggest specific paths, but to indicate processes that could lead teachers and students to reflect on how machines and human beings are increasingly interacting, making it almost impossible to dissociate one from the other.

Based on the analyzed articles and the practical proposal for integrating AI into teaching, the paper indicates the need for continuing teacher education and also highlights the importance of teachers sharing experiences of integrating AI with education among their peers in order to improve and apply pedagogical practices on the subject. Such aspects may

assist schools to move forward, not at the mercy of technological advances, but alongside them, to provide the integral formation of human beings. In this process, it is also important to foster students' critical thinking, in order to form thinking beings who do not allow themselves to be dominated by the machine, nor are they totally oblivious to it. As a rhizomatic extension for the movement and exchange of knowledge, we hope that there will be a hybridization of ways of learning in this increasingly digital society.

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