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Generative artificial intelligence, education and innovation in the context of data capitalism: dilemmas and possibilities[1]

Inteligência artificial generativa, educação e inovação no contexto do capitalismo de dados: dilemas e possibilidades[2]

Inteligencia artificial generativa, educación y innovación *en el contexto del capitalismo de datos: dilemas y posibilidades*

Alexia Pádua Franco[3]
Universidade Federal de Uberlândia

Raquel Aparecida Souza[4]
Universidade Federal de Uberlândia

Abstract: This theoretical-reflective essay discusses the possibilities of the ethical and responsible incorporation of generative AI into educational processes developed in times of data capitalism, which is constituted by tense associations between human and non-human agents. To contextualize this discussion, it examines the sociotechnical dimension of digital technologies, more specifically AI, reflecting on their labor, environmental, and algorithmic racism implications. It then problematizes the neoliberal conceptions of innovation present in science, technology, and education policies in Brazil, which have driven the development and use of AI and the process of the platformization of education, reducing teaching practices to technological operationalization. Finally, starting from the concept of innovation based on a nurturing tradition, it reflects on how the contextualized and critical appropriation of generative AI can be built, in schools and universities, based on the valorization of autonomous and authorial human teaching to mediate the process of forming the hybrid reader, considering the role of these educational spaces in fostering critical citizenship in a hyperconnected world.
Keywords: Generative AI; Data Capitalism; Education; Innovation; Nurturing Tradition.

Resumo: Este ensaio teórico-reflexivo discute as possibilidades de incorporação ética e responsável da IA generativa em processos educativos desenvolvidos em tempos de capitalismo de dados, constituído por tensas associações entre agentes humanos e não humanos. Para contextualizar esta discussão, examina a dimensão sociotécnica das tecnologias digitais, mais especificamente das IAs, refletindo sobre suas implicações trabalhistas,

[1] Translator's Hermilo Pinheiro Santana, UFRB, Salvador, Bahia. E-mail: Hermilosantana.mus1@gmail.com.
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[3] Postdoctoral Researcher in Education. Federal University of Uberlândia (UFU). Uberlândia, Minas Gerais (MG), Brazil. E-mail: alexia@ufu.br; Lattes: http://lattes.cnpq.br/4607042780750206; ORCID: https://orcid.org/0000-0002-2715-3627.
[4] Postdoctoral Researcher in Education. Federal University of Uberlândia (UFU). Uberlândia, Minas Gerais (MG), Brazil. E-mail: eraquelas@gmail.com; Lattes: http://lattes.cnpq.br/9208469507359517; ORCID: https://orcid.org/0000-0001-5906-0671.

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ambientais e de racismo algorítmico. Em seguida, problematiza as concepções neoliberais de inovação presentes em políticas de ciências, tecnologia e educação no Brasil que têm impulsionado o desenvolvimento e uso de IAs e o processo de plataformização da educação que reduz o fazer docente à operacionalização tecnológica. Por último, a partir da concepção de inovação baseada em uma tradição nutriente, reflete sobre como pode ser construída, nas escolas e nas universidades, com base na valorização da docência humana autônoma e autoral para mediar o processo de formação do leitor híbrido, a apropriação da IA generativa de forma contextualizada e problematizadora, considerando o lugar destes espaços educativos na formação crítica de cidadãos que vivem em um mundo hiperconectado.
Palavras-Chave: IA Generativa; Capitalismo de Dados; Educação; Inovação; Tradição Nutriente.

Resumen: Este ensayo teórico-reflexivo discute las posibilidades de incorporación ética y responsable de la IA generativa en procesos educativos desarrollados en tiempos de capitalismo de datos, constituido por tensas asociaciones entre agentes humanos y no humanos. Para contextualizar esta discusión, examina la dimensión sociotécnica de las tecnologías digitales, más específicamente de las inteligencias artificiales (IAs), reflexionando sobre sus implicaciones laborales, ambientales y de racismo algorítmico. A continuación, problematiza las concepciones neoliberales de innovación presentes en políticas de ciencia, tecnología y educación en Brasil, que han impulsado el desarrollo y uso de IAs y el proceso de plataformización de la educación, el cual reduce el quehacer docente a la operacionalización tecnológica. Por último, a partir de la concepción de innovación basada en una tradición nutricia, reflexiona sobre cómo puede construirse, en las escuelas y universidades, a partir de la valorización de la docencia humana autónoma y autoral para mediar el proceso de formación del lector híbrido, la apropiación de la IA generativa de manera contextualizada y problematizadora, considerando el lugar de estos espacios educativos en la formación crítica de ciudadanos que viven en un mundo hiperconectado.
Palabras clave: IA Generativa; Capitalismo de Datos; Educación; Innovación; Tradición Nutriente.

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Introduction

Research and debates about the presence of generative AI in the context of Basic and Higher Education have intensified since the end of 2022, when the use of generative AI - ChatGPT[5] - became popular. Unlike conventional digital technologies, generative AI not only processes information but is capable of generating content from large volumes of data and interaction with the user, raising ethical, pedagogical, and social concerns related to authorship, learning, teacher autonomy, algorithmic biases, data privacy, reproduction of structural inequalities, environmental damage, among others.

[5] ChatGPT is a generative AI model developed by OpenAI, designed to generate responses in natural language, simulating a conversation with a human being. It is proprietary, closed-source software trained with large volumes of data to understand and generate responses based on the context provided by the user.

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When considering the role of generative AI in the content generation process, different uses and meanings are attributed to it, as addressed by Pimentel and Carvalho (2025, p. 221-236). There is discussion about whether it can be considered an author, co-author, plagiarist, editor, assistant, interlocutor, or teaching machine. Questions arise about whether those who use it establish a magical relationship with it as if it were an oracle that answers their questions unquestionably. Whether they are an interviewer, plagiarist, copyist, researcher, or author. Questions are raised about whether those who develop it act like Victor Frankenstein, a character in Mary Shelley's work, who gave life to a creature similar to human beings, which, when abandoned to its own fate, learned about humanity and was feared and misunderstood by it.[6]

Amid these controversies, this article discusses how generative AI can be incorporated into educational processes in a critical, ethical, and contextualized manner, considering its limits, risks, and possibilities for use in an emancipatory education project (Freire, 1982). To this end, its argument is based on the assumption that AI, and more specifically generative AI, is not a simple tool that enhances human work and multiplies knowledge, but rather a socio-technical artifact that is constituted by and constitutes networks and associations between human and non-human agents that permeate social processes, as suggested by Actor-Network Theory (ANT) proposed by Bruno Latour (2012).

The methodology adopted in this study is qualitative in approach, structured as a theoretical essay that intersects theoretical references on data capitalism, artificial intelligence, public education policies and digital technologies, knowledge and educational practices in digital culture with a critical reading of documents relating to science, technology, and education policies in Brazil.

To guide the reading and better understanding of the text, it was organized into three sections. The first, "Artificial intelligence in the context of data capitalism," synthesizes the development and use of artificial intelligences, including generative AI, in the context of data capitalism, reflecting on their labor, environmental, and algorithmic racism implications that need to be considered in planning educational practices in schools and universities. The second section, "Artificial intelligences and neoliberal educational policies," reflects on the neoliberal conceptions of innovation present in science, technology, and education policies in Brazil that have driven the development and use of AI, including in the process of platformization of

[6] Published by Editora Antofágica (RJ) in 2023, the special edition of Mary Shelley's novel Frankenstein, first published in England in 1818, features an introduction and afterwords written by Ilana Casoy (criminologist), Cristhiano Aguiar (literary critic), and Nina da Hora (computer scientist), who reflect on how the conflicts presented in this science fiction classic encourage us to think about science, the internet, and artificial intelligence in relation to ethics, responsibility, and social justice.

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education. Finally, the section "Innovation nourished by traditions: possibilities for critical insertion of generative AI in education" discusses, based on the concept of nurturing tradition, possibilities for critical, ethical, and responsible appropriation of generative AI in schools and universities, in a process of democratic education.

Artificial Intelligence in the Context of Data Capitalism

To reflect on the dilemmas and possibilities of generative AI's presence in educational processes developed in schools and universities, it is necessary to situate this socio-technical artifact within the scope of data capitalism, that is, in the current context in which data collected on different digital platforms are converted into capital.

According to Silveira (2021, p. 5), "digital capitalism has transformed into digital-datafied capitalism, that is, driven by data." It is based on "datafication," which is the process of converting human actions and expressions that unfold in the hybridity between physical spaces and digital platforms into data, which are sold in a "business-technological arrangement" governed by large technology companies (big tech) located in the USA and, more recently, in China.

This process of data platformization involves human work and the action of algorithms programmed to extract, select, and organize personal and location data, information about equipment used, browsing behaviors, about content consulted or posted, about user interactions, about followers and pages followed. In this way, algorithms become agents of power, surveillance, control, and profit by monitoring and profiling users, predicting future consumer needs, influencing behaviors, consumption desires and political decisions, supporting the selection of job candidates, identifying people through facial recognition, etc.

Human work is performed both by users of digital platforms and by hired workers (Coeckelbergh, 2023, p. 95-96). Users work for free for big tech companies when they provide their data by filling out forms without which they cannot use the platform or applications, when they search, like, comment on and post content, follow profiles, use filters to correct photos, participate in personality tests or thematic chains, among other actions and reactions.

Workers (sub)contracted by outsourced companies spread around the world extract minerals necessary for manufacturing hardware, perform repetitive tasks to label data and train AI to recognize objects, animals, human beings, to detect and eliminate unwanted content according to the platform's profile. According to a report published in the newspaper O Globo (Causin, 2023), "digital trainers spend hours and clicks identifying texts, images, and audio for the improvement of AI systems in exchange for a few dollars per hour."

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Based on this information shared on the internet by billions of people around the world, collected, selected, and stored in huge databases that are, for the most part, in data centers controlled by big tech companies, it was possible to train generative AI to statistically process, based on user commands and prior machine learning, this data that represents part of the knowledge accumulated by humanity. Part and not all of the knowledge accumulated by humanity, because people from different social classes, regions, and levels of education do not participate equally in this information-sharing process due to inequalities in digital inclusion caused by discrepant qualities of internet connection, processors and memory capacity of the equipment used, and mastery of operational and info-communicational skills (Franco, 2021)[7]. Furthermore, the programming of AIs, including generative AI, involves linguistic, racial, geopolitical choices and biases, among others, as highlighted by Coeckelbergh:

> In the data collection phase and in the design or creation of datasets, we make choices about how to abstract reality. [...] In machine learning, abstraction through statistical processes creates a model of reality; it is not reality itself. This includes choices: choices related to the algorithm itself that will perform the statistical operation that takes us from data to patterns/rules, along with the choices involved in designing the database on which the learning algorithm is trained. This aspect of choice [...] means that we can and should ask important questions about the choices made. For example, is the training dataset representative of the population in question? Is there any bias built into the data? [...] These choices are never merely technical questions, but also have a crucial ethical component. (Coeckelbergh, 2023, p. 87-88).

The questions posed by Coeckelbergh alert us to another dimension of AIs: their social and cultural biases that constitute the selection and organization of information that will compose databases and, therefore, the results of searches, queries to generative AI, and facial recognition. In this sense, researcher Tarcízio Silva (2022) analyzes "algorithmic racism," defining it as:

> the way in which the disposition of technologies and socio-technical imaginaries in a world shaped by white supremacy performs the racialized algorithmic ordering of social classification, resources, and violence to the detriment of minoritized groups. Such ordering can be seen as an additional layer of structural racism, which, moreover, shapes the future and horizons of power relations, adding more opacity to the global exploitation and oppression that has already occurred since the colonial project of the 16th century (Silva, 2022, p. 69).

[7] Franco (2021) details digital inclusion inequality in Brazil, using data from 2018. Although some figures have changed in recent years, the assumptions that allow us to understand the complexity of digital exclusion remain the same.

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The website "Unveil: racial justice, AI and digital technologies" provides the "Timeline of algorithmic racism: cases, data and reactions" (Silva, 2025), initially accessible on Tarcízio Silva's Blog (2022). Its development began in 2010 and is continuously maintained and updated by the researcher and other collaborators to record cases, reports, and data on algorithmic damage and discrimination, with the intention that they be disseminated and analyzed to enhance collective reactions regarding the observed damages and against discriminatory algorithmic systems.

Among the axes presented in this interactive timeline, the following cases stand out:

> [...] Search for "black girls" results in pornographic content; Google Photos tagged black people as "gorillas"; Israeli startup claims to identify facial features of terrorists; Facebook's advertising system allows excluding blacks and Latinos, an illegal practice; Searching "black woman teaching" on Google leads to pornography; Apps like Uber and Lyft charge more from residents of peripheral and non-white neighborhoods [...] (Silva, 2022, n.p.).

The high energy and environmental cost generated for maintaining data centers that store the databases that feed AIs is also a problem that needs to be considered in understanding them as a socio-technical artifact. The physical structures where network equipment that processes, stores, and distributes digital data is installed require an enormous amount of water and energy to operate, which harms the water and energy supply for the population of the localities where they are installed. Several countries that already have experience with data centers no longer want to install them in their territories, which has encouraged big tech companies to look for spaces to build their data centers in countries of the global south. The newspaper Intercept, in May 2025, published a report denouncing the intentions of the Brazilian government to offer benefits for the installation of data centers in Brazil. According to the report,

> The Ministry of Finance is expected to send to the National Congress [...], a provisional measure with a series of incentives for the data center industry in the country. One of them is the exemption from payment of federal taxes, in addition to other benefits for technology companies that install their infrastructure in Brazil. Although the policy has not yet been made official in Brazil, it is already being presented by Minister Fernando Haddad to foreign investors and technology companies in Silicon Valley. The problem is that the Ministry of Finance and other departments involved in drafting the provisional measure have not presented cost-benefit calculations that justify the package of favors being extended to companies. It is not clear what Brazil has to gain from these concessions. (Martins, 2025, n.p.).

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In short, the development and use of AIs involves social and ethical dimensions related to human and non-human beings (Coeckelbergh, 2023, p. 167), which must be considered in planning educational practices that involve generative AIs in schools and universities. Practices that should not be restricted to using digital technologies as tools based on a neoliberal conception of innovation, as will be discussed below.

Artificial Intelligence and Neoliberal Educational Policies

In 21st-century educational policies, the word innovation is frequently present and is normally associated with the use of digital technologies in educational spaces, as if this alone guaranteed improvements in education and the training of children, young people, and adults. It is common to affirm the importance of schools and universities adapting to "new times" to enable effective and efficient education, especially for the formation of entrepreneurial mindsets. In short, a neoliberal conception of innovation that disregards the relationship between individual and collective; past, present, and future.

Traces of this movement are found in two federal government documents related to science, technology, and education: the Brazilian Artificial Intelligence Plan – PBIA (Brasil, 2025a), and the InovaEDUCAÇÃO call for proposals from CAPES (Brasil, 2025b). Both present AI of different types and degrees of complexity as innovative instruments capable of personalizing teaching, supporting teachers, increasing educational efficiency, and optimizing school management. By privileging an instrumentalist view of innovation, centered on technologies and products, they disregard pedagogical tradition, marginalize the role of the teacher, minimize the critical development of students, and ignore the social complexity of the school environment.

The PBIA (2024-2028), whose motto is "AI for the Good of All," is presented as a strategy of the Brazilian federal government to promote, regulate, and apply artificial intelligence (AI) in the country in an ethical, inclusive, and sustainable manner. The document defines AI as:

> [...] the set of models, algorithms, techniques, and methodologies that can be implemented as computational systems that produce results such as predictions, classifications, recommendations, and decisions, based on learning processes based on large volumes of data, with the potential to influence physical and virtual environments. (Brasil, 2025a, p. 17).

It establishes investments in three dimensions of actions: a) immediate impact, to solve specific problems in priority areas for the population (health, agriculture, environment, industry, commerce and services, education, social development, public

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service management); b) structuring actions related to AI infrastructure and development, dissemination, training and capacity building in AI, improvements to public services and business innovation using AI, AI regulatory and governance process; c) actions for plan management and monitoring.

Innovation via AI appears in the PBIA as an essential driving force for technological sovereignty, economic growth, and improvement of Brazilians' quality of life. However, as summarized by Franco, Rocha and Silva (2025), its launch was accompanied by analyses made by researchers who pointed out weaknesses:

> in the amount, origin and distribution of investments, in establishing the responsibilities of the public and private entities mentioned in the plan, in guaranteeing Brazil's digital sovereignty and individual and collective rights, in the feasibility of achieving the goals within the established deadlines and with the planned resources, as well as in respecting the linguistic diversity existing in the country. (Franco; Rocha and Silva, 2025, p. 225).

In their article, the authors raised and analyzed the actions provided for in the PBIA that involve Brazilian public universities (Franco; Rocha and Silva, 2025), among which appear some aimed at school and higher education. In addition to goals to create courses and disciplines for training professionals in programming, data science, and AI, and to promote research on AI, investments are planned to create AI systems that contribute to the "simplification and automation of management processes and accountability of financial resources from FNDE transfers and the Direct Money in School Program," for monitoring attendance and performance of Basic and Higher Education students that may lead to school dropout and evasion. There are also plans to encourage the development of "Generative AI systems to support teachers in Formative and Diagnostic Assessment for Literacy and Language Development," "Intelligent Mathematics Tutoring Systems Unplugged with Generative AI, from first to fifth year of Elementary School"; "Welcome systems using positive psychology, generative AI and intelligent tutoring systems to promote learning and well-being."

For the use of these systems, "teacher training" actions are announced – the choice of this expression, in itself, already demonstrates the technicist bias of developing AIs for education that standardizes psychological reception and learning processes, disregarding the singularities and social, cultural, structural nuances of the human agents that form the diversity of school communities that exist in Brazil, which can deepen inequalities already existing in the education system.

In the PBIA, the National Council for Scientific and Technological Development (CNPq) and the Coordination for the Improvement of Higher Education Personnel

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Foundation (CAPES) are cited as funding agencies for actions that can be developed in universities. In this context, it is possible to highlight call for proposals n. 3/2025 – InovaEDUCAÇÃO from CAPES, which was published in March 2025, to "select projects aimed at improving the quality of Public Education at all levels of education, promoting the wide dissemination of innovative solutions in the country." Regarding its objectives, the presentation of the call on the CAPES website explains that it seeks:

> [...] to encourage pedagogical innovation through the dissemination of resources and solutions in Artificial Intelligence aimed at education, promoting the improvement of teaching quality through innovative practices. In addition, it intends to democratize access to knowledge through technological resources for public and free use, support the initial and continuing training of teachers with technological innovation, and expand the use of educational technologies in teaching, learning, and public management processes. (Brasil, 2025b, emphasis added)

In the detailing of innovative technological solutions in artificial intelligence that will be selected, nine areas are listed in item 1.2 of the call: I - Learning Platforms, II - Intelligent Tutoring Systems, III - Virtual Assistants, IV - Automated Assessment System, V - Performance and Learning Analysis, VI - Games and Interactive Simulations, VII - Accessibility Tools, VIII - Augmented and Virtual Reality, IX - Student Retention.

It is observed that, according to this call, the pedagogical innovation that contributes to improving the quality of teaching and democratizing access to knowledge is instrumental, that is, it is centered on the dissemination of resources and solutions in AIs that "simulate human cognitive processes, such as learning, reasoning, perception, decision-making, and problem-solving" (Brasil, 2025b, n.p.), and on teacher training for their use in teaching, learning, and public management processes.

Both in the PBIA and in the CAPES call, the neoliberal conception of educational innovation as application and consumption of digital technologies is evident. There is an incentive to partially replace the teaching function with automated tutoring systems, as well as a centrality of AI as a technical solution to structural problems (dropout, learning difficulties), without discussing confronting the social and educational inequalities that generate them. As argued by Peixoto and Araújo (2012), this conception must be contrasted with one that analyzes technologies as social constructs, loaded with economic, political, and ideological interests.

To do this, a key point that needs to be problematized is how neoliberal policies that suggest that technologies are synonymous with educational innovation disqualify teachers, reduce their autonomy and authorship, and naturalize their precarious working conditions. It has become common sense to affirm that what hinders

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educational innovation is teacher resistance and their lack of training to insert ICTs, including AIs, into their educational practices. These statements are accompanied by the illusion that digital technologies will remedy teachers' lack of time to diagnose students' learning difficulties, to plan classes that excite them, and therefore will reduce their overload and fatigue.

Thus, governments invest millions in acquiring platforms, online training courses, and various applications to "help" education professionals develop technological competencies that will "facilitate" their work, reducing the complexity of teaching to an instrumental dimension. Disguised as support tools, digital technologies have been inserted to monitor and control teachers, students, and administrators, and to seek a supposed improvement in educational indices, to meet the desires of the neoliberal system that devalues teaching knowledge and practice in favor of technological solutions that transform the quality of education into metrics of effectiveness and efficiency.

This is the process of platformization of education that has expanded throughout the national territory, with the states of São Paulo (SP) and Paraná (PR) as precursors of what is most violent in the use of digital platforms combined with different AIs, especially those programmed according to the Business Intelligence (BI) process. BI transforms raw data about teachers, students, and other education professionals, provided by each of the state schools, into meaningful information to define and justify educational policies that even involve dismissing teachers and removing school principals.

According to Sczip (2025), a teacher in the Paraná state network who uses the Power Business Intelligence tool from Microsoft on their platforms,

> digital learning platforms (DLP) and school management applications [...] transform teachers into executors of repetitive and exhausting activities. [...] They feel reduced to mere appendages of digital paraphernalia, leaving them with the simple role of assigning activities, checking student access, checking grades, and all manner of tasks [...], whose sole purpose is to generate information to feed the data economy and the government's shamelessness in announcing such a model as synonymous with quality. The platforms capture data on student performance and behavior, transforming education into an environment that resembles a company, where it is continuously evaluated and classified in pursuit of goals. With this, platform capitalism not only redefines the role of the teacher, but also the very nature of education, moving it away from its democratic, critical, and transformative potentialities. (Sczip, 2025, p. 1-2)

In the state of São Paulo, digital platforms are associated with the Super BI tool, developed by the company BXBsoft do Brasil. Information recorded on the website of

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the Education Department of the municipality of Pirajú (SP) explains how Super BI integrates data generated by different applications that teachers, students, and administrators are required to use in their daily lives, classifying school units:

> [...] Super BI is a tool that centralizes important educational indicators in one place. It covers everything from student attendance to participation in large-scale assessments and engagement in learning platforms promoted by the Education Department. The indices of the Aluno Presente, Prova Paulista, Redação Paulista, Tarefa SP, Alura, Khan Academy, and Matific panels (unified under the concept of Gamified Mathematics) have specific weights. These, when added together, make up the Final Grade. Additionally, a Vulnerability Index of School Units is integrated into the Final Grade. (São Paulo, n.d.)

The damage to democratic education and the work of education professionals generated by this business and neoliberal logic of educational "innovation," centered on digital technologies that encompass AIs, was analyzed by researchers from the Public School and Democracy Group and the Public School and University Network (2025), and denounced by Katya Braghini:

> [...] strictly speaking, we are no longer talking about "education," because the Super BI implemented in public schools in São Paulo is an information generation technology with business logic, for immediate gains. Students, teachers, principals are the sources of raw data. The school is an application ground, like a laboratory for technocratic management of a corporate nature, for the monetization of information and the legitimized justification of external interventions, outsourcing, auctions, civic-military models [...] (Braghini, 2025, n.p.)

To resist this business and techno-centric logic that has shaped school education, actions are necessary at the level of macro-policy and micro-policy developed in daily school life. To this end, the solution is not to eliminate AIs and other digital technologies from educational policies and educational processes, but to consider other possibilities for articulating these non-human agents with the human agents who experience the challenges of formal education in their daily lives. Articulations delineated by the socio-technical dimension of AI and by a conception of innovation that dialogues with conceptions and foundations of school and university that contribute to the formation of critical citizens co-responsible for social justice: autonomous and authorial teachers, curricula organized according to knowledge accumulated by humanity in its diversity and different degrees of visibility, dialogical interaction between students and teachers. The last section of this article reflects on these possible articulations, focusing on the use of generative AI in the classroom, based on the concept of nurturing tradition developed by Sacristán (1999).

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Innovation Nourished by Traditions: Possibilities for Critical Insertion of generative AI in Education

The concept of "nurturing tradition" was presented by Sacristán (1999) when differentiating the reproductive cycle and the innovative cycle of educational actions. According to the author, the reproductive cycle develops educational action based on the reproduction of tradition, that is, reinforcing practices and cultures already consolidated. The innovative cycle develops new actions based on the nurturing tradition of existing practices and cultures, creates habits in line with historical and cultural processes, causing changes that accumulate culturally:

> In the innovative cycle, practice is understood as nurturing tradition, not to fix it and declare it static, but to perfect it. The perception that the reproductive cycle does not work at a given moment occurs when we realize that there are new social or cultural conditions to which educational practices do not usually respond [...] The action of education is inserted in the cycle of reproduction – innovation of objectified culture conceived as something open. [...] personal and social knowledge will show its contribution to the innovative cycle if it is a decoder and critical refiner of tradition, light in the creation of new habits, at the same time that it is a narrative that tells, giving an account to ourselves and others, of the meaning of innovative action and the recreated practice or objective culture [...]. (Sacristán, 1999, p. 77-78)

Thus, thinking about the insertion of generative AI in school and university education is a demand of contemporaneity, which should not be ignored based on a technophobic and reproductive conception of educational action. On the other hand, a technophilic adherence to instrumentalist innovation practices to "modernize" educational processes is also not the solution. Innovation that considers the socio-technical dimension of generative AI and is nourished by routines, habits, cultural norms, theories, academic and pedagogical traditions historically accumulated, not without conflicts, choices, and negotiations, is desirable.

The use of generative AI and other digital technologies in the classroom can be supported by the tradition of dialogical pedagogical practices[8] in which the teacher, in an autonomous and authorial way, mediates access to, understanding of, and confrontation with knowledge from different origins and encourages mutual learning among their students. That is, an educational action in which the human teacher creates a tension between what is known,

[8] This characterization of dialogical pedagogical practices based on teacher autonomy and authorship as tradition may seem strange to the reader. However, the neoliberal proposals for innovation in education and its platformization discussed in the previous section, which disqualify teachers, make these dialogical pedagogical practices traditions that nurture non-technical innovation.

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what is not known, what already exists and what one wishes to transform, in a contextualized way and considering values, needs, interests, and knowledge shared by the school community which, most of the time, brings together different and divergent cultures of multiple and unequal subjects among themselves.

It should not be forgotten that the very innovation that characterizes generative AI could only exist because of a tradition. That is, a massive amount of data representing knowledge accumulated by part of humanity that nourishes generative AI and enables its statistical training, as discussed in the first section of this article. A generative AI that, if used hastily, at the pace imposed by neoliberalism that privileges optimization, adaptation, and speed, transforms its users into copyists and plagiarists of depersonalized, decontextualized knowledge, with linguistic, ethno-racial, and social biases that go unnoticed.

Schools and universities are educational spaces that can contribute to building another relationship with content generated by generative AIs. To do this, they need to dialogue with changes in the semiotic-cognitive profile of their students, which are generated by the relationship between human and non-human agents, that is, by the relationship between the reader and the technological supports of language. According to Pimentel and Carvalho (2025, p. 234), "the semiotic technologies that permeate our daily lives shape our experiences and cultures, structure our society, modify our cognition, and reconfigure the ontology of the human."

Traditionally, the pedagogical practices of universities and schools based primarily on written language rely on the skills of the contemplative reader of books: one who develops thinking characterized by concentration, abstraction, and conceptualization. According to Santaella (2013, p. 269), "a book, a drawing, and a painting require from the reader the slowness of a perceptive, imaginative, and interpretive surrender in which time does not count."

This tradition is potent for nourishing pedagogical practices with readers who have been changing their semiotic-cognitive profile in relation to new generations of information and communication technologies. These are readers who do not replace one another, but coexist, according to contexts and reading supports. According to the typology presented by Santaella (2013; 2024), in addition to the contemplative reader who predominated from the 16th to the 19th century, the speed of inventions of information and communication technologies from the end of the 19th century onwards triggered the constitution of four other types of readers: the mobile reader, from the beginning of the 20th century, who develops a fragmented reading with attention distributed among images, sounds, and words in motion, disseminated by television, cinema, radio, billboards, product packaging, newspapers, and

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magazines that inhabit urban space; the immersive reader of the labyrinth of hypertexts available on electronic screens of fixed computers and wired internet, who from the last decade of the 20th century, navigates interactively through links, menus, tabs in a non-linear way, expanding or diverting paths; the ubiquitous reader of the second decade of the 21st century who accesses hypermedia texts, in continuous and fluid flow, from different offline and online places, through mobile devices connected to the internet via Wi-Fi and inhabited by social networks, apps, and platforms, almost everything in the palm of their hand; the iterative reader of the last decade who converses with generative AI, in back-and-forth movements, to obtain from it a response that satisfies them:

> The iterative process is one that progresses through successive refinements. The generative system with which the robot is equipped reacts according to what it has available depending on the stimuli it receives. The more iterative the user's demands are in relation to the result they want to obtain, the more refined the responses will be. [...] In situations of concrete use of generative AI, therefore, of situated cognition, the dialogue ceases as a function of the point at which the iteration and demands of the reader cease. (Santaella, 2024, n.p.).

Pimentel and Carvalho (2025) suggest another name for the generative AI reader: generative readers. According to them,

> The generative-conversational capacity of AI inaugurates a new relationship with knowledge, with the potential to transform our ways of learning and thinking, pointing to the emergence of a post-human epistemology, in which the knowing subject shares the process of knowledge construction with artificial agents. The new reading practices also lead us to recognize the emergence of a new cognitive reader profile: the generative reader. (Pimentel; Carvalho, 2025, p. 229)

Based on research conducted with students in computer science courses at universities in Rio de Janeiro in 2023, they identified that the generative reader is one who "converses" with generative AI for various activities with at least three purposes: researching information (informative conversational reading); asking for explanations about some content they are having difficulty understanding (didactic conversational reading); requesting a summary of the main ideas of a work (conversational meta-reading). These reading modalities are even encouraged by the platforms themselves. Regarding informative conversational reading, when the user searches on Google, since the first half of 2024, the first result presented is a text produced by Gemini AI, with an indication of the websites used to generate the summary. Regarding conversational meta-reading, when opening a text in Adobe PDF, a suggestion appears in the upper margin: “this appears to be a long document Save time by reading a summary created by the AI assistant.”

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In these reading practices, the authors identify weaknesses such as harm to interpretive competence, the risk of accessing information with errors, superficial or that reflects biases (Pimentel; Carvalho, 2025, p. 237). Weaknesses that can be circumvented if teachers contribute to the development of contemplative reading that involves time, concentration, attentive observation, reflective and questioning attitude, data verification. In short, if the new reading modality is complemented with traditional contemplative reading. In this sense, even before the popularization of ChatGPT, Santaella proposed that formal educational spaces dedicate themselves to "training a hybrid reader" (2013, p. 283). She argues that:

> [...] one type of reader does not lead to the disappearance of another. [...] Each of them contributes differently to the formation of a reader equipped with increasingly hybrid and increasingly complex cognitive skills. [...] Based on this, I have also argued that [...] the greatest challenge of education today [2013], at all levels, from elementary to graduate students, is the creation of strategies for integrating the four types of readers, contemplative, mobile, immersive, and ubiquitous, that is, strategies of complementation and not substitution of one reader for another... (Santaella, 2013, p. 281-282)

In times of generative AI, this proposal can be expanded, that is, schools and universities have the challenge of training the hybrid reader who integrates the potentialities of contemplative, mobile, immersive, ubiquitous, and generative/iterative readers.

The appropriation of generative AI must, therefore, occur through teacher mediation and pedagogical practices that favor reflection, contextualization, and problematization of the data produced, nourishing itself from the tradition of contemplation, unhurried and in-depth reading, focused and reflective, added to the attention distributed among fragments of images, sounds, and words in motion, of non-linear interaction with hypertexts and hyperlinks, of the ability to converse with generative AI through commands (prompts) that can refine responses.

In this process, the tradition of contemplative reading would not be a resistance to change or denial of it, but a nutrient for dealing critically with current information and communication technologies, so that students are encouraged to analyze, contextualize, and reflect on the information they consume and produce with the help of generative AI. They are mobilized to make time available to redo prompts to eliminate observed biases and inaccuracies, to confront generative AI responses with reliable sources.

Contextualizing means identifying authorship and situating in time and space the depersonalized and atemporal knowledge delivered by generative AI, making time available

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to investigate the links reported secondarily by some generative AIs or when it does not even do that, as is the case with ChatGPT, seeking other sources of information.

It is also necessary to instigate generative readers to distrust the information delivered by generative AIs, based on the understanding that it makes a statistical combination of data that compose a database that, however large, does not encompass all knowledge produced by humanity, considering that this knowledge is multiple, involving knowledge more or less made visible by the algorithms of big tech companies that dominate the internet, by the knowledge of science that still privileges productions from the global north. For this, they need to understand that generative AI is not a neutral "oracle," but is trained under the command of standards defined by white men from the global north, disseminated and naturalized, which impacts the responses generated, which present linguistic, social, and ethno-racial biases.

It is essential that this hybrid reading movement be conducted ethically and responsibly, which involves making explicit the use of generative AI in the production of content that will be shared, identifying which generative AI was used, when the "conversation" took place, based on which commands.

Queiroz, Franco, Rocha and Silva (2025), based on an experience developed with students in the final years of Elementary School and High School, highlight the importance of developing this educational process that they named literacy in generative AI. The researchers report that the experience showed that young people:

> [...] use generative AI to develop school work without citing that they used it and with fragile critical appropriation of the information generated by them. This becomes worrying, since the opacity of this technology makes it difficult for students to understand how information is processed, trusting what is presented to them. This can decharacterize student autonomy and authorship, induce plagiarism and reproduction of incorrect information, because AI mixes different sources, without proper reference, and is always trained to provide answers, even if they are incorrect, inaccurate or doubtful. Thus, it is emphasized that it is essential to integrate, transdisciplinarily, literacy in generative AI into the Basic Education curriculum, so that students who are forming critical thinking know how to use generative AI in a guided way, without compromising cognitive development, the capacity for analysis and reflection, authorship and creativity. A literacy that forms individuals who critically appropriate generative AI, through understanding its biases, in addition to learning about data security and privacy, and other limitations, risks and social impacts of this technology that tends to be increasingly present in our daily lives. (Queiroz; Franco; Rocha and Silva, 2025, p. 487-488).

Since the popularization of ChatGPT, many teaching and research institutions have promoted debates, drafted and published recommendations on the ethical and responsible use of generative AI in teaching and learning processes and in the production of scientific

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knowledge (Almeida et al., 2025; Sampaio; Sabbatini; Limongi, 2024, among others). A common point in the recommendations is the assumption that human supervision must be present throughout the process and must be responsible for the final production. In formal education spaces, it is essential that this supervision be conducted by the tradition of autonomous and authorial teaching that is being threatened by algorithms, in the neoliberal innovation process of education, based on platformization, as discussed in the second section of this article. Teacher mediation is paramount, as teachers guide the use of generative AI through curation, reflection, and problematization, in contrast to the uncritical or instrumental use of technology.

Thus, instead of trying to eliminate the teacher's work overload and fatigue with automated systems for diagnosing learning difficulties, tutoring, and producing slides for classes, it is necessary to value this teacher, going beyond what Faria Filho (2023) calls the "myth of training" as if it, by itself, were capable of solving the weaknesses of the educational system. It is necessary to confront the problem of concrete working conditions that sustain pedagogical practice, recognizing the centrality of aspects such as salary valorization, reduction in the number of students per class, balance between the workload dedicated to classes and planning, as well as the guarantee of institutional time and funding to enable non-standardized continuous training processes on platforms.

Pimentel and Carvalho (2025) reaffirm that teacher authorship is irreplaceable, by defending:

> the construction of co-creation processes with generative technologies, provided they are based on ethics, respect for pedagogical practice, and valorization of teaching work and human relationships. What we reject is the replacement of teachers and the class by a complete automation of the teaching process, which tends to reduce education to a technocratic and dehumanized model. There is a movement underway, driven by market logics, that seeks to automate all spheres of life, including education. In the face of this, it is urgent that we be alert and that, as a society, we reject the realization of a dehumanized education, centered on technological efficiency and disconnected from the human, relational, and critical dimension that constitutes the act of educating. (Pimentel; Carvalho, 2025, p. 268)

Between education without technology and education without teachers, innovation nourished by tradition shows us the possibility of an emancipatory, dialogical education that resists neoliberal education projects.

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Final Considerations

This theoretical-reflective essay, based on the conception of digital technology as a socio-technical artifact and on the nurturing traditions of dialogical education, autonomous and authorial human teaching, and contemplative reading, discussed the possibilities for the ethical and responsible incorporation of generative AI into educational processes developed in times of data capitalism.

To this end, schools and universities must strengthen themselves as a critical nucleus of information circulating in multiple social spaces (De Certeau, 1995) and a space for retaining the flow of hyperconnected society (Sibilia, 2012). This does not mean only analyzing the media content consumed and the content generated by generative AI, based on commands from the iterative reader. It must involve the complex socio-technical network that encompasses human and non-human agents: the functioning of digital platforms, their terms of use and privacy, how they collect sensitive and user navigation data; the social and cultural biases involved in the choices made to organize the data collected and train AIs, as well as the implications of the control of this process by big tech companies in the global north; algorithmic racism present in the content generated and decisions made by AIs; the precarious working conditions of those who handle the data that trains AIs and extract the minerals necessary for the functioning of hardware; the environmental cost of data centers; the violence of the process of controlling teaching work in relation to students through the platformization of education based on Business Intelligence (BI) incorporated by neoliberal educational policies.

In short, articulating tradition and innovation is the possible way to overcome the poles of technophobia and technophilia and promote educational processes based on awareness of the ethical, social, environmental, labor, and educational implications of the use of AI, and more specifically generative AI.

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[9] In the references, the full names of authors have been retained to highlight the presence of women in science, as suggested by researcher Débora Diniz (2013).

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