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From paper to digital platforms: contrasts and continuity in distance education

From paper to digital platforms: contrasts and continuity in distance education

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SUMMARY

This article examines the evolution of Distance Education (DE) in Brazil, from correspondence courses in the early 20th century to the integration of Artificial Intelligence (AI) into contemporary educational practices. The qualitative and documentary research analyzes legislation, institutional reports, and specialized literature, seeking to understand the historical milestones, theoretical foundations, and current challenges of the modality. Among the classic theories, Moore's transactional distance, which addresses autonomy and interaction; Peters' industrialization, which compares DE to production processes; and Holmberg's guided didactic conversation, which emphasizes empathy and communication, stand out. Contemporary theories, such as Siemens' connectivism and Vygotsky-inspired digital socioconstructivism, reinforce the importance of networks and technological mediation. Furthermore, Engeström's Activity Theory and Rogers' Diffusion of Innovations Theory help understand the adoption of educational technologies. The study reveals that distance learning has gone through cycles of resistance, regulation, and consolidation, expanding access to education but also facing dropouts, precariousness, and inequality. The incorporation of AI—in adaptive platforms, automated feedback systems, and content curation—opens up new pedagogical possibilities, but raises ethical questions related to plagiarism, privacy, and technological dependence. The study concludes that distance learning is a field in constant transformation, in which technology must serve as a critical and inclusive mediator, without replacing the humanizing role of the teacher. The future of this modality will depend on consistent public policies, ongoing teacher training, and the ethical use of digital tools, ensuring innovative and socially just education.

Keywords: Artificial Intelligence; Digital Inclusion; Pedagogical Mediation; Educational Policies; Educational Technologies.

ABSTRACT

This article explores the evolution of Distance Education (EaD) in Brazil, tracing its development from early 20th-century correspondence courses to the contemporary integration of Artificial Intelligence (AI) in educational practices. Based on a qualitative and documentary approach, the study analyzes legislation, institutional reports, and specialized literature, aiming to understand historical milestones, theoretical foundations, and current challenges in the field.
Among classical theories, Moore's theory of transactional distance emphasizes autonomy and interaction; Peters' industrialization model compares EaD to mass production processes; and Holmberg's guided didactic conversation highlights empathy and communication.
Contemporary perspectives, such as Siemens' connectivism and Vygotsky-inspired digital socioconstructivism, reinforce the role of networks and technological mediation. Furthermore, Engeström's Activity Theory and Rogers' Diffusion of Innovations help explain the adoption and adaptation of educational technologies. The analysis demonstrates that EaD in Brazil has experienced cycles of resistance, regulation, and consolidation. While it expanded access to education, challenges such as dropout, inequality, and precariousness remain. The incorporation

of AI — through adaptive platforms, automated feedback systems, and content curation — brings new pedagogical opportunities but also raises ethical concerns related to plagiarism, data privacy, and technological dependency. The study concludes that EaD is a constantly evolving field in which technology should function as a critical and inclusive mediator, without replacing the humanizing role of teachers. Its future will depend on robust public policies, continuous teacher training, and the ethical use of digital tools, ensuring innovative, equitable, and socially responsible education.

Keywords: Educational Innovation; Digital Transformation; Pedagogical Mediation; Higher Education Policy; AI in Education.

1 INTRODUCTION

Distance Education (EaD) represents one of the most significant transformations of the global educational scene. In Brazil, its history dates back to the beginning of the 20th century and is marked by cycles of resistance, regulation and consolidation. This article aims to present an evolutionary line of Brazilian distance learning, discussing its main historical milestones and legal, as well as the technological innovations that shaped this type of teaching.

Distance Education (EaD) is one of the most significant transformations of the contemporary educational scenario, representing not only a teaching modality, but a paradigm that questions traditional conceptions of space, time and pedagogical mediation. In Brazil, its historical trajectory reveals cycles of resistance, regulation and consolidation that reflect social, technological and broader epistemological (MORAN, 2007).

The integration of Artificial Intelligence (AI) into education represents one of the most impactful transformations of the 21st century. In higher education, it has been incorporated as a tool to support learning, personalize teaching, analysis predictive performance and support for institutional management (Luckin et al., 2016). However, Understanding its impact requires an analysis of the historical trajectory of the technologies that shaped access to knowledge, from medieval manuscripts to today's algorithms generative.

Throughout history, educational development has always maintained a close relationship with the technologies employed in the creation, dissemination and preservation of knowledge. Each significant technological advancement – from the invention of printing to the emergence of the Internet

computer world – fundamentally transformed the functions performed by educators, students and educational establishments, simultaneously modifying approaches established pedagogical practices. In this context, artificial intelligence does not represent a rupture isolated in the educational process, but constitutes a natural stage of this technological evolution, although with the potential to generate profound and transformative changes in the scenario educational.

2 THEORETICAL FRAMEWORK

2.1 Classical Theories of Distance Education

The theoretical field of EaD was consolidated based on three main conceptual currents that remain influential in contemporary practices: the theory of transactional distance of Moore, Peters's theory of industrialization, and Peters's theory of guided didactic conversation. Holmberg.

2.1.1 Transactional Distance Theory (Michael Moore)

Moore (1993) developed the concept of transactional distance as a central element for understand distance education. According to his theory, distance in education is not merely geographical, but pedagogical and communicational, determined by three fundamental variables: structure, dialogue and learner autonomy.

Structure refers to the degree of flexibility or rigidity of the educational program, including objectives, content, assessment methods, and instructional strategies. Dialogue is characterized through two-way interaction between teacher and student, mediated by communication technologies. Autonomy relates to the student's ability to determine their goals, resources and learning methods.

The concept of autonomy permeates the fundamental notion of work in didactic conversation, as Distance learning is an exercise in independence, which involves planning and organizing time and also the development of individual study. This perspective is particularly relevant in the contemporary context, where AI technologies can both augment and restrict student autonomy, depending on its pedagogical implementation.

2.1.2 Industrialization Theory (Otto Peters)

Peters (1983) proposed an analysis of distance education based on industrial principles, characterizing it as a rationalized, standardized and mass-produced educational production process. The Industrialization Theory was developed by Otto Peters who made a comparison between distance learning and industrial processes, identifying elements such as division of labor, mechanization, mass production, economies of scale and quality control.

This perspective, although criticized for its technicist emphasis, offers relevant insights for understand the scalability of distance learning and the contemporary challenges of personalization via AI. The tension between industrial standardization and algorithmic individualization represents one of the central paradoxes of contemporary digital education.

2.1.3 Theory of Guided Didactic Conversation (Börje Holmberg)

Holmberg (1985) based his theory on didactic communication between teacher and student, emphasizing the conversational and empathetic nature of the distance learning relationship. His theory states that distance learning favors student motivation, promotes satisfaction in learning and produces the study relevant to the individual learner and their needs, creating a feeling of relationship between the learner and the distance learning institution.

Holmberg's theory anticipates central issues in AI-mediated education, especially regarding the personalization of learning and the maintenance of the human dimension in automated processes.

2.2 Contemporary Theories: Digital Connectivism and Socioconstructivism

2.2.1 Connectivism (George Siemens)

Connectivism, proposed by Siemens (2005), emerges as a response to the limitations of theories traditional learning methods in the digital age. This theory holds that knowledge resides in networks of connections, and learning occurs through the ability to navigate and create these connections.

Central tenets of connectivism include: diversity of opinion as a source of knowledge; learning as a process of connecting specialized nodes; the ability to synthesis and pattern recognition; and the constant updating of knowledge as an activity central to learning.

In the context of educational AI, connectivism offers a theoretical lens for understanding such as recommendation algorithms, content curation systems and learning networks collaborative redefine training processes.

2.2.2 Digital Socioconstructivism

Based on Vygotsky's (1978) contributions on the zone of development proximal and the social mediation of learning, digital socioconstructivism examines how educational technologies can facilitate the collaborative construction of knowledge. Vygotskian theory of semiotic mediation finds new relevance in the age of AI, where algorithms act as cultural mediators, influencing not only what we learn, but how we collectively construct meaning. The zone of proximal development can be reinterpreted as a space for interaction between human and artificial intelligence, where emerge new learning possibilities.

2.3 Theories of Technological Mediation

2.3.1 Activity Theory (Engeström)

Activity Theory, developed by Engeström (1987) based on the work of Leontiev, offers a framework for analyzing tool-mediated human activity systems. In digital education, this theory allows us to examine how educational technologies work as mediating artifacts that transform both the subject and the object of the activity educational.

Engeström's model is particularly relevant for analyzing systemic contradictions emerging in the integration of educational AI, including tensions between educational objectives humanistic and algorithmic optimization logics.

2.3.2 Diffusion of Innovations Theory (Rogers)

Rogers (2003) offers a model for understanding how technological innovations are adopted in social systems. In education, this theory helps explain patterns of resistance and acceptance of educational technologies, from the first correspondence courses to platforms contemporary AI.

3 METHODOLOGY

This research adopts an exploratory qualitative approach, using documentary analysis historical as the main methodological strategy. The empirical corpus covers milestones regulatory, educational policies, institutional reports and published specialized literature between 1904 and 2025.

Data collection followed criteria of thematic relevance, historical relevance and documentary availability. Decrees, ordinances, INEP reports were analyzed, UNESCO documents and academic productions indexed in scientific databases.

Data analysis was based on the principles of content analysis (BARDIN, 2011), organizing information into emerging thematic categories: historical milestones, theoretical basis, technological transformations, contemporary challenges and perspectives future.

4 THE ANALOG ERA: MECHANICAL REPRODUCTIONS AND EDUCATION PRE-DIGITAL DISTANCE

Before digitalization, access to knowledge was profoundly limited by reproduction technology. In ancient times, manuscripts were copied manually by scribes, which restricted knowledge to the literate elites. With the invention of the printing press by Gutenberg in 1440, knowledge began to democratize, but still under the control of publishers and institutions (Eisenstein, 1979).

The first official record of distance learning in Brazil dates back to **1904,** with typing courses and shorthand offered by correspondence, widely publicized in the newspapers of the time. These courses aimed at professionalization and reached distant regions through Mail.

With the growth of the media, radio began to be used for educational. In **1939,** the University of the Air was created , a project that aimed to teach literacy young people and adults, especially in rural areas. In **1967,** the **University of Brasília (UnB) – Minerva Project,** in partnership with the Padre Anchieta Foundation, using community radio stations as a means of broadcasting classes.

In the 20th century, technologies such as the **Xerox machine** (launched commercially in 1959) made possible the rapid reproduction of teaching materials, representing a leap in **democratization of content.** Teachers could distribute texts in class, and students could share study materials more easily – even if they still depend on physical presence or postal services for access.

A notable example in Brazil was the **Instituto Universal Brasileiro (IUB),** founded in 1941. Using the Post Office, the IUB offered **distance education by correspondence,** reaching millions of Brazilians in remote areas or with restricted access to education formal. Handouts were sent by mail and questions were resolved by letter or telephone, representing a primitive, yet effective, form of technology-mediated teaching (Gomes, 2011).

During the 18th to 20th centuries, encyclopedias and textbooks dominated as tools to systematize and transmit knowledge. In Brazil, the **Barsa Encyclopedia,** launched in 1964, became a landmark in family education. Its various volumes covered scientific, historical and cultural information, often used in school research and academic works.

However, access to Barsa was limited to families with greater purchasing power — the investment could reach the value of a car of the time. Knowledge, therefore, remained **"bottled up",** static and with restricted access. New editions were only released after years, and there were no continuous updates as there are today in digital environments.

In the 1970s , Brazil witnessed an important innovation: the use of television as a pedagogical resource. In **1971,** the Roberto Marinho Foundation created **Telecurso 2º Grau,** which would become consolidated in the following decades as one of the largest distance learning initiatives aimed at basic education. The content was broadcast on open TV, allowing millions of Brazilians had access to schooling.

Despite the recurring use of distance learning in various initiatives, it was only in the **1990s** that Brazil began to structure the modality in legal terms. In **1996,** the enactment of the **Law of Guidelines and Bases of National Education (LDB – Law No. 9,394/1996)** represented a milestone by formally recognizing distance learning as a valid teaching modality at all levels.

In addition, **Decree No. 2,494/1998** regulated the provision of distance learning in higher education, allowing universities, university centers and colleges to start offering courses

undergraduate and postgraduate courses in this modality, provided they are authorized by the Ministry of Education. cation (MEC).

The turn of the millennium was marked by the increasing digitalization of education. With the popularization of the internet in the early 2000s, institutions began to adopt **Environments Virtual Learning Environments (VLEs),** such as Moodle and Blackboard, allowing interaction more robust between students and teachers, even remotely.

In **2005,** Decree **No. 5,622** updated the distance learning regulations, replacing the 1998 regulations. This new legal framework expanded the scope of the modality, allowing in-person activities in support centers and defining clear rules for evaluation, certification and infrastructure technological.

Currently, EaD is undergoing a new transformation, with the incorporation of **intelligence artificial intelligence (AI)** and **adaptive learning** in educational processes. Tools such as ChatGPT , **automated tutoring platforms, personalized assessments** and **performance dashboards** transform the role of teacher and student.

In addition, hybrid models regulated by **MEC Ordinance No. 2,117/2019 emerge,** which authorizes up to **40% of the workload of in-person courses** to be held at distance learning. More recently, discussions on **MEC Ordinance No. 378/2025** put the future of distance learning flexibility in check, requiring **a minimum of 50% in-person attendance** for various undergraduate courses.

The turn of the 20th century to the 21st brought the **digitalization of knowledge.** The personal computer made it possible to create, edit, and store texts digitally. The internet, in turn, especially with the emergence of search engines like Google in 1998 – radically transformed academic research. With just a few clicks, it became possible to access databases, articles scientific, digital books and discussion forums.

The emergence of online course platforms (such as MIT OpenCourseWare in 2001, Khan Academy in 2006 and MOOCs in 2012) further expanded the reach of education, with free or low-cost content. Search engines and digital libraries have become to replace physical encyclopedias, offering interactivity and constant updating of content.

From the 2010s onwards, with the advancement of techniques such as **machine learning** and **deep learning,** AI has become a protagonist in higher education. Software capable of personalize learning paths, predict dropout, and provide automated feedback have been implemented in several educational institutions around the world (Holmes et al., 2019).

The use of AI on platforms such as ChatGPT, Khanmigo (Khan Academy), Duolingo Max and Coursera Plus exemplifies the **algorithmic transformation of the educational process.** These tools already act as digital tutors, explaining content, solving exercises and adapting the level of difficulty to the individual needs of the student (UNESCO, 2021).

Furthermore, the concept of **educational Big Data** has gained momentum. Today, universities and research centers analyze performance, engagement and academic trajectory data to guide pedagogical and administrative decisions (Siemens & Long, 2011).

5. THE URGENCY OF A NEW EDUCATIONAL PARADIGM

The arrival of AI generates not only enthusiasm, but also ethical and pedagogical challenges. The issue of automated plagiarism, the misuse of generative tools and the possibility replacement of human activities require **new institutional policies, review of assessment methodologies** and **continuing teacher training.**

Additionally, legislation such as the **General Data Protection Law (LGPD - Law No. 13.709/2018)** in Brazil and the **General Data Protection Regulation (GDPR)** in the European Union European Union imposes restrictions on the collection and use of educational data, requiring that solutions AI technologies are transparent, safe, and accountable.

For much of the 20th century, access to formal education was a challenge for large portions of the Brazilian population. The **Brazilian Universal Institute (IUB),** founded in 1941, stood out as one of the first major **distance education (EaD)** initiatives in country. Using the Post Office as its main means of communication, the IUB offered courses technical and professional training by correspondence, with printed materials sent directly to students' homes (Gomes, 2011). The model offered the possibility of studying

without the need to attend in-person institutions — a remarkable innovation for its era.

However, the method had significant limitations:

- Feedback **between student and teacher** took days or even weeks, making the interaction asynchronous and slow;
- The content was **static and standardized:** all students received the same handouts, no adaptations for different learning styles;
- **Content updates depended on physical reprints,** causing delays and costs logistics;
- The **scale was limited by the postal infrastructure,** restricting the immediate reach day of the proposal.

Despite these limitations, the IUB was instrumental in demonstrating that education could, yes, go beyond the physical boundaries of the classroom, influencing future generations of educational technologies.

Comparison between the IUB methodology and contemporary educational technologies evidences a radical paradigm shift. With the arrival of the **internet and platforms digital** in the late 1990s and early 2000s, an acceleration process began in access to information, interactivity and personalization of teaching.

Today, **artificial intelligence (AI)** enables:

- **Instant feedback:** AI-powered platforms answer questions in real time, correcting gem exercises and adapt explanations according to the student's performance.
- **Dynamic and interactive content:** Printed handouts gave way to videos, simulations, res, gamification and virtual learning environments that can be updated con- continuously.
- **High personalization:** Algorithms adapt learning paths based on profile individual student, overcoming the standardized logic of printed courses.

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- **Global and scalable access:** The geographical barrier has been virtually eliminated. Platform-educational programs reach millions of users simultaneously, with operating costs onals much smaller than those of postal logistics.

The contrast is remarkable: if before exchanging a letter meant days of waiting, today it doubt can be resolved in seconds by an AI-powered virtual assistant. What used to was limited by envelopes and stamps, now it expands through high-speed networks and cloud servers.

6. "CHEATS" EVOLVE: FROM MANUAL CHEATING TO ALGORITHMIC ASSISTANCE

The search for ways to facilitate academic performance — not always through ethical means — follows the history of education. The so-called traditional **"cheat sheets"** used by students in assessments, consisted of hidden notes, signals between colleagues or furtive consultations to physical materials. Such strategies, while ingenious, were low-scale and high-risk. In addition, Furthermore, they contributed little to real learning, as the focus was on specific memorization, not in conceptual understanding.

With the emergence of the **internet and computers,** this dynamic has changed. Students before they became:

- Perform **quick searches** during online activities;
- Use **platforms for sharing answers** and work;
- Resorting to **"copy and paste",** generating frequent cases of plagiarism.

The most recent — and disruptive — evolution is the use of **generative artificial intelligence** as a support tool (or shortcut) in studies. Models like **ChatGPT** are capable to write academic texts, solve complex problems, summarize content and even simulate arguments. With this, a new challenge arises: **distinguishing genuinely knowledge acquired from that generated by automated systems.**

AI, when misused, can become a sophisticated and virtually ineffective "glue." undetectable. On the other hand, when well guided, it acts as an **intelligent tutor,** promoting active learning, personalized explanations and student autonomy.

Considering Iser's (1996) reflections on reception theory, adapted to the context Brazilian educational system by theorists such as Zilberman (2003), we can understand that the learning process requires an active reader-student, capable of filling in the "gaps" textual with their own experience and prior knowledge. When artificial intelligence completely assumes this interpretative and creative function, the student loses the opportunity to develop their hermeneutic skills. Zilberman (2009), in his studies on literature and education, emphasizes that true learning occurs in dialogical interaction between the subject and the text, a process that is compromised when mediated exclusively by algorithms that eliminate the need for critical reflection.

Rojo (2012), an important Brazilian researcher in literacy studies, proposes that digital age demands new multiliteracies, including the ability to critically navigate between different sources and technologies. From this perspective, the ethical use of AI in education should not replace the student's cognitive process, but expand their possibilities of access and analysis of information. Rojo (2013) argues that critical digital literacy involves understanding not not only how to use technological tools, but also how to question their production, its algorithms and its limitations. Thus, the formation of competent student readers in the era of AI requires the development of an investigative stance that allows us to distinguish between the knowledge constructed collaboratively with technology and that merely reproduced for her.

7. RETHINKING ASSESSMENT AND ACADEMIC ETHICS IN THE AGE OF AI

Faced with this scenario, educators and institutions need to rethink their **teaching methods. assessment** and **academic integrity criteria.** Traditional tests — centered on memorization of content — become less and less effective. In their place, they gain space proposals based on:

- **Resolution of open** and non-trivial problems;

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- **Authorial projects,** focusing on creativity and originality;
- **Practical application of knowledge** in simulated or real contexts;
- **Supervised collaborative work,** valuing the process as much as the result.
  tado.

More than preventing the use of AI, the challenge is **to teach students how to use it ethically.** **and critical.** AI should not replace thinking, but augment it; it should not be a tool of fraud, but an **instrument for constructing knowledge.**

Freire's (1996) perspective on problem-posing education offers a path to understand this pedagogical transformation. For the educator from Pernambuco, the process Education must start from the problematization of reality, stimulating curiosity epistemological and the development of critical thinking. In this sense, the ethical incorporation of artificial intelligence in educational practices can represent an opportunity for materialize Freirean principles, as long as it is used as a mediator of education dialogic and transformative. Freire (2011) already warned about the dangers of "banking education", in which knowledge is passively deposited in students. The uncritical use of AI can intensify this trend, transforming algorithms into new "depositories" of ready information. On the other hand, when used critically and reflectively, AI can enhance the collective construction of knowledge, allowing students and educators to explore new possibilities for research and creation, always maintaining the humanizing dimension of educational process as the center of pedagogical actions.

For artificial intelligence to be an ally and not an obstacle to higher education, its integration must be guided by pedagogical, ethical and inclusive principles. Among the most promising applications, the following stand out:

1. **Personalizing learning:** Intelligent tutoring systems adjust content according to the student's performance, pace and style, overcoming the "one size fits all" model of teaching materials.
2. **Automated feedback and assessment:** AI can correct objective assessments, generate personalized comments and identify specific difficulties, freeing up time for that teachers focus on qualitative assessments.

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3. **Content curation:** Algorithms can recommend relevant educational resources.
   advantages — articles, videos, courses — based on interests and learning gaps.
   of each student.
4. **Automation of administrative tasks:** Virtual assistants and automated AI systems
   help with scheduling, class management and answering frequently asked questions,
   optimizing teachers' time.
5. **Immersive environments and simulations:** AI enables the use of complex simulations and
   augmented reality environments, especially useful in areas such as medicine, engineering,
   niaria, applied sciences and design.

Masetto's (2003) contribution to the understanding of pedagogical mediation in teaching higher education offers a solid theoretical basis for thinking about the integration of AI into educational practices university students. The Brazilian educator emphasizes that pedagogical mediation goes beyond simple transmission of information, involving the creation of conditions so that the student develop intellectual autonomy and the ability to learn continuously. From this perspective, artificial intelligence must be conceived as a mediation tool that enhances the interaction between teachers, students and knowledge, without replacing the fundamental role of the teacher as a critical mediator of the educational process. Masetto (2012) also highlights the importance of the pedagogical competence of the university professor in the digital age, arguing that technical mastery must always be linked to solid pedagogical training.

Thus, the effective implementation of AI in higher education demands not only investment in technology, but mainly in the continuing education of teachers capable of using these tools in a reflective, critical and humanizing way, ensuring that development technological is always at the service of the integral education of students.

8.CONTINUITY, RUPTURE AND RESPONSIBILITY

The journey of education, from paper to algorithm, shows a trajectory marked by continuities and ruptures. What began with letters and handouts now reaches the intelligence

artificial, and although the means change, the end remains: **to expand access to knowledge, develop critical thinking and form autonomous citizens.**

The role of educational institutions is to ensure that these tools are **used in a ethical, effective and inclusive manner** — not as substitutes for the educational process, but as intelligent extensions of thinking, learning and teaching.

For decades, human knowledge was transmitted through analog resources, printed and physical. Textbooks, dictionaries, and encyclopedias were pillars of learning, and communication with educational institutions was done by letters or telephone calls. The Encyclopedia Barsa, launched in Brazil in 1964, represented a milestone in the dissemination of knowledge in Brazilian residences, considered by many to be the "Google of the time".

Teaching was centered on the figure of the teacher, with expository methodologies and assessments standardized. Little was discussed about personalizing learning, and access to knowledge was limited by time, space and financial resources.

From the 1990s onwards, with the popularization of personal computers and the internet, a profound transformation began in access to information and in the way of teaching and learning. der. In Brazil, the internet reached the general public in 1995, and the first experiences of Edu- Distance Education (EaD) emerged around 1998. The MEC regulated EaD through the Decree No. 2,494/1998, consolidating it over the years with Decree No. 5,622/2005. digitalization has promoted greater student autonomy and new virtual learning environments. zagem, such as Moodle and Blackboard.

The arrival of personal computers and, especially, the internet, transformed radically change the way knowledge is produced, accessed and shared. Platforms like Google, Wikipedia, and YouTube have decentralized knowledge, allowing any individual with access to the network could learn autonomously.

Higher education institutions have started to adopt Virtual Learning Environments (AVA), such as Moodle and Blackboard, in addition to promoting distance learning courses (EaD). Mediation technology began to offer more accessible and flexible educational experiences, preparing the terrain for digital culture in education.

In the 21st century, AI is gaining momentum in the education sector, personalizing learning paths learning, automating corrections and predicting behaviors. UNESCO highlights its

role in inclusion and administrative optimization. Tools like Khanmigo (Khan Academy), Coursera and edX platforms, and initiatives at Brazilian universities such as UFPE and PUC-Rio exemplify this revolution.

From the 2010s onwards, Artificial Intelligence (AI) began to occupy a space significant in educational practices. With the launch of ChatGPT in 2022 and the expansion tools like Khanmigo (Khan Academy) and smart assistants on platforms like Coursera, a new era of educational interaction is emerging: mediated by algorithms, adaptive learning and automatic content generation.

Generative AI has the potential to personalize learning paths, correct automatically evaluate, assist in textual production, optimize teachers' time and tutors and provide real-time feedback. This movement leads to the redefinition of the roles of teacher and student: the teacher becomes a mentor and content curator, while the student is invited to be more autonomous, critical and protagonist of your learning journey.

9. RISKS, ETHICS AND CHALLENGES OF AI IN EDUCATION

The use of AI also brings ethical challenges, such as personal data protection (LGPD), risks technological dependency, algorithmic biases, excessive standardization, and inequality of access. It is vital to ensure transparency, equity, and inclusion for technology to benefit all.

Despite the benefits, incorporating AI into education also raises questions sensitive. The main challenges include:

- **Plagiarism and misuse:** Students can use AI to circumvent evaluation processes.
- **Disinformation:** Inaccurate responses can be generated without critical filters.
- **Privacy:** The use of personal data to train algorithms requires care and compliance. compliance with legislation, such as the LGPD in Brazil (Law No. 13,709/2018).
- **Digital inequality:** Not everyone has equal access to technologies, which can amplify further widen educational disparities.

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It is essential that institutions adopt clear policies on the ethical use of AI, empower teachers and students, respect data privacy and promote equity in access to technologies.

Kenski's (2003) analysis of technologies and teaching offers a critical perspective essential to understanding the ethical challenges of AI in Brazilian education. The researcher emphasizes that the incorporation of educational technologies should not be seen only as a technical issue, but as a process that involves pedagogical, social and deep cultural aspects. Kenski (2012) warns of the risk that fascination with novelty technological obscure fundamental issues related to the democratization of education and critical training of students. In this sense, the implementation of AI in educational institutions higher education must consider not only its technical efficiency, but also its potential to reproduce or amplify inequalities already existing in the Brazilian educational system. The author argues that any technological innovation in education must be accompanied by critical reflection on its social impacts, ensuring that the use of AI effectively contributes for the construction of a more just, inclusive education committed to training integral of citizens, especially in a country marked by profound inequalities socioeconomic conditions like Brazil.

10. THE FUTURE OF LEARNING WITH AI

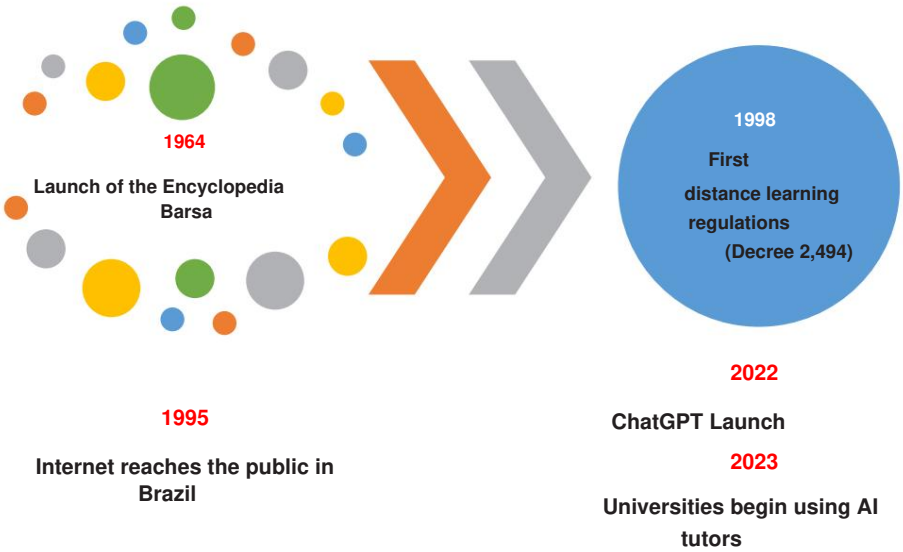
With the advancement of generative AI, such as ChatGPT, teaching will become increasingly personalized, hybrid, and data-driven. Data-driven learning (Learning Analytics) will enable more accurate educational decisions. Still, the role of the teacher will continue to be central as a mediator, mentor and ethical agent in the training of students.

The future points to hybrid and increasingly personalized teaching models. Artificial Intelligence will be able to diagnose learning gaps in real time, reconfigure curricula according to individual student performance, integrate resources such as augmented reality, simulations and gamification, in addition to automating administrative routines and academics.

However, it is essential to reinforce that AI is a tool — it does not replace the dimension human aspect of education. Empathy, mediation, ethics, and critical thinking continue to be skills fundamental for educators and managers.

Moran's (2015) view on hybrid education and active methodologies offers a fundamental perspective for understanding the future of AI-mediated learning. Brazilian educator argues that true educational innovation does not reside solely in incorporation of technologies, but in the ability to create more learning experiences meaningful, collaborative, and connected to the students' reality. Moran (2018) emphasizes that the educational model of the future will be characterized by convergence between spaces physical and digital, active and passive methodologies, individual and collective learning, always keeping the teacher as curator and facilitator of the educational process. From this perspective, the AI must be integrated in order to enhance the personalization of teaching without losing sight of the importance of human interaction and the collective construction of knowledge. The author also alerts to the need for educational institutions to develop a culture of pedagogical innovation that goes beyond the simple adoption of technological tools, prioritizing the comprehensive education of students and preparing them to be protagonists in a world in constant transformation, where the ability to continually learn becomes more important than mastering specific content.

Figure 1: Education and Technology Timeline



Source: Adapted by the authors

5 CONCLUSION

Distance learning in Brazil has gone through a long trajectory of legitimization and innovation. From a model by correspondence in the early 20th century to a robust system supported by intelligence artificial in the 21st century, the modality demonstrates flexibility, inclusion and potential for social transformation.

However, challenges persist: student dropout, precarious education, resistance institutional and regulatory frameworks are constantly changing. Therefore, it is imperative that policies public institutions and professionals are prepared for an increasingly dynamic and technological.

The journey of education, from encyclopedias to Artificial Intelligence algorithms, demonstrates a constant evolution in the way knowledge is transmitted and acquired. AI, with its ability to personalize and analyze data, offers a promising horizon for higher education, allowing institutions to adapt to individual needs of students and prepare them for an ever-changing future. However, the success of this integration will depend on a careful, ethical and human-centered approach, ensuring that technology serves as a catalyst for more effective, equitable and engaging.

The transition from paper to digital, and now to artificial intelligence, is not just a change of format, but a fundamental redefinition of how we interact with the knowledge. If before the limitation was physical access and the ability to reproduce, today the challenge lies in navigating and extracting meaning from an ocean of information. The evolution of research and access to knowledge is a testament to the constant human quest for understand and innovate.

REFERENCES

BARDIN, Laurence. *Content Analysis.* São Paulo: Editions 70, 2011.

BARSA ENCYCLOPAEDIA. *Barsa Encyclopedia: original edition.* São Paulo: Barsa, 1964.

BRAZIL. Decree No. 2,494 of February 10, 1998. Regulates art. 80 of Law No. 9,394/96. *Official Gazette of the Union,* Brasília, February 11, 1998.

BRAZIL. Decree No. 5,622, of December 19, 2005. Regulates art. 80 of Law No. 9,394/96. *Official Gazette of the Union,* Brasília, December 20, 2005.

BRAZIL. Law No. 9,394, of December 20, 1996. Establishes the guidelines and bases of education national. *Official Gazette of the Union,* Brasília, December 23, 1996.

BRAZIL. Law No. 13,709, of August 14, 2018. General Personal Data Protection Law (LGPD). *Official Gazette of the Union,* Brasília, August 15, 2018.

BRAZIL. MEC Ordinance No. 2,117, of December 6, 2019. Provides for the supply of cargo Distance learning hours in in-person courses. *Official Gazette of the Union,* Brasília, December 9, 2019.

BRAZIL. MEC Ordinance No. 668, of June 14, 2024. Repeals Ordinance No. 2,117/2019 and establishes new parameters for in-person attendance. *Official Gazette of the Union,* Brasília, June 17. 2024.

CHOPPIN, Alain. L'histoire des manuels scolaires: recent research, new problems velles. *Histoire de l'éducation,* n. 101, p. 59–84, 2004.

EISENSTEIN, Elizabeth. *The Press Revolution in Modern Times: The Press as an Agent of Cultural Change.* São Paulo: Ática, 1979.

ENGESTRÖM, Yrjö. *Learning by expanding: an activity-theoretical approach to development such research.* Helsinki: Orienta-Konsultit, 1987.

FREIRE, Paulo. *Education as a practice of freedom*. 36th ed. Rio de Janeiro: Paz e Terra, 2011.

FREIRE, Paulo. *Pedagogy of autonomy: knowledge necessary for educational practice.* São Paulo: Peace and Land, 1996.

GOMES, Laurindo Leal. *Distance education in Brazil: new times, old challenges.* Brasília: Liber Book, 2011.

HOLMBERG, Börje. *Theory and practice of distance education.* 2nd ed. London: Routledge, 1985.

HOLMES, Wayne et al. *Artificial intelligence in education: promises and implications for teaching and learning.* Paris: UNESCO, 2019.

INEP. *Higher Education Census 2022: results.* National Institute of Studies and Research sas Educacionais Anísio Teixeira. Available at: https://www.gov.br/inep/. Accessed on: August 5. 2025.

ISER, Wolfgang. *The Act of Reading: A Theory of Aesthetic Effect.* 2nd ed. São Paulo: 34, 1996.

KENSKI, Vani Moreira. *Education and technologies: the new rhythm of information.* Campinas: Papirus, 2003.

KENSKI, Vani Moreira. *Technologies and in-person and distance learning.* 2nd ed. Campinas: Papirus, 2012.

KHAN ACADEMY. *Khanmigo: the AI guide for students and teachers.* 2023. Available at: https://www.khanacademy.org/khan-labs. Accessed on: August 1, 2025.

LITTO, Fredric M.; FORMIGA, Marcos (orgs.). *Distance education: the state of the art .* Paulo: Pearson Education, 2009.

LUCKIN, Rosemary et al. *Intelligence unleashed: an argument for AI in education.* London: Pearson, 2016.

MASETTO, Marcos Tarciso. *Pedagogical competence of the university professor.* 2nd ed. São Paulo Paulo: Summus, 2012.

MASETTO, Marcos Tarciso. *University Teaching.* São Paulo: Papirus, 2003.

MORAN, José Manuel. *The education we want: new challenges and how to get there.* Campiin: Papirus, 2007.

MORAN, José Manuel. Hybrid education: a key concept for the transformation of education tion. In: BACICH, Lilian; TANZI NETO, Achiles F.; TREVISANI, Fernando M. *Education hybrid: personalization and technology in education.* Porto Alegre: Penso, 2018.

MORAN, José Manuel. *Active methodologies for innovative education: an approach theoretical-practical.* Campinas: Papirus, 2015.

MOORE, Michael G. Theory of transactional distance. In: KEEGAN, Desmond (ed.). *Theoretical principles of distance education.* London: Routledge, 1993. p. 22–38.

OECD. *AI in education: opportunities and challenges.* Paris: OECD, 2023.

OPENAI. *ChatGPT.* 2022. Available at: https://openai.com/blog/chatgpt. Accessed on: August 5. 2025.

PETERS, Otto. *Distance education: a systems view of online learning.* 2nd ed. Belmont: Wadsworth, 1983.

ROGERS, Everett M. *Diffusion of innovations.* 5. ed. New York: Free Press, 2003.

ROJO, Roxane. *School and digital literacies: new reading and writing practices.* São Paulo: Parable, 2013.

ROJO, Roxane. *Multiple literacies, school and social inclusion.* São Paulo: Parábola, 2012.

SIEMENS, George. Connectivism: a learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning,* v. 2, no. 1, p. 3–10, 2005.

SIEMENS, George; Long, Phil. Penetrating the fog: analytics in learning and education. *EDUCAUSE Review,* vol. 46, no. 5, p. 30–40, 2011.

UNESCO. *Artificial intelligence and education: guidance for policy-makers.* Paris: UNESCO, 2021.

VYGOTSKY, Lev S. *The social formation of the mind: the development of psychological processes superior logics.* São Paulo: Martins Fontes, 1978.

ZILBERMAN, Regina. *Reading as learning.* 3rd ed. Porto Alegre: Mercado Aberto, 2003.

ZILBERMAN, Regina. *Reading and reader formation: a historical-cultural perspective .* Paulo: Context, 2009.