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Digital technologies in the classroom: benefits and challenges

Tecnologias digitais na sala de aula: benefícios e desafios

Tecnologías digitales en el aula: beneficios y desafíos

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Abstract: This study analyzes the benefits and challenges of using digital technologies in the classroom, considering their contributions to learning, inclusion, accessibility, and the development of digital competencies. The presence of virtual platforms, applications, videos, simulators, games, and assessment tools broadens the ways of teaching, learning, producing knowledge, and monitoring student performance. However, the incorporation of these resources alone does not guarantee educational improvement, since outcomes depend on pedagogical intentionality, teacher mediation, school infrastructure, and access conditions. This research is characterized as bibliographic, qualitative, and exploratory, based on scientific articles, books, institutional reports, and official documents published between 2021 and 2025. The analysis indicates that technologies can foster participation, autonomy, collaboration, and the personalization of teaching, but they also present challenges related to the digital divide, teacher education, privacy, distraction, and information quality. It is concluded that their integration should occur in a planned, critical, inclusive, and balanced manner, preserving human interactions and the educational aims of schooling.
Keywords: learning; digital education; teacher education; inclusion; educational technologies.

Resumo: Este trabalho analisa os benefícios e os desafios da utilização das tecnologias digitais na sala de aula, considerando suas contribuições para a aprendizagem, a inclusão, a acessibilidade e o desenvolvimento de competências digitais. A presença de plataformas virtuais, aplicativos, vídeos, simuladores, jogos e ferramentas de avaliação amplia as formas de ensinar, aprender, produzir conhecimentos e acompanhar o desempenho dos estudantes. Entretanto, a incorporação desses recursos não garante, isoladamente, melhorias educacionais, pois seus resultados dependem da intencionalidade pedagógica, da mediação docente, da infraestrutura escolar e das condições de acesso. A pesquisa caracteriza-se como bibliográfica, qualitativa e exploratória, fundamentada em artigos científicos, livros, relatórios institucionais e documentos oficiais publicados entre 2021 e 2025. A análise indica que as tecnologias podem favorecer a participação, a autonomia, a colaboração e a personalização do ensino, mas também apresentam desafios relacionados à desigualdade digital, à formação docente, à privacidade, à distração e à qualidade das informações. Conclui-se que sua integração deve ocorrer de modo planejado, crítico, inclusivo e equilibrado, preservando as interações humanas e os objetivos formativos da educação.
Palavras-chave: aprendizagem; educação digital; formação docente; inclusão; tecnologias educacionais.

Resumen: Este trabajo analiza los beneficios y los desafíos del uso de las tecnologías digitales en el aula, considerando sus contribuciones al aprendizaje, la inclusión, la accesibilidad y el desarrollo de competencias digitales. La presencia de plataformas virtuales, aplicaciones, videos, simuladores, juegos y herramientas de evaluación amplía las formas de enseñar, aprender, producir conocimientos y acompañar el desempeño de los estudiantes. Sin embargo, la incorporación de estos recursos no garantiza, por sí sola, mejoras educativas, pues sus resultados dependen de la intencionalidad pedagógica, la mediación docente, la infraestructura escolar y las condiciones de acceso. La investigación se caracteriza como bibliográfica,

cualitativa y exploratoria, fundamentada en artículos científicos, libros, informes institucionales y documentos oficiales publicados entre 2021 y 2025. El análisis indica que las tecnologías pueden favorecer la participación, la autonomía, la colaboración y la personalización de la enseñanza, pero también presentan desafíos relacionados con la desigualdad digital, la formación docente, la privacidad, la distracción y la calidad de la información. Se concluye que su integración debe realizarse de manera planificada, crítica, inclusiva y equilibrada, preservando las interacciones humanas y los objetivos formativos de la educación.
Palabras clave: aprendizaje; educación digital; formación docente; inclusión; tecnologías educativas.

1 Introduction

Digital technologies have come to occupy different areas of everyday life and have changed the ways information is communicated, produced, circulated, and stored. In education, these changes can be observed in the use of virtual environments, applications, videos, presentations, games, digital libraries, simulators, and collaborative tools. The presence of these resources has brought schools closer to modes of communication and representation that are already part of students' social experiences, but it has also increased the responsibility of educational institutions to provide guidance on their conscious use. Brasil (2023a) recognizes digital education as a necessary dimension of citizenship education, while Santos et al. (2022) emphasize that access to information must be accompanied by the development of the ability to select, evaluate, and use content responsibly.

The incorporation of digital resources can make activities more diverse and broaden the possibilities for representing content. A subject that appears abstract in an exclusively oral presentation may be understood more clearly when associated with images, animations, interactive maps, videos, or simulations. Dehaene (2022) explains that learning depends on attention, active engagement, error correction, and knowledge consolidation. UNESCO (2023), however, warns that technology must remain subordinate to educational purposes. This means that mere contact with a screen does not produce learning, since students need to interpret information, relate it to prior knowledge, and understand its application.

The expansion of connectivity in Brazilian schools represents progress, but it does not eliminate the differences among school systems, regions, and social groups. The Comitê Gestor da Internet no Brasil (2024) points to inequalities in computer availability, connection quality, and the spaces designated for the pedagogical use of the internet. At the same time, Brasil (2023b) establishes measures to promote meaningful connectivity in public institutions by integrating infrastructure, equipment, and educational use. These data demonstrate that digital inclusion cannot be measured solely by the presence of an internet signal. It also depends on

suitable devices, maintenance, technical support, professional training, and genuine opportunities for student participation.

The choice of this topic is justified by the need to understand the conditions that transform a technological tool into a pedagogical resource. Although schools and teachers increasingly use platforms, applications, and digital materials, practices are still often limited to replacing the board with presentations or printed exercises with electronic forms. In addition, concerns arise regarding distraction, misinformation, plagiarism, exposure of personal data, and unequal access. Santos and Sá (2021) associate pedagogical appropriation with teachers' critical education, while the Comitê Gestor da Internet no Brasil (2025) highlights the need to monitor how resources are actually used. In view of this, the following question is posed: what benefits do digital technologies offer to the teaching process, and what challenges must be addressed so that their use in the classroom is inclusive, safe, and pedagogically meaningful?

The general objective of this study is to analyze the benefits and challenges related to the use of digital technologies in the classroom. Specifically, it aims to discuss their pedagogical contributions; present tools and resources applicable to teaching; analyze their potential for inclusion and accessibility; identify structural and pedagogical limitations; reflect on safety, ethics, and responsibility; examine their relationship with instructional planning; understand ways of evaluating outcomes; and discuss the teacher's role in mediating digital experiences. These objectives take into account that innovation does not stem solely from the presence of equipment, since it requires choices consistent with the curriculum and students' needs, as argued by Machado et al. (2021) and UNESCO (2023).

The research is characterized as bibliographic, qualitative, and exploratory. The search was conducted using Google Scholar, SciELO, the Journal Portal of the Coordination for the Improvement of Higher Education Personnel, Cetic.br, the Ministry of Education portal, and official Federal Government websites. The descriptors used were "digital technologies in education," "digital technologies in the classroom," "digital educational resources," "digital inclusion and accessibility," "teachers' digital competencies," "digital citizenship," "planning with technologies," and "pedagogical mediation." Articles, books, reports, and legal documents published between 2021 and 2025, available in full and related to the topic, were included. Duplicate publications, materials without verifiable authorship or provenance, texts unavailable in full, and studies not directly related to the established objectives were excluded. After selection, an interpretive reading of the identified contributions was conducted and thematically organized.

2 Pedagogical benefits

Digital technologies offer pedagogical benefits when their use addresses a concrete need in the teaching process. The value of a resource lies not only in its electronic format, but in the opportunities it creates to observe, compare, experiment, produce, and share knowledge. Santos et al. (2022) clarify that the selection of digital materials must consider their suitability for students, while Dehaene (2022) relates learning to the learner's active engagement. Thus, a presentation, video, or application becomes pedagogically relevant when it helps the class understand specific content, formulate hypotheses, solve problems, or communicate what they have learned.

Texts, photographs, maps, animations, audio recordings, graphs, and videos can present different dimensions of the same subject, which facilitates the understanding of abstract concepts. Dehaene (2024) explains that conscious thought integrates information received through different channels and makes it possible to organize it into broader interpretations. Brasil (2022), in turn, establishes that school education should encompass competencies related to digital culture and computing. This combination of modes of representation can bring content closer to students' realities, provided that the materials are not used merely to fill time or make the lesson visually appealing.

Within the same class, some students quickly understand an explanation, while others need to revisit concepts, observe new examples, or complete additional activities. Educational platforms can offer supplementary materials, exercises with varying levels of complexity, and more rapid feedback. Dehaene (2021) demonstrates that learning to read requires progressive practice and consolidation, while UNESCO (2023) recognizes that technological resources can support more flexible educational pathways. This personalization, however, should neither isolate students nor transfer decisions requiring pedagogical knowledge and teacher sensitivity to automated systems.

Quizzes, games, forums, polls, and simulators can encourage the formulation of responses, comparison of strategies, and review of knowledge. Dehaene (2022) assigns feedback on errors a central role in learning, since students need to recognize the difference between their initial response and the expected outcome. Corrêa, Rocha, and Nunes (2021) observe that teachers' digital competencies affect how these instruments are incorporated into school practice. Thus, an interactive activity should not be limited to response speed; it must create conditions for students to understand why they answered correctly or incorrectly.

The availability of resources also affects the feasibility of implementing these practices. The Comitê Gestor da Internet no Brasil offers the following observation:

> For schools to help reduce inequalities, access to high-quality internet must be available in spaces used for educational purposes. (Comitê Gestor da Internet no Brasil, 2024, p. 89).

A proposal based on online research, audiovisual production, or collaborative activities loses its purpose when the connection is unstable or when only a few students can use the equipment. Brasil (2023b) treats meaningful connectivity as an integration of access, quality, and pedagogical purpose, while the Comitê Gestor da Internet no Brasil (2023) highlights differences in access among institutions and social groups. Therefore, providing internet access is not enough; it is necessary to ensure that it is available in the place, at the time, and under the conditions in which learning occurs.

In these experiences, students can share responsibilities, comment on work, compare arguments, and construct a collective response. Machado et al. (2021) relate technologies to educational processes based on the exchange of experiences, while Santos and Sá (2021) argue that digital appropriation must go beyond a merely instrumental dimension. Collective work, however, requires organization. Without guidance, only one member may take on the task while the others remain observers. It is the teacher's responsibility to define roles, monitor participation, and create opportunities for the group to explain its choices.

Virtual visits, libraries, museums, documentaries, and institutional repositories provide access to materials that would not be physically available at school. Brasil (2023a) associates digital education with critical access to information, while Santos et al. (2022) point to the need to evaluate the reliability, authorship, and suitability of the content found. The abundance of results presented by search engines requires an investigative stance. Students need to learn to compare sources, identify publication dates, distinguish opinion from evidence, and recognize possible interests involved in the circulation of a given message.

Instead of merely answering exercises, students can create a podcast, video, infographic, presentation, digital story, or concept map. These activities require information selection, planning, language organization, and revision. Dehaene (2024) relates the development of thought to the ability to integrate and communicate content, while Brasil (2022) includes creation, analysis, and problem-solving in the development of digital competencies. To prevent authorship from turning into the copying of internet pages, the assignment should require students to take a position, compare, justify, and present the sources used.

Forms, portfolios, platform records, and successive versions of a work product help identify progress and difficulties. The Comitê Gestor da Internet no Brasil (2025) demonstrates that the educational use of technologies involves practices related to assessment, communication, and activity organization. Dehaene (2022) reinforces that feedback must be timely to allow responses to be revised. This monitoring should not reduce students to a score or graph. The data provided by platforms must be interpreted by the teacher alongside observations, written work, oral contributions, and different forms of participation.

Visual elements, challenges, and rewards can spark initial interest, especially when they resonate with experiences familiar to students. However, the curiosity prompted by the resource must lead to an understanding of the content. UNESCO (2023) warns that adopting a tool should be justified by its educational contribution, while Dehaene (2022) distinguishes effective attention from transient stimulation. A lesson can be enjoyable without promoting consistent learning; likewise, a simple activity can produce profound reflections when it has a clear purpose and active participation.

Knowing how to click, download a file, or access a social network does not mean critically understanding the digital environment. Brasil (2023a) relates digital education to the exercise of citizenship, communication, and the safe production of knowledge. Santos et al. (2022) add that teachers and students need to develop criteria for selecting resources, protecting information, and creating content. Schools thus assume the responsibility of teaching behaviors related to source verification, respect for authorship, online interaction, and the protection of personal data.

A class can analyze public data, monitor environmental changes, compare news reports, produce educational campaigns, or map community problems. Brasil (2022) proposes that digital competencies be developed in an integrated manner across different areas of knowledge, while Machado et al. (2021) value educational experiences connected to lived needs. A technological resource ceases to be an accessory when it makes it possible to investigate a real issue, interpret information, and construct evidence-based responses.

Reading on paper, handwriting, play, bodily movement, hands-on experimentation, dialogue, and social interaction remain essential. UNESCO (2023) recommends balance in the adoption of technologies, and Dehaene (2021) demonstrates that learning involves attention, perception, practice, and interaction with different forms of representation. Responsible integration combines digital and non-digital resources according to the content, students' age, and the intended objectives.

3 Digital tools and resources

Digital tools designed for education have different functions and must be chosen according to lesson objectives. Virtual environments, text editors, video platforms, applications, games, simulators, and assessment instruments do not produce the same results. Santos et al. (2022) explain that educators' digital competence includes locating, selecting, adapting, producing, and protecting resources. The Comitê Gestor da Internet no Brasil (2024) adds that taking advantage of these possibilities depends on the availability of equipment, connectivity, and training. Therefore, the choice should begin not with an application's popularity, but with the knowledge to be developed.

Virtual Learning Environments, such as Moodle and Google Classroom, help organize materials, activities, notices, deadlines, and feedback. Their use can facilitate continuity in monitoring students' schoolwork, provided that the platform does not function merely as a file repository. Machado et al. (2021) relate technological appropriation to experimentation and reflection on practice, while Santos and Sá (2021) advocate teacher education connected to concrete school situations. A well-organized environment should provide clear instructions, accessible materials, assessment criteria, and understandable communication channels.

Teachers can use these formats to introduce a subject, demonstrate a procedure, or revisit knowledge. Students can also produce materials to communicate what they have learned. Dehaene (2024) relates consciousness to the ability to integrate information and organize it coherently, while Brasil (2022) includes production, communication, and problem-solving among the competencies associated with digital education. The creation of a video or podcast, therefore, needs to involve research, scripting, analysis, revision, and acknowledgment of sources.

In Science, they can represent reactions, human body systems, and physical motion; in Mathematics, they help visualize shapes, functions, and relationships among quantities. Dehaene (2022) considers active participation essential to learning, while UNESCO (2023) recommends that the choice of technology be linked to a clear educational purpose. A simulation gains value when students modify variables, make predictions, and interpret results, rather than merely observing images produced by the system.

Quizzes, forms, and games can support diagnostic and formative assessments. Responses provide indications of understood content and difficulties that need to be revisited. Corrêa, Rocha, and Nunes (2021) associate effective use of these instruments with educators' pedagogical competencies, and Dehaene (2022) assigns feedback on errors an important role in

reorganizing knowledge. However, an automated score does not represent learning in its entirety. Assessment needs to include written work, argumentation, problem-solving, participation, and the ability to apply knowledge in new situations.

Texts, photographs, recordings, projects, and revised versions can be brought together to demonstrate progress and difficulties. The Comitê Gestor da Internet no Brasil (2025) identifies the increased use of platforms in school activities, while Machado et al. (2021) value educational processes that encourage reflection on one's own experience. To avoid the mere accumulation of files, teachers should define selection criteria and set aside opportunities for students to explain why they included each piece of work and what they learned from it.

Digital libraries, virtual museums, and institutional repositories provide access to books, documents, images, and scientific materials. Brasil (2023a) associates digital education with the critical use of information, and Santos et al. (2022) observe that content selection requires evaluating authorship, reliability, currency, and suitability. A page ranked highly by a search engine is not necessarily a trustworthy source. School research should teach students to identify who is responsible for a publication, compare information, and recognize advertising or opinion-based content.

Screen readers, speech recognition, enlarged text, captions, and text-to-speech converters provide support for different needs. The Comitê Gestor da Internet no Brasil (2024) includes the use of technologies with students with disabilities among the topics required in teacher education. UNESCO (2023) stresses that solutions need to be accessible and compatible with the context. Thus, recommending an application is not enough; its functionality must be tested, and it must be determined whether students can use it independently.

Some platforms collect information, display advertising, or share data with other companies. Brasil (2023a) relates digital education to safety and citizenship, while the Comitê Gestor da Internet no Brasil (2024) warns of risks associated with the platformization of education. Before registering a class, the school needs to verify the permitted age range, the privacy policy, and the actual need to enter personal data. Ease of access must not take precedence over student protection.

4 Inclusion and accessibility

The discussion of digital technologies must consider who is able to access resources and under what conditions. Inclusion does not merely mean providing internet access or allowing students to use a device. It involves connection quality, equipment availability, content accessibility, and pedagogical support. The Comitê Gestor da Internet no Brasil (2024)

identifies differences between public and private schools and between rural and urban schools, while Brasil (2023b) establishes meaningful connectivity as an objective of national policy. When these conditions are not met, a digital activity can reinforce inequalities that already exist outside school.

Assistive technologies offer important resources for students with visual, hearing, physical, or intellectual disabilities, or with specific learning difficulties. Screen readers, adapted keyboards, captions, audio description, enlarged text, voice commands, and augmentative and alternative communication can facilitate access to the curriculum. UNESCO (2023) recognizes the potential of these instruments to expand educational opportunities, and the Comitê Gestor da Internet no Brasil (2024) emphasizes the need to train teachers to use them. Simply installing a program does not ensure inclusion; it is necessary to verify whether it meets the student's needs.

A video without captions can exclude a deaf student; an image without a description can prevent understanding by someone who uses a screen reader; a file scanned as a photograph may not be recognized by reading software. Santos et al. (2022) advocate careful evaluation of resources before use, while Brasil (2023a) associates digital education with broad and responsible participation. Producing accessible materials from the outset reduces the need for subsequent adaptations and benefits the entire class.

Activities assigned for completion at home may appear simple, but they presuppose access to a device, connectivity, space, and time to study. The Comitê Gestor da Internet no Brasil (2023) demonstrates that home access is unequal, while UNESCO (2023) warns that technological solutions can deepen disparities when they depend on resources that some students do not possess. Schools should offer printed alternatives, scheduled times for using equipment, and opportunities to complete activities within the school environment itself.

Mobile phones can broaden access because they are present in many households, but their educational use does not solve every difficulty. Small screens, limited storage, and data consumption can hinder reading, writing, and the production of assignments. Brasil (2023b) recognizes that educational connectivity involves infrastructure and suitable devices, and the Comitê Gestor da Internet no Brasil (2025) shows that mobile phones remain a common means of access. Teachers are responsible for planning tasks compatible with the devices available and avoiding excessively large files.

Resources incorporating audio, images, and text make it possible to present content through more than one mode of communication. Dehaene (2021) explains that learning to read depends on gradual processes and systematic practice, while Dehaene (2022) relates

consolidation to the structured review of knowledge. Tools can enable review and repetition, but teacher support remains indispensable for identifying difficulties that automated systems do not recognize.

Indigenous and migrant students, as well as those belonging to traditional communities, may encounter materials far removed from their reality. Brasil (2023a) provides for digital education aimed at civic participation, and UNESCO (2023) advocates solutions suited to users' languages and contexts. Digital translators and dictionaries can help, but they do not replace respect for the identities, repertoires, and social experiences present in the classroom.

Captions help those studying in noisy environments; audio supports students in the literacy process; enlarged fonts facilitate reading; visual instructions make tasks easier to understand. Santos and Sá (2021) advocate education that considers the complexity of pedagogical situations, while Santos et al. (2022) identify suitability for the target audience as a criterion for selecting resources. Accessibility, therefore, is not an add-on, but an integral part of material quality.

Family participation can facilitate access, especially in the early years, but responsibility for teaching should not be transferred to parents or guardians. Machado et al. (2021) value collaborative networks in education and technology use, while the Comitê Gestor da Internet no Brasil (2023) demonstrates that families have different capacities to provide support. Instructions need to be simple, objective, and compatible with household routines, without requiring technical knowledge that has not been taught.

5 Challenges and limitations

Unequal access represents one of the main obstacles to integrating technologies into teaching. The existence of a school internet connection does not guarantee sufficient speed, coverage in every classroom, or the availability of equipment for the class. The Comitê Gestor da Internet no Brasil (2024) identifies significant differences between institutions in urban and rural areas and between public and private institutions. Brasil (2023b) seeks to address this situation by expanding meaningful connectivity, but implementation depends on infrastructure, maintenance, support, and coordination among public authorities.

The national report objectively identifies a limitation that remains present in many schools:

> The lack of devices and educational resources for use in teaching and learning activities remains a challenge to the adoption of these tools. (Comitê Gestor da Internet no Brasil, 2024, p. 89).

Occasional use of a laboratory does not amount to the continuous integration of technologies into the curriculum. UNESCO (2023) warns that investments focused on equipment may have little effect when they are not accompanied by training, content, and assessment. Brasil (2023b) likewise associates educational connectivity with the availability of devices and their effective use, rather than merely with network installation.

Many professionals learned to use platforms during emergency situations, without time to reflect on methodologies, accessibility, and security. Corrêa, Rocha, and Nunes (2021) identify differences in digital competencies among teachers, while Santos and Sá (2021) advocate training that goes beyond brief and fragmented courses. Mastery of technical functions is necessary, but it is not sufficient. Teachers need to know when to use a resource, what learning they intend to foster, and how to assess its outcomes.

Superficial use occurs when technology merely replaces one medium without changing student participation. A presentation may reproduce the same traditional lecture, just as an electronic form may repeat mechanical exercises. Machado et al. (2021) associate pedagogical change with reflection on practice, while Dehaene (2022) emphasizes that learning requires active engagement. Innovation, therefore, lies not in the digital format, but in the possibility of creating experiences that foster inquiry, authorship, dialogue, and the application of knowledge.

Notifications, games, and social media compete for attention during an activity. Dehaene (2022) explains that attention selects the information that will gain access to deeper processing, while UNESCO (2023) raises concerns about the excessive use of devices in the school environment. Indiscriminate prohibition does not teach self-regulation, but unrestricted use also undermines the lesson. Clear times, purposes, and rules must be established.

The internet brings together reliable materials, outdated content, disguised advertising, and misinformation. Santos et al. (2022) note that not all educators use in-depth criteria to select resources, while Brasil (2023a) establishes information literacy as a dimension of digital education. Schools need to teach verification procedures, such as identifying authorship, consulting institutional sources, comparing versions, and examining the publication date.

Answers may be copied, shared, or produced without understanding. The Comitê Gestor da Internet no Brasil (2025) shows the growing presence of platforms in school practices, while Dehaene (2024) distinguishes the reproduction of information from its conscious elaboration. To verify genuine learning, teachers may request oral explanations, records of the process, solutions to contextualized problems, and revisions of answers.

Lengthy digital activities may cause fatigue, distraction, and a reduction in physical and social experiences. UNESCO (2023) recommends that technology not indiscriminately replace

face-to-face interaction, while Dehaene (2021) shows that learning involves attention, practice, and contact with different representations. Balancing digital moments with reading, writing, conversation, movement, and concrete experimentation preserves the diversity of the school experience.

Price changes, service interruptions, and changes in data policies may compromise planned activities. Brasil (2023a) stipulates that digital education be accompanied by security and responsibility, and the Comitê Gestor da Internet no Brasil (2024) warns about data collection by educational services. Institutions should avoid depending on a single tool and should assess the terms of use in advance.

6 Safety, ethics, and responsibility

The use of digital platforms in the school environment involves data concerning children, adolescents, families, and professionals. Information such as names, images, voices, performance, and email addresses must be protected. The Comitê Gestor da Internet no Brasil (2024) draws attention to data collection by educational technologies, while Brasil (2023a) includes safety and citizenship among the dimensions of digital education. Schools should examine what information is requested and avoid unnecessary registrations.

Before registering students, it is necessary to examine the terms of use, privacy policy, minimum age, and data-sharing practices. Santos et al. (2022) identified weaknesses in practices for protecting sensitive content, while the Comitê Gestor da Internet no Brasil (2024) points to risks of data breaches, advertising, and the transfer of information to third parties. The convenience of an application cannot take precedence over students' rights.

Authorization for a specific recording does not constitute permission for permanent publication on social media. Brasil (2023a) associates digital participation with respect for individual rights, while UNESCO (2023) argues that educational interests and student well-being should guide decisions. Whenever possible, restricted institutional environments and forms of documentation that do not unnecessarily expose a child's identity should be prioritized.

Groups, forums, and message boards can expand communication, but they may also become spaces for abuse, exclusion, and cyberbullying. The Comitê Gestor da Internet no Brasil (2024) emphasizes the importance of mediation and digital citizenship, and Brasil (2023a) provides for education aimed at responsible coexistence. Communication rules need to be developed with the class and applied consistently.

The ease of copying texts, images, and answers may weaken authorship when an activity values only the final product. Santos et al. (2022) relate digital competence to the responsible

selection and creation of materials, while Dehaene (2024) shows that learning requires conscious elaboration. Teachers should teach paraphrasing, citation, referencing, and respect for copyright, in addition to proposing tasks that require students' own interpretations.

False content may have a professional appearance, manipulated images, and nonexistent references. Brasil (2023a) includes information literacy in its educational policy, and UNESCO (2023) emphasizes the need to prepare students to evaluate digital information. Comparing sources, locating the original publication, and verifying authorship are practices that must be taught continuously.

Texts, images, and answers may be generated automatically, yet contain errors, biases, or fabricated references. The Comitê Gestor da Internet no Brasil (2025) monitors the transformation of digital practices, while Dehaene (2024) distinguishes automatic processing from conscious reflection. The educational use of these tools should include verification, transparency, and student accountability for the content submitted.

Blocking pages reduces some risks, but it does not prepare students to make decisions outside school. Santos and Sá (2021) advocate educational processes based on critical understanding, while Machado et al. (2021) value the collective construction of knowledge. Digital education needs to teach responsible choices, risk recognition, and how to seek help when inappropriate situations arise.

Families also need guidance on privacy, image exposure, passwords, and online interaction. The Comitê Gestor da Internet no Brasil (2024) recognizes that education for digital citizenship extends to the community, and Brasil (2023b) associates the expansion of connectivity with effective educational use. Communication should be clear, without placing sole responsibility on families for problems that also require institutional measures.

7 Lesson management and planning

Planning determines whether technology will serve a pedagogical function or merely be a decorative element. Before selecting a tool, teachers need to define the objective, prior knowledge, activity, resources, and assessment criteria. Santos and Sá (2021) argue that technological integration should be connected to reflection on practice, while Machado et al. (2021) relate training to the ability to reorganize strategies. Learning, not the application, should be the starting point.

Brasil (2022) establishes the need to integrate digital competencies into Basic Education curricula. This guidance indicates that technology should not appear as an isolated activity. Dehaene (2022) demonstrates that learning is consolidated when new information is connected

to previously constructed knowledge. Therefore, the resource must be integrated into a coherent sequence, with introduction, development, monitoring, and review.

When preparing a lesson, practical matters should be anticipated: the number of devices, internet access, password requirements, activity duration, and the availability of an alternative. The Comitê Gestor da Internet no Brasil (2024) shows that equipment and connectivity are still not uniformly available, while Brasil (2023b) recognizes the need to improve infrastructure. A contingency plan prevents technical failures from completely disrupting the activity.

Screen time management must also be planned. Not every stage needs to take place on a device. A video may introduce the topic, but the discussion may occur orally; research may be conducted digitally, while the findings may be recorded in writing or presented. UNESCO (2023) recommends balance, and Dehaene (2021) shows that different practices contribute to the consolidation of learning. Alternating modes of communication, media, and movement reduces fatigue and distraction.

Teachers should explain which pages will be accessed, when the device may be used, and how participation will occur. The Comitê Gestor da Internet no Brasil (2024) associates mediation with the development of digital citizenship, while Brasil (2023a) provides for critical, safe, and ethical use. Rules understood by students tend to be more educational than prohibitions imposed without explanation.

When there are not enough devices for everyone, pairs or groups can foster collaboration, provided that roles are distributed. Machado et al. (2021) value learning based on the exchange of experiences, and Santos et al. (2022) advocate adapting resources to the group's profile. It is important to alternate who operates the device, records information, reads instructions, and presents conclusions.

Materials with captions, image descriptions, legible fonts, and objective instructions broaden participation. UNESCO (2023) associates technology and inclusion with the removal of barriers, while the Comitê Gestor da Internet no Brasil (2024) points to the need to prepare teachers to serve students with disabilities. This review should take place before the lesson, not only after a difficulty arises.

The Comitê Gestor da Internet no Brasil (2023) shows that the quality of access varies among households, and Brasil (2023b) recognizes that inclusion depends on connectivity and equipment. Mandatory assignments should not presume unlimited access. Schools need to provide adequate deadlines, lightweight files, and an in-person or printed alternative.

Teachers need to decide what evidence will demonstrate that the objective has been achieved. Dehaene (2022) emphasizes the importance of timely feedback, while Santos and Sá

(2021) advocate reflection on the effects of practice. Records of participation, student work, explanations, and revisions provide more comprehensive information than automated scores.

Lesson management also includes observing reactions and adjusting the course of action. A planned tool may reveal unexpected difficulties or take more time than anticipated. Machado et al. (2021) understand teacher development as a continuous process, and the Comitê Gestor da Internet no Brasil (2025) reinforces the need to monitor actual uses. Recording what worked helps improve future activities.

8 Impact and evidence

Assessing the impact of technologies requires determining whether learning, participation, or access to the curriculum has improved. The number of devices used does not constitute sufficient evidence. UNESCO (2023) warns that educational decisions should consider outcomes and context, while the Comitê Gestor da Internet no Brasil (2025) provides indicators on the presence and use of resources. The focus must remain on what students have learned.

Outcomes can be monitored through diagnostic assessments, activities, portfolios, projects, and observations. Dehaene (2022) explains that feedback makes it possible to correct hypotheses and strengthen knowledge, while Santos et al. (2022) show that digital resources can assist in organizing practices. Comparing initial and final work makes it possible to identify progress that a single grade does not reveal.

They may consider understanding, argumentation, authorship, collaboration, and the use of sources. Brasil (2022) relates digital competencies to problem-solving and production, while Dehaene (2024) emphasizes the conscious integration of information. Assessment needs to value reasoning, not merely the technical appearance of the work.

Access time, number of clicks, or percentage of correct answers do not explain the student's entire experience. The Comitê Gestor da Internet no Brasil (2024) warns of risks related to the collection and processing of educational data, and UNESCO (2023) questions excessive reliance on automated metrics. Teacher observation remains necessary.

Participation can be important evidence, but it must be analyzed qualitatively. A student may access an activity many times and still have questions; another may participate less and demonstrate sound understanding. Santos and Sá (2021) advocate a complex interpretation of educational situations, while Machado et al. (2021) value reflection and professional exchange. Teachers should combine numerical indicators with descriptive records.

An activity may raise the class average while simultaneously excluding students who lack access or have difficulty using the technology. The Comitê Gestor da Internet no Brasil (2023) highlights inequalities in the conditions for participation, while Brasil (2023b) seeks to expand connectivity in schools. Analysis of the results should consider social, territorial, and individual differences.

Questions about clarity, difficulties, usefulness, and interest reveal aspects that do not appear in grades. Dehaene (2022) associates learning with active engagement, and UNESCO (2023) argues that users' needs should be considered when adopting technology. Listening to students does not mean accepting every preference, but rather acknowledging their participation in the process.

Assessment also needs to determine whether knowledge can be applied outside the tool. A student who answers correctly in a game should be able to explain the concept, solve another problem, or produce an original response. Dehaene (2024) distinguishes automatic recognition from conscious elaboration, while Brasil (2022) values the application of knowledge in different situations. Transfer indicates more consistent learning.

An activity may yield good results but require resources that the school cannot sustain. UNESCO (2023) recommends assessing sustainability and suitability, while the Comitê Gestor da Internet no Brasil (2025) shows that technological infrastructure varies among institutions. Simple and stable solutions may be more useful than complex platforms.

9 The role of the teacher and mediation

The presence of technologies does not diminish the importance of the teacher. On the contrary, the abundance of information increases the need for guidance, selection, and contextualization. Santos et al. (2022) show that selecting resources requires criteria, while Brasil (2023a) associates digital education with critical development. Educators help students transform scattered information into organized knowledge.

Teachers analyze the curriculum, identify needs, and anticipate forms of participation. Santos and Sá (2021) argue that pedagogical use cannot be separated from reflection, while Machado et al. (2021) value professional autonomy. Decisions should not be delegated to the automatic operation of a platform.

During the activity, teachers observe strategies, questions, and forms of collaboration. Dehaene (2022) assigns feedback a central role in learning, and Dehaene (2024) relates consciousness to the ability to examine information. Well-formulated questions help students explain their choices, recognize errors, and construct new answers.

Teachers also perform curation, which means selecting reliable materials that are age-appropriate and consistent with the content. Santos et al. (2022) note that many educators still need to develop more rigorous selection criteria, while UNESCO (2023) warns about the quality and suitability of digital solutions. Curation protects the class from false content, disguised advertising, and inappropriate approaches.

Mediation includes guiding online interaction. The Comitê Gestor da Internet no Brasil (2024) relates digital citizenship to practices of safety, privacy, and respect, while Brasil (2023a) provides for the development of responsible behavior. Teachers need to discuss the consequences of offensive comments, undue exposure, and unauthorized sharing.

Corrêa, Rocha, and Nunes (2021) show that digital competencies are not equally distributed among professionals, while Machado et al. (2021) understand training as an opportunity for collaboration and self-directed professional development. Courses need to address concrete problems, rather than merely presenting application features.

Mediation also protects the realm of human relationships. Dehaene (2022) recognizes the importance of interaction and feedback, while UNESCO (2023) warns against the indiscriminate replacement of face-to-face contact. Conversation, listening, human connection, and emotional support cannot be automated. Technology can support, but not replace, the educational encounter.

Some students use applications with ease but have difficulty evaluating information; others need initial technical support. Brasil (2022) treats digital competencies as knowledge that must be taught, and Santos et al. (2022) reject the idea that everyday familiarity is equivalent to critical proficiency. Schools should not assume that everyone already knows how to use these resources.

Teachers can provide models, criteria, and feedback and then gradually expand student responsibility. Dehaene (2021) demonstrates that complex skills develop progressively, while Santos and Sá (2021) advocate contextualized educational practices. Autonomy does not mean the absence of the teacher, but the ability to act based on acquired knowledge and criteria.

Dialogue with families and the school team is also part of mediation. The Comitê Gestor da Internet no Brasil (2023) shows that access conditions vary, while Brasil (2023b) assigns shared responsibilities for implementing connectivity. Establishing institutional rules prevents each teacher from having to address security, infrastructure, and disciplinary problems in isolation.

10 Final considerations

Platforms, applications, videos, simulators, and accessible resources can foster participation, authorship, collaboration, and the monitoring of learning. However, their presence does not replace planning, human interaction, or the diversity of experiences required for comprehensive education.

It was also possible to identify that the challenges extend beyond technical proficiency. Unequal access, unstable connectivity, lack of equipment, insufficient training, data exposure, misinformation, plagiarism, and distraction require pedagogical and institutional measures. Inclusion depends on accessible resources and alternatives for students who do not have the same material conditions. Digital safety and citizenship need to be taught as parts of the curriculum.

It is concluded that teachers remain central to this process, as they select resources, guide research, monitor difficulties, provide feedback, and assess outcomes. Technology should serve educational objectives rather than determine the course of the lesson. Its responsible integration requires a balance between digital resources and face-to-face experiences, public investment, continuing education, and ongoing assessment of practices.

References

BRASIL. Conselho Nacional de Educação. Câmara de Educação Básica. Resolução CNE/CEB nº 1, de 4 de outubro de 2022. Normas sobre computação na Educação Básica: complemento à Base Nacional Comum Curricular. Brasília, DF: Conselho Nacional de Educação, 2022. Disponível em: https://www.gov.br/mec/pt-br/cne/pdf/normas-classificadas-por-assunto/base-nacional-comum-curricular-ensino-medio-bncc-em/rceb001_22.pdf. Acesso em: 5 set. 2026.

BRASIL. Decreto nº 11.713, de 26 de setembro de 2023. Institui a Estratégia Nacional de Escolas Conectadas. Brasília, DF: Presidência da República, 2023b. Disponível em: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/d11713.htm. Acesso em: 5 set. 2026.

BRASIL. Lei nº 14.533, de 11 de janeiro de 2023. Institui a Política Nacional de Educação Digital e altera as Leis nº 9.394, de 20 de dezembro de 1996, nº 9.448, de 14 de março de 1997, nº 10.260, de 12 de julho de 2001, e nº 10.753, de 30 de outubro de 2003. Brasília, DF: Presidência da República, 2023a. Disponível em: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/lei/l14533.htm. Acesso em: 5 set. 2026.

COMITÊ GESTOR DA INTERNET NO BRASIL. Pesquisa sobre o uso das tecnologias de informação e comunicação nas escolas brasileiras: TIC Educação 2022. São Paulo: Comitê Gestor da Internet no Brasil, 2023. Disponível em: https://cetic.br/pt/publicacao/pesquisa-sobre-o-uso-das-tecnologias-de-informacao-e-comunicacao-nas-escolas-brasileiras-tic-educacao-2022/. Acesso em: 5 set. 2026.

COMITÊ GESTOR DA INTERNET NO BRASIL. Pesquisa sobre o uso das tecnologias de informação e comunicação nas escolas brasileiras: TIC Educação 2023. São Paulo: Comitê Gestor da Internet no Brasil, 2024. Disponível em: https://cetic.br/media/docs/publicacoes/2/20241119194257/tic_educacao_2023_livro_completo.pdf. Acesso em: 5 set. 2026.

COMITÊ GESTOR DA INTERNET NO BRASIL. Pesquisa TIC Educação 2024: resumo executivo. São Paulo: Comitê Gestor da Internet no Brasil, 2025. Disponível em: https://cetic.br/media/docs/publicacoes/2/pt-br/20251217165730/tic_educacao_2024_resumo_executivo.pdf. Acesso em: 5 set. 2026.

CORRÊA, Isabel Aparecida; ROCHA, Else Betânia Gomes da; NUNES, Simone Guessi da Conceição. Competências digitais docentes: um estudo com professores da Educação Básica em Palmas-TO. Humanidades & Inovação, Palmas, v. 8, n. 50, p. 333-345, 2021. Disponível em: https://revista.unitins.br/index.php/humanidadeseinovacao/article/view/3471. Acesso em: 5 set. 2026.

DEHAENE, Stanislas. É assim que aprendemos: por que o cérebro funciona melhor do que qualquer máquina (ainda...). Tradução de Rodolfo Ilari. São Paulo: Contexto, 2022.

DEHAENE, Stanislas. É assim que pensamos: como o cérebro trabalha para formarmos consciência do mundo. Tradução de Rodolfo Ilari. São Paulo: Contexto, 2024.

DEHAENE, Stanislas. Os neurônios da leitura: como a ciência explica a nossa capacidade de ler. Porto Alegre: Penso, 2021.

MACHADO, Gabriella Borges et al. O uso das tecnologias como ferramenta para a formação continuada e autoformação docente. Revista Brasileira de Educação, Rio de Janeiro, v. 26, e260048, 2021. Disponível em: https://educa.fcc.org.br/scielo.php?pid=S1413-24782021000100234&script=sci_arttext. Acesso em: 5 set. 2026.

SANTOS, Gislene Munhoz dos; CASARIN, Helen de Castro Silva; ALMEIDA, Cátia Cândida de; LUCAS, Margarida. Uso de recursos educativos digitais por educadores das séries iniciais do Ensino Fundamental. Perspectivas em Ciência da Informação, Belo Horizonte, v. 27, n. 2, 2022. DOI: 10.1590/1981-5344/40006. Disponível em: https://www.scielo.br/j/pci/a/dtC7S6J5TQzWpB3jqks47tj/. Acesso em: 5 set. 2026.

SANTOS, Taciana Brasil dos; SÁ, Ricardo Antunes de. O olhar complexo sobre a formação continuada de professores para a utilização pedagógica das tecnologias e mídias digitais. Educar em Revista, Curitiba, v. 37, e72722, 2021. Disponível em: https://revistas.ufpr.br/educar/article/view/72722. Acesso em: 5 set. 2026.

UNESCO. Relatório de monitoramento global da educação 2023: tecnologia na educação: uma ferramenta a serviço de quem? Paris: UNESCO, 2023. Disponível em: https://www.unesco.org/gem-report/pt-pt/technology. Acesso em: 5 set. 2026.