AI Literacy Framework: the Art and Design Educational Borderline

Inteligencia Artificial y su alfabetización: la frontera educativa del arte y el diseño

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Abstract

The integration of Artificial Intelligence (AI) into art and design education requires a comprehensive reevaluation of existing curricula and pedagogical approaches, highlighting the need to cultivate AI literacy among managers, educators, and students. The current ambiguity surrounding the definition of AI literacy underscores the need for a structured and revised framework, particularly given the diverse interpretations and implementations in educational settings. This article presents the findings of ongoing research into AI literacy and its importance to art and design education. Through a documentary research method, we reviewed studies that contribute to the discussion of the nature of AI literacy and its implications. Our findings suggest that AI literacy extends beyond technical proficiency, encompassing three abilities: to understand and interpret AI systems, to navigate their ethical implications, and to recognize their broader social and cultural impact within art and design. Recognizing this pivotal moment in AI integration, this article proposes a borderline framework that outlines progressive levels of AI literacy development as it becomes embedded in art and design education. Each level is constructed through the lens of three key dimensions: understanding, ethics, and social impact.

Keywords • AI, AI literacy, AI ethics, artificial intelligence, design education

Resumen

La integración de la Inteligencia Artificial (IA) en la educación en arte y diseño requiere una reevaluación integral de los planes de estudio y enfoques pedagógicos existentes, lo que pone de manifiesto la necesidad de cultivar la alfabetización en IA (AI literacy) entre directivos, docentes y estudiantes. La ambigüedad actual en torno a la definición de alfabetización en IA subraya la necesidad de un marco estructurado y revisado, especialmente dada la diversidad de interpretaciones y

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aplicaciones en los entornos educativos. Este artículo presenta los hallazgos de una investigación en curso sobre la alfabetización en IA y su importancia para la educación en arte y diseño. A partir de un enfoque de investigación documental revisamos estudios que contribuyen a la discusión sobre la naturaleza de la alfabetización en IA y sus implicaciones. Nuestros hallazgos sugieren que la alfabetización en IA va más allá de la competencia técnica e incluye tres capacidades: comprender e interpretar los sistemas de IA, abordar sus implicaciones éticas y reconocer su impacto social y cultural en los ámbitos del arte y el diseño. Reconociendo este momento decisivo en la integración de la IA, el artículo contribuye con un marco liminal que describe niveles progresivos de desarrollo de la alfabetización en IA a medida que se integra en la educación en arte y diseño. Cada nivel se construye desde la perspectiva de tres dimensiones clave: comprensión, ética e impacto social.

Palabras clave • IA, alfabetización en IA, Inteligencia Artificial, ética en IA, educación en diseño

Introduction

The main goal of this article is to provide a framework for identifying the scope and possibilities for integrating AI literacy into art and design education. We used a documentary methodology, as it enables the reconfiguration and deepening of existing knowledge through the critical and systematic analysis of diverse sources, as well as the understanding of patterns and relationships in social phenomena (Luvezute *et al.*, 2015; Marcelino *et al.*, 2024; McCulloch, 2004; Mogalakwe, 2006). We referred to academic articles published in indexed journals that proposed an approach to the concept of AI Literacy. Following the search, selection, collection, classification, organization, and analysis, which are fundamental components of the documentary research method, we identified the perspectives that collectively build consensus and present them as findings in this document.

The article is organized into four sections. The first, as an introduction, addresses the process of AI appropriation in everyday activities. For us, it is important to highlight that there are studies examining how humans appropriate technology, which help us identify the stage AI is currently at in this process. To do so, we present a brief historical overview of the key milestones in the development of AI to its current state. The second section presents the findings of studies examining AI in educational settings. One of the main points to consider is that, unlike definitions of other literacies, AI literacy does not focus solely on the knowledge and use of technology but involves more profound implications. Therefore, the third section presents the challenges we identified for incorporating AI into education, which can be understood within three perspectives: understanding, ethics, and social dimensions. The repeated mention of these three axes throughout this article may seem redundant, but such repetition is necessary as these are the axes around which the discussion has centered. Finally, the fourth section proposes a pathway that may also serve as an assessment rubric to integrate and evaluate the level of AI integration in an educational environment focused on art and design. The contributions of this article center on an updated discussion of AI studies in educational contexts, the identification and presentation of the three main paradigms, and a pathway for integration that may also serve as an internal evaluation guide for educational organizations.

AI literacy in daily life

On November 30, 2022, ChatGPT was launched, and the world turned its attention to Artificial Intelligence (AI) and its capabilities. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO) «the world is set to change at a pace not seen since the deployment of the printing press six centuries ago» (UNESCO, 2021). Currently, about 80% of people interact with AI without being aware of it (Romero Mireles, 2023). However, Chat GPT is one of the most

rapidly adopted technologies, reaching one million users in its first five days, 100 million in two months, and it is now estimated to have around 400 million users (*La Nación*, 2025).

The exponential growth of Chat GPT allows us to identify the disruptive nature of AI, meaning it is a technology that will impact all areas of society. Some of its reach is already visible; for example, 77% of the business sector already uses it in their internal processes. In the health sector, 90% of hospitals in developed countries have incorporated it for diagnoses and medical management (López Blanco, 2025). The education sector is no exception. According to a study by the Digital Education Council (DEC), an association of universities from various countries, 86% of higher education students already utilize AI in their learning processes, with 54% of them using it daily (DEC, 2024). The same study reports that among the primary uses of AI, information searching accounts for 69%, while only 24% of students use it to create documents. However, the situation is not the same for all countries, as they face significant needs and barriers regarding technology. For instance, Mexico ranked «68th out of 193 countries in the Government AI Readiness Index, showing weaknesses in its strategic vision, adequate regulation, and internal digital capabilities» (UNESCO, 2023).

Statistics also present several challenges when regarding the teaching community. Although more than 30% express positive views on integrating AI into education, three out of five schools have not discussed the use of AI for assignments and homework with their students. This reflects a lack of coordinated effort by institutions to design strategies that can incorporate AI into teaching and learning processes. Furthermore, the academic community also shows resistance to AI. Among the primary concerns of teachers are the risk of plagiarism in student work (65%) and the concern that the use of AI will diminish interpersonal interaction for learning (62%) (AIPRM, 2025).

Models of technological appropriation

Like any technology, AI is subject to appropriation by a particular social group. If a technological development fails to integrate into social life it, hence, becomes discarded. Whether due to cost, utility, ease of commercialization, or other reasons. This may be a gradual or immediate process. Technologists study the development of these connections through various models of technological appropriation, which can help us understand the current position of AI educational appropriation.

Sandoval (2022) refers to the process where an object moves from the public to the private sphere as «domestication of technology». This process also involves its commercialization. This happened with television. Initially, moving images could only be consumed in public. It was not until the invention of television that audiovisual content could shift from public to private. First it became present in public areas of the home, such as the living room, and then moved into the bedrooms, the private zone. AI is a technology that enters our lives through mobile devices and private technologies that we take into our bedrooms, sharing countless pieces of private information with them. Perhaps until recently, we did not realize we were interacting with AI when using various applications or phone functions. Now, we can create a specific account or profile to interact with AIs and perform tasks privately. The possibility of subscribing to and paying for AI-based services is significant evidence of AIs process of commodification, that is, technological appropriation.

Another model posits a two-way exchange and transformation: first, technology modifies user activities, and second, user needs and activities transform and drive the evolution of technology (Celaya, Lozano & Ramírez, 2010). This case is readily observable in the development of different AI technologies, as one of their key characteristics is that the technology now learns directly from interaction with its users. Thus, user needs and interaction have produced AI versions that are easier to understand and have more practical functions for everyday life.

Finally, Davis & Granic (2024) propose following the Technology Acceptance Model based on perceived usefulness and perceived ease of use. In short, accepting technological development depends on perceiving them as useful and easy to use. Cell phones transitioned from having physical keypads to flat screens with touchscreen technology because it was perceived as easier to use and became more useful, faster, and capable of displaying more functions. Perhaps generative AI has not yet reached this point. Its capabilities are still very broad, making it difficult to understand its possibilities beyond simple tasks like planning, writing an email, or translating. The education sector perceives AI with skepticism because it is unclear how to utilize it to enhance learning. Similarly, people involved in creative processes perceive it as a threat because it is not yet clear how it can collaborate in enhancing these processes; instead, AI is perceived as a replacement rather than a complement. As pointed by Marshall Bender (2024), «It is also clear that AI will impact students' future work lives. Predicting the future of employment in the age of AI is difficult» (p. 164). Still, the AI tools are not yet 100% user-friendly, teachers and artists still have much to learn about generative AI and the necessary and best prompts to create. AI tools require a degree of knowledge that is still complex which makes their appropriation difficult. It is no coincidence that awareness of AI and its capabilities went viral with the emergence of ChatGPT, as one of its main characteristics was its user-friendliness and ease of use.

AI historical background

If history has taught us anything about technology, it is that disruptive innovations do not happen in isolation. Instead, they combine different factors and scientific and technological advancements in various areas of knowledge until their integration achieves a significant impact. The emergence of Artificial Intelligence has been no different. According to Galaviz (2016) in the 1940s, Norbert Wiener coined the term «cybernetics» to refer to the discourse from different disciplines that aimed to «explain, from a logical point of view, the functioning of the human brain based on its fundamental components: neurons» (p. 42).

Different authors identify this context as one of the main precursors to Artificial Intelligence, highlighting the contributions made by McCulloch and Pitts to the understanding of neural networks (Chakraverty *et al*., 2019; Farizawan *et al*., 2020). This background is important because, forty years later, in the 1980s, John Hopfield and Geoffrey Hinton would go on to design deep learning, which enables artificial neural networks to learn from their errors and is now the foundation for AI. For these advancements and their impact on technology, another forty years later, they were recognized with the Nobel Prize in Physics (Freire, 2024). The term *Artificial Intelligence* is attributed to McCarthy (1956) when he proposed a summer research project on AI for Dartmouth University.

Several publications have also contributed to the discourse and debate surrounding AI. Since it is impossible to refer to them all, we will highlight those that we consider the most important to understand the emergence of AI. Alan Turing (1950) developed the «Turing Test» which could determine whether a computer can truly think like a human. Later, Minsky (1961) publish a state-of-the-art overview of AI and its challenges, which marked the emergence of scientific interest in AI. McCorduck & Feigenbaum (1986) documented the role of AI in the global technological race, in which Japan was betting on machines that could «think» and understand human language. Their publication is an X-ray of a moment when AI represented a decisive field for global leadership.

Additionally, there are some events considered key to the emergence of Artificial Intelligence. Above all, we believe they are elements that have also culturally impacted, providing visibility, awe, and acceptance of AI innovations. The most well-known is when IBM's supercomputer Deep Blue defeated chess champion Garry Kasparov in 1996 (Berman, 2023). Years later, in 2011, the matched their supercomputer Watson against two human champions on the world-renowned television show *Jeopardy!* (Markoff, 2011). In 2006, Google

initiated its self-driving car development program, which ten years later evolved into the company Waymo (Ohnsman, 2016). In this context, Alexa, Amazon's virtual assistant, arrived, impressive for its voice command interaction, and has managed to sell 600 million devices since its launch (Panay, 2025). Finally, in 2020, OpenAI launched its ChatGPT model, which went viral two years later.

The educational landscape in the face of generative AI

Education is not exempt from the AI revolution. The use of AI is increasingly common among students in their learning tasks, both inside and outside the classroom. It is a reality that educators face in their daily practice, as it is becoming a necessity for professionals. The urgency to rethink the entire educational system has been pointed out since the turn of the millennium because of the rapid evolution of technology (Ganascia, 1993). Today, more than ever, institutions need to adapt and to anticipate the transformations of learning and knowledge creation.

For this reason, the study of AI literacy is essential to analyze its implications, applications, and repercussions in education. In the case of AI, literacy refers to understanding its technological principles, its diverse applications, as well as its social implications. «In digital literacy we learn skills with little awareness of the origin of the technology we use and of its impact on what we do and who we are» (Rodríguez, 2019: 4). Literacy is not only about knowing how to use the technology but also about understanding the reasoning behind it and being capable of evaluating its consequences.

Despite current research on AI literacy using the term across various disciplines to refer to a set of skills (Long & Magerko, 2020), few studies have thoroughly explored how to conceptualize AI literacy (Ng *et al*., 2021b). This is understandable, as it is a very recent application of the term with multiple uses in various fields.

The term «AI literacy» was first introduced by Burgsteiner *et al*. in 2016 (as referenced by Ng *et al*., 2021b) who defined it as the necessary skills to understand the fundamental principles and notions of Artificial Intelligence. These skills have become indispensable. We live in a world where algorithmic decisions affect multiple aspects of human life, such as acquiring products and services, job selection, and business decision-making, among many others. Long & Magerko (2020) describe AI literacy as a set of skills that allow individuals to critically evaluate AI technologies, interact and cooperate effectively with them, and even use them as tools online, at home, and in the workplace. The authors also mention that «individuals will likely be more well-equipped to leverage the different capabilities of AI and humans to solve problems if they understand AI's strengths and weaknesses» (Long & Magerko, 2020: 4).

AI literacy goes beyond mere familiarity with the function and use of this technology, it also involves understanding how to use it ethically, responsibly, and critically in modern society. Nevertheless, most people regularly underestimate the relevance of AIs ethical aspects, seeing them as external or secondary compared to technical concerns in the workplace (Hagendorff, 2020). According to Pinski & Benlian (2024), AI literacy refers «to human proficiency in different subject areas of AI that enable purposeful, efficient, and ethical usage of AI technologies» (p. 1). Likewise, education is not exempt from this situation, students place little importance on ethical issues in AI, such as bias, legal aspects, and intellectual property rights (Gong *et al*., 2020).

Considering that AI has a significant impact on daily decisions, its misuse could cause irreversible adverse effects on individuals and society. «Technical work on detection and disruption should be a main source of efforts to build AI and data literacies, but this is often not the case» (McCosker, 2024: 2795). As such, Kong & Zhang (2021) propose three ethical principles in AI literacy: «*1)* the use of AI should not violate human autonomy; *2)* AI's benefits should outweigh its risks; and *3)* AI's benefits and risks should be distributed equally» (as referenced by Kong *et al*., 2023: 17).

The rise of generative AI and its implications for education

AI alarm bells did not go off until the emergence of generative AI, that «set of methods and applications capable of generating content (text, images, software, or anything else) with characteristics indistinguishable from those a human would produce» (Casar, 2023: 473). Generative Artificial Intelligence is a prevalent topic in recent research, «seemingly taking the position of a disruptive technology that has the potential to significantly transform industries ranging from productivity to creativity» (Strobel *et al*., 2024: 4546), including, of course, art and design practice and education (Delgado & Sarraute, 2025). However, technology continues to evolve, and its impact across various fields, including education, remains difficult to envision fully.

To understand how generative Artificial Intelligence works and its ethical implications, it is helpful to follow Huston (2024), whose explanation is particularly clear.

> Most of the controversy surrounding scholarly plagiarism centers on large language models (LLMs), such as GPT (generative pre-trained transformers), which operate on the principles of machine learning (ML) and natural language processing (NLP). Fundamentally, these models are trained on vast datasets of text, encompassing a wide array of subjects and styles, to learn patterns and structures inherent in human language. […] Once trained, LLMs can perform a variety of language tasks, including text completion, translation, summarization, and content generation, often producing results that closely mimic human-written text. Their ability to generate plausible, coherent text based on given prompts or to continue a given text sequence makes them powerful tools for a range of applications, from creative writing to coding assistance (Huston, 2024: 21).

In other words, given that AI applications are trained on existing texts, which are human-made products (so far), the issue is not merely the production of new content but rather the absence of attribution or credit to original sources. Therefore, «plagiarism is likely the most obvious concern for Gen-AI in education» (Marshall Bender, 2024: 164). It is irrelevant that human creativity itself is also based on countless references, or that creative training often comes through the imitation of existing works. What is at stake here is a deliberate and invisible action. This is one of the fundamental reasons why it is necessary to consider ethics as part of AI literacy, as McGowan (2024) declares, «GenAI literacy in education becomes fundamental as the capacity to engage effectively, reasonably and ethically, with generative artificial intelligence tools for use in learning and teaching activity» (p. 15).

On the other hand, García-Peñalvo, Llorens-Largo & Vidal (2024) state that the focus should be placed on personalized learning. Citing various authors (Chng *et al*., 2023; Gubareva & Lopes, 2020; Vázquez-Ingelmo *et al*., 2021; Yilmaz *et al*., 2022; Zhang *et al*., 2020), they broaden AI's scope for education. The authors propose to see them as intelligent tutors and virtual assistants, aiding immersive and interactive learning experiences, and collaborating with data analysis to understand and enhance student performance.

Today's students live in a world deeply intertwined with intelligent technological systems, making it crucial that AI literacy be integrated into 21st-century digital literacy for all students. It is an essential skill not only for IT professionals but for everyone, both in professional contexts and daily life (Ng *et al*., 2021a, 2021b). New knowledge, skills, competencies, and values are required for life and work in the age of AI (Bozkurt *et al*., 2023; Ng *et al*., 2023), along with the willingness to develop public policies and management programs within educational institutions. «Educators must guide students in navigating this complexity, ensuring that the use of Generative Artificial Intelligence enhances rather than diminishes their creative and analytical skills» (Huston, 2024: 27). That is why AI literacy has become essential in educational contexts.

There are numerous AI-based platforms and applications designed to support both educators and students. Some assist in course planning and individual

lesson design, such as Eduaide and Twee; others help in building presentations, like Canva and Slidesgo; some generate lesson content, such as Curipod and Microsoft Copilot; and there are tools for transcription (text-to-speech or speech-to-text) like Audiopen and Otter. Others, like Quizziz and Gradescope, support assessment processes. Particularly noteworthy are Claude, which helps identify weak parts of an essay, and Copyscape, which aids in detecting plagiarism.

Among all of these, ChatGPT stands out as one of the most well-known due to its rapid rise in popularity. Key benefits identified in the use of this platform include personalized learning and immediate responsiveness. Risks include the potential for technological dependency, limited access to resources, and a lack of training for teaching staff (Pérez & Robador, 2023). More precise studies analyze this AI as a potential tool for fostering critical thinking among students (Atencio-González *et al.*, 2023).

In terms of training for AI use the importance of mastering prompts stands out. These refer to the technical instructions given to the AI to perform tasks. Morales-Chan (2023) has conducted a study on different types of prompts and how to utilize them effectively for developing educational resources, among other possibilities that can yield tangible benefits in the teaching-learning process.

Three challenges of AI literacy for education

The increasing availability of resources allows students to begin developing AI knowledge, even from an early age, ensuring that future generations are better equipped to navigate a world shaped by AI technologies. «Recent researchers proposed the term 'AI literacy' to put forth the importance of adding AI to the 21st-century digital literacy skills for everyone, including young children» (Ng *et al.*, 2021a, 2021b). It is essential for educational institutions to promote open dialogue between educators and students about its purpose, ethics, privacy, algorithmic bias, and the social impact of digitalization and automation.

The North Central Regional Educational Laboratory (NCREL) and the Metiri Group, in a 2003 report, identified the competencies needed by professionals in the 21st century. Digital Age Literacy was among these competencies, including seven other literacies, such as visual and technological literacy. AI literacy falls within the latter and can even be narrowed to «Generative AI literacy». Although they could not foresee the emergence of AI as we know it today, they identified necessary skills for interacting with technology: «technological literacy is knowledge about what technology is, how it works, what purposes it can serve, and how it can be used efficiently and effectively to achieve specific goals» (NCREL, 2003: 22).

Researchers have identified AI literacy as an «essential ability for future talent to explore uncertain and complex societies, predict future problems, and find solutions» (Yi, 2021: 363). Because AI is a technology «that often operates autonomously and can adapt according to the context» (UNICEF, 2021) it is essential to provide people with tools to anticipate the future impact of technology and society, by developing essential skills, promoting responsible social practices, and encouraging inclusive social design (Yi, 2021).

However, «recent studies, […], have raised questions about the extent to which youth are aware of AI in their everyday lives and its application in industries of the future that may limit their interest in pursuing learning trajectories that lead toward careers in these fields» (Lee *et al.*, 2021: 191). Therefore, AI literacy is crucial in relation to education's role in building futures. As Lérias *et al.* (2024) affirm: «A higher level of AI literacy will allow us to find and implement better solutions to add value to the teaching-learning process through AI technologies and simultaneously support teachers and students» (p. 10).

Through this study, we identified three main challenges regarding AI literacy: the challenge of understanding, the ethical challenge, and the social challenge. Educational institutions that aim to reach the highest levels of AI literacy (provided in the table at the end of this article) will have considered these three challenges in the development of training programs and action protocols within their organizations.

The Challenge of Understanding

The application and evolution of AI in higher education is not a matter of possibility but of responsibility. As Garriga *et al.* (2024) point out, «With the ability to produce and disseminate content on a large scale, certain actors creating false content may use this technology to develop deceptive narratives that spread quickly and reach massive audiences» (p. 180). AI literacy in education should adopt a holistic approach, accounting for the risks posed by AI usage, especially those still undefined in the realm of misinformation. This approach becomes critical in creative disciplines such as arts and design, where creators have a responsibility to navigate the boundaries of plausibility. To the untrained eye, many AI-generated outputs may appear truthful, thus contributing to the misinformation we currently face. Knowledge and awareness are fundamental aspects of the human proficiency dimensions (Pinski & Benlian, 2024).

However, as with all emerging technologies, the teaching community initially resists incorporating AI into both their practice and classroom activities. «Teachers' perspectives can act as a barrier to teaching AI» (Sperling *et al.*, 2024: 9). Now, more than ever, with creative software integrating AI into its tools, educators must be prepared to utilize it as a valuable resource. Training educators on the scope and meaning of AI will be essential, promoting ongoing experimentation «with generative AI and evaluating its usefulness for various professional goals. They need the freedom, resources, and training to gain wide exposure to how contemporary professionals are using generative AI for workplace communication» (Cardon *et al.*, 2023: 281).

The challenge intensifies when considering the rapid pace of technological development. Constant updates and emerging tools make it difficult to acquire and retain a deep understanding of AI. Researchers are now raising new questions regarding educators' capabilities: «do educational leaders and teachers have enough knowledge in the field of AI to distinguish a poorly developed system from a good one?» (Lérias *et al.*, 2024: 4). As AI becomes increasingly embedded in education, it is essential that the learner has «a basic knowledge of what AI is to be able to think critically about it» (Stolpe & Hallström, 2023: 7). But also, «students should understand the application of AI to their school and work activities» (Cardon *et al.*, 2023: 277). Much like a toolbox, students should be able to distinguish which AI tool best suit a given task. The challenge of understanding involves identifying available tools, their capabilities, applicability, scope, and limitations. It is a challenge because the range of possibilities continues to grow and evolve constantly.

The Social Challenge

Aside teaching the technological aspects of AI, that is its functionality and reach, «literacy should consider social phenomena instead of merely focusing on literal education» (Yi, 2021: 355). Literacies must be conceived more «than static competencies that an individual develops or possesses, literacies are dynamic and collective» (McCosker, 2024: 2790).

As technology advances, promoting AI literacy through a lens that reflects on its impact on social phenomena will be essential in empowering students to make informed decisions, solve problems, and interact effectively with AI. One crucial consideration is that, in the near future, AI could also marginalize those who cannot access or manipulate the technology, heralding the era of the «digital divide and digital exclusion» (Yi, 2021: 360) among society's members. Thus, true technological literacy oriented towards generative AI literacy involves not only knowing how to use and interact with it but also understanding its reach and consequences.

Another issue within the social challenge is equity. The implementation of AI technologies can significantly deepen inequalities in education. «Children in low and medium Socioeconomic Status (SES) schools and centers were better at collaborating but had a harder time advancing because they had less experience with coding and interacting with AI technologies» (Druga *et al.*, 2019: 111). Hence, it is urgent to «address the

equity and access issues that may arise given that some platforms require payment for premium services which limits access for students (and schools) from disadvantaged socioeconomic backgrounds» (Marshall Bender, 2024: 166). This illustrates how a wider educational quality gap is created between students from low SES backgrounds, who often lack access to technological tools, and those in more affluent environments. Moreover, Druga *et al*. (2019) identify that children from low SES backgrounds not only tend to underperform in AI-related skills but also face greater obstacles in understanding AI concepts due to limited use of such technologies. In other words, AI literacy entails understanding the social challenge, which implicates considering that its implementation could worsen the digital divide, also referred to as the «AI divide» (Kitsara, 2022), potentially bringing economic advantages to countries that adopt it earlier in their internal processes (Bughin & Van Zeebroeck, 2018). AI implementation in educational institutions must consider the learning needs of underrepresented groups when teaching AI (Ng *et al*., 2021b).

UNESCO's recommendation highlights ten core principles that lay out a human-rights centered approach to the Ethics of AI. Among these, there are several that call for non-discrimination, human oversight, and promoting awareness. Its implications reach the scope of economy, sustainability, culture, health, communications, and education policies (UNESCO, 2021). These principles serve as a global ethical framework to guide the development and deployment of AI technologies in a way that respects human dignity and fundamental freedoms. By encouraging inclusiveness and accountability, the recommendation seeks to ensure that AI systems contribute to equitable and just societies. Furthermore, it emphasizes the importance of building capacity and fostering international cooperation to bridge technological divides and prevent the deepening of existing inequalities. Therefore, AI literacy must address not only technical competencies but also the social challenges posed by AI technologies, such as bias, surveillance, and unequal access.

The Ethical Challenge

AI literacy must include an understanding of the ethical implications of using these technologies, especially in educational environments where equity, data privacy, and trust are fundamental. Ethics becomes a central component in the educational framework that incorporates AI, since these technologies can replicate or exacerbate existing biases. AI systems can result in discriminatory outcomes if they are trained on biased data or designed without considering diverse perspectives. Educational institutions must recognize this risk and actively work to mitigate it through diverse representation and responsible data management (UNESCO, 2019). «When AI models are trained on biased data, they can inherit and perpetuate these inaccuracies, leading to biased outcomes» (Hanna *et al*., 2025: 3). According to Hanna *et al.* this Bias refers to «systematic and unfair favoritism or prejudice in AI systems, which can lead to discriminatory outcomes» (p. 3). The authors identify three main factors responsible: *1)* data bias, when the training of AI uses unrepresentative data; *2)* development bias, which is the result of the inappropriate when there is misuse of AI algorithms in model development; *3)* interaction bias, when the AI user interactions are inappropriate (Hanna *et al*., 2025).

AI literacy must empower students not only to understand how systems work but also to develop a critical attitude toward their usage. This means fostering the ability to identify when and how technology might be used inappropriately, especially regarding privacy, surveillance, or exclusion. Ethical considerations must be present at every stage of the educational process involving AI, from the choice of tools to implementation and evaluation. «To foster ethical and responsible AI use, learners should develop an understanding of bias, privacy, and accountability in AI systems and how these concepts relate to social justice, fairness, and equity» (Ng *et al*., 2023: 9).

Another key point in this ethical challenge lies in transparency and explainability. Students and teachers alike must understand how an AI system arrives at its conclusions or suggestions. The lack of transparency

in some generative AI models can hinder trust in the educational process and, more seriously, lead to the uncritical adoption of AI-generated content. Educators must also be equipped to assess the ethical implications of incorporating AI into their teaching, «this includes understanding the potential harm caused by misuse or misinterpretation of AI tools» (Ng *et al*., 2023: 10). This preparation is essential for creating an environment where AI use is not only technically correct but also socially and ethically responsible.

In conclusion, AI literacy goes far beyond understanding how AI tools function. It must address three key dimensions: *1)* the challenge of understanding the technology and its evolution; *2)* the social challenge of avoiding increased inequalities and digital exclusion; and *3)* the ethical challenge of fostering critical, fair, and responsible use of AI systems.

This multidimensional approach must be central to the development of AI education programs, especially in contexts like teacher education, where decisions made today will impact future generations. The development of responsible, equitable, and reflective AI literacy should be a collective effort between educational institutions, policymakers, and society at large.

Discussion: AI literacy borderline for design education

Based on the documentary study, we identified three core axes that shape AI literacy as a skillset. The first is comprehension, defined as the ability to understand AI concepts, evaluate AI outputs critically, and integrate AI meaningfully into creative and pedagogical practices; the second, ethical reasoning, is referred to as the capacity to recognize, articulate, and engage with ethical issues related to AI, and to develop responsible frameworks for its use in art and design. Finally, the third is social awareness, which involves understanding and reflecting on the broader social, cultural, and economic implications of AI.

Nevertheless, how challenging is it to develop it within institutions? What would be the following steps to take? There appears to be a significant gap between discussions about the implications of AI use and the actual possibilities of incorporating it within institutions. For this reason, as a contribution of this article, we developed the following table (Table 1), which outlines both a pathway for integrating AI into art and design education and an assessment rubric. The table is inspired by one developed by the Digital Education Council (DEC, 2024), which proposes dimensions and levels for assessing an institution's readiness to embrace artificial intelligence. In this case, the table (Table 1) serves as a roadmap for technological appropriation. In other words, the four levels presented across four columns may represent the steps to follow, attributes that institutions should aim for to promote a learning culture in which artificial intelligence has been meaningfully incorporated into the teaching-learning process.

Additionally, the table displays, in rows, the three axes identified through documentary research: the challenge of understanding, the social challenge, and the ethical challenge. The first row corresponds to the understanding factor, which refers to the technical aspects of available tools and their usability, as well as the ability to incorporate them into the creative process; the second, the ethical factor involves awareness of issues related to authorship and verisimilitude that arise from using AI, and what it means to integrate AI into various creative workflows; the third, the social factor implies different levels of awareness about the impact of AI in diverse social spheres, encouraging a long-term perspective and considering its potential to transform culture, the economy, and creative processes.

The first column corresponds to the first level: the recognition and understanding, that is, understanding AI's possibilities, limitations, consequences, and concerns. The second level (second column) refers to its application potential. Once the academic community acquires a level of awareness, the next step is to experiment with the technology within the boundaries of its ethical and social implications. The third and fourth levels (displayed in the third and fourth columns) enable the development of a learning culture. Beyond knowing how and when to use that technology, these levels encourage discussion about its use, and the results be-

Table 1 AI Literacy borderline for design education

Skills	*Level 1*	*Level 2*	*Level 3*	*Level 4*
Comprehension	Understand basic concepts of AI, its capabilities, limitations, and general use for art and design projects.	Apply AI tools to create or support art and design projects.	Critically evaluate AI outputs; compare traditional *vs* AI-driven creative processes.	Integrate AI meaningfully into pedagogy and workflows; innovate with AI to extend creative and and conceptual boundaries.
Ethics	Recognize basic ethical concerns in using AI tools; identify and articulate ethical dilemmas in AI-generated art & design.	Apply attribution and transparency practices when using AI in creative processes.	Engage in critical discussions about AI's role in shaping cultural and aesthetic norms.	Formulate ethical frameworks for responsible AI use in education and design practice; design public policies and action protocols for Ai inclusion in art & design education.
Social Impact	Understand that AI affects society, broadens the digital divide, and affects the creative industries.	Acknowledge social paradigms, construction of meaning, and power dynamics, embedded in AI processes.	Critically reflect on the cultural shifts AI may bring to design practice, education, creative authorship, and creative economy.	Develop and implement strategies for using AI in socially responsive and community-centered design education.

Table 1. Four levels of development of AI literacy, within comprehension, ethics and social impact as fundamental factors.

come prompts for inquiry, reflection, and research motivation. AI also becomes part of the institution's way of thinking and acting.

Institutions have yet to find a way to begin discussing the use of AI in teaching and learning practices. For this reason, this table can serve as an assessment rubric: a guide for initiating dialogue and understanding the perspectives of the entire academic community. This guide can help raise awareness, especially by spreading the idea that it is not only about teaching how to use technological tools, but also about considering other dimensions. AI literacy will enable institutions to take a stance on this technology, which is already used daily in academic activities, to develop a starting point, and to design a path for improvement.

We present this table (Table 1) as a borderline framework for art and design education, emphasizing that we are at a pivotal moment for its integration, in that blurry space where certain practices are already emerging, yet there are no clear policies or protocols in place. This framework serves as a foundation for institutions to develop strategies that fully embrace the benefits of incorporating AI literacy into design education.

There is still much to be done and debated regarding this rapidly evolving technology. This document intends to become a starting point, a referential framework for future discussions on the development of AI literacy, a skill that will be fundamental in the second half of the 21st century, and a key factor in shaping teaching and learning processes in art and design education.

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