

REPORT 5

Artificial Intelligence Literacy:

Challenges and Opportunities in Education

[ANONYMIZED REPORT — ALL IDENTIFYING INFORMATION REMOVED]

Abstract

This work aims to investigate Artificial Intelligence (AI) literacy in the educational context, a topic of growing importance given the rapid expansion of this technology. The research examines the possible integration of AI into educational institutions, without disregarding complementary literacies in programming and data. The challenges and opportunities present in the implementation of AI literacy are explored, suggesting the creation of a platform focused on the training of educators, providing support so that they can integrate AI into the classroom and develop innovative curricula that prepare students for a digital and automated future.

1. Introduction

The concept of literacy, traditionally linked to the ability to read and write, has evolved significantly in the contemporary context. Today, it encompasses a wide range of competencies that include the ability to understand, interpret, communicate, and use information in different formats and contexts. This expanded concept of literacy also involves critical thinking, problem-solving, and the use of technologies to access and disseminate knowledge [Ricieri et al. 2024]. In this way, literacy transcends traditional alphabetization and incorporates essential skills for active, critical, ethical, and responsible participation in our society.

In [omitted for blind review], the concepts of alphabetization and literacy are frequently intertwined. According to [Soares 2004], the distinction between these terms is less clear here than in countries such as France and the United States. Initial learning of reading and writing (alphabetization) is often confused with mastery of reading and writing use skills (literacy), making them overlapping concepts.

Artificial Intelligence (AI) literacy emerges as an important topic in the [omitted for blind review] educational scenario. Although there is a vast literature on AI literacy at the global level, there is a gap in the application and discussion of this topic in the [omitted for blind review] context. The main challenges in this area include the lack of adequate infrastructure and resources in educational institutions, resistance to change on the part of educators and administrators, and the scarcity of qualified professionals to teach AI. In addition, ethical issues, inequality in access to technology, and digital exclusion are significant barriers that cannot be ignored [Oliveira et al. 2024].

The still limited way in which AI literacy is explored in literature focused on [omitted for blind review] education highlights the need for more studies that consider the local reality. This work aims to explore whether and how AI has been addressed in [omitted for blind review] schools, considering its impact on educational practices and on preparing students for the digital world and the labor market. Furthermore, it is important to understand the relationship between AI literacy and complementary literacies, such as programming and data literacy.

Training students in AI within the educational scope does not involve only the superficial transmission of technical knowledge about how it works and the use of applications that have become popular, such as ChatGPT. It also involves the development of practical skills that enable individuals to truly understand the technology and to use AI in an ethical and responsible way in their personal, academic, and professional lives. This requires updated curricula, adequate technical resources, and the continuous development of educators who can act as multipliers of this knowledge [Oliveira et al. 2024, Duque and Moura 2023].

The [omitted for blind review], in its updated version, includes computing in a complementary manner, which may open the way for the integration of AI literacy into school curricula. The recent National Digital Education Policy (PNED), established by Law 14.533/2023, reinforces the need to prepare students for the digital era, promoting the inclusion of digital competencies as an integral part of basic education. These guidelines serve as incentives for AI knowledge to reach students through the

training of educators, aligning them with national educational policies [omitted for blind review].

This work intends not only to explore the current state of AI literacy at a global level but also to suggest paths to integrate this knowledge into educational curricula, understanding the reality that exists today in the country. The vast literature available on AI literacy in other countries can serve as valuable inspiration for this area to also gain strength in [omitted for blind review]. Currently, there are few studies focused on the [omitted for blind review] reality, which makes the adaptation of international best practices to the local context even more important [Duque and Moura 2023]. Thus, it is essential that [omitted for blind review] students are prepared for the challenges and opportunities that AI may offer, providing better and more equal educational opportunities, and for this, educators must be prepared and guided. By filling this gap, it is possible to boost innovation and educational development in the country.

2. Theoretical Foundation

In this section, the main concepts necessary to understand the purpose of this work are presented. Understanding these concepts is important to address how AI is transforming education globally and what challenges and opportunities can be identified in the implementation of this technology in the [omitted for blind review] educational environment.

2.1. Information Systems and General Systems Theory

Information Systems (IS) are a multidisciplinary field that integrates information technology, business processes, and people to collect, process, store, and disseminate information. Understanding IS is important to understand how artificial intelligence can be used in various contexts, which may include the business world and also education. According to [Laudon and Laudon 2024], IS are fundamental for strategic decision-making, operations management, and organizational innovation.

In the context of AI literacy, IS provide a structure for the implementation and use of artificial intelligence. Adequate AI

literacy should aim to enable individuals not only to use AI tools but also to understand related algorithms, practical applications, and ethical implications of this technology. The integration of AI with IS allows organizations to analyze large volumes of data and thus identify patterns, predict trends, and optimize processes, enabling more assertive decision-making.

General Systems Theory (GST), developed by Ludwig von Bertalanffy [Ramage and Shipp 2009], is an interdisciplinary approach that seeks to understand the general characteristics of systems, regardless of their type, structure, or scale. This theory is applicable to several fields, such as biology, engineering, sociology, and especially IS. GST provides a comprehensive perspective that allows understanding how IS components interact and influence each other. Regarding AI literacy, GST highlights the importance of understanding the connections between different technological, organizational, and human components. An AI system, to be considered successful, cannot be just a collection of algorithms but rather an integrated set of hardware, software, data, and people working together to achieve specific objectives. This theory helps to understand how changes in one component can affect the entire system, promoting a systemic view relevant to the development and implementation of AI-based solutions.

To connect the concepts of IS and GST, it is essential to consider that both fields mutually benefit in the creation of more efficient and effective solutions. For example, IS are often seen as complex systems that require a systemic approach to be well understood and managed. Applying GST principles to IS allows a better understanding of how different technological and human components interact. According to Laudon and Laudon (2024), the effectiveness of IS in supporting decision-making and organizational innovation depends on a clear understanding of these interactions and interdependencies.

In the context of IS, AI literacy involves enabling individuals to understand and use AI technologies critically and ethically. This includes learning basic AI principles up to practical application in different contexts. In the educational field, for example, AI literacy enables educators to integrate these technologies into their pedagogical practices and classroom

activities, acting as multipliers. Consequently, through educators, students can also be trained.

The integration of IS and GST provides a solid foundation for the development of AI systems that do not function in isolation but as integrated parts of a larger whole. This is crucial to ensure that AI solutions are not only technically effective but also aligned with organizational objectives and capable of adapting to changes in the technological and business environment.

3. Methodology

For the development of this work, the Speculative Design methodology was used, exploring possible futures and their technological, social, cultural, and ethical implications. This methodology was applied using the three provided workbooks, which served as structuring guides for the reflections and proposals of this study.

3.1. Workbook 1: Where Are We?

The first workbook was fundamental for mapping the current context of AI literacy in [omitted for blind review]. The proposed activities allowed a critical analysis of how AI literacy is perceived and practiced in schools. Initially, it was identified that the AI literacy scenario was disconnected from the [omitted for blind review] educational reality, where AI is still not fully integrated into classrooms.

During the exploration of the definitions of literacy and alphabetization in the [omitted for blind review] context, the focus of the work—previously more global and generic—was adjusted to the local reality. This process helped identify the scarcity of specific studies on AI literacy in [omitted for blind review], highlighting the need for deeper investigation relevant to the national educational context.

3.2. Workbook 2: Where Are We Going?

In the second workbook, the proposal was to explore possible futures for AI literacy in [omitted for blind review], considering the rapid popularization of AI technologies. This

workbook guided the analysis of trends identified in the first workbook and their possible evolutions.

It was important to reflect on the next steps for AI education, especially if no adequate intervention is carried out. Through the activities of this workbook, it was possible to speculate on the impact of these trends in the short term (less than five years), given the speed at which AI is becoming popular. It was concluded that the lack of intervention could result in an unequal and fragmented integration of AI into school curricula, increasing educational disparity and inequalities of opportunity between different regions and educational institutions.

3.3. Workbook 3: Where Do We Want to Go?

The third workbook was used to define a desired future for AI literacy in the [omitted for blind review] educational context. Through the proposed reflections, a more propositional approach was developed, focused on the possible creation of a concrete solution. This workbook was used to sketch an IT solution that could be implemented to train educators in AI.

The proposed solution includes the creation of an accessible and free educational platform, offering online courses, content streaming, interdisciplinary workshops, and interactive teaching materials. In addition, other necessary actions were explored to ensure the effectiveness of this solution, such as partnerships to provide technological resources and monitoring of the application of BNCC and PNED guidelines.

Using the third workbook, a structured intervention was planned that aims to transform the current scenario, providing a more equitable and inclusive AI education for all students, regardless of their socioeconomic condition.

4. Artificial Intelligence Literacy Today

For this section, I revisit what was presented as the state of the art of AI literacy in the previous work in order to provide an overview of the topic on a global scale. Five articles published between 2022 and 2024 were analyzed, addressing the importance of AI literacy, its challenges, its integration into school curricula, as well as the necessary competencies, the

components that could make up such curricula, and some frameworks related to the theme.

It is important to highlight that none of the articles cited in this section focus on [omitted for blind review] education; however, the components and competencies listed within each component can be used in the suggestion of developing a curriculum that meets the needs of [omitted for blind review] educators and students.

4.1. Articles

The subsections below present brief summaries of the articles mentioned, which can be found in the references of this work.

4.1.1. [Walter 2024] Embracing the future of Artificial Intelligence in the classroom: the relevance of AI literacy, prompt engineering, and critical thinking in modern education

Highlights the importance of AI literacy in modern classrooms, arguing that, in addition to technical knowledge, students must develop skills in prompt engineering and critical thinking. It suggests that integrating these skills into the curriculum can better prepare school-age individuals for a future in which AI plays a central role in various professional fields.

4.1.2. [Chiu et al. 2023] Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education

Presents a systematic review on opportunities, challenges, and future recommendations for research focused on AI in education. It identifies the rapid evolution of AI technologies as a major challenge, making it difficult for educational institutions to keep their curricula up to date. It also highlights the need to further explore the training of individuals to use AI in a critical and ethical manner.

4.1.3. [Stolpe and Hallstrom 2024] Artificial intelligence literacy for technology education

Discusses the need to integrate AI literacy into technology education curricula. It addresses the challenges faced by educational institutions, including overloaded curricula and a lack of specialized resources. It emphasizes the need for

educator training that enables these professionals to understand AI and to convey these concepts to students in an accessible way.

5. Proposed Solution

This notebook was used to sketch an IT solution that could be implemented to train educators in AI.

The proposed solution includes the creation of an accessible and free educational platform, offering online courses, content streaming, interdisciplinary workshops, and interactive teaching materials. In addition, other necessary actions were explored to ensure the effectiveness of this solution, such as partnerships to provide technological resources and monitoring the application of the BNCC and PNED guidelines.

Using the third notebook, a structured intervention was planned that aims to transform the current scenario, providing a more equitable and inclusive AI education for all students, regardless of their socioeconomic condition.

6. Final Considerations

A longitudinal analysis of the results obtained after the implementation of AI curricula could also provide concrete data regarding the proposed interventions and guide improvements.

For future work, it would be interesting to explore the application of AI literacy initiatives in different educational contexts and regions, as well as to analyze the long-term impacts of the proposed platform on teacher training and classroom practices.

References

[Some of the references were omitted due to blind review]

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