REPORT 2

Use of Artificial Intelligence in Literacy Education

[ANONYMIZED REPORT – NO IDENTIFYING INFORMATION]

Abstract

Literacy is an essential stage in individual development; however, in [omitted], significant challenges remain. Artificial intelligence makes it possible to personalize teaching and scale pedagogical methodologies, helping to overcome educational barriers and challenges related to access to quality education. This work applies speculative design to discuss present and future scenarios of the use of artificial intelligence in education, focusing on the literacy process of children in the early years of elementary school. Ethical, social, and technological implications are addressed.

Through a literature review and the construction of speculative scenarios, this work contributes to the discussion on the role of artificial intelligence in the future of education. Perceptions are discussed regarding how artificial intelligence can be used to increase literacy rates and help ensure that all children have access to quality education. The first section presents an introduction; the second section reviews speculative design literature; the third section describes how speculative design is explored in this work; Section 4 applies speculative design to the study topic; and the final section presents the conclusion.

1. Introduction

The literacy process is essential in an individual's life. Through reading and writing, people gain autonomy to understand information, acquire knowledge, and communicate effectively. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), literacy is defined as the "ability to identify, understand, interpret, create, communicate, and compute, using printed and written materials associated with varying contexts" [UNESCO, n.d.].

However, literacy among children in the early years of elementary education in [omitted] faces significant challenges, especially in a context of social and economic inequality. According to the First Results Report of the *Child Literacy Indicator* [INEP 2022], in 2023 only 56% of children enrolled in public institutions were literate. In 2021, after the onset of the COVID-19 pandemic, this figure dropped to 36%, reflecting the difficulty of ensuring effective literacy processes through remote education, particularly in a country where access to technology is still uneven. The national goal for literacy by 2030 is 80%.

In this context, this work proposes a reflection on the use of artificial intelligence as a potential tool to improve literacy rates in [omitted]. Artificial intelligence has the potential to personalize learning, provide real-time feedback, and create adaptive content tailored to the specific needs of each student, contributing to equal educational opportunities.

Using speculative design—an approach that employs imagination to explore possible futures—this work reflects on potential scenarios of AI use in education. Speculative design does not aim to predict the future but rather to open new perspectives and enable discussions about the futures we collectively wish to build.

The objective of this work is to explore how artificial intelligence can support the literacy process and contribute to the national literacy goal for 2030. Through a literature review and the application of speculative design, challenges and opportunities associated with this technological integration in education are identified, and possible solutions are proposed.

2. Speculative Design – Literature Review

Before introducing speculative design, it is important to understand what design is. All artificial things are designed; however, not everything that is designed has a physical structure, such as organizational structures of companies or governments [Norman 2013]. Whether designing a physical object like a bookshelf, a conceptual construct like the theory of relativity, or a digital artifact like a website, someone must

think about the subject and decide how the final artifact will function.

Design has existed since prehistory, when humans needed tools such as spears or shelters. However, design as a formal field is relatively recent and comprises multiple specialties. According to Norman (2013), these can be grouped into three categories:

- **Industrial design:** creation and development of concepts and specifications that optimize function, value, and appearance of products and systems for mutual benefit of users and manufacturers.
- **Interaction design:** strongly related to technology, aiming to improve people's understanding of what can be done, what is happening, and what has just occurred.
- **Experience design:** designs products, services, processes, and environments focusing on the quality and pleasure of the overall experience.

Design concerns how things work, how they are controlled, and how people interact with technology [Norman 2013].

While design is often perceived as problem-solving, confronting major challenges such as overpopulation or global warming reveals that design is inherently optimistic and requires changes in values, beliefs, and behavior [Dunne & Raby 2013]. Speculative design uses imagination to explore "wicked problems" and redefine our collective relationship with reality.

Rather than predicting what the future *should* be, speculative design explores what the future *could* be, recognizing that notions of "better" vary across individuals and cultures. Future studies acknowledge that multiple futures are possible. Henchey (1978) proposed four categories of futures:

- **Possible:** anything that can be imagined, regardless of probability;
- **Plausible:** futures that make sense given current conditions;
- **Preferable:** futures we would like to see happen;

- **Probable:** futures most likely to occur based on present trends.

Speculative design uses these categories to foster debate and collective reflection about desirable futures rather than predictions [Dunne & Raby 2013].

3. Speculative Design in Practice

In this work, speculative design is applied based on instructional material that frames the process around three key questions:

1. Where are we?
2. Where are we going?
3. Where do we want to go?

These questions correspond to present conditions, plausible futures, and preferable futures, respectively.

3.1. Where Are We?

Understanding the current context requires analyzing media agendas, technological trends, and their relationship to AI-assisted literacy. Data collection tools such as Google Trends and innovation mapping platforms help identify signals and trends shaping the present.

Artificial intelligence in education encompasses multiple applications, including student assessment, automated grading, personalized learning systems, intelligent tutoring, virtual laboratories, and remote education [Chen et al. 2020]. Most applications, however, remain focused on administrative tasks rather than inclusive learning support.

Despite significant benefits, challenges persist, including infrastructure limitations, teacher training, equitable access, development costs, algorithmic bias, and ethical concerns such as transparency and data protection [Kamalov et al. 2023].

4. Speculating on the Future of Artificial Intelligence in Literacy

Current literacy rates highlight the urgency of innovation. With a national goal of reaching 80% literacy by 2030, artificial intelligence could support inclusive literacy platforms with audiovisual content, real-time feedback, and adaptive challenges.

AI-driven intelligent tutoring systems could personalize literacy exercises, support remote or in-person learning, and promote educational equity. However, socioeconomic barriers, infrastructure gaps, and ethical concerns remain significant obstacles.

Ethical debates surrounding AI—including bias in facial recognition systems and underrepresentation of marginalized groups in training datasets—underscore the need for inclusive and transparent design practices [Buolamwini & Gebru 2018].

4.2. Where Are We Going?

If no intervention occurs, AI adoption in education is likely to remain concentrated in administrative tasks and private institutions, with limited focus on inclusion or accessibility in public education. Investment trends indicate that AI development is largely driven by private sector funding, especially in developed countries [McKinsey 2022; HAI 2022].

4.3. Where Do We Want to Go?

A preferable future involves the development of a free, inclusive online literacy platform powered by artificial intelligence. This platform would provide audiovisual content, adaptive exercises, and intelligent tutoring to support children with diverse learning needs, including cognitive disabilities such as dyslexia.

Teacher collaboration, infrastructure investment, ethical governance, and continuous evaluation would be essential to ensure accessibility, data protection, cultural relevance, and psychological well-being of students.

5. Conclusion

This work applied speculative design to explore possible futures of artificial intelligence in education, focusing on literacy in early elementary education. By examining present conditions, probable futures, and preferable scenarios, the study highlights both the potential and the ethical challenges of AI adoption in literacy education.

While AI offers promising opportunities for personalized and inclusive learning, socioeconomic inequalities and ethical concerns must be addressed. Government support and academic engagement are crucial to advancing toward a preferable future in which AI contributes positively to equitable and high-quality literacy education.

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