

TEMA MONOGRÀFIC

Artificial intelligence: a new grammar or the end of knowledge? Lessons for historians of education¹

Intel·ligència Artificial: una nova gramàtica o la fi del coneixement? Lliçons per als historiadors de l'educació

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RESUM

En aquest article, connectem la intel·ligència artificial (IA) amb la història de l'educació responent quatre preguntes clau: (a) Què ens pot ensenyar la història de l'educació sobre el futur de la IA a l'educació? (b) Com està afectant la IA el nostre coneixement sobre les històries educatives? (c) Com es pot utilitzar la IA en l'ensenyament?

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ment de la història de l'educació? (d) Com pot servir la IA com a eina de recerca dins de la història de l'educació com a disciplina acadèmica?

Concloem el següent: (a) Si els professors no adapten les maneres en què avaluen els estudiants, la IA no canviarà la gramàtica escolar existent. L'aprenentatge personalitzat és una possibilitat, però només si primer es produeixen canvis sistèmics. (b) La IA pot ser una eina valuosa per adquirir coneixements sobre la història de l'educació, però és essencial equilibrar-ne el raonament inductiu amb un enfocament hipotetico-deductiu, implicar els estudiants en l'anàlisi crítica i continuar buscant fonts primàries. (c) Els creadors d'imatges basats en IA es poden utilitzar als tallers d'història de l'educació per millorar la comprensió tant de la IA com del passat educatiu generat a través d'imatges. (d) Els creadors d'imatges es poden utilitzar per a la denotació i connotació, o per visualitzar memòries individuals de l'escola, o construir de manera col·laborativa realitats històriques de l'escola, fomentant un «passat viu».

PARAULES CLAU: Intel·ligència Artificial Generativa; Història de l'Educació; Gramàtica de l'escolarització; creadors d'imatges d'IA; Formació del professorat.

ABSTRACT

This article links artificial intelligence (AI) with the history of education by answering four key questions: (a) What can the history of education teach us about the future of AI in education? (b) How is AI affecting our knowledge about educational histories? (c) How can AI be used in teaching history of education? (d) How can AI be used as a research tool within the academic discipline of history of education?

Our findings reveal the following: (a) AI will not alter the existing «grammar of schooling» if teachers fail to adapt how they students are assessed. Systemic changes are required first for personalized learning to become a possibility; (b) AI can be a valuable tool for acquiring knowledge about the history of education, although it is essential to balance its inductive reasoning with a hypothetical-deductive approach, engage students in critical analysis and continue to seek out primary sources; (c) AI-powered image creators can be used in history of education workshops to enhance the understanding of both AI and educational history as generated through images; (d) Image creators can be used for denotation and connotation, as well as to visualize individual school memories or collaboratively construct historical school realities, thus fostering a «living past».

KEYWORDS: Generative Artificial Intelligence; History of Education; Grammar of Schooling; AI Image Creators; Teacher Training

RESUMEN

En este artículo conectamos la Inteligencia Artificial (IA) con la historia de la educación respondiendo a cuatro preguntas clave: (a) ¿Qué puede enseñarnos la historia de la educación sobre el futuro de la IA en la educación? (b) ¿Cómo está afectando la IA a nuestros conocimientos sobre la historia de la educación? (c) ¿Cómo puede utilizarse la IA en la enseñanza de la historia de la educación? (d) ¿Cómo puede servir la IA como herramienta de investigación dentro de la historia de la educación como disciplina académica?

Concluimos lo siguiente (a) Si los profesores no adaptan su forma de evaluar a los alumnos, la IA no cambiará la gramática actual de la escolarización. El aprendizaje personalizado es una posibilidad, pero sólo si antes se producen cambios sistémicos. (b) La IA puede ser una herramienta valiosa para adquirir conocimientos sobre la historia de la educación, pero es esencial equilibrar su razonamiento inductivo con un enfoque hipotético-deductivo, implicar a los estudiantes en el análisis crítico y seguir buscando fuentes primarias. (c) Los creadores de imágenes con IA pueden utilizarse en talleres de historia de la educación para mejorar la comprensión tanto de la IA como del pasado educativo generado a través de imágenes. (d) Los creadores de imágenes pueden utilizarse para la denotación y la connotación, o para visualizar recuerdos escolares individuales, o construir de forma colaborativa realidades escolares históricas, fomentando un «pasado vivo».

PALABRAS CLAVE: Inteligencia Artificial Generativa; Historia de la Educación; Gramática de la Escolarización; Creadores de imágenes AI; Formación del Profesorado.

1. LINKING ARTIFICIAL INTELLIGENCE AND THE HISTORY OF EDUCATION

Ever since generative artificial intelligence (AI) entered the realm of education, we have been inundated with facts and fiction, opinions and observations. Amidst this upheaval, one figure has taken centre stage: the teacher. As students now have access to AI tools capable of simulating thought and even basic reasoning, the role and relevance of human instructors (i.e. teachers) have come under scrutiny. At a time when the future of education seems uncertain, taking a step back to examine the past is worthwhile. This article links AI with the history of education and examines its role both as an academic field and a subject at teacher training colleges and faculties of

education and pedagogy. To my knowledge, historians of education have not yet engaged with this topic. In this sense, the time has come to fill this gap by answering four key questions:

- a) What can the history of education teach us about the future of AI in education?
- b) How is AI affecting our knowledge about educational histories?
- c) How can AI be used in teaching history of education?
- d) How can AI be used as a research tool within the academic discipline of history of education?

We will particularly focus on AI-powered image creators to understand how generative AI functions, as well as its potential applications. Generative AI is versatile and capable of performing tasks such as brainstorming, writing, summarizing, programming, planning, advising, analysing data, generating images and retrieving information from the internet. However, it is image generation that holds special relevance for teaching history of education, since visual material has always played a crucial role in education, heavily influenced by figures like Pestalozzi. Moreover, history of education teaching has traditionally relied on visual representations to immerse students in historical education contexts. These include oil paintings², photographs³ and engravings⁴, which serve as invaluable resources for illustrating educational practices and settings across different eras.

2. ARTIFICIAL INTELLIGENCE: THE END OF THE «GRAMMAR OF SCHOOLING»?

What can the history of education teach us about the future of AI in education? Historians of education have repeatedly pointed out that new technologies tend to have a limited impact on the way educational practices are organized

² DEKKER, J. *Children's Emotions in Europe, 1500 – 1900: A Visual History*, London: Bloomsbury, 2024.

³ GROSVENOR, I., LAWN, M. & ROUSMANIERE, K. (eds.). *Silences & Images. The Social History of the Classroom*, New York: Peter Lang, 1999; BRASTER, S., GROSVENOR, I. & POZO ANDRÉS, M. M. DEL (eds.), *The Black Box of Schooling. A Cultural History of the Classroom*, Brussels: Peter Lang, 2011.

⁴ POZO ANDRÉS, M.M. DEL & BRASTER, S. «Exploring new ways of studying school memories. The engraving as a blind spot of the history of education», in YANES-CABRERA, C., MEDA, J. & VIÑAO, A. (eds.). *School Memories. New trends in the History of Education*, Cham: Springer, 2017, pp. 11-27.

by teachers and school authorities.⁵ When technologies such as radio, television, computers and tablets were introduced into classrooms, they were heralded as educational game-changers. Nonetheless, traditional approaches to how things were done in education did not fundamentally change. In these instances, historians of education often refer to the «grammar of schooling», coined by Tyack and Tobin in 1994, and taken up by many other scholars working in the history of education field.⁶

The «grammar of schooling» is a description of *what* education is rather than an explanation of *why* education is the way it is.⁷ The «grammar of schooling» encompasses familiar patterns such as age-based grading, subject division, scheduled class times, standardized assessments and teacher-centred instruction. These features resemble the way in which labour and production were organized in factories dating back to the industrial revolution and Taylorism or scientific management. Factories stood for standardization, mechanization, control, supervision, discipline and efficiency, and school organization followed suit. Thus, *industrialism* as the dominant societal discourse in the nineteenth century is one way to *explain* why schools follow a traditional grammar. This argument aligns with the correspondence principle put forward by the educational sociologists Bowles and Gintis in *Schooling in Capitalist America*, published in 1976: the hierarchical structure of schools mirrors the organization of capitalist workplaces. In schools, teachers act as authority figures akin to managers in the workplace. Grades and levels in

⁵ CUBAN, L. *Teachers and Machines: The Classroom Use of Technology Since 1920*. New York: Teachers College Press, 1986; Cuban, L. «Reforming again, again, and again». *Educational Researcher*, vol. 19, issue 1 (1990), pp. 3–13. DOI: <https://doi.org/10.3102/0013189X019001003>; CUBAN, L. (1993). «Computers meet classroom: Classroom wins». *Teachers College Record*, vol. 95, issue 2 (1993), pp. 185-210. DOI: <https://doi.org/10.1177/016146819309500202>; CUBAN, L. *Oversold & Underused: Computers in the Classroom*. Cambridge, MA: Harvard University Press, 2001.

⁶ TYACK, D. & TOBIN, W. «The “Grammar” of Schooling: Why Has It Been So Hard to Change?», *American Educational Research Journal*, vol. 31, issue 3 (1994), pp. 453-479; TYACK, D.- & CUBAN, L. *Tinkering Toward Utopia. A Century of Public School Reform*. Cambridge, MA/London: Harvard University Press, 1995; DEPAEPE, M. «Demythologizing the Educational Past: An Endless Task in History of Education», *Historical Studies in Education*, vol. 9, issue 2 (1997), pp. 208-233; DEPAEPE, M. *Order in Progress. Everyday Educational Practice in Primary Schools: Belgium, 1880-1970*. Leuven: Leuven University Press, 2000; VIÑAO FRAGO, A. «Do Education Reforms Fail? A Historian's Response». *Encounters on Education*, issue 2 (2001), pp. 27-47; DEPAEPE, M. & SMEYERS, P. (eds.). *Educational research: the educationalization of social problems*. Heidelberg: Springer, 2008; CUBAN, L. *Inside the Black Box of Classroom Practice: Change Without Reform in American Education*. Cambridge, MA: Harvard Education Press, 2013.

⁷ COURTNEY, S. J., MANN, B. «Thinking with ‘Lexical’ Features to Reconceptualize the ‘Grammar’ of Schooling: Shifting the Focus from School to Society». *Journal of Educational Change*, issue 22 (2021), pp. 401–421. DOI: <https://doi.org/10.1007/s10833-020-09400-4>.

education resemble wages in the workplace, incentivizing conformity and performance. Moreover, the tracking and sorting mechanisms in education reflect social stratification and economic inequality.

The twentieth century introduced other discourses, paradigms or rationales that influenced educational change. One important example would be the New Education or Progressive Education movement with its demands for child-centeredness, customization, individualization and personalization. More recent decades have seen neo-liberal discourse leaving a mark on education through a focus on competition, school autonomy, deregulation and decentralization, transparency about outcomes and the freedom of parents to select a school of their choice (for instance, one that scores highly in school tables). This neo-liberal discourse resulted in some slight modifications to the familiar grammar, with more importance attached to performance tests, published lists of high-scoring schools and even country rankings based on PISA scores.⁸ In general, however, the image of education has remained unchanged, whether during the neo-liberal era of Margaret Thatcher and Ronald Reagan, or in the present day with the rise of populist parties and neo-conservative politicians. Thus far, there has been no major shift from the traditional one-size-fits-all grammar of schooling to a new approach characterized by child-centredness and personalized learning. The question we must ask ourselves today is whether generative artificial intelligence tools, like ChatGPT, will trigger an educational revolution and lead to a new «grammar of schooling».

When ChatGPT 3.5 was released on 30th November 2022, it certainly looked like the start of a revolution. After reaching one million users within its first five days, by the end of January 2023 it had 100 million active users, outpacing the growth of other major platforms such as Facebook, Instagram or TikTok, and making it the fastest-growing consumer software application in history.⁹ It quickly gained popularity among students and, just as quickly, educational authorities and, particularly, exam boards condemned its use. The authorities wanted to ban ChatGPT from schools as students are expected to produce authentic and original work. They viewed work created with AI as

⁸ Programme for International Student Assessment. Organisation for Economic Co-operation and Development. <https://www.oecd.org/pisa/>.

⁹ SCHMIDT, P.G., MEIR, A.J. «Supplementary Material for the Article Using Generative AI for Literature Searches and Scholarly Writing: Is the Integrity of the Scientific Discourse in Jeopardy?», *Mathematics Research*, issue 9 (2023). DOI: https://scholar.smu.edu/hum_sci_mathematics_research/9.

cheating or a form of plagiarism since the program generates answers based on vast amounts of information, including copyrighted materials. Such reactions are entirely consistent with the traditional «grammar of schooling».

Of course, some voices within scholarly communities did not disregard AI. AI was now a reality and bound to impact the working lives of students, whether during their studies or afterwards. In this vein, it made little sense for educational institutions—whose very purpose is to prepare students for the future world of work—to remain silent and adopt the stance of artificial intelligence having no place at institutions founded on the human capacity for thinking and reasoning.

This stance was already somewhat unstable in 2024. Indeed, from the very beginning programs such as ChatGPT went far beyond simply browsing a digital encyclopaedia for answers—something students had already been doing with Wikipedia since 2001. Rather, one feature of the new AI programs is their ability to respond to questions they have not been specifically trained in, thus demonstrating «emergent capabilities».¹⁰ This new development in AI history dates back to Alan Turing's seminal paper on machine intelligence, published in 1950.¹¹ After decades of incremental progress, AI made a huge leap in 2022. Thanks to neural network architecture, generative AI could now write poetry, provide legal or medical advice, develop strategies, organize events, write computer code and even teach.¹² In 2024, the update to ChatGPT 4, followed by ChatGPT 4o and the o1 preview—the latest model of the program's newest iteration—created an even more powerful tool. In this sense, educational institutions can no longer ignore AI and or its profound impact on society.

Certain scholars have taken the lead in exploring the interplay between AI and education. In *Artificial Intelligence for Learning*, Donald Clark expresses his enthusiasm and optimism about the transformative potential of AI in education. For Clark, AI will change how people learn, making the education sector more efficient and effective.¹³ He positions AI as a

¹⁰ The Alan Turing Institute (2024). *The Turing Lectures: What is Generative AI?* [Video] YouTube. <https://www.youtube.com/watch?v=fwaDtRbfioU&t=61s>.

¹¹ TURING, A.M. «Computing machinery and intelligence». *Mind*, vol. 54, issue 236 (1950), 433–460. DOI: <https://doi.org/10.1093/mind/LIX.236.433>.

¹² KNIBERG, H. (2024, January). *Generative AI in a Nutshell. How to Survive and Thrive in the Age of AI*. DOI: <https://www.youtube.com/watch?v=2IK3DFHFRfw&t=476s>

¹³ CLARK, D. *Artificial Intelligence for Learning: Using AI and Generative AI to Support Learner Development* (2nd ed.), London: Kogan Page, 2024.

groundbreaking learning technology, comparable to the printing press, radio, television and computers, all of which have driven significant societal and cultural changes throughout history.¹⁴ AI may have an even deeper impact than these earlier technologies since it can do more than *print* text or *deliver* content—it can *create* text and *generate* content on its own. By leveraging vast amounts of digitally available text, AI can *synthesize* new material instead of merely copying existing works. Despite this transformative potential, AI will not render teachers irrelevant. On the contrary, teachers will continue to be an integral part in the learning process, particularly in guiding and contextualizing AI-driven tools. Their AI expertise and understanding will be essential to ensuring its effective and ethical integration into education.

From the outset, leading international organizations such as the UNESCO, the OECD, the World Bank and the World Economic Forum have acknowledged the challenges AI poses for education and society.¹⁵ All these organizations have produced frameworks, reports and guidelines for the future. It is important to note that these key players in global education do not promote a new «grammar of schooling». Instead, they focus on establishing governance and regulatory frameworks to develop and enforce an ethical use of AI in education, and safeguarding data privacy. Furthermore, they aim to ensure that AI applications in education are accessible to all students by promoting inclusion and equity. They also advise aligning educational curricula with new requirements in the workplace, emphasizing so-called twenty-first-century skills such as critical thinking, problem-solving, creativity and collaboration. Finally, they seek to develop AI literacy by equipping both students and teachers with the necessary skills to understand and use AI effectively.

These recommendations do not appear to signal the end of the traditional «grammar of schooling», where teachers continue to play a central role in the hierarchical organization of educational processes. This perspective aligns with Yong Zhao's position on «world class learners». Zhao argues that future

¹⁴ CLARK, D. *Learning Technology: A Complete Guide for Learning Professionals*, London: Kogan Page, 2023.

¹⁵ MIAO, F., CUKUROVA, M. *AI Competency Framework for Teachers*, UNESCO, 2024; MIAO, F. & SHIOHIRA, K. *AI Competency Framework for Students*, UNESCO, 2024; OECD, *OECD Digital Education Outlook: Towards an Effective Digital Education Ecosystem*, Paris: OECD, 2023; MOLINA, E., COBO, C., PINEDA, J. & ROVNER, H. *AI Revolution in Education: What You Need to Know. Digital Innovations in Education*, Washington: World Bank, 2024; World Economic Forum. *The Presidio Recommendations on Responsible Generative AI*, Geneva: World Economic Forum, 2023.

classrooms must transcend traditional boundaries, becoming student-centred, culturally responsive and personalized. These classrooms should foster supportive and equitable environments where each student is empowered to take charge of their own learning, and explore multiple pathways to acquire skills and knowledge within a global learning ecosystem.¹⁶ This vision represents nothing less than a paradigm shift, one which requires us to break down traditional borders and discard antiquated mindsets.

In a recent article about artificial intelligence and education, Yong Zhao insists that AI needs a new «grammar of schooling».¹⁷ He claims that even recent books advocating for new teaching skills in response to challenges from AI still adhere to the core principle of traditional schooling: one-size-fits-all.¹⁸ Indeed, it is a type of education that focuses on producing average workers rather than fostering strong citizens, just as it did during the industrial revolution. In order to attain this goal, a new type of personalized education is required where children spend time developing their unique strengths, instead of overcoming weaknesses or acquiring abilities in an area they are neither good at nor passionate about to, at best, achieve a mediocre skillset.¹⁹ AI could be a transformative force in education, but only if we move beyond the old «grammar of schooling» or, as Zhao puts it: «If we want education to follow a different grammar, we need to change the language».²⁰ This language of «personalized learning» cannot be driven by teachers but managed by students.

In response to the question, What can the history of education teach us about the future of AI in education?, we find AI will not fundamentally alter

¹⁶ ZHAO, Y. *World Class Learners: Educating Creative and Entrepreneurial Students*, Thousand Oaks, CA: Corwin, 2012; ZHAO, Y., TAVANGAR, H., MCCARREN, E., RSHAID, G. F. & TUCKER, K. *The Take-Action Guide to World Class Learners Book 1: How to Make Personalization and Student Autonomy Happen*, Thousand Oaks, CA: Corwin, 2016; ZHAO, Y. *Learners Without Borders. New Learning Pathways for All Students*, Thousand Oaks, CA: Corwin, 2021.

¹⁷ ZHAO, Y. «Artificial Intelligence and Education: End the Grammar of Schooling», *ECNU Review of Education* (2024), pp. 1–18. DOI: 10.1177/20965311241265124.

¹⁸ FADEL, C., BLACK, A., TAYLOR, R., SLESINSKI, J. & DUNN, K. *Education for the Age of AI: Why, What, and How Should Students Learn for the Age of Artificial Intelligence?*, Boston, MA: The Center for Curriculum Redesign, 2024; ROBERT, J. *AI in Education: How Teachers and Educators Can Create Personalized Lesson Plans, Provide Real-time Feedback, and Help Students Reach their Full Potential Using Artificial Intelligence*, Madtown Publishing, 2024. Also see: HOLMES, W., BIALIK, M. & FADEL, C. *Artificial Intelligence in Education Promises and Implications for Teaching and Learning*, Boston, MA: Center for Curriculum Design, 2019.

¹⁹ ZHAO, Y. «Artificial Intelligence and Education... *op. cit.*» p. 5.

²⁰ *Ibidem*, p. 13.

the existing «grammar of schooling». Students are likely to embrace AI as a tool to assist them with their assignments within a traditional education structure. AI can help with finding information, analysing data, summarizing books and articles, writing new texts and generating new content. In fact, AI already outperforms students in completing standardized assignments set by teachers, just as computers can beat humans at board games like chess or Go. Therefore, if teachers do not change the ways in which they assess students, AI will not disrupt the existing grammar, but merely make students' tasks easier. Personalized learning is only an option if the system changes first.

The history of education shows teachers are generally reluctant to radically change established methods or abandon what they have learnt at teacher training colleges and through years of practical experience, even when new technologies are introduced. This is why international organizations advise governments to focus on training teachers to effectively work with AI. However, this transformation will obviously not happen overnight. Additionally, teachers' activities are often shaped by parental expectations linked to traditional approaches in schooling.

The sociology of education and curriculum history provide additional insights into why AI is unlikely to alter classroom practices and school organization. In *The Micropolitics of the School*, Stephen Ball highlights the complex internal dynamics within schools, where power struggles between different factions of teachers—in terms of generation, gender or teaching methods—can significantly hinder reform efforts. These conflicts can make even small shifts in educational practices difficult.²¹ Similarly, historical research on curriculum development reveals how knowledge is selected and organized is deeply embedded in institutional routines and power structures.²² Moreover, the historical evolution of curricula reflects broader social, cultural and political forces, making sudden changes difficult to implement.²³ Perspectives from the sociology of education and curriculum studies jointly emphasize how obstacles to modifying educational practices are not limited to school culture or tradition, but are intricately tied to organizational dynamics, how knowledge is selected and how schools operate.

²¹ BALL, S.J. *The Micro-Politics of the School. Towards a Theory of School Organization*, London: Routledge. DOI: <https://doi.org/10.4324/9780203808733>.

²² GOODSON, I. *School Subjects and Curriculum Change* (3rd ed.), London: Falmer Press, 1993.

²³ McCULLOCH, G., GOODSON, I. & GONZÁLEZ-DELGADO, M. *Transnational Perspectives on Curriculum History*, London: Routledge, 2019.

In other words, education has an inherent conservative streak that resists radical change or revolution. While AI is revolutionary in its own right, it is unlikely to alter this deeply ingrained characteristic.

3. ARTIFICIAL INTELLIGENCE: THE END OF KNOWLEDGE AS WE KNOW IT?

How is AI affecting our knowledge about educational histories? ChatGPT and other large language models (LLM) like Bard, Claude and Llama are far from perfect. In fact, the OpenAI website explicitly states «ChatGPT can make mistakes», emphasizing how human teachers will still play a crucial role in the education sector. However, this will only be true if firstly educators are aware of the concerns surrounding AI and secondly, if they actively work to debunk the myths about what AI can do. Some of the issues AI poses regarding knowledge about the history of education include:

- a) Generative AI models are like *black boxes*. We do not know exactly what information they hold, nor do we fully understand how they work. What we do know is that even in the new world of AI, the old saying *garbage in, garbage out* still applies. AI models are trained on large datasets, but if these are biased, the results will be equally so.²⁴
- b) Generative AI models produce generalized responses based on patterns identified in large datasets through inductive methods. Induction can lead to overgeneralizations, such as «a swan is white» or «in the nineteenth century male teachers used rods in classrooms to discipline pupils, while female teachers did not».²⁵ Since most images in a dataset will depict white swans, nineteenth century male teachers with rods and women teachers without, these statements automatically appear to be «true». However, we must recognize these so-called truths are nothing more than stereotypes. In other words, AI image creators produce *stereotypical images of reality*.
- c) Most AI models are programmed with algorithms designed to prevent the generation of sexual or violent content. As a result, AI image creators

²⁴ ACION, L., RAJNGEWERC, M., RANDALL, G. & ETCHEVERRY, L. «Generative AI poses ethical challenges for open science». *Nature Human Behaviour*, issue 7 (2023), pp. 1800–1801. DOI: <https://doi.org/10.1038/s41562-023-01740-4>.

²⁵ BRASTER, S. «Exhibiting teachers' hands: Storytelling based on a private collection of engravings», in HERMAN, F., BRASTER, S. & DEL POZO ANDRÉS, M.M. (eds.). *Exhibiting the Past. Public Histories of Education*. De Gruyter Oldenbourg, 2023, p. 309-332.

do not produce images depicting sexual or violent acts. However, AI models do exhibit diversity. Without specifying the race, ethnicity or gender of an individual, the program does not generate an image of a white Caucasian male as the most obvious choice. In reality, the *political correctness* of the generated images has been widely shared on social media. So, we now «know» that according to some AI image creators, the Founding Fathers of America were black men, the Pope is an Indian woman and the Disney princess Snow White is an Asian girl.

- c) Without sufficient data, AI can still produce an answer it deems «most plausible». For example, if we ask AI to generate an image depicting how a teacher in the seventeenth century taught mathematics, it creates an image of a male figure perfectly dressed in an authentic seventeenth-century outfit but using a twentieth-century electronic calculator.²⁶ These issues arise because there are no online images of education accurately depicting how teachers taught mathematics in the seventeenth century. In such instances, however, the program still responds, but the answers it provides are what we call *hallucinations*.
- c) AI models struggle with understanding *contexts* (and in the history of education (almost) everything is a matter of context). This can result in oversimplified responses.²⁷ For instance, an AI image creator may not recognize that a decorated wooden box hanging on a wall in a seventeenth-century schoolroom was used as a backpack for carrying books and a slate to school. Similarly, it may fail to imagine that a textile bird on a teacher's desk was once used as an instrument to trigger punishment.

Considering the aforementioned issues, it is crucial to take the disclaimer on the OpenAI website stating that AI programs can make mistakes seriously. Older generations, such as the Baby Boomers (born after World War II) and Generation X, are likely to do so. However, younger generations—including Millennials (Generation Y), who came of age during the rise of the internet and digital technology; Generation Z, who grew up with smartphones and

²⁶ BRASTER, S. «Classroom Anomalies: Lessons for Historians of Education from AI Images Creators», in ROITH, C. & FIGUEREDO-CANOSA, V. (eds.). *XXII coloquio de historia de la educación. Transnacionalidad y transculturalidad en la historia de la educación durante la modernidad y la contemporaneidad*, Almería: Editorial Universidad de Almería. 2024, pp. 384-388.

²⁷ OWOSENI, A., KOLADE, O. & EGBETOKUN, A. «Generative AI and Its Implications for Higher Education Students and Educators», in *Generative AI in Higher Education*, Cham: Palgrave Macmillan, 2024. DOI: https://doi.org/10.1007/978-3-031-60179-8_1.

social media; and Generation Alpha, the first generation to live in a world with AI—may be less sceptical about the possibilities of advanced technology.

Research indicates that younger generations tend to be more optimistic about AI's potential benefits. For instance, a study found that Generation Z participants are generally positive about the possible advantages of generative AI, including enhanced productivity, efficiency and personalized learning.²⁸ This optimism may lead to lower scepticism regarding AI's limitations and potential errors. In contrast, older generations may approach AI with more caution. This cautious approach may stem from less exposure to AI technologies and a greater awareness of their potential pitfalls.

Understanding these generational differences is crucial to discerning how older teachers connect with younger students regarding AI use in education. Our expectation is for teachers to possibly find it challenging to convince Generation Z and Alpha students regarding AI's potential dangers, especially when it comes to the quality of knowledge. Younger generations of students often embrace new AI tools as co-pilots on their flights to success. They may respond to teachers' scepticism with a belief that AI will improve over time in performing various tasks. Having grown up in a world where obtaining information is just a matter of asking the right questions or writing correct prompts and codes, these students might question the usefulness of teachers and the relevance of traditional textbooks. The argument made by teachers that knowledge acquired through AI tools may be incorrect and original sources must be constantly verified will be dismissed by students as an annoying and outdated attempt to keep them occupied. Students have grown up in a post-truth society, where truth is merely an opinion, conspiracy theories offer the «real» answers, alternative facts have replaced actual facts and feelings are more important than evidence.²⁹

The real danger of integrating AI in education lies in the youngest generation of students possibly developing an indiscriminate trust in AI-generated content. They might also assume that all information necessary for generating new content is available online. They may view the pursuit of

²⁸ CHAN, C. K. Y., LEE, K. K. W. «The AI generation gap: Are Gen Z students more interested in adopting generative AI such as ChatGPT in teaching and learning than their Gen X and millennial generation teachers?», *Smart Learning. Environments*, vol. 10, issue 60 (2023), pp. 1-23. DOI: <https://doi.org/10.1186/s40561-023-00269-3>

²⁹ MCINTYRE, LEE. *Post-Truth*, The MIT Press, 2018. DOI: <https://doi.org/10.7551/mit-press/11483.001.0001>

authentic, undiscovered sources as irrelevant, believing that a machine with access to all existing digital information in the world simply provides better answers than their teachers who, in their time, relied on reading some peculiar smelling old books in the reading room of library. Overreliance on AI tools, which often depend on inductive reasoning, risks undermining the value of theoretical knowledge derived from the hypothetical-deductive method.

Inductive reasoning in AI involves drawing general conclusions from specific data patterns. For example, in all the classrooms I have seen, there has been a blackboard. Hence, all classrooms have blackboards. While this approach enables AI systems to identify trends and make predictions, it has inherent limitations. In contrast, the hypothetical-deductive method emphasizes formulating hypotheses and rigorously testing them through experimentation and observation. This approach fosters critical thinking and a deeper understanding of underlying principles, which are essential for advancing knowledge beyond existing data. Therefore, while AI can be a valuable technological tool in education, it is crucial to balance its inductive reasoning with a hypothetical-deductive methodology. Encouraging students to engage in critical analysis and making them search for primary sources as evidence for testing hypotheses are necessary tasks for teachers in the era of AI. The next section looks at how this task can be fulfilled in the history of education.

4. USING AI-GENERATED IMAGES ON HISTORY OF EDUCATION COURSES

How can AI be used in teaching history of education? In February 2023, a few months after the ChatGPT platform was launched, I took up the challenge of exploring AI's usefulness in the history of education on a master's programme entitled *Memoria y crítica de la educación* (Memory and Critique of Education). The master's programme was organized by the University of Alcalá and UNED (National University of Distance Education), in cooperation of the Complutense University of Madrid. The workshop I ran for the programme was part of the subject «Iconography of Education». It involved using AI programs that could generate images and freely available to students at the time the course was running.

The reason for setting up a history of education workshop on image creating AI tools seemed a logical step to take at the very moment generative

AI emerged in the century of the image.³⁰ It was important to teach students how to understand the present day through a critical analysis of images from the past, representing how education was shaped across different eras and spaces.³¹ We saw examples of how existing images could be analysed, how new images of educational scenes could be collected by scraping the web and how to generate virtual images using DALL·E 2, an image creator launched in April 2022. DALL·E 2, whose name was inspired by the Spanish painter Salvador Dalí and the robot WALL·E from the Pixar movie, was part of OpenAI, which developed ChatGPT³² for text-based interaction between humans and machines.

A specific assignment in the workshop involved creating new images to determine how accurately an AI image generator could depict a classroom in a specific year and country visited by a particular student. The conclusion at the end of the workshop was that DALL·E 2 performed remarkably well. Generated images from the recent past looked a lot like the memories students had of the same period. At least all the stereotypical classroom objects they could remember were where they were meant to be. However, when prompted to depict classrooms from the distant past, DALL·E 2's performance declined. A notable error was the inclusion of blackboards in seventeenth-century classrooms—a clear anachronism as blackboards were not introduced until the early nineteenth century.³³ Obviously, the course lecturer was aware of this anomaly, and the students who took the course learned this too, although not thanks to AI. At the very least, the experience prompted students to reflect on AI's benefits and shortcomings, especially with regard to historical accuracy. It underscored the importance of critical thinking and the necessity of cross-referencing AI-generated content with established historical

³⁰ RITCHIN, F. *Bending the Frame. Photojournalism, Documentary, and the Citizen*, New York: Aperture, 2013. p. 160.

³¹ ROSE, G. *Visual Methodologies: An Introduction to the Interpretation of Visual Materials* (5th ed.), London: Sage, 2022; BRASTER, S. & POZO ANDRÉS, M.M. del. (2020). «From savages to capitalists: progressive images of education in the UK and the USA (1920–1939)», *History of Education*, vol. 49, issue 4 (2020), pp. 571–595. DOI: <https://doi.org/10.1080/0046760X.2019.1701096>; POZO ANDRÉS, M.M. DEL & BRASTER, S. «The visual turn in the history of education: origins, methodologies, and examples», in FITZGERALD, T. (ed.). *Handbook of Historical Studies in Education*, Singapore: Springer International, pp. 893–908.

³² <https://chatgpt.com/>.

³³ PHILLIPS, C.J. «An Officer and a Scholar: Nineteenth-Century West Point and the Invention of the Blackboard», *History of Education Quarterly*, vol. 55, issue 1 (2015), pp. 82–108. DOI: <https://doi.org/10.1111/hoeq.12093>.

knowledge. The exercise highlighted that while AI tools like DALL·E 2 can be valuable in visualizing historical settings, they are not infallible. Their outputs are influenced by the data they are trained on, which may contain biases or gaps, leading to inaccuracies. Therefore, the presence of human chatbots, also known as «teachers», remains crucial to ensure the reliability of AI-generated content.

In February 2024, we revisited the idea of using AI image creators as part of the same master's programme. By this time, the landscape of AI image generation had expanded significantly. While DALL·E 2 was still freely available for generating images, new and improved tools had emerged, offering more advanced capabilities and varied features.

One of the most notable advancements was the release of DALL·E 3, integrated into ChatGPT-4. DALL·E 3 demonstrated clear improvements in understanding and executing prompts, producing images that were far more accurate and detailed compared to its predecessor. However, access to this tool required a monthly subscription, making it less accessible to users with limited budgets. The same technology also powered the Image Creator integrated into Microsoft's Bing search engine.³⁴ Bing's version offered 15 free daily tokens, enabling users to generate images using natural language prompts—a user-friendly feature that made the tool widely accessible for casual and educational purposes.

Other programs gained prominence, such as Midjourney, a powerful image generator renowned for producing some of the most realistic and artistic visuals.³⁵ However, Midjourney's approach to crafting prompts was more complex, requiring users to learn specific techniques to achieve optimal results. Additionally, Midjourney no longer offered a free version, creating a barrier to anyone who wished to experiment without making a financial commitment. In turn, several open-source and freemium tools provided alternatives for users seeking free or low-cost options. Programs like NightCafe offered free plans with basic functionality,³⁶ while platforms such as Fotor,³⁷

³⁴ <https://www.bing.com/images/create>

³⁵ <https://www.midjourney.com/home>

³⁶ <https://creator.nightcafe.studio/>

³⁷ <https://www.fotor.com/>

Leonardo AI,³⁸ DreamStudio,³⁹ Craiyon,⁴⁰ SeaArt⁴¹ and Adobe Firefly⁴² expanded the range of available tools. In addition to these, Ideogram 2.0 entered the scene generating highly realistic images.⁴³ Ideogram 2.0 focused on integrating typographic and graphic design capabilities alongside image generation, making it particularly appealing for users interested in combining visual and textual elements.

In terms of teaching history of education, these AI-powered image creators can be used in workshops to enhance the understanding of both AI and the educational past as generated through images. The challenge is to have students experiment with one or more programs, and write prompts related to schools and classrooms, introducing variations based on time periods, countries, languages and other factors. Through constant comparison, a group of students should arrive at statements about the way education is organized in space and time according to the generative AI models, which are trained on millions of images of schools and classrooms available on the internet.

The next step is to contrast these conclusions with authentic images from specific times and places. The challenge in analysing AI-generated images lies in finding anomalies and explaining why we see what we see. To illustrate this approach, we use an example of an authentic photograph from 1930 and four images generated by DALL-E 3 and Ideogram 2.0, demonstrating how AI can be used in the history of education.

³⁸ <https://leonardo.ai/>

³⁹ <https://beta.dreamstudio.ai/generate>

⁴⁰ <https://www.craiyon.com/>

⁴¹ <https://www.seaart.ai/>

⁴² <https://firefly.adobe.com/>

⁴³ <https://ideogram.ai/t/explore>



Figure 1. Children gather around a teacher as she writes different animal names on the blackboard. 1930. Source: <https://www.yahoo.com/lifestyle/1930-today-heres-school-looked-040000544.html>

Figure 1 shows a photograph found on a Yahoo Lifestyle website in a collection of photographs entitled «From 1930 to today, here's what school looked like the year you were born».⁴⁴ The caption beneath the photograph reads: «Children gather around a teacher as she writes different animal names on the blackboard. 1930». We uploaded the photograph to Google Images to trace its origins. The search generated a list of websites, many affiliated with Yahoo on Pinterest, but the photograph also appeared in several journals. On an Argentinian website,⁴⁵ the image was used to illustrate an article entitled: «Lo que no va más. ¿De dónde viene el uso de la palabra “señorita” para referirse a las maestras?» (The way things were. Where does the use of the word ‘Miss’ come from when referring to teachers?) The picture was also featured as an illustration in an article about the UK’s National Union of Women Teachers,⁴⁶ as well as in The New Yorker article «The Comma Queen. To Whom it may concern».⁴⁷ The latter included a caption with the text: «Does civilization depend on the proper use of “who” and “whom”? Photo-illustration by The New Yorker; Source: FPG/ Hulton Archive/ Getty». This allowed us to trace

⁴⁴ <https://www.yahoo.com/lifestyle/1930-today-heres-school-looked-040000544.html>

⁴⁵ <https://misionesonline.net/2022/10/21/por-que-se-dice-senorita-a-las-maestras/>

⁴⁶ <https://daily.jstor.org/the-woman-teacher-documents-a-feminist-labor-unions-victory/>

⁴⁷ <https://www.newyorker.com/culture/culture-desk/comma-queen-to-whom-it-may-concern>

the image to the Hulton Archive.⁴⁸ However, we still lack crucial information about the photograph's origins—specifically, the who, what, when, where and why behind the photograph. At this point, the only confirmed detail is the date, 1930, but we have not been able to cross-check it.

We used the caption of the photograph in Figure 1, «Children gather around a teacher as she writes different animal names on the blackboard. 1930», to generate an image with DALL·E 3. To do this, we used Microsoft's search engine Bing, which produced three images. One of these is shown in Figure 2.

As we have stated above, image creators aim to be politically correct. Therefore, if a caption mentions children but does not specify race, ethnicity, gender or number, the generated image might depict a group of 30 Asian boys and girls. This demonstrates that Microsoft's image generation tool does not default to the assumption that individuals in an image are white.

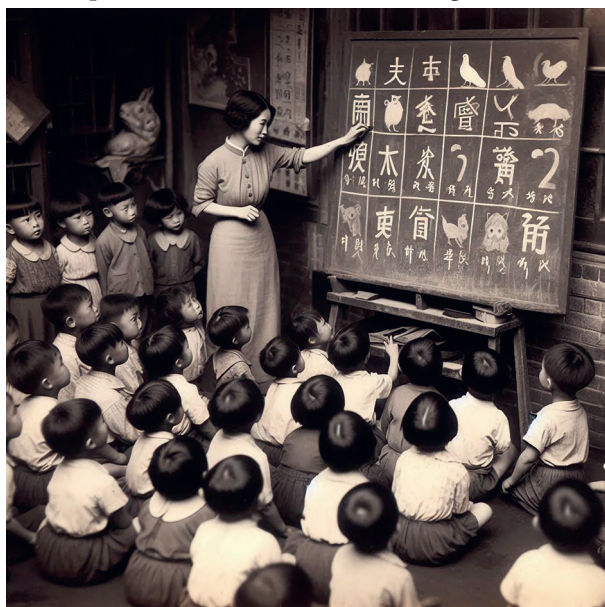


Figure 2. Image created by DALL·E 3 using the caption of figure 1 as a prompt.

⁴⁸ <https://www.gettyimages.es/collections/hulton-archive>

When comparing the three images generated simultaneously, we observed that two depicted Western teachers and children.⁴⁹ In all three images, the teachers were female (which is logical considering the caption mentions «she»), the classrooms always included both boys and girls, and all the children looked very young. Notably, the number of children varied—approximately 30 in the Asian version and about 15 in both Western versions. This difference may reflect a stereotypical view of China as a densely populated country. The age of the children might also be influenced by the fact that the description mentioned female teachers. Generally, female educators are more commonly associated with teaching younger pupils compared to male teachers.

ChatGPT offers the option to upload images, after which users can ask the chatbot to describe them in detail. In traditional image analysis, this process is referred to as denotation. When working with AI, we might call it «prompt management». In the realm of AI, the instructions or codes used to generate new images are called prompts. The prompt generated by ChatGPT based on the photograph in Figure 1 reads as follows:

«A vintage (sic.) classroom scene featuring a teacher standing at a large chalkboard, teaching a small group of children. The teacher is writing the words 'cow' and 'dog' in cursive on the chalkboard. She is dressed in a modest, long dark dress from the early 20th century. The children, wearing simple, old-fashioned clothing, are gathered closely around her, watching intently. One child in a patterned dress looks slightly turned toward the viewer. The classroom has wood-paneled walls, a dark floor, and a stove or heater in the corner. In the foreground, another student sits at a wooden desk, turned slightly to observe the group at the board. The lighting is soft, creating a nostalgic, warm atmosphere reflective of early 20th-century educational settings.»⁵⁰

⁴⁹ We do not include these images in this article to save space.

⁵⁰ <https://www.chatgpt.com> (ChatGPT 4o, 2024).

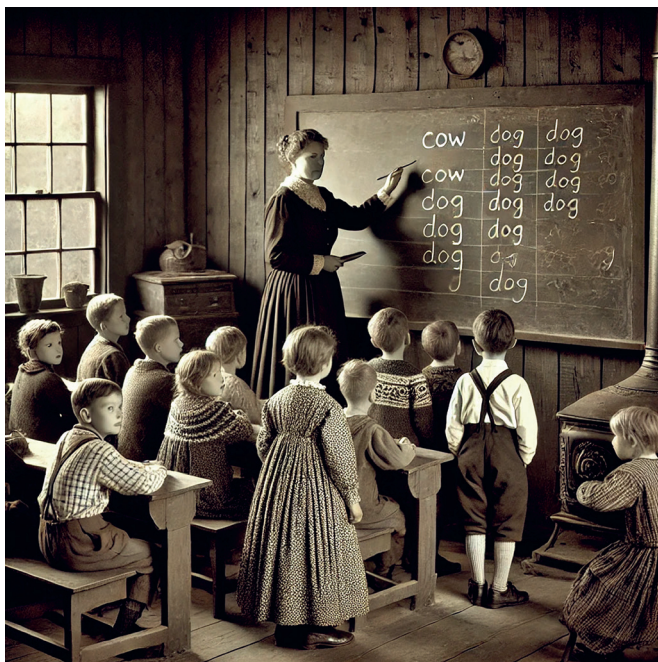


Figure 3. Image generated by DALL·E 3 using the prompt written by ChatGPT

Figure 3 was generated using the same program as Figure 2 (i.e. DALL·E 3). Further examination reveals the image more closely resembles the original photograph in Figure 1, with one clear exception. The AI controlling the image creator has decided to include school desks in the classroom. Although school furniture is not mentioned in the prompt, DALL·E 3 seems to associate classrooms with school desks. As a result, it added school desks to the image, arranged in the traditional manner—facing the blackboard—and emphasizing a teacher-centred classroom layout.

The tendency of DALL·E 3 to «assume» that classrooms are teacher-centred is also observed in another image creation program: Ideogram 2.0. Figure 4, created using said program and based on the caption of the original photograph in Figure 1, illustrates this point. The phrase «children gather around a teacher» from the caption is visually interpreted as «children sitting at individual school desks listening to a teacher». Once again, we see that without specific instructions regarding the teaching methods depicted, the image

creator defaults to a teacher-centred approach when associating teachers with children. Additionally, mentioning the word «blackboard» in the caption leads the program to automatically place the scene in a classroom, reinforcing the conventional setting where teachers and children are typically imagined.



Figure 4. Image generated by Ideogram 2.0 using the caption of figure 1 as a prompt.

Figure 5 concludes our exploration of how image creators handle general descriptions of educational interaction between teachers and children, as well as detailed AI-generated prompts used to describe original images. In this case, the generated image closely resembles the original photograph.

We translated the original words «cow» and «dog» written on the blackboard in Catalan, just to demonstrate how AI-generated prompts can be adjusted to fit specific needs. Additionally, we replaced the teacher's face with that of a well-known teacher, Justa Freire,⁵¹ to show how image creators allow for personalized modifications to create more historically accurate or meaningful depictions. This highlights another way AI can be connected to the history of education: AI image creators can be valuable research tools for bringing educational histories to life, enabling us to create more realistic representations of the past than we might have previously imagined.

⁵¹ POZO ANDRÉS, M. M. *Justa Freire o la pasión de educar. Biografía de una maestra atrapada en la historia de España (1896-1965)*, Barcelona: Editorial Octaedro, 2013.



Figure 5. Image generated by Ideogram 2.0 using the prompt written by ChatGPT (translating the words cow and dog in Catalan and swapping the face of the teacher with the face of Maestra Justa Freire with SeaArt).

5. CHALLENGES OF AI FOR HISTORY OF EDUCATION RESEARCH

How can AI be used as a research tool within the academic discipline of history of education? The example given in the previous paragraph can be elaborated on much more extensively than space allows us to do here. A workshop on the intersection of AI and history of education would provide ample time for this. Such an analysis could include an iconological examination of the original photograph about which we know very little, apart from the date. As with all historical photographs, we must not assume that the image in Figure 1 was merely a snapshot, in this instance one taken in a classroom in 1930. It could very well have been a staged composition, orchestrated by the photographer to depict a close interaction between a teacher and her students. Photographs always invite questions about their authenticity and this applies equally to AI-generated images and photographs we conventionally label as «originals».

These «original» images can be analysed with the help of AI, provided we critically reflect on the results returned. By way of example, we include here the response generated by ChatGPT 4o after uploading the photograph in Figure 1 and requesting an analysis using the concepts *denotation* and

connotation.⁵² Since the denotation description is almost identical to the prompt we used to reproduce the image, we have excluded this part of the text for reasons of space. The analysis with the heading *Connotation (Implied Meaning and Context)* reads as follows:

«Educational Practices: The image conveys traditional teaching methods where the teacher assumes a central authoritative role. Writing on the blackboard suggests an emphasis on rote learning or basic literacy skills like spelling and vocabulary.

Class Dynamics: The clustering of students around the teacher may imply a close and interactive teaching moment. However, the presence of a lone student in the foreground could signify differing levels of engagement or perhaps a structured classroom hierarchy.

Time Period and Socioeconomic Context: The style of clothing and classroom furniture suggests a rural or small-town setting in the early 20th century. The children's worn clothing may reflect socioeconomic hardships or limited resources during this era.

Gender Roles: The teacher, a woman, reflects the evolving role of women in education during the early 1900s. Her formal attire suggests professionalism, aligning with historical shifts in women's participation in the workforce.

Photographic Staging: Given the composition and positioning of the subjects, this photograph may have been staged. The interaction between the teacher and students, as well as the placement of the lone student, could have been arranged to portray an idealized classroom scene rather than an authentic moment.

Symbolism: The blackboard and chalk symbolize foundational education, while the words "cow" and "dog" may represent the basics of learning, linking literacy to everyday life or agricultural settings. The stove suggests a practical approach to managing a rural classroom, ensuring warmth in what could have been a cold environment.

This image not only documents a historical classroom scene but also invites reflection on how education, social dynamics, and visual representation intersected during that period.»

We leave it to the reader to judge the quality of this analysis. For instance, the last sentence could raise some eyebrows: is it an hallucination, or is it so

⁵² BARTHES, R. *Elements of Semiology*, Paris: Éditions du Seuil, 1964.

profound that we are unable to fully grasp its meaning? At the very least, the observation that the photograph might have been «staged» to depict an «idealized classroom» aligns with our own interpretation, made prior to generating the analysis with ChatGPT 4o. It is also clear that nowadays AI is more than capable of describing images in detail, which could be invaluable when analysing large sets of images. The generated text could then be used to perform either a quantitative or qualitative content analysis.

AI image creators could also be used in research is to depict individual school memories or collaboratively construct historical school realities, thus fostering a «living past». We have included two examples of how this could be done.

First, we could invite people to share their school memories through oral history interviews. We could then generate images with AI based on their recollections. While these images are inherently socially constructed, if the individuals validated the AI-generated images as reflecting «the way it actually was», we would gain a unique opportunity to present histories of education with «new» historical evidence, hidden within the memories of the respondents.

Second, where interviews are not an option, we could convene an expert panel to construct images of education from centuries past. By collaborating with various professional groups, we could develop detailed descriptions of educational scenes to create «a living past». This approach aligns with practices often used by filmmakers, with one key distinction: in this instance, historians of education would take the lead in creating images that closely resembled historical realities. By contrast, filmmakers would only typically consult historians with a view to ensuring a certain degree of historical accuracy in their productions, which, in many cases, remain incomplete or inaccurate.

In conclusion, integrating oral histories, evidence based on primary documents and AI-generated imagery offers a transformative approach to tell histories of education in new, different and non-traditional ways. Nevertheless, due to the entrenched conventions of historical research—what could be termed the «grammar of historical research»—it is likely that historians of education will resist incorporating AI image creators into their future work. Similarly, just as the «grammar of schooling» often resists transformative change, the academic discipline may find itself constrained by long-standing practices, limiting AI's potential to revolutionize both education and historical research in the field.