

The impact of artificial intelligence on the production of scientific knowledge

O impacto da inteligência artificial na produção do conhecimento científico

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 Carlos Laranjeira¹

¹Instituto Politécnico de Leiria.
Leiria, Portugal.

Corresponding author:

Carlos Laranjeira
Escola Superior de Saúde, Departamento de Ciências da
Enfermagem. Campus 2 – Morro do Lena – Alto do Vieiro
Apartado, 4137, 2411-901. Leiria, Portugal.
E-mail: carlos.laranjeira@ipleiria.pt

Artificial intelligence (AI) is today one of the main catalysts for social acceleration, significantly impacting education, and raising questions related to the use of its tools in the production of scientific knowledge⁽¹⁾. Increasingly, a blurring of the lines between humans, machines and nature is observed, as well as a rapid transition from information scarcity to an information fog. In parallel, the emergence of AI has brought new possibilities for collecting and interpreting data in ways that were not previously possible through traditional methods.

Indeed, and unsurprisingly, research has increasingly focused on the role of AI in teaching and student learning. In this regard, trends and research focuses in AI were examined, using a bibliometric analysis to analyze the evidence on AI in science education, published between 2013 and 2023⁽²⁾. The results indicate that AI-based science education has gained exponential prominence in recent years. On the other hand, the findings highlight that the main research focuses were related to data mining, educational robots, and machine learning incorporated into the production of scientific knowledge⁽²⁾. Adopting a broader perspective on machine learning in education, some areas were highlighted for future research, including how this type of learning can be integrated into different disciplinary domains beyond computing, as well as the need for more evidence on its social and ethical implications⁽³⁻⁴⁾.

A significant gap in the emerging literature on AI in knowledge production concerns the impact of AI on scientific practices and the implications of this impact for education. The use of AI raises some fundamental questions, particularly regarding how science is conducted and by whom science is produced. Scientific practices have been a central theme in recent edu-

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cational reforms⁽⁴⁾, which has prompted great concern on the part of teachers and educators, given the paradigmatic shift that highlights the importance of student involvement in how science is produced.

When exploring the implications of using AI in education, it is important to consider the broader social context that creates demands for both citizens and scientists. Advances in AI are so rapid that we live in what is essentially an “acceleration society,” where educational systems often remain static, and seem unable to keep pace with the rate of change⁽⁵⁾. As a result, a significant knowledge and skills gap emerge between what traditional educational organizations produce and what society demands. Another disturbing phenomenon is “future shock,” defined as a psychological state that people and entire societies face when they perceive many changes in a short space of time⁽⁴⁾. Due to the dizzying speed of the imposed changes, people have difficulty keeping up and, feeling overwhelmed, do not care about the motivations behind technological innovations.

One aspect of alienation from AI is the lack of understanding of the codes through which a machine is programmed. In the context of education, if students have not had contact with computer science, they are likely to experience deficits in understanding how AI is applied in their areas of intervention⁽⁴⁾. In terms of understanding programming languages, some teaching and machine learning initiatives maintain the traditional (i.e., textual) approach, using traditional programming, while other approaches shift the focus from programming to the design of neural network structures⁽⁴⁾. These differing perspectives can lead to confusion among students regarding the role of programming in AI. Another educational approach is to ask students to train machine learning models with data, including curation, cleaning, and labeling of that data^(4,6). Although these elements of learning are relevant and need to be explored in greater depth to address different learning outcomes in education, the main purpose of this editorial is to focus on an area that is poorly defined in the available evidence, namely the role of AI in scientific practices. The intention is

not to raise questions about the mastery of technical and instrumental skills [although they are important], but rather about a broad understanding of how AI is infiltrating scientific practices⁽⁴⁾. Given the frenetic pace of innovation in AI, education will benefit from research that can bring new insights into how student education uses AI in the service of science. A fundamental question that arises in this discussion is why AI-informed practices need to be integrated into nursing education. The premise underlying this question is that academic and professional practices need to be organized in a way that ensures students are well-prepared in terms of scientific literacy.

Therefore, it becomes opportune to develop more research on: (a) the nature of AI-facilitated scientific modeling; (b) students’ learning about the role of AI in advancing care practices; (c) evidence-based decision-making derived from AI; and finally, (d) the training of teachers and educators on the influence of AI on educational practices, specifically in understanding and teaching the role of biases associated with the use of AI tools.

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