COMMENTARY

Pedagogy, Cognition, Human Rights, and Social Justice

Benedict du Boulay[1]

The market for Artificial Intelligence in educational applications and tools has seen rapid growth and has attracted a lot of interest, not all of it positive. It is, however, important to distinguish the academic research community as embodied, for example, in the International Society for Artificial Intelligence in Education (AIED) from the ever-increasing commercialisation of these tools and technologies (aied). In the rest of this opinion piece, I designate the overall applications of Artificial Intelligence in education as "aied" and the academic research community as "AIED". As a relatively small academic society, AIED is in a weak position to regulate this market, when even governments are finding it difficult to regulate uses of Artificial Intelligence in other areas (Henz, 2021).

It is clear that there are legitimate concerns about aied's rollout of tools and applications in education making use of (or claiming to make use of) Artificial Intelligence in terms of datafication and surveillance and possibly also of poor pedagogy (Selwyn, 2020; Watters, 2015, 2023; Williamson, 2018, 2019). What is a lot less clear is that the blame lies with the academic community, AIED, or that it has been blind to ethical and societal issues. In particular, the implied claim that AIED has championed "poor pedagogy" is just wrong, as I have argued in detail elsewhere (du Boulay, 2019). Indeed, it has built on and developed a wide range of techniques used by human teachers (du Boulay & Luckin, 2001, 2016; Graesser et al., 2001; Person et al., 1995; Porayska-Pomsta & Mellish, 2013). Moreover, there is a mis-characterisation of both the traditional and the posited "new" role of AIED to "address pedagogy, cognition, human rights, and social justice" as if these were not already part of its brief.

Computer-based technologies of all kinds, including Artificial Intelligence, have penetrated all aspects of our lives. Artificial intelligence has made huge progress, with many systems and technologies now seen as an unremarkable part of the landscape, driven in part by the advances in machine learning and their access to big data. This spread is particularly true for education, where the

✉ Benedict du Boulay
   b.du-boulay@sussex.ac.uk

1   University of Sussex, Brighton, UK

reduction of face-to-face interactions because of COVID has led to the rapid and widespread deployment of learning platforms and communication technologies, and to a lesser extent, tools based on Artificial Intelligence at all levels in education (Webb, 2022).

The field of artificial intelligence in education (aied) is some 50 years old. Scholar was one of the first AI-based teaching systems, based on symbolic AI rather than machine learning, and had the rudimentary pedagogy of asking and answering questions about geographical facts and relationships (Carbonell, 1970). Since then, aied and AIED have progressed both through academic research, such as via the AIED Society, as well as through commercial development, such as Alelo (https://www.alelo.com/), Carnegie Learning (https://www.carnegielearning.com/) and Squirrel AI Learning (https://squirrelai.com/).

Progress from Scholar to the present day has progressed along seven broad dimensions, as evidenced here largely through AIED citations. This is not supposed to be a complete review of the field, merely an indicative collection of citations to substantiate my main point that AIED is already researching pedagogy, cognition, human rights, and social justice.

1. Learner modelling: Not just tags in a semantic network representing the domain as in Scholar but much more dynamic representations of the learners' evolving and changing cognition (Greene et al., 2021), metacognition (Azevedo et al., 2022), affect (Arroyo et al., 2014), motivation (del Soldato & du Boulay, 1995), and meta-affect (Rebolledo Mendez et al., 2021).

2. Domain modelling: Not just a semantic network as in Scholar but production rules (Koedinger & Corbett, 2006), constraints (Mitrovic, 2012), simulations (Lesgold et al., 1992; Rodrigo et al., 2008), games (Sabourin et al., 2013). For an overview see (Aleven et al., 2023b).

3. Pedagogic strategies: not just question asking and answering and one-to-one interaction as in Scholar but problem-solving (Anderson et al., 1995; VanLehn et al., 2005), learning through examples (Najar et al., 2016), learning by teaching (Biswas et al., 2016), learning by prompted discussion (Graesser, 2016), reciprocal teaching (Chou & Chan, 2016), learning from critiquing (Saadawi et al., 2008), learning by challenging (Lehman et al., 2013), learning by confusing (Lehman et al., 2013), learning through gaming (Pareto, 2014). For an overview see (Aleven et al., 2023a).

4. Interactive modalities: not just typed words in rudimentary English as in Scholar but speech input and output (Johnson, 2019), diagrammatic input and output (Biswas et al., 2016) and body movements (Martinez-Maldonado et al., 2018).

5. Variety in users: Not just one-to-one with an individual student as in Scholar but also pairs (Harsley et al., 2017), groups (Hoppe et al., 2020), teams (Sottilare et al., 2018) whole classrooms (Holstein et al., 2018) and educational administrations (Bates et al., 2020).

6. Length and breadth of interaction: not just an hour's worth of instruction as in Scholar but now whole semesters e.g. MATHia marketed by Carnegie Learning.

7. Ethical, social and cultural context, human rights: Not at all as in Scholar but now concern for the ethical (Sjödén, 2020), social (Kim, 2005; Ogan, 2011; Walker & Ogan, 2016) and cultural context of the field (Casas et al., 2015; Johnson, 2007) including human rights (Burleson & Lewis, 2016; Schiff, 2022). For an overview of ethical and social issues see (Holmes & Porayska-Pomsta, 2022; Porayska-Pomsta & Mellish, 2013; Williamson et al., 2023).

From the above, it is clear that pedagogy and cognition have been foci of AIED for a long time as have issues of social and cultural context. The interest in ethics and human rights is relatively more recent but is strong.

In summary, I have tried to show that the quotation presented to the panel at AIED 2022 was mistaken in two broad areas. The first is that it conflated "aied" – the broad field of commercial and academic activity – with "AIED" the largely academic activities of the International Society for Artificial Intelligence in Education which sponsored AIED 2022. The second is that it implied that there were areas such as pedagogy, cognition as well as the social, cultural, ethical and human rights aspects of the field that were not yet part of the existing areas of research in AIED when they were.

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