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COMMENTARY

The Future Trajectory of the AIED Community: Defining the 'Knowledge Tradition' in Critical Times

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It goes without saying that the AIED community represents a distinctive and central role in the current research and debate around the use of AI in educational settings. Like any other community or field of study, AIED represents a particular set of intellectual and methodological frames or 'knowledge tradition' (Furlong & Whitty, 2017).

Although it is not possible in such a short essay to go into any ontological and epistemological discussions of this knowledge tradition in depth, work in the AIED community tends to be broadly characterised by a desire to use technology as the primary way to address perceived problems in education. This view of technology and learning can be seen as an "engineering view of education" (Oliver, 2016; drawing on Peters, 2006) where technology (in this case AI systems) are seen as relatively neutral tools that can be developed to achieve specific learning outcomes (Williamson & Eynon, 2020). The precise theory of learning differs (and has largely moved from cognitivist to more constructivist modes) as has the range of AI techniques and models to achieve learning goals (facilitated by significant advances in machine learning). Yet, the underlying belief that technology can support learning in making it more efficient and effective if it is designed appropriately remains. The most typical research methods employed are randomised control trials and other experimental designs to test causal models (Oliver, 2016). Such approaches align with a knowledge tradition that can be described as the "New Science of Education", where Education can primarily be studied through using methodologies from the natural sciences, and is very focused on questions of learning outcomes and other statistical measures of student achievement. It is an area of revival, with many academic supporters, and one heavily

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supported by education policy actors both nationally and internationally (Furlong & Whitty, 2017).

It is of course, highly risky for anyone (particularly someone from outside the field) to try to capture some of the tenets of AIED, yet this representation is (I hope) largely uncontroversial. Taking such a position does not mean that the AIED community cannot explore questions of pedagogy, cognition, human rights, and social justice as proposed in the prompt for this special issue. Indeed, the community already does a lot of work in cognition and certain aspects of pedagogy. However, it does mean that these areas are conceptualised and explored in a particular way, and precisely how they are being defined needs to be explicit.

For example, although rarely articulated, much of the conceptualisation and practice of ethics in AIED are consequentialist, specifically utilitarian in nature (Hakimi et al., 2021). In other words, most discussions focus on what actions lead to the greatest good for the most people, and are characterised by generalizable standards and impartiality (Willis and Skunk, 2017). This can be useful in its clear commitments to privacy, consent and data protection but can encounter challenges particularly in defining what "good" is and when dealing with unintended outcomes (Willis, 2014). In contrast, other knowledge traditions may be more likely to take a different stance. For example, ethics of care approaches which are more normative and focus on questions of what justice looks like in education before asking how best to respond (Willis and Skunk, 2017; see also Hakimi et al., 2021 and Holmes and Porayska-Pomsta, 2022).

Indeed, the initial prompt for this special issue could be taken in two ways. Is it a call for a rethinking of the central tenets of AIED, or is it a call to broaden out the core focus of issues that the AIED community deem central to their community? I suggest the latter is more feasible and productive: particularly if this broadening out of core issues also means stronger connections with other knowledge traditions.

Every knowledge tradition is different. All communities experience critiques from those outside that tradition. Yet all traditions make an important contribution. Currently AIED is experiencing attention from other communities which could broadly be described as "critical", that come from quite a different epistemological and ontological perspective. In such approaches technology is viewed as something more than a tool, instead theorising it as an artefact that embodies social, cultural and political practices; and that draws attention to questions of experiences, values, and social and political structures (Oliver, 2016). Those that take this more critical view, problematize research from the AIED field as it tends to pay less attention to the messy realities of the classroom and broader questions of education, leading to the critiques listed in the prompt for this special issue (Williamson & Eynon, 2020; Selwyn, 2022).

These two distinct knowledge traditions cannot be straightforwardly bridged as the philosophical foundations of the two communities are quite different. Nevertheless, there have been some positive engagements between the two, including invitations for shared academic contributions such as this special issue and others (e.g. Buckingham Shum and Luckin, 2019).

To further enhance these discussions, there are things that both knowledge traditions can do. In the remainder of this paper, I primarily focus on what the AIED community can do to respond to critique and to move the community forward as

outlined in the prompt. I suggest three areas of focus: addressing the balance between advances in the learning and computational sciences; making clearer the connections between advances in learning theory and education; and to tackle AIED's relationship with the commercial sector.

Addressing the balance between advances in learning and computational science

AIED research is characterised by a combination of basic and applied research, where AIED researchers create systems (typically forms of intelligent tutoring systems) in response to educational problems. The development of such systems draws both on "existing AI theories, tools, and techniques" and "models of human cognition, affect and motivation" (Kay, 2012: 66). In building and deploying AIED systems research can "speak back" to both areas with a reciprocal relationship building between them (Kay, 2012). It therefore makes an important contribution to the development of AI-based technologies for classrooms, the use of AI to understand, measure and improve learning, and advances in AI itself (Holmes et al., 2019; Kay, 2012).

From my outsider perspective it appears that this important interplay between these contributions (Kay, 2012) are now a little out of kilter. The exponential increase in the availability of digital trace data, data storage and computational power over the past decade has enabled technical and methodological developments in AIED; and this has encouraged an influx of researchers and new related research communities (such as educational data mining, learning at scale and learning analytics). A large proportion of these changes are a welcome asset. Indeed, there has been significant collaboration between them (such as the creation of the International Alliance to Advance Learning in the Digital Era). However, part of the shift in who is interested in AIED includes a new interest from AI researchers from outside the field of education, who see education as a new arena to work in primarily due to the availability of 'Big Data' in some learning and educational settings. This group, who may be from a more computer science or technical background, are unlikely to be sufficiently grounded in learning and cognitive sciences to frame research problems appropriately and speak back to the field.

In such a move, there risks a shift away from learning theory to "common sense" theories of education where, for example, predicting typologies of learners is equivalent to predicting typologies of consumers; and the quality of the predictive model is prioritised over the implications for understanding of learning theory or the educational implications.

This over-focus on advances in machine learning at the expense of the other advances in developing understandings of human learning is an issue that the AIED community is tackling. As Rosé and colleagues argue, what is required is the "development of explanatory models of learners that not only accurately predict data but also provide scientific insights and yield practical outcomes" (Rosé et al., 2019: 2943). Such a resolution is a central part of responding to critique or determining a new role for the community in the debates around the role of AI in education.

Developing the connections between learning and education

Second, despite the name of the community, AIED largely tends to be about conceptualising and informing theories and practices of learning, not education. These are of course related but distinct. In order to also consider education, the community should be clearer about what their work contributes to the wider domain of education and what it does not, and focus more attention on the realities of the move of AIED systems from the lab to 'the wild'.

This is not to say that AIED researchers are not aware of what happens in the classroom. For example, many are well aware of the risks of personalisation or a focus on "behaviourist teaching machines" both for the student in terms of getting into a rut and being bored, but also in how it limits what is possible in the classroom (Du Boulay, 2019). Indeed, as I will return to in the conclusion, some of this kind of critique levelled at the AIED community represents a conflation of the AIED academic community and the AI offer for education from the commercial sector.

However, it is perhaps fair to argue that it would be helpful for the AIED community to more clearly define what it is aiming to achieve in schools and how AIED learning systems fit within education systems. This would involve making explicit what people in this field believe education "is" and how it should be. Types of questions to be tackled could include: beyond making learning more effective and more efficient, what vision of education is AIED aiming to support? Whose vision does that represent? Does it / should it work across cultures and across the globe?

A lack of focus on education, as opposed to learning, can also be seen in the discussions of AIED and the role of teaching. Although one strength of AIED is its methodological rigour and its commitment to practice, the methods employed are, as Furlong and Whitty suggest, "highly technical in nature and necessarily relate to forms of knowledge that are significantly distant from the forms of knowledge that circulate in Education as a field of practice" (Furlong & Whitty, 2017: 29). Such work can provide "expert technical knowledge" as the AIED community intends. Yet although such knowledge is designed to be helpful to teachers, its nature can "reduce the scope for professional judgement and thereby turns teachers into technical functionaries" (Furlong & Whitty, 2017: 29) thus risking automation. This is in direct contrast to what many researchers from the AIED community argue, i.e., that AI is not about the replacement of teachers but to augment their practice (du Boulay, 2019). Yet what this augmentation "looks like" in the classroom tends to focus on questions of usability and outcomes of the system. What this means for teachers' identity and their professional practice are less often explored.

It is perhaps not the role of AIED researchers to focus on these wider questions of education in depth, but articulating often implicitly held visions of education and linking to other knowledge traditions that focus on educational issues could potentially strengthen the contribution of the community.

To be distinct from the commercial AIED sector

Third, is the AIED communities' relationship with the commercial sector. There is an understandably complex relationship between academic research in AIED and commercial applications of AIED. In some senses this has been necessary as the commercial sector can provide a valuable source of access to funding, data and markets; and this is important for this community that is characterised by a commitment to interventions in practice.

However, there are some fundamental disconnects between academia and the commercial sector which are becoming more problematic as the market grows. The commercial sector does not always have the same values as AIED academics, as ultimately their focus is primarily about making profit, focusing on areas of learning and education that are most marketable and producing products that are reliable, potentially not reflecting the advances made by academics in AIED.

One challenge for the academic AIED community is to be able to make the difference between them and the commercial sector clear. At times some critiques of the AIED community have perhaps been unjustified, by conflating commercial AI in educational settings with the work of academic AIED researchers. There is a responsibility on both sides to be precise about what, and who, is being critiqued. Yet there is a significant role for the community to make those distinctions clearer, and challenge the commercial sector more often. Indeed, it is uniquely placed to test the technical validity of the models being generated by the commercial sector. Developing ways to hold the commercial sector to account may be a productive way that the academic AIED community could collaborate with other knowledge traditions.

In closing, the current AI 'Spring' has been a challenging time for the AIED community: it has intensified discussions about what kinds of research 'count' as AIED, has encountered critique from other knowledge communities, and had to navigate its relationship with the commercial sector that is now largely responsible for most of the hype, development, and implementation of the majority of AI systems in education.

This has, as the prompt for this special issue suggests, encouraged a period of self–reflection. While there may be calls for a radical shift in the very tenets of what the AIED community stand for, it may be more productive to recognise the strength and longstanding nature of the community and use this time not to reject everything that has gone before – but instead to take a clear position on particular aspects that are currently in flux.

In a general sense, these suggestions are of value to any academic community or sub-field broadly working in the area of Education and Technology. Whatever knowledge tradition we are from we would do well to focus on what matters to the community, to define it and what it stands for, and to better connect to other knowledge traditions where possible. This then places AIED in the strongest position to respond to outside critique, maximising the positive impact of its research, and determining the future trajectory of the field.

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