The EdTech difference: Digitalisation, digital pedagogy, and technology enhanced learning

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Abstract

This editorial is in support of an issue of the Journal that has a focus on educational technology (EdTech). With this in mind, this editorial will provide advice on how the editorial team for this section feels that educational technology will evolve into the latter part of the 2020's, especially given the disruption caused by the COVID-19 pandemic. Examples are given of how writing in this space has changed over the years of the pandemic, with a history of EdTech given, followed by an argument for the need for technology to be used in context. This is followed by descriptions of good practice around theoretical framing, methodology rigour, inclusion of the people element, and the need for the technology to serve a purpose. The piece concludes with a summary of where the editorial team feels the field will go from here into the future. Throughout, practical examples of submissions made over the last few years are given to help illustrate a coherent direction. It is anticipated that this editorial will serve as a guide for future authors to use in service of better educational technology outputs in the future.

Practitioner Notes

1. The use of technology in education needs to serve a purpose.
2. Theoretical framing is an essential underpinning of any EdTech practice.
3. EdTech research needs to ensure it embodies valid and reliable research methods and measures for evaluation.
4. Technology needs to enhance learning in all contexts, regardless of mode of learning.
5. EdTech researchers need to ensure that people and their behaviours are reflected in the technology-based processes.

Keywords

Educational technology, digital pedagogy, sociotechnical computing, educational theory, evaluation methods.

Introduction

Throughout the pandemic, educational technology (EdTech) was offered by educators and institutions to address challenges posed by emergency remote teaching (ERT). In ERT, higher education curriculum is digitalised through a process of rapidly uploading lessons, lectures, assessments, instructional materials, and learning activities that were once face-to-face. Such a pivot meant few staff and students were sufficiently prepared for learning environment centered around technology. The Zoom (2020) monthly active users' growth from 10 million daily users in December 2019 to 300 million in April 2020 is testament to this growth. The higher education sector has conflicting views as to the permanency of the current digital-driven learning and teaching climate (e.g., Logemann et al., 2022; Kinash et al., 2021; Rapanta et al., 2021). Yet, the authors (representing the EdTech editors of the Journal of University Teaching and Learning Practice (JUTLP)) feel that a focus on educational technology is important, and that even if the digital climate changes, it's important to provide guidance on how EdTech research is conducted, both for the benefit of the future authors in JUTLP, as well as for the sector as a whole.

This is especially critical because we know that even before the pandemic, the concept of educational technology was gaining steam, indicated by a rise in top tier journals focusing exclusively on educational technology. In 2020, Scopus listed Internet and Higher Education and Computers and Education in its top five education journals. Google Scholar ranks and lists the top 20 educational technology journals (Computers and Education rank as #1). Indeed, JUTLP launched a dedicated educational technology subsection in June 2021 in recognition of the increasing role of technology in learning and teaching practice. This shift for the Journal is important and recognises the existing educational technology literature published. Increasingly, educational technology-based research is characterised less by pilot studies and practice papers and more through rigorous evaluative multidisciplinary research. The latter is termed the Scholarship of Technology Enhanced Learning (SoTEL: Cochrane et al., 2018; Wickens, 2006), and existed well before the pandemic. This work, built on foundations of Boyer's (1990) scholarship of learning and teaching, attends to synergistic relationships between learning, teaching, and technology.

The purpose of this Editorial is to establish a clear focus of the Journal's section on educational technology by identifying key areas where the discipline could improve. That is: the types of literature published in the section; and those that are out of scope. To do this, this Editorial begins with a historical narrative of educational technology to situate the reader. Following, it responds to key pitfalls: the overemphasis of technology, the need for stronger theory, and the missing human link. This Editorial is concluded by highlighting how future authors can engage with educational technology research in more meaningful, rich, and enabling ways.

Technology must be used in context

Educational technology as we understand it – computers in learning environments – began to emerge in the mid-to-late 1970s with the emergence of personal computers (e.g., the Apple II). The enabling of individual teachers with their own machine supported the subtle shift away from chalkboard and paper-based learning exclusively during the 1980s (Saettler, 2004).

It is into this space that EdTech found itself thrust in the 1990s and into the twenty-first century, with computers becoming ubiquitous in classrooms already steeped in educational theory (Galbreath, 1992). And like many other fields, the first to consider this were the technologists, examining technology use in the classroom environment from a technology-first approach, with

researchers in the UK for example using this as an opportunity to consider the learning footprints of students, and how different learning spaces could afford different learning experiences (Sharpe et al, 2010). In this context, usability studies and descriptions of interventions abounded, with many examples of early EdTech theory building on tools first with little education background (Bennett et al, 2014; Heinrich et al., 2016).

In the past decade, there has been a shift towards more rigorous studies, and approaches to evaluate eLearning (Phillips et al, 2012). While educational scholars (e.g., Hattie, 2012) were enhancing educational theory for the computing age, technology-based scholars (e.g., Goodyear, 2005) were approaching this from the other direction, asking how technology could become more rigorous when backed by theory. Goodyear (2005), in particular, asked scholars to consider how theory could inform practice and how this work could connect with theory.

Then came evaluation. As clear theoretical framing became more prominent, the question of efficacy emerged (Heinecke et al., 2001). And this question is one that the discipline continues to grapple with. Beyond usability, educational theorists often think about learning outcomes, but in this case how do we control for the classroom, in technology research? And how do experimental computer scientists, still working in this space, understand how to conduct more qualitative, almost psychological evaluation of their subjects? Ali et al. (2021) speak to evaluation more specifically. It is these questions that the discipline needs to start asking into 2022 and understanding how research can be embedded as part of the EdTech experience.

Yet, in practical settings, teachers are frequently seeking out technology support from academic developers, educational designers, and technologists. This emerging area is significant in today's higher education domain when the complexity of relationships between teaching and learning practices is increasing as we rethink higher education in the digital age, especially in the context of a global COVID-19 pandemic. The growing availability and capability of digital tools enable us to explore the process of teaching and learning in new ways, and can even change the way we teach and learn. However, this shift tends to lead the academics to focus on the use of technology, instead of the adoption of technology tools to enhance teaching and learning experiences (Cowling & Birt, 2018).

It is understandable that academics need to know how to use a digital tool technically, yet in the process of learning and mastering the use of the tool, there is a potential danger for academics to overlook the core of teaching and learning – the pedagogical aspect – especially amid a global pandemic when teaching and learning becomes virtual overnight (Ahmed & Opoku, 2021). In other words, the danger of putting technology first in teaching and learning compromises student learning experiences (e.g., Väätäjä & Ruokamo, 2021). Using technology for teaching and learning is beyond the simple use of technology (i.e., operational) as the potentials of technology are under-utilised (e.g., Gurukkal, 2021). For example, using Zoom or MS Teams to deliver a lecture, while using digital technologies, it is hardly 'teaching' but 'broadcasting'. Instead, the ideal online teaching and learning environment would perhaps be the use of ICT tools that create peer/collaborative experiences (e.g., the use of breakout rooms or Padlet) or develop interaction/engagement (e.g., the use of chats or polls) within the lecture.

The need for stronger theory

Not unique of higher education is the need to consider the value of theory in research. Indeed, many manuscripts rejected by the Journal lack a strong theoretical framework for the assumptions underlying the practical intervention. While the Journal rests on the edge of practice and theory, it

does require an interaction between both. The scientific method is a practical endeavour, but it is evidence-based. By its very nature, this is what defines it as a scientific endeavour, where a question is first posed and formed before it is answered and then refined. In educational technology, the issue is more in relation to understandings of how technology tools fit into practice and practical settings. At its core though, is the need for clear and evidence-based practice. Technology may be a key tenet, but it cannot be the first step.

Previous educational theorists like Piaget, Vygotsky, and Dewey (see Mooney, 2013) inform learning and teaching practice, and can provide theoretical foundations applicable to teaching online, or with educational technologies. For example, a recording of a long lecture uploaded to a Learning Management System is a poor experience for most students (Guo et al., 2014; Mayer, 2014). Teachers and students in lockdown missed face-to-face conversation and interaction, and human connection (Tice et al., 2021), something higher education communities have previously valued.

Educational technology presents many complex, messy problems that are not linear. Ertmer and Newby (2016) argue that educational technology research is a reciprocal process, that is experimenting with educational technology affordances can lead to changes in teaching practices and beliefs, prompting further research. In this lens, educational technology research begins with a questioning or an expansion of a particular educational theory (Antonakis, 2017). Both theory and practice of teaching and learning needs to underpin research (Percy et al., 2021), and studies about technology-enhanced learning are not exempt.

Where educational theory is ignored in technology-enhanced learning and teaching, pedagogical practice also suffers. In the rapid pivot to emergency remote teaching, much curriculum was digitised and transmitted via technology rather than transformed by it (Crawford 2021). Teaching and learning practice is increasingly under pressure because of increased academic workloads, the exigencies of emergency remote teaching, among other well-known pandemic pressures. It is tempting to position technology implementations as solving educational problems. However, as Boud notes, "people have agentic intentions, not technologies" (2019, p. 1040). Developing new systems, designing discussion forums or social media networks do not enhance learning per se; such technology merely provides more channels of communication, whereby students already have access to increasingly sophisticated systems outside of university. Research published in this Journal must be cognisant of that.

The design and facilitation of learning are critical. Much is now known in educational research about the implementation of online or blended learning, particularly as this has become a renewed and urgent area of interest for practical reasons during the pandemic. Only research that reviews and engages with the extant online learning and collaboration literature (e.g., Al-Samarraie & Saeed, 2018; Giannikas, 2020; Hoadley, 2018; Kebritchi et al., 2017; Sun & Chen, 2016; Yukselturk & Yildirim, 2008) will progress and add value to the field. Despite decades of research, the scholarship of educational technology remains under-theorised (Hew et al., 2019), and presents a challenge for alignment with core concepts.

To extend and create meaningful educational technology research, future researchers need to: build on previous educational technology literature; b) analyse educational technologies from a conceptual perspective; explore contemporary educational technology practices; find implications beyond the effectiveness of a particular educational technology case study; and take a critical and reflexive stance on technology. As we move past the pandemic, the Journal should look for studies that exemplify these qualities.

Supporting more rigorous methods

Despite a growing need for a focus in technology, the integration of this with educational theory as well as the publications of educational technology-based and -informed research has been varied in the Journal of University Teaching and Learning Practice, as it has within the context of broader higher education literature over the last thirty years. Indeed, forthcoming work by Choi-Lundberg et al. (2022) highlights how the concept of digital innovation in higher education learning and teaching is fraught with challenges, and often lacking high quality evaluation measures. We concur, and highlight the need for more rigorous quantitative and qualitative methods (or mixed) for considering whether the embedding of educational technology into a classroom (online, in-person, or blended) has efficacy and supports better outcomes for students and educators. In particular, we reflect on the need for greater context, clarity between learning and satisfaction, alignment with core concepts, and a grounding in genuine challenges for learning and teaching.

Specifically, the role of context cannot be underestimated. Intelligence quotient (IQ) testing research has recognised this for decades (Klebanov & Brookes-Gunn, 2006; Zax & Rees, 2002). In learning and teaching practice, the importance of context is also recognised. Student socio-economic status, demographic factors, and the diverse pathways students undertake on their journey towards higher education need to be considered (Akiba et al., 2007; Milner, 2013). Yet, many submissions rejected by the Journal were done so from a lack of explicit awareness of the context of their research. A study, situated in a particular local context, can have international recognition and application. This only happens, however, in the event of careful exposition of the context. Such a presentation allows readers to examine the environmental conditions that may be transferable across to their own local contexts. To provide a recent example, emergent evidence discusses how critical internet access and reliable hardware are during lockdowns (Cifuentes-Faura et al., 2021). In developing nations, where this is less of a commonplace assumption, studies that draw on augmented reality or technology-dense learning and teaching will clearly have reduced appeal. Without appropriate consideration to context, it can be difficult to carefully explore which elements may be transferable and under what environmental conditions these will be suitable.

In a recent Editorial, editors of the Journal (Ali et al., 2021) spoke to the need for greater validity and reliability in the use of student evaluations in research. Much of their commentary applies here, with student evaluations a common mechanism for measuring the perceived success of new educational technology. Student satisfaction surveys can be used to drive an understanding of student views, but they are laden with bias and institutional politics that can enable these to be seen as blunt instruments rather than devices for growth. For example, in a recent study on COVID-19 web-based video conferencing ($n = 162$ undergraduate medicine students: Fatani, 2020), student satisfaction was measured using the students' evaluation of education quality. Satisfaction in this study was measured by asking the extent to which students agree with positive statements (e.g., 'the faculty member's explanations were clear' and 'students were invited to share their ideas and knowledge'). Such a tool is common practice in determining if students found the learning enjoyable and were satisfied. Yet, how do we know that this web-based video conferencing practice *actually* enabled students to learn and to achieve? Contrast this to criterion-based assessment, where rubrics with standards of attainment are used to assess student performance (e.g., Pui et al., 2021). These concepts are distinct, and to understand if learning has been achieved (a key outcome of education), student satisfaction alone will not suffice.

In educational technology research, it is critical to ensure that the embedding of new technologies into learning and teaching requires careful connection to proximal and distal indicators to measure

success (or otherwise). Indeed, this may begin with statistics on usage (e.g., click rates, downloads, view time), but cannot end there. User experiences are key to understanding how a developmental program or learning experience outlined in a paper is going from a user point of view, but it is not an assurance that they are learning. In one study, online learning and engagement predicted learning, and this predicted satisfaction (Baber, 2020). We suggest this relationship may be more complex, but can acknowledge the strength of measuring engagement, learning achievement, and satisfaction as interrelated but conceptually distinct constructs. We recommend authors considering educational technology research to ensure that evaluation of engagement (with and of tools), learning, and satisfaction (with learning processes) is conducted to demonstrate the efficacy and validity of such analysis (e.g., Crawford & Kelder, 2019). Descriptive statistics (e.g., mean scores changing, or higher clicks) alone are not sufficient to do this.

Luthans (2002) wrote of a concern in the organizational behaviour literature, and we draw on this insight in the educational technology context. In this piece, Luthans (2002) coined positive organisational behavior as a response to support stronger and more rigorous concepts in the literature over airport-style concepts that were interesting, not evidence-based. In the EdTech space, this same comment could be made. Boyer (1990) created an impetus for change in the scholarship of learning and teaching, and this created opportunity for understanding how we can engage with more rigorous and evidence-based technology-enhanced learning research. There is an important intersection that exists between learning and teaching, but so too does technology overlap and interact with this relationship. During and beyond the COVID-19 pandemic, this relationship will be more prominent.

A greater focus on learning, whether online or not

One concern that is evident in the pandemic literature is an over-emphasis of repackaged learning and teaching theory in online environments. For example, teaching presence and teaching immediacy are prominent conversations in face-to-face learning environments. Such concepts have been translated to online environments (Bangert, 2008), yet they may be qualitatively different conversations. The same is true, but more prevalent during 2020-2022 emergency remote teaching, where examples shown highlight the practice of moving printouts in class into online environments, or converting in-class lectures into online Zoom sessions. The latter has a genuine difference (Tice et al., 2021). Joint attention theory applies to in-class lectures and workshops, but likely does not in a Zoom room where microphones and videos of participants are off. Moving online may be beneficial for students and staff, but such a pivot requires careful consideration of the affective, cognitive, and behavioural changes that are a required response as part of the transition. Effective and rigorous scholarly research drawing on core concepts embedded in an understanding of technologies is needed to make a valuable Journal contribution.

Antonakis (2017) presents on five 'diseases' of making useful research (see Table 1). These, while more closely situated in the business and management discipline, also offer useful insights. It is commonplace for literature to conflict with one another, and findings to have competing results. It is not commonplace for those grievances to be examined critically, and future testing or theorising to resolve the difference. Was it sampling issues? Was it context? Or something else?

Table 1:
Antonakis' diseases of useful research

Disease	Definition (quote from Antonakis, 2017, p. 5)
Significosis	An inordinate focus on statistically significant results
Neophilia	An excessive appreciation for novelty
Theorrhea	A mania for new theory
Arigorium	A deficiency of rigour in theoretical and empirical work
Disjunctivitis	A proclivity to produce large quantities of redundant, trivial, and incoherent works

The Journal of University Teaching and Learning Practice has been seeking to build more cohesive bodies of works within our editorial sections, and the formation of these has created greater opportunities to look at each section holistically. Curiously, the vast majority of theoretical models are not tested empirically (Kacmar & Whitfield, 2000), quantitative research not explored from a qualitative lens in future work, or vice versa. The Journal has not published many studies that have insignificant findings, primarily due to the lack of rigorous studies that are submitted with insignificant results. But it's important to note that learning concepts that are not related, or have no significant relationship, is equally as important as demonstrating relationships that do. The Journal should consider this in the future.

For higher education research to be of its highest quality, and to support and enable the practice of student learning and academic teaching, educational technology is no longer a curiosity, but rather an expectation. The degree of embeddedness will vary, but the scholarly work that explores it must carefully consider the contribution it makes.

The missing human link

Technology enhanced learning is based on learning, teaching, and technology, but it also involves human interaction, human resources, and critical conversations (Steeples & Jones, 2012). These human elements are intertwined with technology processes, and support the embedding of an informed practice, rather than content forced to fit into available technology (or 'shoveling': Kehrweld & Parker, 2019). Yet the focus on some work seen rejected from the Journal emphasises traditional views of techno-centricity. This clouds opportunities for academics to be empowered to develop transformative online education, despite such learning providing learner-centred higher education where flexibility affords learner preferences, heightens learner experiences, supports productivity, and shares control with agentic learners (Kehrweld & Parker, 2013).

Educational technology research is more than online learning, and hence needs to be built on pedagogical principles and theory, along with social usability. It is not simply emergency remote teaching and requires more than personal experience and anecdote to establish authentically, with online learning and academic self-efficacy, being examples of important factors in continuing online practices (Psotka, 2022). Academic attitudes need to be reshaped from reactive to proactive,

enabling a shift to creative, pedagogically sound ways of working in the online environment (pre-emption: Witzenberger and Gulson, 2021). In addition, much of the higher education curricula have been adapted to an online format, particularly during COVID-19. So it seems obvious that research on best practices for interactive learning environments needs to be prioritised by academics (Psotka, 2022), research that supports a focused attempt to characterise learner and learning, teacher and teaching, within technology enhanced learning contexts. And such manuscripts are encouraged in the Journal.

Technological innovation to stretch the institutional core activities, like learning and teaching, are key to the success of higher education (Adams & Ivanov, 2015). When academics can understand that EdTech consists of social, technical, and pedagogical usability dimensions, they are more likely to detect potential issues when designing or evaluating online courses (e.g., Pham et al., 2021). There are emergent and established professional learning and professional development programs in higher education, along with associated research. While this Editorial highlights some of these briefly, these should serve as useful examples rather than an extensive list. The Developing Teaching Practice section of the Journal supports scholars to pioneer in this field of research (see Gonzalez et al., 2021).

For academics to understand EdTech as more than emergency remote teaching, there needs to be professional development. To avoid individualism and isolation, professional development needs to be collaborative and social (Tammets et al., 2013). Professional development using communities of practice as a way of making learning and knowledge building a social process is becoming more widely utilised in higher education settings. Having a common interest, concern or passion enables members to look at how to enhance it by interacting regularly (Wenger, 1989). To develop and enculturate members to shared understandings and ways of working in relation to EdTech would allow a reflective, inclusive, participatory, learning oriented approach that promotes knowledge growth in meaningful ways that are embedded.

It is established that socio-technical systems bring people together to share information and to collaborate in an environment where scaffolding enhances the sharing of individual and group knowledge (Tammets et al., 2013). Through such a process, the value of EdTech and the application of principles and practices can be shared and developed in academics. Individuals can plan their own competence development following reflection on conversations with others. Student involvement in this learning process is also essential (e.g., Wilson et al., 2020) The higher education community can collectively formulate norms and visions for the broad community and for specific disciplines.

Finally, Legemaate et al. (2021) highlights that all organisations are socio-technical systems, based on social as well as technical aspects. Higher education institutions commonly have social aspects dominate due to the focus on innovation and learning, rather than technical aspects. EdTech is a socio-technical system within the higher education system, for both academic and student stakeholders. It is therefore critical to prioritise social presence and social interaction and simultaneously ensure that the information load is neither overwhelming nor necessary (Pham et al., 2021). Socio-technical systems theory claims that productivity is reliant on combining social and technical aspects. These elements allow individual needs and tasks to be approached flexibly. Considering socio-technical theory in teaching ensures technology is applied to improve learning, but also to integrate the technical and social systems to enhance the experience of learning for the individual (Wilson et al., 2021).

Consideration needs to be given to affording students to learn together and also learn apart. This method can help learners to examine learning through critical questioning – collaboratively and independently, building social and individual skills and knowledge. Cochrane and Stretton (2022) assert that innovative socio-technical approaches, although not necessarily new, are establishing relevance to long-term strategies in higher education, beyond the current emergency responses to learning as an outcome of the COVID-19 pandemic. Such strategies will need to be applied in both face-to-face and online learning contexts now and into the future.

Where to from here?

COVID-19, in many ways, has exacerbated and accelerated questions about the utility of educational technology in higher education. This Editorial has begun to explore and address questions of how educational technology research in the Journal has also influenced views, and also what it should mean for future publications the Journal considers. One observation that stems from this Editorial is that modality is not a justification, in and of itself. Online curriculum is not the same as face-to-face on-campus learning, yet they will likely draw on matching and similar pedagogical adaptations.

This Editorial began by viewing an abbreviated history of educational technology, and through this it was evident that there is still a significant need to prioritise pedagogy over technology. This means asking first what methods of teaching will enable the greatest and highest quality student learning opportunities, and subsequently examining the technologies that afford such opportunity. Indeed, at times, there will be a need to weigh and judge between the functionality of soft- or hardware against the blue sky desires of an enriching pedagogy. Such examinations of practical implementations that examine the emergent tension there is welcomed.

The rationale for a focus on pedagogy is to continually remind authors of the core of higher education: learning. This Editorial highlights this core, and how it relates directly to educational technology engagements, and how some manuscripts rejected by the Journal focus on the technology almost independently of those individuals who will use it. Understanding how students learn best across diverse modalities is important, and the pedagogies that do and do not apply in those contexts, is critical to applying a best practice tech

So, student learning, pedagogy, and technology form key foundations of effective educational technology research. Added to this are teachers, and the human aspect of education. Educators support the use and misuse of educational technology, and often occupy research roles in examining the efficacy of such tools. Recognising that inside the implementation of educational technology are individuals who resist, support, adopt fast and slow, and experience eustress and distress is key to successfully using such tools. Academic staff form part of this, and so too does educational technologists, designers, developers, and academic developers alike. Students are the other key human group involved.

To conclude this Editorial, when considering the environmental conditions of educational technology research (people, technology, pedagogy, learning), evaluating implementation or efficacy requires careful consideration to rigorous methods. That is, practice papers still have an evidence-base and apply logical and conceptually validated assumptions to establish a case for implementation, and for its process of evaluation. The Journal encourages greater emphasis on high quality technology-based learning and teaching research, and argues for a strong and considered approach to engaging with the extant literature surrounding technology. Why? So, we know what

does and does not work. And to improve the lives of diverse students and teachers through the use of technology.

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