

Responsible EdTech for Impact: A UCL Collaborative Approach

“Making an impact” is a common theme of current discussions around educational technology (edtech) in industry, academia and amongst investors. Academic researchers hope to understand how technology can positively influence learner outcomes or teaching quality, and the technology industry designs and market products that claim to do the same. Impact investors, seeking to generate both a financial return and a measurable societal benefit from investmentsⁱ, are increasingly looking towards education as a market in which they can make a difference. While the majority of the estimated \$715B of impact investment funds currently under managementⁱⁱ are dedicated to environmental or sustainability issues, the percentage of impact funds invested in edtech is set to increase by more than \$112B by 2026ⁱⁱⁱ.

This should not come as a surprise. UNESCO and others believe that advances in our use of educational technology and artificial intelligence (AI) have the potential to expand access to quality education around the world^{iv}, along with increasing the likelihood of nations achieving the 17 Sustainable Development Goals (SDGs)^v. Some education systems are already realising the power of AI and learning analytics to individualise learning delivery, provide teachers real-time data to inform practice, transform student assessment, predict student academic, well-being or social issues, and enable students to regulate their own learning^{vi}. Encouraging investment in and use of edtech and AI in education sounds like an easy decision to make. Unfortunately, responsibly designing and implementing edtech that truly makes an impact is anything but simple.

From an impact investment point of view, achieving the dual objectives of profitability or return on investment while simultaneously delivering a meaningful impact to education is challenging. This is partly because defining and measuring impact is often more difficult in education than it is for other impact investments where the results can be more easily quantified (e.g. number of solar panels installed or vaccinations given) and success and failure are clearer^{vii}. Isolating the impact that a particular edtech intervention has on a variety of cognitive or non-cognitive learner outcomes is a much more complex endeavour, and one that most edtech companies or investors are ill-equipped – or unwilling -- to take on. It is easier, cheaper, and faster to measure the financial success of an edtech product or service, without taking into consideration whether the product actually delivers any benefits to learners.

The recent COVID-19 pandemic increased technology use amongst learners of all ages; school-aged children in particular are spending more time online than they were before the pandemic. Global children’s organisations such as UNICEF and the Lego Foundation believe this makes everyone in edtech responsible for thinking about the impact that their products or services have on learners^{viii}. A recent World Economic Forum blog highlighted what many in education already believe: edtech is simply not delivering on its promise to improve education^{ix}. Researchers analysing the top 100 educational apps on the Google Play and Apple stores found that the majority of the most downloaded apps do not adhere to core principles of quality learning, at best providing young children with opportunities for rote learning or memorisation and at worst, distracting them from learning altogether.^x Yet edtech companies continue to perform well financially, with 36 edtech unicorns globally as of summer 2022. These companies are collectively valued at over \$105B,^{xi} but what do we know about the educational value they provide?

The onus isn’t just on industry to make better edtech, however. The edtech industry and its investors would both benefit from engaging with academia to:

- Understand the science of learning, as well as related factors such as motivation, engagement, cognition, learner background and prior knowledge;
- Learn what research has already been conducted in the domain, what works, and what doesn't;
- Make evidence-based decisions about product development and technology choices; and
- Measure impact of the edtech during the development process and after implementation.

Likewise, academic researchers could also benefit from stronger connections with industry to bring their good ideas to market. Countless well-researched, successful educational technology interventions simply sit on a shelf once the research project's funding runs dry. Forward-thinking universities have the foresight to realise that they must become more entrepreneurial to engage with multifaceted, transdisciplinary and cross-sector alliances that will enable 'transformational collaborative advantage' rather than solely competitive advantage. This is a win-win for all stakeholders as well as for people and the planet. Universities have untapped potential to work with global industry, governments and civil society to make a big impact towards achieving the UN SDGs by driving social, organisational and technological innovation.

UCL believes in the need for so-called "next-generation universities" to avoid working in silos and instead develop and execute strategic alliances with other organisations to help tackle global issues such as the UN SDGs. As such, UCL is actively creating spaces and programmes in which different communities and their stakeholders can collaborate and form partnerships to address these common challenges. This paper provides an example of such a convening executed in the service of edtech by three world-leading UCL departments: the [Centre for Digital Innovation \(CDI\)](#) leverages UCL's relationship with [Amazon Web Services \(AWS\)](#) and builds on fact that 80% of UCL technology spinouts are built using AWS technology; the [Institute for Education \(IOE\)](#) has been named Number 1 for Education in the QS World University Rankings by Subject for nine years in a row and leads global discussions on teaching and learning with technology; the [UCL Faculty of Engineering](#) helps drive innovation and develop and support entrepreneurs through its multiple accelerators around digital technology.

UCL Centre for Digital Innovation

UCL's Centre for Digital Innovation (CDI) was launched in partnership with AWS with the objective of nurturing digital solutions to solve real-world problems in healthcare and education. The programmes and offerings from CDI offer support to entrepreneurs in health and education from UCL's own research communities as well as start-ups from outside of the university.

"UCL and AWS joined forces to build innovative digital solutions to the world's problems in healthcare and education. The UCL Centre for Digital Innovation powered by AWS will lead us to solutions that are evidence based, commercially sustainable and focus on the needs of the world's citizens."

A variety of programmes and events from CDI provide entrepreneurs with expert help from partners to support both innovation and commercialisation of their ideas. These include the following:

- [Impact accelerator](#): Start-ups developing innovative technology solutions for healthcare or education are provided with individualised support in their efforts to build cloud-based products that are grounded in research evidence, sustainable and can demonstrate benefit in a real-world setting.
- [UCL Edtech Labs](#): Multiple global accelerator programmes for educational technology start-ups provide a 12-week programme that covers building and scaling impactful products through a

blend of entrepreneurial and educational research training. UCL Edtech Labs has as its objective to help companies create high-quality educational technology that revolutionises how people learn.

One of the multi-departmental events addressing edtech was the Global Start-up Mini-Summit, directed at edtech start-up companies, investors and academics working in edtech and AI. This was the first of many recurring Mini-Summits that invite industry, academic and investment stakeholders who are already convening for a larger event to gather and discuss challenges and opportunities in edtech.

Global Start-up Mini-Summit

As part of London EdTech Week, UCL's CDI and Edtech Labs jointly hosted the Global Start-up Mini-Summit at IDEALondon, UCL's outpost in the City. The objective of the summit was to investigate ways of mobilising the edtech ecosystem to find solutions for the world's pressing educational challenges. Over 130 people convened at IDEALondon over the course of the day, including start-up founders, academic researchers, and investors in education technology. Attendees also included representatives from MindCET, Israel's centre for innovation and technological development in education.

The day's activities began with the start-ups themselves. Founders who had recently completed their three-month programme with the UCL Edtech Labs accelerator, as well as select Israeli start-ups working with MindCET, each had three minutes to pitch their products to attendees. Two UCL Edtech Labs start-ups, Ikigai Data and Smash Medicine have products that rely on AI. Their journeys towards ethical use of AI in their products are described in the following boxes.

Ikigai Data

Ikigai is a careers' data and insights company, building tools and experiences that equip young people with bespoke career guidance so they can find and manage their *ikigai*: their reason for being. Ikigai partners with educational institutions to ensure that all young people have access to the information, resources and networks they need to maximise their employment opportunities and boost their career outcomes.

Ikigai uses AI responsibly in their product by investigating, understanding and mitigating the unintended negative consequences of the recommendations they bring to their users. They collaborate with AI experts and researchers to design, build and implement algorithmic solutions that are inclusive of all their users. They are also on a continuous journey to build new sources of data about occupations and labour markets so that the information provided by the product is not biased by geography, time or industry.

Ikigai's participation in the UCL Edtech Labs accelerator helped crystallise the focus of the research they are planning to measure impact and continue designing and modifying their product. Their current research plans to investigate the extent to which the variables considered by their multi-factorial, AI-driven career recommendation model weigh in the career decisions made across different profiles of users. They hope that this research body will shed light on the skill pockets, career cliffs and glass ceilings that prevent diversity and social mobility in society.

SmashMedicine

SmashMedicine is a crowdsourcing application for higher education in which students are engaged as partners through the active co-creation of course-related content. Their product aims to increase healthcare student confidence in creating, reviewing and consuming educational material in order to improve the lives of patients and citizens, and they have a variety of measures in place to understand whether they are making an impact on an ongoing basis.

SmashMedicine's objective is to develop AI that helps improve learning outcomes and promote academic integrity. They approach each stage of design, development and deployment of AI with care and rigour. Their team believes that, fundamentally, AI must be designed, developed and tested by a wide and diverse range of learners and educators, not just engineers. As such, they have checkpoints throughout their development processes to mitigate unintended bias. This includes researching statistical and machine learning approaches in the relevant area, discussing pros and cons of various approaches as a team and testing and iterating the AI with a wide and diverse range of learners and educators.

The UCL EdTech labs programme has provided SmashMedicine with a framework for refining and enhancing the effectiveness of their product. The research-first approach of the accelerator helped SmashMedicine understand and empathise with their users more deeply whilst providing a robust and systematic way of collecting key evidence. Importantly, they were provided with tools to evaluate their social impact, which have allowed them to break out impact goals into measurable elements, ensuring they are on track to deliver their mission of improving the lives of everyone through impactful and inclusive learning experiences.

Can AI help to deliver human-centric education?

The Mini-Summit continued with presentations, workshops and a panel discussion with academics from various departments within UCL concerned with edtech and AI. Professor John Shawe-Taylor, Director of the Centre for Computational Statistics and Machine Learning at UCL, kicked off the afternoon. His keynote presentation introduced a topic that would continue throughout the day: namely, the idea of designing AI to be more human-centred. His presentation began by stressing the importance of education to accomplish the United Nation's SDGs, a set of 17 interlinked objectives that prioritise protecting the planet and its most vulnerable inhabitants.¹ He outlined the great potential for AI in education and, using data from his own recent research, spoke about the need for AI to make learning enjoyable and engaging. He recommended improving the relationship between humans and AI by promoting better understanding of how AI works and using it to engage people's natural curiosity. He spoke about his research into open educational resources (OER) and AI, which has resulted in a multi-modal, cross-cultural, and cross-lingual network for OER across multiple subject domains, linking different OER websites and providing search and recommendation capabilities for users.^{xii}

Collaborating to save the world

Professor Alison Clark-Wilson from the UCL Institute of Education's Knowledge Lab maintained the group's focus on education and the SDGs in her "World Saver" workshop. All 17 SDGs require multi-stakeholder collaboration and partnership within and between countries in order to meet objectives. For this reason, all summit attendees were encouraged to collaborate in groups and asked to choose

one or more SDGs and think of a technology solution to solve them. The groups' findings were presented in a What's App chat, and ideas included a "downloadable internet" product allowing remote villages to continue offering educational services even when natural disasters cut them off from the country's internet.

Considering ethics in artificial intelligence for education

Next Professor Kaśka Porayska-Pomsta of the UCL Knowledge Lab gave a presentation on ethical considerations for edtech. She discussed a detailed set ethical dimensions identified in the context of AI more broadly, which she then contextualised within educational applications. She raised many important questions about what designers of AI in education need to address to ensure that their products stand up to scrutiny with respect to their ethical value. Much of her presentation was based on current and forthcoming publications^{xiii} in which she and colleagues emphasise the need to gather various stakeholder perspectives and voices to understand the purpose for AI in education and the role it needs to play in society. Like Professor Shawe-Taylor, Professor Porayska-Pomsta's work emphasises need for a human-AI connection and for considerations of transparency, explicability, and human autonomy in the development of AI systems for any domain.

Tomorrow's world: Responsible innovation and impact

The day concluded with a panel discussion including Professors Clark-Wilson and Porayska-Pomsta, as well as Professor Manolis Mavrikis, Professor of AI and Learning Analytics from the UCL Knowledge Lab; Graça Carvalho, Director of the UCL CDI; and Michelle Duquette, Co-founder of London Edtech Week and strategic marketing expert. The panel began with each speaker's definition of responsible innovation and impact and how various actors in edtech can add value to the industry. The audience was interested in discussing the role and practical implementation of so-called "responsible AI" in edtech, however several concerns were raised regarding the compatibility between the many ethics principles and design methods (e.g. substantial involvement of target users in the design of the products) and business viability of such methods in terms of resources, especially for start-ups. The panel discussion made clear that much of how the technology is perceived, and indeed whether it is considered useful or not, is a reflection not only of transparency on behalf of the edtech researchers and providers but also communication. The latter requires all parties having an understanding and awareness of AI approaches and their potential and pitfalls. To this end, Profs Porayska-Pomsta and Mavrikis highlighted the critical work conducted at the UCL Knowledge Lab and the Master's in Education and Technology^{xiv} that includes their course on AI in Education targeted particularly to teachers, social scientists and edtech designers. Similarly, Graça Carvalho pointed to the need to adopt methodologies from engineering for testing innovation with schools, teachers and other stakeholders directly. CDI is exploring options for collaborations with the UCL IOE Faculty of Education and Society to make such transdisciplinary evaluations possible.

Conclusions, recommendations, and next steps

As the discussions during the Mini-Summit highlighted, there is significant work to be done to ensure that the potential of edtech and AI in education are not wasted. This work includes industry, academia, investors and practitioners being able to measure and understand the impact of edtech to a variety of learning or teaching outcomes, but it also includes a diverse group of these actors and other stakeholders engaging in discussions around the responsible use of AI in education.

Some work has been done by multi-national organisations such as UNESCO and the OECD to get policymakers to agree to ethical AI guidance and principles. However, countries vary in the extent to

which they honour or enforce these principles^{xv}. There is a need for partnership between research, industry and policy to enable responsible AI ecosystem. Such partnership needs to take the following issues into consideration:

- Changing thinking about how AI is understood and evaluated in terms of its ethical and societal value.
- Ensuring a balance of knowledge, skills, influence and benefits between all actors in AI ecosystem, including engineers, researchers, policymakers, corporate sector, users and general public.
- Enabling and promoting a mindset of ethical AI.
- Providing incentives to encourage willingness to explore different models for AI and data-driven technology, from the development algorithms to the creation of policy and governance.
- Championing AI solutions that enhance and celebrate human diversity, creativity, curiosity, agency, welfare and well-being.

Industry, academia and education need to work together on these issues and to focus efforts to provide solutions that make a real impact on the factors that extend high-quality educational experiences to everyone who needs them. The programmes at CDI have the potential to make a real difference in linking start-ups, investors and industry and showcasing the importance of measuring and communicating edtech's impact.