Abstract

The purpose of this oral presentation and paper is to share the process and outcomes of an international collaboration exploring the futurology of educational technology. This multi-phased collaboration centers on envisioning the impacts of future technologies within the classroom and articulating resultant implications for teacher professional development. It leverages interdisciplinary knowledge and expertise from within and beyond educational colleges in partner universities, namely, the Mary Lou Fulton Teachers College in Arizona State University, United States of America, and the Institute of Education in Dublin City University, Ireland.

A question at the heart of this collaborative study was how can we prepare the teachers of tomorrow to use technology in the classroom in the most effective way possible? Given the rapid development of technology and the subsequent adoption in formal and informal educational settings, how can we prepare a new generation of educators to adopt, and optimize technologies in their classroom? According to the 2017 New Horizons K-12 Report, Artificial Intelligence (AI) and the Internet of Things (IoT) will be generally adopted by 2022 [1]. Artificial Intelligence is often thought of the “next wave” of technology, but our goal is to move beyond the near future, and look to what will be the “new” technology 25 to 30 years from now. Using the forecast of common “narrow” AI implementations across classrooms within five years as the baseline for our model, we aim to envision what technologies will have an influence on, and be implemented within, learning ecologies over the next several decades, an era we describe as the ‘Diamond Age’.

This paper will discuss the need for such a collaborative project, the current development of the multi-phased, multi-year project scope, as well as the future directions and joint-program goals. In many cases, the education sector handles new and emerging technology in a reactionary fashion. One of the aims of this collaborative project is to look at educational technology from a futurist perspective to lay a thought provoking foundational model in order to redefine what education may look like in the “classroom of tomorrow”. The intended goal of this futurist model of educational technology is to re-conceptualize how teacher preparation programs think about preparing future educators.

Keywords: educational technology, futurology, emerging technology, futurist model, semantic web.

1 INTRODUCTION

One of the main questions at the heart of this collaborative study is how can we prepare the teachers of tomorrow to use technology in the classroom in the most effective way possible? Expanding on that core question, and given the rapid development of technology and the subsequent adoption in formal and informal educational settings, how can we prepare a new generation of educators to adopt, and optimize technologies in their classroom? Each year the New Horizon Report [1] release their predictions of technology adoption in increments based on “time to adoption” ranging from one year or less, to five years. At the time of publication, the 2017 New Horizons K-12 Report predicts that Artificial Intelligence (AI) and the Internet of Things (IoT) will be generally adopted by 2022 [1]. While Artificial Intelligence is often thought of the “next wave” of technology, our goal is to move beyond the near future, and look to what will be the “new” technology 25 to 30 years from now. As the baseline for our model, we aim to envision what technologies will have an influence on, and be implemented within, learning ecologies over the next several decades, an era in which there are expectations of such significant technological advancement that it would constitute a new epoch - the ‘Diamond Age’. In framing the title for this paper, we drew inspiration from a book titled: The Diamond Age [2] which relates a coming-of-age science-fiction story dealing with themes including: education, social class, and artificial intelligence. The term ‘Diamond Age’ represents the significant advancement in science and technology that would allow for diamonds to be manufactured by using nano-technologies to
combine carbon atoms. Therefore, in this paper, the term 'Diamond Age' refers to significant advancements in science and technology that represent a great technological leap forward (analogous to advancements in epochs of Stone Age, Bronze Age or Iron Age in past times).

This paper discusses the need for a collaborative project exploring frontier research across a range of disciplines that has the potential to significantly advance technological developments and re-shape the landscape of education. In this regard, the paper describes the formation of the consortium, the current development of the multi-phased, multi-year project scope, as well as the future directions and joint-program goals for this innovative research project. In many cases, the education sector handles new and emerging technology in a reactionary fashion.

1.1 International collaboration

Arizona State University (ASU) and Dublin City University (DCU) have been engaged in international collaboration since 2006. In 2013 ASU and DCU signed the Transatlantic Higher Education Partnership resulting in new projects to advance education and research in North America and Ireland [3]. Through this collaborative effort, the Mary Lou Fulton Teachers College from ASU and the Institute of Education from DCU held a convening in Washington D.C. in the fall of 2017 to discuss various broad-level educational issues and form research collaborations. From this convening, a research group was formed with a focus on education and technology. At the core of the technology group is the aim to engage with educational technology from a futurist perspective, moving beyond the contemporary technologies and working to forecast and model the impact future technological developments and innovations may have on the school of the future.

1.2 Members of the international collaborative team

The collaborative team is comprised of a unique blend of academic researchers and professionals, drawing on the variety of respective backgrounds, knowledge, and expertise in education and technology. To help frame the international collaboration, a brief biography of the founding team members is provided below.

1.2.1 Arizona State University: Mary Lou Fulton Teachers College

Dr. Joseph Doiron is a Fulton Fellow at the Mary Lou Fulton Teachers College. His research largely focuses on understanding the educational policy, product, program, and organizational futures that various stakeholders in the United States and around the world envision. Additionally, Dr. Doiron is working to reimagine the teaching workforce of the future and how teacher education programs prepare those teachers.

Dr. Sean M. Leahy is the Director of Technology Initiatives for the Office of Scholarship & Innovation. In this role Sean supports the exploration and integration of educational and emerging technologies (through internal programs and partnerships with external companies and organizations) to prepare the next generation of teachers and teacher educators to become creative designers of transformative learning experiences. Dr. Leahy’s research is focused on the use of technology in online and traditional learning environments, emerging technologies, design, and media production.

1.2.2 Dublin City University: Institute of Education

Dr. Charlotte Holland is Associate Dean for Research in DCU Institute of Education, and Associate Professor in the School of STEM Education, Innovation and Global Studies. She lectures, researches, publishes, and supervises doctoral students in the areas of education for sustainability, technology-enabled learning, and creative instructional design. She is Director of the Regional Centre of Expertise in Education for Sustainable Development for the greater Dublin region, RCE Dublin, which was acknowledged as a centre of expertise in sustainability education by the United Nations University in 2014.

Dr Francis Ward holds the position of Assistant Professor in Music Education at the School of Arts Education and Movement, DCU Institute of Education. Trained as a pianist, dancer, and ethnomusicologist, Francis is interested in arts education in its broadest context, and is involved in a range of research activities, including music in schools, integration of music across the curriculum, music education and social inclusion, creativity, informal and non-formal music/dance transmission, virtual pedagogies, online learning, technology in/as the classroom, transformations of orality, and the creative processes in music/dance composition.
2 PROJECT DESCRIPTION

In schools, children and young people are often encouraged to speculate and hypothesize about the wonder that their future might hold - to "project themselves into the realm of the not yet" [4]; in the same way, through this collaboration, we aim to explicate (at some level) the futurology of educational technology. Accurately predicting the future is difficult, and some may argue impossible, but through our project we aim to employ futurology to develop models of possible technology developments and provide framework for addressing technological advances in a proactive method. Previous publications have addressed that the nature of knowledge will also change as a result of the capabilities afforded by these new advances in technology [5]. As the title of this paper suggests, our project aims to focus on the wave of emerging technology that may not yet be in the colloquial dialogue, namely looking beyond the Semantic Web (Web 3.0). Web 3.0 or the Semantic Web (which are used somewhat interchangeably) describes the “technologies [that] enable people to create data stores on the Web, build vocabularies, and write rules for handling data” [6], essentially describing a shift in the way we use the web presently to one in which inferences can be made by computers on the web of data containing machine readable information or context around the actual data input. Furthermore, Web 3.0 opens exciting new opportunities through the convergence of cloud computing and crowdsourcing technologies, allowing for sharing and processing of knowledge from a diverse range of sources (made available through the so-called Internet of Things, IoT) by large groups of people - thus, it offers new ways to harness the collective intelligence of groups in consideration of matters or challenges at local, national and/ or global levels, and in the generation of new information and knowledge. Moving beyond Web 3.0, our collaboration is exploring frontier developments across a range of disciplines to get a sense of emerging scientific and technological developments that will likely have a translational impact on teaching practice, learning experiences and the learning environment.

2.1 Need for collaborative project

Education and technology discussions often focus too narrowly on specific products, technologies, or contexts. There is a real need for transatlantic, global research, discussion, and cooperation about how the vector of technology and education will affect classrooms. This need is perhaps even more salient when we consider teacher education, and how teacher educators can prepare for the future before new technologies arrive in the classroom, ‘bypassing’ formal channels of education and processes of teacher preparation. This project is multi-phased and multi-year (2 year), with specific goals for each phase and each year of the project, as described in the following section. The initial team, with a current membership of four, is expected to significantly expand to include more colleagues from each of the partner institutions in the first year, and furthermore, in the spirit of Web 3.0, the intention is to also harvest and harness the collective intelligence of interested parties beyond the boundaries of these institutions through the promotion of discussion and dialogue on the emerging project findings in the public sphere throughout the life-time of the project. While the span of the initial collaboration is two years, it is envisaged that the collective participating in this initiative will continue to engage in new explorations of matters relating to technology in, of and for education beyond the lifetime of the project. The overall mission of the consortium is three-fold: i) keep the community abreast of emerging developments at the frontier of arts, humanities, social sciences, and science and technology research; ii) facilitate interdisciplinary discussion and dialogue on the possible implications of these developments on or for education in 21st century, and how teacher education may be impacted or will need to respond to the developments; and iii) disseminate regularly through social media and print media the emergent outcomes of these discussions in the public sphere.

3 RESULTS AND OUTPUTS

One of the driving goals of our collaborative research team is to work towards the development of a futurist model of educational technology to re-conceptualize how teacher preparation programs think about preparing future educators. To this end we have identified a set of short, medium, and long-term goals that reflect the multi-modality of our collaborative efforts. We do expect, that new goals will be added and others revisited as we progress in the work.

3.1 Short term output goals

Our first target of short term output for our collaborative efforts have been defined as completed steps within the range of three to six months from our initial meeting and group formation in late October of
2017. We have identified three short term goals which are explained in no particular order. The first, conference proposals, meant as a venue for sharing the work we are embarking on and to strengthen our international collaboration as well as look for similar research groups that may be working in parallel with our research goals. This first goal will be completed in early March 2018 with the first publication of this work as part of the proceedings of INTED 2018. Second, the dissemination of our work through popular press or other journalistic outputs as a way of extending the visibility of our work beyond the traditional academic forums. This goal is in progress with our team being formerly connected to the editorial staff at Future Tense. Future Tense is an online technology publication that explores the impact of emerging technology on our lives, and is a partnership of Slate, New America, and Arizona State University [7]. Our third goal for the short-term outputs (that is also considered an ongoing goal) is to publish blog posts around our work through the official blog from ASU’s Office of Scholarship and Innovation as a starting point. At the time of writing, this goal has not yet been reached, but is anticipated to be completed with an initial blog post in the Spring 2018 semester.

3.2 Medium term output goals

The medium-term goals were defined as completed outputs ranging from six to twelve months. To date, two medium term goals have been identified. The first, and the most focal, is the publication of a white paper on the “Digital Frontier” in which we explore the futurist perspective to develop a thought provoking foundational model that may redefine what education looks like in the “classroom of tomorrow”. To this effort the core aim of this white paper is to raise awareness of emerging and future innovations that will likely impact on the educational landscape, with a view to informing planning for teacher professional development, teaching and learning, learning spaces, and learning experiences from 2020 onwards (with a specific focus on Ireland and the United States). The second goal is the formation of a joint-institution, interdisciplinary research forum. Progress on this goal is in the early stages of development. We are optimistic that the development and completion of our short-term goals will provide proof of concept of the opportunities needed to create this research forum.

To further support the development of this collaborative forum around the questions of education futures, we are also pursuing funding from the National Science Foundation (NSF) for the formal creation of a Research Collaboration Network (RCN). The goals that we have established for our education futures forum and the stated goals for the RCN grant program overlap considerably. “The RCN program provides opportunities to foster new collaborations, including international partnerships, and address interdisciplinary topics.” [8]. The program is not intended to support existing networks or primary research activities, but rather the creation of new interdisciplinary forums or networks that are expressly interested in the sharing of information. The RCN awards are designed to support the “means by which investigators can share information and ideas, coordinate ongoing or planned research activities, foster synthesis and new collaborations, develop community standards, and in other ways advance science and education though the communication and sharing of ideas.” [8]. In short, these are the stated goals of our research forum and we intend to utilize NSF funding to help facilitate the achievement of them.

3.3 Long term output goals

Our long terms goals have been identified as outputs we would like to see reached within one to two years. In this category, we have identified several key areas of expanded collaboration we think would provide substantial benefit to the future of educational technology. The first goal is to explore the possibilities of developing a joint course on educational technology futures. The initial plan for this course is that it could run twice a year (summer and winter) and alternate campus locations at Dublin City University and Arizona State University respectively. This jointly offered course would allow both universities to leverage their existing Transatlantic Higher Education Partnership [2] for student and faculty mobility. The second goal would be to look into opportunities to host a series of symposiums and or workshops around our collaborative project on the future of technology and the impact on education. Another goal we have identified is to reach out to technology stakeholders (companies, organizations, faculty, teachers, students, etc.) in Ireland and the United States to engage in empirical research on emerging technology. As with the medium-term goals we identified, our long-term goals are subject to change as we get further into our initial work and discover new connections or relationships to explore.
4 CONCLUSION

There are many factors that are likely to shape what schools will look like in 20 years, including but not limited to the impacts of emerging science and technological developments. Education systems are very often slow to respond to change, and sadly, tensions can emerge where there is a lack of planning to ensure that new technological developments can be integrated in a meaningful way by teachers, learners and school systems. This paper has outlined the progress to date with respect to the formation of an international collaboration exploring the futurology of educational technology and the likely impact of these developments for teacher education. In doing so, we have initiated a process that seeks to proactively identify developments at the frontier of research likely to have translational impact within our education systems, and thus, to provide those involved in teacher education with advanced notification of that which has the potential to benefit or challenge prevailing learning ecologies.

REFERENCES


