



# Preface: Reflections on the waves of emerging learning technologies

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## Abstract

There have been many waves of emerging learning technologies over the past few decades. Some of these waves are extended, some waves are connected, and other waves are repeated. The authors discuss the special journal issue from the standpoint of their personal involvement in many such waves during their careers. They also detail the evolution of this special issue and the potential audiences and stakeholders for it. In the end, they pose several questions and points to ponder in looking toward the future.

## Introduction

This preface was written as a means of lending an historical context and some humanization to the systematic research reviews found in this particular journal issue. By including personal reflections, accounts, and anecdotes of our own participation in the field of emerging learning technologies over the past few decades, it was hoped that the research revealed in this special issue could be better understood and appreciated. Consequently, at times, our reflections and stories will be based in the places in which each of us worked; in particular, West Virginia University and Indiana University for Curt Bonk and Utah State University, Brigham Young University, and Lumen Learning for David Wiley.

We feel most fortunate to have worked in such special places where so much was happening at significant moments in society in terms of emerging technologies for learning. Over the years, both of us have been involved in personally developing, funding, beta testing, researching, evaluating, and reporting on various software tools and learning-related portals (Curt Bonk since the 1980s, David Wiley since the 1990s). Our experiences hopefully equip us with useful insights and a base from which to offer a macro lens to this special issue.

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## Some stories to be told

There is admittedly a lack of humanness when reading the seemingly endless rows and columns of data in the charts, tables, and figures of a journal issue that is focused on summarizing masses of research. Therefore, it is vital to keep in mind the personal investments that were made in different technologies as they emerged in assorted learning environments and situations. Stated another way, each of the thousands of research reports that were considered and then selected and analyzed for the manuscripts in this special issue has countless underlying stories. We start this preface with two stories of our own.

### Story #1: Are you covering learning objects?

It is 8:00 am on Friday morning September 3, 1999. Professor Curt Bonk (hereafter “Curt”), enters Room 1210 of the School of Education at Indiana University (IU) and finds it filled with many of the top master’s and doctoral students of his program as well as visiting scholars from Australia, Finland, Korea, and the United States. In fact, 14 of 20 students who are enrolled would move on to professorial positions of their own after graduation.

Course syllabi are soon passed out for his course on “Interactive Tools for Learning and Collaboration” (Bonk 1999). Steve, a new doctoral student who had worked in instructional design and consulting in Silicon Valley until earlier that month was sitting in the middle of the room toward the front (i.e., within a few feet of the instructor). He raises his hand and asks if the course would cover a fast-emerging topic called “learning objects.” He then comments about the outdated design of instructor’s homepage; in effect, implying that the instructor may not be qualified to teach this class. Light chuckles are heard within the room.

A few seconds later, an international student from Korea, JY, seated three rows behind Steve also wants to know if learning objects will be addressed because they have suddenly become popular in Korea. She notes that free resources on learning objects had recently been made available from a guy named Wiley (1999a, b). Steve concurs with JY since he has just attended a conference on the topic in the San Francisco Bay area. Soon, several other students in that class join in to voice their concerns that the topic of learning objects is not listed in the syllabus causing the instructor to admit to not knowing much about the topic.

Having spent a good portion of the previous summer of 1999 working on the course syllabus, Curt was somewhat taken aback. During the following weeks, however, he would modify his syllabus and become attuned to the fast-evolving field of learning objects. In fact, during the next 2 decades, Curt would update his syllabus with all sorts of related trends into the field of open education including open source software, open universities, OpenCourseWare (OCW), open textbooks, and open educational resources (Bonk 2009a; Mishra 2017; Wiley and Hilton 2009).

When he finally had a chance encounter with David Wiley at a conference a few years later, he understood why his students were interested in his work. David had a pulse on an inexhaustible amount of information related to the world of open education and he was quite willing to share it. He had formed a team at Utah State University and a Center for Open and Sustainable Learning (COSL) that seemed situated at Ground Zero of the open

education movement in the United States. In addition to talented and committed people, COSL had grants and projects for open courseware research and development.

When Curt met several members of the COSL team at the E-Learn conference in Vancouver in late October 2005, he learned that they had designed “superhero” role cards for team member identity in the openness movement and to help market their message (Bonk 2009b). Of course, David would be “The Opener” while others were designated the “Persuader,” the “Maverick,” and “Captain Connections.” Perhaps more important than these savvy marketing skills, the COSL team was helping develop standards for OCW with a tool called eduCommons. Additionally, COSL was coordinating conferences, summits, institutes, and online discussions on OCW and open education. With those initiatives in place, they were actively recruiting other colleges and universities to participate in these efforts.

A couple of years later, David would help found the Open High School of Utah and also play a pivotal role at a company related to open education, Flat World Knowledge. That string of innovative educational projects and ideas soon landed “David Wiley” in Fast Company’s 100 Most Creative People in Business in 2009 (Fast Company 2009); he was, in fact, the only person in the list from the field of instructional design and educational technology. Such notoriety signaled that emerging technologies for learning were starting to attract immense attention, not just from educators, but from the media, venture capitalists, politicians, and society in general.

During this time, one thing was becoming increasingly clear, learning technologies were emerging and evolving at a much faster pace at the start of the twenty-first century than had ever been witnessed in the previous one. It was almost as if a magic switch went off toward the end of the 1990s to bid adieu to educational technology as we knew it and to signal the start of an era where such technology would not simply be used to enhance, augment, or extend human learning and intelligence, but potentially transform it in revolutionary ways not seen before (Bonk 2009a).

Despite all the exuberance for learning with technology at the start of this millennium, the world of educational technology in the twenty-first century is one that remains filled with caveats, concerns, and an assortment of unknowns. Some raise cautionary flags over the cost justifiability of different technologies tools and applications. Others sound alarms over their practical implications. Still others ask whose needs are being served and for what purposes we adopt or integrate a particular technology tool or application into our instruction.

So, as we started with a personal story about the topic of learning objects from 1999, it is perhaps appropriate that we start to close this section with a quote from Prince, who is famous for a song referencing that particular year. Prince stated, “Technology is cool, but you’ve got to use it as opposed to letting it use you” (Lauer 2004). For the past 2 decades, the field of learning objects, now open educational resources (OER), has continued to evolve and find new uses and applications (Bonk 2009a, b; Clinton and Khan 2019; Mishra 2017; Wiley and Hilton 2009, 2018). There has been an explosion of reports about the significant cost savings and flexible uses of OER (Baraniuk 2008; Hilton 2016) as well as many others about the shortcomings and difficulties of finding high quality and locally appropriate open education content (Conole and Brown 2018; Lee et al. 2007; Rolfe 2017; Weller 2014). As these reports come out, students will likely continue to demand that this topic be included in course syllabi related to emerging learning technology and trends in instructional technology.

Fast forward a little over 2 decades to mid-June 2020, and Bonk has recently finished teaching a 30th anniversary edition of that same course, which ironically is now titled “Emerging Learning Technologies,” thereby matching this special issue theme. It is also

affectionately known as “the monster syllabus” course due to its 100-page syllabus of open educational resources and open access materials (Bonk 2020). In the spring of 2020, Bonk was teaching the course both online and face-to-face (FTF); however, in Week 9, the FTF section had to suddenly shift online due to COVID-19. Since nearly all the course materials were open access, Bonk and his students found the transition seamless. In reflection, he is fortunate to have listened intently to David and the COSL team about open education long ago. We now, in fact, turn to a story from David himself who documents a ground-breaking moment in the history of learning with technology and open educational contents.

## Story #2: Open certificates in preMOOC days

It is the summer of 2007, and David Wiley (an open education leader; hereafter “David”) is pondering how to make his fall course more open. For several terms now he has been putting his course syllabus in a public wiki and encouraging students to edit it. He has been selecting readings for his courses that are available on the public Internet and that anyone can read without purchasing a textbook or logging into the campus library. In addition, he has been encouraging students to submit their homework assignments for his classes by publishing them on a public blog where the whole world can read and engage with them.

But that is prior course history. David is always tinkering with his course and attempting to find ways to enhance and perhaps even transform student learning. As such, he is now pondering how he can step it up this term. What might be a powerful pedagogical idea in line with his course goals?

Some additional reflection soon prompts a realization: When you teach a class where the syllabus and readings are all on the public Internet, and where students publish their homework on blogs, it could be possible for anyone to participate in that class. Anyone. They would not need to apply to the university, get accepted, or pay tuition in order to participate—they would just browse the syllabus on the public wiki, read the publicly accessible readings found on the Internet, come back to the public syllabus to see what the week’s writing assignment was, and then publish it on their blog. Anyone with an Internet connection could “learn along from home.”

A person could not earn university credit for taking a course this way, but they likely would not care. David would be teaching “Introduction to Open Education” in the fall—the first time such a course had ever been offered—and he figured that there would be enough interest that people would come and participate without formal recognition from his institution (i.e., Utah State University). Still, people might want to have something to show for the effort that they made in taking the class. So, when David announced the new course and its open design that would allow anyone in the world to participate, he promised to give completers a signed certificate showing that they had participated in the course. It would not have the university’s name on it or come with credits, but it would be something.

People were interested. More than fifty people from around the world formally signed up for this obscure graduate seminar by adding their names and blog addresses to the wiki-based syllabus. Many others followed along less formally. The open course design inspired many related efforts, including a spring 2008 course by Siemens and Downes on connectivism that had many more participants and was the first course to be called a “massive open online course” or MOOC (Bonk et al. 2015; de Freitas et al. 2015; Downes 2008; Fournier and Kop 2015; Zhu et al. 2018, 2020). The open course design also prompted the Chronicle of Higher Education to publish an article titled, “When

Professors Print Their Own Diplomas, Who Needs Universities?” (Young 2008), which “inspired” “interesting” conversations about the design of that particular course with university administration.

The work of opening this course happened in the context of broader efforts in the Center for Open and Sustainable Learning (COSL) at Utah State University. As alluded to in the first story above, COSL was the home of eduCommons, an open source software platform for sharing open educational resources that powered one-third of the open courseware initiatives at universities around the world. COSL organized the annual Open Education Conference from 2005 to 2007 and published Yochai Benkler’s *Common Wisdom: Peer Production of Educational Materials* (Benkler 2005). In addition, COSL staff wrote commissioned analyses on open education topics for organizations like the OECD. With such books, conferences, and reports, COSL was a clear leader in the movement toward open education.

In the midst of all that, David and other COSL staff members founded the Open High School of Utah, a public, statewide, online charter high school. Importantly, the school’s charter documents require it to use open educational resources throughout its curriculum (Note: the school was renamed “Mountain Heights Academy” in 2013). Suffice it to say, there was extensive energy and momentum in the air around using “open” as a lever to improve student learning.

Like all other supposedly novel designs, the Fall 2007 Introduction to Open Education course was not a whole cloth reimagining unlike any course or experience that preceded it. Rather, it was the result of the slow accumulation of incremental design innovations over many semesters that, like the pile of grain in the sorites paradox, eventually became recognizable as a distinct thing. And perhaps this is why the pace of change in learning technologies seems to be accelerating so rapidly—there is a lot more on the ed tech pile today than there was 20 years ago.

## The waves

Anyone teaching about or researching emerging learning technologies for the past few decades realizes that the topics of interest change like the wind. Multimedia, hypermedia (e.g., HyperCard and SuperCard), idea processors, CD ROM, interactive laser-discs, geometry and algebra tutors, microworlds and artificial realities, Logo and then Lego Logo programming, and asynchronous collaboration of many stripes, were popular in the technology waves of the 1980s and 1990s. However, as Reeves and Lin (2020) remind us in their concluding manuscript of this special journal issue, we often talk about these technologies in a decontextualized manner, instead of detailing their thoughtful use in educational settings, the learning theories which they represent, or the specific education-related problems and issues that they can help address.

As constructivist theories were embraced in the 1980s and 1990s, knowledge building and sharing tools arose to exemplify key concepts and principles. Interest in these topics soon gave way to experimentations with podcasts, wikis, blogging tools, and other forms of social media in the 2000s. These were termed Web 2.0 because the user could now create and add content to the Web, not just locate and passively consume it. In the second half of that decade, attention shifted to the use of shared online video for learning as well as flipped classrooms, virtual worlds like Second Life, open textbooks, and various forms of mobile learning.

And the waves of learning technologies show no sign of letting up here in 2020. In fact, it is becoming extremely difficult for educators and researchers to keep up with all the advances. This special issue is, in part, a response to this dilemma.

As indicated in the introduction, during the past few decades, each of us has been highly active in developing and attempting to understand the impact of particular emerging learning technologies. As would be expected, our personal involvement in some of these waves of learning technology are much wider and deeper than others. Each wave is built upon different circumstances and unique flavors of opportunities. What seems clear to us is that some waves are extended over time whereas some are connected to other waves and still others are repeated in cycles as they go in and out of favor.

### Extended waves

Some waves are extended. As an example, in 1990, Curt and his colleague Padma Medury at West Virginia University (WVU) conducted a national survey of collaborative writing technologies and similar tools. What they discovered was a more diverse and robust field than they had expected. Collaborative Writer, DIScourse, Realtime Writer, Conference Writer, Aspects, Group Writer, Prep Editor, and the Knowledge Builder were just a few of the tools for collaborative writing from a distance that existed some 3 decades ago (Bonk et al. 1994). Such tools provided a shared space for knowledge generation, document editing, project collaboration, idea exploration, and resource exchange (Schrage 1990). With the emergence of these tools, society now had virtual napkins for brainstorming, discussing, cataloging, and sharing ideas that were available to learners whenever they were connected to the Internet.

In the midst of this revolution in collaborative and interactive learning technologies that appeared at the dawn of the Web in the late 1980s and early 1990s, the School of Education at Indiana University (IU) in Bloomington opened for classes on August 31, 1992. That grand opening happened to be the day after Curt arrived on the IU campus after spending 3 years on the faculty at West Virginia University (WVU). He soon discovered the handsome new School of Education building was purposefully funded to be a demonstration, research, and development site for innovative learning technologies (see Bonk 1998; Bonk and King 1998). During the ensuing decade, Curt and his various research teams conducted extensive research on online collaborative writing and computer conferencing tools that expanded upon his earlier work at WVU. This extended work resulted in an edited volume of their research titled, “*Electronic collaborators: Learner-centered technologies for literacy, apprenticeship, and discourse*” (Bonk and King 1998).

It is important to point out that none of the first wave of collaboration tools that are mentioned above still exist today. However, they indirectly or directly led to such software tools as Slack (Kim 2019), Google Meet (Verbrugge 2020), Microsoft Teams (Carter 2019), Flipgrid (Gronseth and Hutchins 2020; Mahmoudi and Gronseth 2019; Vander Ark 2019), Google Docs, and other remote document and screen sharing systems today. Unlike such first-generation software which supported collaborative writing, contemporary collaborative technologies of 2020 are more focused on work team production, communication, and efficiency; collaborative writing being one aspect of such work team production and communication and document exchange.

Perhaps the technology trend most directly related to early collaborative forms of writing is wikibooks. The Wikibooks website was launched in 2003 as a sister site to Wikipedia. Like many other online collaborative writing tools such as Google Docs, documents

created on the Wikibooks website rely primarily on asynchronous collaboration. In the late 2000s, Bonk and his colleagues conducted a series of studies on the experiences, challenges, and motivations of Wikibookians and what they viewed as success and failure for their various online collaborative book writing efforts (Lin et al. 2011; Sajjanraj et al. 2008). They also explored the opportunities and barriers of cross-institutional wikibooks (Bonk et al. 2009, 2010).

Fast-forward a decade or so later to 2020 where interest in collaborative writing technology remains (Abrams 2019; Li and Zhu 2017), including in language learning environments (Yim and Warschauer 2017), but also in the tools for work team production and efficiencies, detailed above. Such rapid changes in society and shifts in focus make useful research on emerging learning technologies difficult since the utility may be short-lived.

### Connected waves

Some waves are connected to other waves. When Curt arrived at IU in 1992, it was not just collaborative writing technology that was being explored and tested. As a federally funded technology demonstration site, the IU School of Education was beaming with many types of learning technology experiments. For instance, the Vision Athena project from Ameritech (Lee 2004; Lee and Hutton 2007) had IU faculty members and staff experimenting with videoconferencing via PictureTel throughout all eight IU campuses as well as with many school districts across the state of Indiana. Curt was part of an innovative project to combine two videoconferencing systems, PictureTel and CU-SeeMe. With the success of that initiative, he could bring guests whose articles his students were reading into his classes as a means to foster a cognitive apprenticeship with enhanced perspective taking (Bonk et al. 1996).

Similarly, other inroads were made at IU in employing synchronous videoconferencing in the 1990s and 2000s to connect people in isolated, educationally impoverished, or rural parts of the world. The goal was not only to provide educational services but to offer opportunities for shared understandings, multicultural awareness, and mutual respect. One such project founded in 1995 in the Center for Excellence in Education (CEE) within the School of Education at IU, the International Studies In Schools (ISIS) project, did just that (Lee 2004, 2006, 2007, 2010; Lee and Bonk 2013; Lee and Hutton 2007).

As described by Lee and Hutton (2007), ISIS helped students in previously isolated and rural Indiana farm communities interact with experts on Egyptian, Malaysian, Chinese, Korean, Kenyan, Iraqi, and Australian culture and the cultural norms of many other countries made possible through the use of videoconferencing technology. The goal of these intercultural educational events was enhanced perspective taking, shared understanding, dignity, respect, and the exchange of highly current information as well as enhanced interpersonal skills (Lee 2007, 2010). Through such synchronous technology mixed with thoughtful and appropriate pedagogy, the local world becomes global and the global becomes local, if only for 50 min.

ISIS was unique but it was far from the only example of such cross-cultural educational initiatives. Many similar projects and entities, with names like ePals, iEARN (Gragert 2012), Seeds of Empowerment (Buckner and Kim 2012; Kim 2009), the World Forum (Bonk and Sugar 1998), World Savvy, Taking It Global, RoundSquare, Adventure Learning (Miller et al. 2008; Veletsianos and Eliadou 2009), Learning Circles (Riel 1993) and Soliya, have been developed since the 1980s. Millions of learners around the world have participated in them and continue to do so. As indicated, these programs were designed

to foster a range of skills and experiences including cross cultural collaboration and intercultural awareness. They also were intended to enhance or elevate empathy, world peace (Schrum 1991; Veletsianos and Eliadou 2009), interpersonal understanding, mutual knowledge, social cognition (Selman 1980), and a wide range of other vital twenty-first century skills (Maguth 2012). Given current events taking place across the world in 2020, this is the type of learning technology initiative that could have immense positive consequences.

There is even more power to impact the world community with such technology since this is a connected wave. During the past decade, global collaboration and interaction technology has been increasingly used for online language learning (Bonk 2009a; Xu 2019). For example, programs like VIPKid are focused on Chinese youth learning English with the synchronous videoconferencing support of North American teachers (McCorvey 2018; Zhang 2019). Of course, VIPKid and all other such global programs mentioned above require some instructor training for success. Accordingly, there have been an array of research initiatives and projects devoted to preparing teachers for a global education age filled with cross-cultural collaboration in fully online and blended classes (Hardman 2019; Kumi-Yeboah 2018; Longview 2008; Merryfield 2007, 2008; Merryfield and Kasai 2009; Oliver et al. 2019).

What is clear is that we have entered a new age of education; one that no longer takes place with the kids down the block or even those in one's own city or local region. In addition, one's teachers can come from any corner of the planet at any moment of the day. These opportunities for global interaction and sharing will only increase in the coming decades. Not surprisingly, the ability to collaborate with others electronically around the globe has brought an unparalleled amount of pedagogical possibilities and excitement to the educational world along with a whole host of unanswered research questions and technological problems (Bonk and King 1998).

And the waves keep coming. Today, when much of the world is dealing with a global pandemic, an assortment of popular tools for real-time connections like Zoom (Flaherty 2020; Hogan and Sathy 2020; Snider 2020), Adobe Connect, Cisco WebEx, BlueJeans, Skype, Google Hangouts, and Facebook Messenger Rooms (Gynn 2020; Hughes 2020) have brought renewed attention to the instructional capabilities of synchronous technology. Such synchronous forms of communication and interaction offer unique opportunities for contacting special guests and experts (Janning 2019; Kumi-Yeboah 2018); especially as K-12 schools and higher education institutions struggle with this new era of online instruction brought about by COVID-19 (Kamenetz 2020; Page 2020). Again, we see connected waves.

There seems to be a renewed interest in contacting experts as a means to potentially transform the conventional instructional situation by extending one's classroom to the greater world community (Hardman 2019; Kumi-Yeboah 2018; Lee and Bonk 2013). As Lee and Bonk (2013, p. 133) point out, "There has never been a time in the history of formal education when a classroom space could so swiftly be altered or transformed by online expertise." Small wonder that research and experimentation pertaining to synchronous conferencing has flourished during the past quarter century (Martin et al. 2017).

## Repeated waves

Some waves are repeated. As Web-based instruction met with some resistance in the late 1990s and early 2000s, the term blended learning surfaced and soon became widely used (Bonk and Graham 2006; Bonk et al. 2002). This term reemerged a decade later as

educators became both familiar and comfortable with it (Cleveland-Innes and Wilton 2018; Shen et al. 2013). Today, blended learning is one of the most researched areas of the field of instructional design and educational technology.

This wave is a repeater. In fact, ideas and activities regarding blended learning are front and center yet again today with the emergence of COVID-19 (COL 2020; Hodges et al. 2020). Yet, despite more than 2 decades of blended learning use, educators are still unclear about what the term actually means. In a recent *EDUCAUSE Review* article, Dziuban et al. (2020) ask whether blended learning is best defined as a treatment effect that can potentially lead the way to prescriptive instructional practices. They also suggest that it might be a broad description for an evolving local practice. In the end, they acknowledge that for many educators blended learning is best suited as a flexible and responsive term that can accommodate a wide range of educational practices (Dziuban et al. 2020).

Another repeating wave relates to open content in education. This wave goes by many names, including open content (Wiley 1998), open courseware (MIT 2001), open educational resources (UNESCO 2002), and open textbooks (e.g., Benkler 2005). In all these manifestations, learning materials are made available to the public under an open copyright license that provides everyone with permission to copy, edit, and share the learning materials freely and legally (Wiley 2015; Wiley and Hilton 2009). For those seeking additional information on this particular wave, Hilton (2016) provided the first systematic review of the research on open educational resources and Clinton and Khan (2019) published the first meta-analysis pertaining to this topic.

## The emergence of this special issue

Suffice to say, we have seen countless educational technologies over the past 3–4 decades. This special issue of *Educational Technology Research and Development* (ETR&D) on “Systematic Reviews of Research on Learning Environments and Technologies” documents the extraordinary amount of relevant research that has been conducted in this area recently. There is no grand masterplan when it comes to technologies for learning. The waves keep coming. Repeatedly! Clearly, there will be no moratorium placed on new ones.

With these incessant waves, aspects of human learning are changing; learning is becoming more open, online, blended, massive, immersive, mobile, gamified, video-based, collaborative, social, flipped, and personal, to name a few (Bonk 2016). It is as though the gigantic advances in communication and transportation devices seen in the last century are being matched in this century by myriad developments in learning technologies. Stated another way, this is quickly becoming the “Learning Century” and the thoughtful use of emerging technology to learn can help humankind find success within it. However, as we explain below, myriad challenges and issues remain.

Given all this momentum, it was deemed vital to create a space to discuss the research on emerging learning technology. Accordingly, a Presidential session at the Association for Educational Communications and Technology (AECT) conference on October 24, 2018 was created titled, “*Systematic Reviews of the Research on Emerging Online Technologies: What’s Been Done; What’s To Come*” (AECT 2018). It was in that session where many of the contributors to this special issue presented earlier versions of their research, including the two of us.

The event offered opportunities to lay out the spectrum of research on learning technologies. Participants shared their research directions and insightful overviews of the research literature in one of the four following areas: (1) social media, (2) open educational resources, (3)

massive open online course (MOOCs), or (4) synchronous learning. These teams of researchers detailed some of the major findings emanating from their research in these four strands and some of the common research methods undertaken to date. The participants also pointed to untapped areas of research in these areas that await further exploration.

Based on the success of that Presidential session, Florence Martin, Vanessa Dennen, and Curt Bonk were invited to edit this special issue of *ETR&D*. A call for proposals went out and 48 proposals were received. Of these, 13 made it into this issue.

With the plethora of online learning technologies emerging during the past 2 decades, there has been a persistent and mounting need for scholars—both young and those more seasoned—to better understand what research has been conducted, what it says, and what research gaps remain. Suddenly, there has been a tidal wave of systematic reviews of different online learning technologies published during the past couple of years. Regrettably, as stated earlier, many of those reports address learning technologies as “things” without the context of specific problems that they can help solve.

Simply put, the affair with new technology pervades society. As H. R. McMaster aptly put it, “We’re so enamored of technological advancements that we fail to think about how to best apply those technologies to what we’re trying to achieve” (Erdmann 2013). Today, in this era of COVID-19, now is the exact time to begin focusing on problems that technology might address rather than studying technology for technology’s sake. However, such solutions should not be just for “emergency remote teaching” in dire times (Hodges et al. 2020).

Writing in their daily blog column for *Inside Higher Ed*, Maloney and Kim (2020) recently argued, now is the time to look ahead a few decades and ponder, “Where might we be in 2050?” Maloney and Kim see many upcoming changes in how we use technology to engage students in both curricular and co-curricular activities as we adopt learner-centered pedagogical approaches that de-emphasize instructional strategies for content delivery, and, in turn, promote experiential and community-based learning and overall learning innovation (Kim and Maloney 2020).

In part, the purpose of this particular journal issue is to bring together a group of innovative researchers who have completed systematic reviews of the research on emerging learning technology from different angles. As such, this special issue should have massive appeal to graduate students and those early in their post-graduate careers looking for research topics to explore during their graduate studies and beyond. It should simultaneously appeal to more senior researchers and scholars who are seeking to understand how these fields have evolved in terms of the research as well as where the open gaps in the research remain.

The articles in this issue, written by dozens of prominent leaders in the field of instructional design and educational technology, provide insights on what the research to date says on social media, MOOCs, wearable technology, mobile language learning, mobile game-based learning, mobile literacy tools, technology for special education, adaptive learning, and other crucial topics. In addition, they detail some of the common research methods undertaken to date and offer pointed guidance and suggestions on untapped areas or issues that await further exploration.

## **Audience and stakeholders**

As indicated, for the past few decades, scholars in the field of instructional design and educational technology have been scrambling to keep up with the pace of technological advances and associated pedagogical change. For one, they have had to learn about each technology trend or invention well enough to answer questions from students curious

about the current state of the research as well as the theoretical implications. At the same time, they would need to know the instructional possibilities and other practical implications when serving on strategic planning committees of different institutions and organizations. Third, technology trends foster media inquiries requiring the ability to condense the research down to a couple of pointed sound bites. Fourth, colleagues, friends, and family members might directly or indirectly encounter different technologies for learning—be it in the form of a popular virtual world or videogame—and inquire about the particular cognitive, behavioral, and social benefits and detriments of playing for extended periods. Alternatively, they might ask specific questions about the virtual world or game itself. Fifth, to be an expert in one or more emerging technology trends, one needs to conduct research that pushes the field ahead. Most importantly, such research should target important local or more global issues and problems.

All of these audiences and stakeholders have different interests and inquiries. But what is common among them is that they want answers. They desire anything and anyone that can help them make sense of recently emerging or popular educational technology innovations for their particular situation and perspective. But what are the problems to be addressed or solved? That is where meta-analyses and systematic reviews of the research can play an increasingly larger role in society. And special issues on such meta-analyses and reviews, like this one, are pivotal to the decision making of organizations and institutions across educational sectors.

They are not, however, intended to be a one-stop shop to find answers for everything in the field. Given the acceleration of learning technologies since the dawn of this millennium, that would require global contributions and collaborations on a massive scale. This is just one journal issue with a finite number of research topics thereby guaranteeing that it will be useful for a fleeting moment in historical time. Nevertheless, it can find use in college classes on learning technologies, research methods, and trends and issues in the field. It should also help policy makers with their technical reports, briefs, and proposals intended to provide targeted funding and support.

Finally, these meta-analyses and systematic reviews of the research can serve as starter fuel for those currently conducting research in any of the areas addressed in this issue as well as those who do so in the coming decade. For scholars who arise in this latter camp, we urge you to first clarify and appropriately detail and define the problem or issue that you are attempting to solve. Reflect on who might benefit from the technology and how. Think about the learning environments that such technologies work in. Just who are the stakeholders that potentially will benefit from this research? What are the means by which learners most effectively learn? How does engagement, collaboration, interaction, and feedback occur in this system? And how does all this come together to solve an important problem? In other words, do not just focus on a type of technology without addressing the broader context.

As Geoff Mulgan from University College London observed, “The emphasis is too often on shiny hardware rather than how it is used...A tablet replacing an exercise book is not innovation, it’s just a different way to make notes” (Burns 2012). At the same time, Mulgan points to the potential for digital technology to rethink and reorganize how learning takes place both inside and outside of school structures, including powerful global peer collaboration possibilities. However, as he astutely argues, such transformations too often take a backseat to standardized exam systems, preset curricula, and educational norms. Ironically, in the closing piece of this special journal issue, *Reeves and Lin* start with a quote from Mulgan offering a similar tone and challenge.

Again, during this pandemic and far beyond, we should be rethinking educational structures and norms and the role of various learning technologies within them (Dede 2020; Maloney and Kim 2020; Mishra 2020). We urge researchers to not simply look at the systematic review averages and totals, but to ponder the educational implications that stem from all the stacks of research papers that they spent months reading and analyzing. And, as we highlighted at the start, take time to reflect on the fact that there are innumerable interesting people, important stories, and unique contexts that underly each of those studies that never found their way into the printed report. Without such reflections, why bother at all?

### **In closing this opening: The standing wave**

We recommend those reading this special journal issue keep some of the stories and experiences detailed in this preface in mind. You may be part of an extended, connected, or repeated technology wave and not yet realize it. As indicated, it is perhaps impossible to expect a single special journal issue to adequately cover the range of instructional design and educational technology research issues, trends, and topics salient at this moment in time, let alone attempt to address the myriad new ones which will emerge during the coming months, years, and decades ahead.

Instead, the pieces in this issue give a snapshot of the research data on select technology advancements and how they are currently impacting education across sectors and age groups. Without a doubt, there will be edited volumes like this one that appear in the future which will report on vastly different technology trends, opportunities, and points of interest. Experimentations that are taking place in the current era of COVID-19 will only accelerate the explosion of technological and pedagogical innovations and models of education.

When you turn the pages, you will quickly see that each article is quite informative. You will also notice that a wide range of emerging learning technology trends, concerns, and opportunities are outlined and summarized in the various articles. Naturally, we recommend you start with the introduction to this issue from Martin et al. (2020). It will be a means for you to grasp significant points, issues, challenges, and gaps in the research before diving in further. Careful reading should provide you with a fresh set of research questions and possible initiatives to personally pursue or suggest to those that you are mentoring and advising. Clearly, as shown by the momentous research reflected in the articles in this special issue, there are many insightful suggestions for future research and exploration.

Perhaps the most frustrating thing about the field of learning technologies is the way it obsesses over technologies while devaluing or even ignoring problems faced by learners around the world. For decades, learning technologies like those discussed in this special volume have been elevated to objects of study in and of themselves. All too frequently, those working in our field respond to questions about their research agenda with answers like “I study iPads,” “I study augmented reality,” or “I study open educational resources.” We question whether this fetishization of learning technologies will help us make sustained, meaningful improvements to the world in the future. As long as we are focused on the tools themselves, the ongoing march of learning technologies will resemble an endless series of waves eternally breaking on the shore only to draw out and come crashing in again without making a visible difference in the surrounding landscape.

We encourage learning technologists to follow the old advice, ‘fall in love with the problem, not the solution.’ The world is full of so very many problems that desperately need solving—racism, poverty, crime, climate change, war, Internet access, educating

refugees... the list goes on and on and range from the local to the global. At the very least, we encourage the reader to consider adding a problem to their answer to the question above. For example, “I study how to help young women maintain their interest in science and math into their high school years. iPads show real promise for mitigating this problem.” Or “I study how to make higher education more effective and affordable to students who are most at-risk. Open educational resources have an important role to play in making that happen.”

Fall in love with a problem—let it be your “standing wave.” Then as the inevitable extended, connected, and repeated waves of learning technologies roll past over the years, you will have a steady foundation from which to evaluate and use them instrumentally to make the world a better place.

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