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978-1-107-09544-1 - Educational Psychology and the Internet
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Introduction

I had my most significant Internet-driven education experience long before I realized the role that the Internet could play in creating a new type of education. It was as a participant in one of the most successful initiatives into Internet-infused education long before most anybody put the two ideas – Internet and education – together, before almost anybody had even considered using Web-based/Internet tools in teaching and learning processes. My experience in educational psychology and the Internet started in the mid-1990s. A colleague, David Kritt, knowing I was feeling separated from discussions of ideas that were close to my heart in my new job, suggested I join a listserv run out of the University of California San Diego called XLCHC established by Michael Cole and the Laboratory of Human Cognition. The initial reason behind the listserv was to maintain a vibrant educational community during a period of dwindling resources, especially for the type of sociocultural/sociohistorical research central to the work of many of the laboratory's members and affiliates. The list was completely accessible to anybody who wanted to join. I can remember sitting in the second bedroom in our townhouse in Clear Lake Texas (just down the road from NASA), firing up my modem, which I used for very little in those days, listening to the crackle and the long beep, and typing in the Universal Resource Locator that David had given me, following the directions for joining and waiting. Hours or perhaps days later (at this point I can't remember) messages from members of the community started showing up in my mailbox.

The first few messages were welcomes to the list, one from David, a couple from people I had met at conferences. And then I experienced something that could be described as nothing less than extraordinary: Ideas started falling out of the list and into my computer. People were offering me (and of course the list) a continuous stream of ideas, sometimes three lines long, sometimes three pages long – and inviting comments, additions, counterarguments. Discussions could go on for

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days. Posters would make recommendations for reading, new individuals would emerge and push the discussion in new directions. Some of the list members were writing from California, some from New York, some from Europe, some from Australia, some from Japan – I had no idea where a lot of people were writing from. Sometimes people would drop out of the discussion for a few days and then pick back up without missing a beat. Some people would drop out of discussions and then reemerge in other discussions. Sometimes discussions would disappear for weeks and then suddenly gain new life through an insight or a long-forgotten reference. People would take chances with their thinking I had never seen before. Graduate students might challenge the most preeminent scholars in the field. And those scholars would challenge them back.

The listserv did not always work to its ideal but it always worked, and continues to work to this day – the type of sustainability that is rare for Internet communities, or really any initiative that does not have constant infusions of money. No matter who came, who left, who upset who, the XLCHC listserv that later became the XMCA listserv continued to pour new ideas into my mailbox – and yet I very quickly began to take the experience for granted. I have continued to log into that list for almost two decades. For most of that time I saw it as a chance to engage in academic discussion simply by opening my e-mail (to which I also never gave much thought). I found over the past few years as I became more interested in the Internet as a phenomenon that would impact human cognition and education that I would keep returning to the listserv less for the exchange of ideas (though it was always interesting) than to see how it was continuing to evolve as an academic discussion forum, but still not understanding its significance. It was not until researching this book – in particular the chapter on massive open online courses-that I understood the implications of XLCHC/XMCA for Internet-infused education and the role that it played, and continues to play, in my own thinking about education – not for the specific ideas discussed (though that is important) but for the way list activity reflected visions of what educationally oriented Internet initiatives could accomplish.

The XLCHC/XMCA is one of the great natural experiments of the Internet, along with Douglas Engelbart's oNLineSystem, Stuart Brand and Larry Bright's Whole Earth 'Lectronic Link, early Multiuser Dungeon games like *MirrorWorld,* and Mark Weiser's ubiquitous computing

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situations at the Palo Alto Research Center starting with the communal coffee pot (all of which will be discussed in some depth in this book), offering an early window into the workings of the Internet and how it might change the way we understand human-to-human interactions/transactions in the context of an internetworked world as we move deeper into the twenty-first century – experiments that were not meant to control, were not looking to achieve some predetermined product or reach a planned endpoint, but evolving in their own directions within the open feedback loops encountered in the new cyberspace created by internetworking technologies. The Internet is an immersive technology – it creates new ecological contexts in which users work and play and explore. We don't really create within these ecologies, we co-construct or coevolve with it. This can often be difficult to grasp, partially because of the Internet's symbiotic relationship with stand-alone computers (and computer-like instruments like smart phones). I have come to recognize the XLCHC/XMCA listserv as one of the best, if not the best, examples of education reimagined for the online universe. The most successful Internet initiatives have been those that consume their participants; but because the participants are operating within an immersive technology, it is often difficult for them to step outside and understand the implications across a broader range of activity. I would argue XLCHC/LXMCA was and is more representative of many of the ideas behind the original massive online open courses than any of the more targeted experiments that refer to themselves as MOOCs (I know this will cause some confusion, so I urge you to come back and read this again after reading Chapter 9 and see if you agree).

XLCHC/XMCA was part of my ongoing life activity – there are almost daily entries in my mailbox – setting the context for a series of conversations I had with three graduate students. The first set of conversations was in the early years of the millennium – just as the Internet was coming of age as a popular medium. Connectivity was becoming easier, more mobile, and more universal; the idea of somebody running out to fix a server in the dead of night was a distant memory. Search engines were making it easier to navigate and find information on the Web. Communication was no longer as dependent on e-mail with the emergence of what-you-see-is-what-you-get writing programs. I was doing an independent study with Min Ju Kang on attachment and cognition, but the conversations naturally drifted toward, first, the impact that

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Internet might have on attachment, and then what seemed to us like important relationships between the Internet and cognition. I was especially interested in the ways that the Internet reflected John Dewey's ideas of knowing, a particular passion at the time. It seemed to me that the Internet provided the perfect context for implementing Dewey's ideas on knowledge, teaching, learning, and Pragmatism in general – related to other projects Min Ju and I were working on together.

The second set of conversations took place a few years later. I decided to try and implement some of the ideas Min Ju and I had been developing in a graduate class. The class, discussed in the last chapter of this book, was a disaster. But Mitchell Bartholomew, one of the students, approached me about extending rather than ending my little experiment. He was the first person I met with a smart phone, which he was continuously checking. I can still hear him saying, "This is it, this is how we communicate with each other now. We have to get it into the classroom." There was an urgency in Mitch that was almost antithetical to the glacial pace of my colleagues in trying to understand and integrate new technologies into education. He was living a good part of his life online, not because of any type of addiction but because this was where a good part of his life now was. He urged me to get on Facebook, he urged me to get on Twitter, he urged me to get off Facebook, he (recently) urged me to get on Snapchat – none of which I did successfully (e.g., I am still on Facebook but with eleven "friends" who are barely acquaintances and I never communicate with). It was Mitch who designed and redesigned the blog-centric courses we tried out on undergraduates (initially much to their dismay).

The third person set of conversations was with Yunhwan Kim – almost the opposite of Mitch. Yunhwan took a more global view, wanting to understand the psychological mechanisms behind individuals' use of the Internet (interestingly I can't even remember if he had a smart phone). It quickly became apparent that there were any number of individual differences in the way students engaged with the blogs in class. Some students loved the blogs, and some students hated them. Some students would write long, expressive posts while other students would write short, targeted posts with relevant links to other sites, and still other students wrote as little as possible. Some students seemed highly motivated to engage in online dialogue, and some students seemed annoyed or even angered that it was part of the class. Yunhwan

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was using sociocognitive theory, in particular Bandura's self-efficacy construct, in his dissertation research and was looking to apply it to Internet-related behavior. The idea of individual differences among users and the role of different types of experience when considering integrating the Internet into the classroom became a pressing issue in our shared research.

The Eric Raymond article "The Cathedral and the Bazaar" (1999) and the idea of Open Source project development served as a backdrop to all of these discussions. The ideas describing the creation of the Linux development community along with further readings on Richard Stallman and the Free Software Foundation and the Apache Foundation merged with the work of Douglas Engelbart and the Augmentation Research Center to provide an underlying structure for our thinking about how we thought the Internet might change education in dramatic ways. At the same time I began reading sporadically existing research on Internet-infused education. The major difficulty is that much of the literature, even within the field of education, was very different from each other – creating a lot of confusion, at least for me.

What I didn't know about internet-infused education

One of the things I have realized in researching this book is that my haphazard entry into explorations of Internet-infused education is not unique. Theory and research on Internet-related education to this point has been something of a maze where different individuals and groups enter from various (intellectual) points, all looking to make it to a central understanding of what the Internet means in education and how best to integrate it into teaching and learning practices. We scurry through the maze using our initial conceptions and belief systems about the Internet and education as our compass, sometimes passing close to each other, overhearing interesting phrases like Web 2.0, hypertext, or affordances seeping through the walls that separate us. We take these phrases and quickly appropriate them to our own journeys, often not thinking what they mean in the larger context of the maze itself. It is ironic that the most powerful tool created to distribute information has suffered from communities studying the Internet being too distributed, or more particularly foregoing the other attribute of the Internet that makes

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distribution viable – as a tool for interconnection. Different groups develop their own meanings and trajectories of thinking about what the Internet means for the role(s) it will play in education. Different branches of Internet-infused education following their own routes through the maze developing expressions and definitions that are unique to their goals. On some levels this may be necessary, but the danger also exists of explorations into Internet and education not only losing some of their richest early conceptualizations to expediency but of the entire program breaking into a "tower of babble." We become so tied to our race to reach the center we forget that what is important is the journey and not the destination (which probably doesn't exist in any case).

I have been as susceptible to this "race through the maze" as anybody. It is not just that I didn't take the time to understand XLCHC/XMCA as an innovation in online education even as I was exploring the philosophies and practices of Internet education; I took phrases and ideas and quickly applied them or discarded them, not so much misusing them as losing their larger meanings and the ways in which they framed my research/discussion. Two examples are the phrases Web 2.0 – which I adopted – and cyberspace – which I discarded.

The phrases Web 1.0 and Web 2.0 were coined by Tim O'Reilly, (2005) an Internet innovator/entrepreneur (perhaps what William Gibson might refer to as a cyberspace cowboy), mostly as a means to differentiate the ways commercial organizations use the Internet (partially an attempt to maintain business-based interest in the Internet after some early, spectacular failures). In general O'Reilly opposes the more interactive Web 2.0 where users are invited into the website as participants to Web 1.0 more static websites – places users (are expected to) visit, take information offered, and either buy whatever wares the site is offering or depart toward other destinations. Web 2.0 has been used to describe pretty much any type of Internet technology where the user is – or can be – an engaged member in online activities that help in some small way to define the site (e.g., in business rating systems, reviews, or community projects, in education-readable/writable applications such as blogs, wikis, or discussion boards). I have come to think for various reasons that Web 2.0 is not a very valuable descriptor for Internet-infused education. First, it makes it seem like the development of the Internet and the Web has in some way been linear – where engagement has somehow followed information distribution. One of the most important

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things in understanding the Internet, especially the ways in which it might qualitatively transform education and unfortunately one of the most difficult to grasp hold of, is that online activity (can) foster nonlinear and nonhierarchical relationships between sources of information and the humans behind them (something not so central to commerce). The thinking that led to the invention of the Web was at least as much a precursor of the Internet as the Internet was a precursor of the world wide web (a discussion that can be found in Chapter 1). But, more important, simple participation is not the key difference in current Internet-infused educational initiatives: Almost all enterprises have at least some Web 2.0 components, including those that are primarily based in distributive frames. A more valuable differentiation for Internet-infused education might be taken from the work of information theorist/historian Iikka Tuomi (2002), one that has been central to the history of the Internet and plays an important role in debates about how we might use the technology in education – whether the Internet is used as a tool to augment the human intellect and develop community (collaboration and/or cooperation) or whether it is used as a tool to distribute information to a wider audience, to scale up educational practices and reach new populations in new ways.

On the other hand, before researching this book I avoided using the term cyberspace – mostly because hackers avoided it. After understanding the origins of the word in cybernetics, I realize the importance it has had in the development of our conceptualizations of Internet activities and the ways it pushes us to think in new ways about critical issues in developing educational programs: Do we try and anticipate the reaction of students, scaffolding their understanding and/or self-regulation through automated interventions based in closed feedback loops, or do we design educational programs so that students become explorers in an expanding information universe that we cannot and should not predict? In any number of instances I have had to go back and rethink my own beliefs about how to approach Internet-infused education. This book and my thinking continue to be a work in progress – its evolution partially mirroring Ted Nelson's original descriptions of hypertext (yet another among many of the concepts I have had to go back and reconsider, including multiple times while writing this book). At another point in time I might have suggested writing this book was an exercise in humility, so often did I have to go back and rethink and reorganize my

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suppositions. Perhaps the greatest lesson I have learned in writing this book is the need to revise our value systems about knowledge – what it means to others and what it means to our own sense of self – that knowing is always an active enterprise and knowledge a work in progress. This is not a new idea: John Dewey and Arthur Bentley stressed this in their book *Knowing and the Known* (1949). But the Internet creates a greater possibility for and a sense of urgency in recognizing that ideas, concepts, products, and projects are constantly open for revision or annotation, and the greatest dangers lie in forgetting this.

The structure of the book

This book is an attempt at a bird's eye view of the maze described earlier, a moment in time that looks to capture various maze runners in process – with the realization that even as I write these words the race continues. The book is divided into two parts: very generally the first part is devoted to the way students (and teachers and administrators) might learn through Internet-infused education, and the second part is devoted to modes of teaching using Internet-infused technologies. A good deal of crossover is found between the two parts, especially with the early chapters informing the later chapters.

The first chapter of the book outlines the development of thinking about internetworking leading to the creation of the Internet and the invention of the world wide web and the following applications – especially the what-you-see-is-what-you-get writing applications – that have popularized Internet activity. This is a topic too little discussed, especially recognition that the Internet and its precursors were about education issues and new trajectories of human thinking long before they were about commerce. The second chapter discusses how the Internet (might) change our views of intelligence, focusing on Vannevar Bush's web of trails, T. H. Nelson's hypertext, and the new attention being paid to collective intelligences, including collaborative intelligence, swarm intelligence, and collective agency. The third chapter looks at the way past and current research in educational psychology that developed separately from Internet activity has been applied in attempting to understand and implement Internet-infused teaching/learning processes. One of the bigger questions educational psychology and education in general are facing is how much

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should we take from earlier research and how much do we need to understand Internet activity in its own right – requiring new theoretical constructs for a new era of human thinking. This will be one of the most interesting but perhaps difficult issues to negotiate as we move deeper into the information age. (Many people are deeply invested in existing cognitive and educational theories – and if you give them up, to whom or to what are you giving them up? At what point are we throwing the baby out with the bathwater?) The fourth chapter is on agency and motivation in Internet-infused education. The Internet demands far more agency on the part of users than almost any other tool – a realization especially salient in educational contexts, where students are often treated as passive recipients of knowledge. How do we change the students' attitudes toward their own roles in traditional education contexts? Do we have to? The fifth chapter looks at the history and research of online social engagement. One of the most discussed aspects of online education is the abilities to establish new types of teaching/leaning communities through networked communications. There is also a growing line of argument that it is very difficult to establish well-functioning online learning communities without some level of social engagement of participants. Yet community is an elusive goal for most online learning initiatives. Online ecologies have very different constraints on social behavior than place-based contexts – how do we navigate these differences as we look to establish what Alfred Rovai (2002) refers to as classroom community?

The second half of the book is focused on Internet-infused teaching – whom we approach, the types of tools that are available to us – what they mean and what they don't mean. There is a lot of confusion about tools like Open Educational Resources, Internet-based learning applications like Course Management Systems, and Internet applications used for teaching/learning, such as blogs and wikis. The sixth chapter takes a philosophical look at the ways instructors go about integrating Internet technologies into their educational practices. One of the (currently) less talked about but important considerations in Internet-infused education is the development relationship between the traditional, place-based classroom (or indeed almost any learning context) and what Manuel Castells (2011) refers to as the new spaces of flows of information created by the Internet. The enclosed classroom has historically been used to define student thinking and help set it on specific trajectories that are meaningful to their bounded social group, but also to try and

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make certain that students understand their immediate social context and their place within it. The Internet by its nature invites students to explore possibilities of thinking and problem solving far outside traditional boundaries, and often not understood by the place-based contexts in which they must live their lives. Both place and space are important in educational practices going forward, and it is crucial to understand the developing relationship between the two. The seventh chapter looks at the Open Educational Resource movement, its history, its possibilities, and its trajectories for education. Chapter 8 looks at the different types of technologies used in the development of hybrid or blended classrooms. The ninth chapter goes into one of the most discussed yet least understood phenomena of integrating Internet capabilities into education practices, expansive, online education, which includes early innovative initiatives like PLATO IV, the originally named massive online open courses (MOOCs), the scalable online education initiatives that are called MOOCs because of a silly *New York Times* headline, and the possibilities of using the extended reach of the Internet for new forms of participatory education. The last chapter is an outline of a new (or not so new) approach to Internet-infused education; Open Source Educative Processes that looks to integrate some of the basic ideas of the Free Libre Open Source Software movement into everyday teaching/learning practices.

The fast and the slow of the information age

It is true that the Internet is moving quickly. I think back two decades sitting in the house of my son's childhood friend when the father received a phone call. He jumped from his chair, threw on an overcoat, and picked up his briefcase saying there was an emergency with his server. He had a small company with a friend connecting three hundred people to the Internet. I had no idea what he was talking about (I often wonder if he became rich or was completely destroyed by the oncoming freight trains of the Internet revolution). Today I am able to connect to the Internet faster using relatively low-speed broadband than I could have ever imagined plugging in my modem, listening to the funny noises, and waiting for my e-mails to load so it could deliver the next messages from XLCHC.

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