

ICT literacies and the curricular conundrum of calling all complex digital technologies “Tools”

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ABSTRACT

Information and communication technologies (ICT) are widely acknowledged internationally as an emerging and increasingly important area of K-16 education. A curricular conundrum centers on whether calling ICT a *tool* enables educators to infuse ICT within their curriculum. We reviewed literature on ICT and technological *tools* in education from 1995 to 2008 and found an increasing number of articles substituted *tool(s)* for more specific terminology. We argue in this paper, given the need to understand ICT within the constantly changing social and cultural contexts of local and global societies, it is misleading when digital hardware, software and infrastructure are reduced to being called a *tool*.

Keywords: *learning, cognition, language, pedagogy, curriculum.*

INTRODUCTION

As educators in Canada, we face a curricular conundrum with regards to the use of information and communication technologies (ICT), within educational contexts. The curricular conundrum centers around whether calling ICT a *tool* better enables educators to infuse ICT within their curriculum, and how and why reducing complex digital devices such as computer hardware, software, and infrastructure to simplified and non-descriptive language supports educator's professional ability to inquire into the social and cultural contexts of ICT within education and societies.

As a field of study, ICT are widely acknowledged internationally as an emerging and increasingly important area of K-16 education. In most provinces across Canada, Education Ministries recommend ICT be infused across K-12 subject area curricula. For example the Alberta Ministry of Education supports the curricular infusion of ICT “to provide students with a broad perspective of the nature of technology, how to use and apply a variety of technologies, and the impact of information and communication technologies on themselves and on society” (“About Information and Communication Technology (ICT),” 2008).

In our review of scholarly and popular literature on the topic of ICT and technological *tools* in education from 1995 - 2008, we found an increasing number of articles that substituted the term *tool* for the use of more specific terminology. For example, Tapscott (1999) wrote, “Needless to say, a whole generation of teachers needs to learn *new tools*, new approaches, and new skills.” (p. 11). The Ministry of Education in British Columbia, Canada, website states, “Information and communications technology is a *tool* to support and enhance student learning” (“Resources to support ICT integration,” 2007). A more recent ministry document refers to ICT as *new tools* (“Resources to support ICT integration,” 2007).

We are concerned that a curricular conundrum has been created by this overuse of the term *tool* to represent all forms of complex digital technologies. In this article, we argue that, given the necessity to understand digital technologies within the constantly changing social and cultural

contexts of local and global societies, it is inappropriate to reduce conceptualizing digital hardware, software, and infrastructure to a simplistic term. Our position is that the oversimplification of complex digital technologies fails to convey the personal, professional, social, cultural, political, and economic significance, meanings, and values emerging as a consequence of the ubiquitous presence of ICT in societies (Walton & Banaji, 2004). Language creates a conceptual way of understanding (Bargh, Chen, & Burrows, 1996) that which it represents. We argue that educators' need language that conveys conceptions of ICT that enable them to understand how the presence of ICT is influencing our lives, relationships, and learning. We propose that educators' need to resist the use of *tool* as a default term in favor of more specific terminology. We further propose that adopting more specific terminology will enable educators to understand multiple conceptions of ICT that will increase their ability to critically engage in ongoing professional education regarding the changing, challenging social and cultural contexts associated with the use of ICT in education and in wider society.

MORE THAN A MEANS AND AN END

In our literature review of ICT *tools* in education, we found educators and researchers rationalized the use of the term *tool* to diminish ICT's importance because it is merely a means to an end. We acknowledge that an important goal of using ICT in education should be to facilitate student learning. Should educators' limit their understanding and teaching of computers to instrumental purposes? Or should they teach students that ICT are having a social and cultural influence of shaping the ends themselves?

In *Technology as a Tool to Support Instruction*, Lynne Schrum (2005), the past president of the International Society for Technology in Education, wrote,

*Technology is a tool that can change the nature of learning. First and foremost, educators want students to learn. It is certainly not enough to tell educators that they need to use the **boxes and wires** that have invaded their schools simply because they are expensive or because students need to know how to use the latest widget. If it's clear that technological tools will help them achieve that goal, educators will use those tools. [emphasis added]*

She goes on to say, "In a technology-rich classroom, students don't 'learn' technology. Technology merely provides the tools to be used for authentic learning. It is a means, not an end. . . . They [educators] must resist the notion that learning to use the 'gadgets' is an end in itself." We agree with Schrum (2005) that educators should "resist the notion that learning to use the gadgets is an end in itself." However research has shown that digital technologies should neither be viewed as a means to an end, nor defined as the ends themselves (Slack & Wise, 2007).

In his book, *Technology and the Character of Contemporary Life*, Borgmann (1984) convincingly argued that isolating technology as a device (*tool*) or a set of devices (*tools*) that deliver a series of services (a means to an end) hides the technology in the background making it more difficult to identify relationships between the technological device and its social and cultural contexts. In other words, Borgmann contends that we should question the *device paradigm* and ask what the specific contextual relationships are among digital technologies and educational practices, how they interact, and how we are constructing learning in this context.

SIMPLE MACHINES OR COMPLEX DIGITAL DEVICES

From our daily experiences and research, we know that digital technologies are more than simple machines or *tools*. Computer hardware, software, and infrastructure are complex technological devices. It does not make sense to suggest that a *tool*, such as an abacus or pencil and paper is comparable to a complex technological device such as a computer with a microprocessor. One

measure of the effectiveness of a microprocessor is often calculated in instructions per second (IPS) or its scientific equivalent, floating point operations per second (FLOPS) ("Floating point operations per second (FLOPS)," 2008). It has been calculated that a person using pencil and paper can calculate 0.0119 instructions per second (IPS). On the other hand, an Intel Core 2 microprocessor can perform over 18.580 gigaFLOPS (one billion or 1×10^9 FLOPS) calculations per second. None of these processes would be taking place, of course, without the direct intervention of a person using these devices.

SOCIAL AND CULTURAL CONTEXT OF ICT

Because all *tools* require someone or a collective group to produce and use them, the social and cultural contexts of ICT should not be overlooked in educational situations (Vygotsky, 1978). The influence of digital technologies on peoples' everyday lives is often reported in the popular press. In the Vancouver Sun, Michael Geist, the Canada Research Chair of Internet and E-commerce Law at the University of Ottawa, recently wrote, "...it is no exaggeration to say that nearly 40 per cent of the Canadian population can scarcely recall a world without the Internet, and that group unsurprisingly views digital issues as important." (Geist, 2008) Young people, who researchers have named *digital natives* (Prensky, 2001) and the *net-generation*, (Tapscott, 1999) tend to consider most digital technologies integrally connected with their lifestyle and their own cultures of learning (Jenkins, 2006). They do not hold an instrumental perspective of ICT (Castells, 2007). For older adults (*digital immigrants*) born well before the commercial sale of digital technologies (Prensky, 2001), these same devices hold very different social and cultural meanings and values because these *tools* were not infused early on into their everyday ways of living (Tapscott, 1999).

Above, Schrum (2005) referred to the computer as "the box and wires." By doing this, we believe, she attempted to emphasize that if educators understand that technology should be used to support students' learning, rather than using technology for its own sake, they will be more inclined to use digital devices in their own classroom practices. We found past research reported educators feel uncomfortable, at times overwhelmed, and even threatened, by educational changes involving ICT (Bauer & Kenton, 2005). This discomfort has been exacerbated when these changes have "invaded their schools" without educator consultations (Bitner & Bitner, 2002). In many cases educators have not been provided with adequate professional development to know how to use ICT in educational contexts (Finley & Hartman, 2004). Without this preparation, educators are not knowledgeable about past research, policies, and practices that would inform their use of terminology. They are ill prepared to accurately identify the basic components of a computer, much less the more complex issues of human computer interactions.

TOOLS OF DREAMS

For a moment, imagine how you would feel if you were in an emergency situation and over heard one paramedic asking their partner for the "box and wires." Can you imagine her/his frustration when she/he received a heart defibrillator when they actually needed a respirator? To push this notion a bit further, imagine one night you fell asleep reading an article describing ICT as educational *tools*. You dreamt that you lived in a world where all technologies were called *tools*. You caught a *tool* (bus) to get to a *tool* (school). The educator used a *tool* (language) to introduce you to the idea of educational *tools* (computers). In the *tool* (lecture hall) you looked around and saw your classmates *tooling* (typing) furiously on their *tools* (laptop computers). You felt confused, disoriented, and disempowered, because your complex experiences of objects and environments were not represented through language. You woke up. Were you dreaming?

NOT SO FAR FETCHED

This absurd tale about the overuse of the term *tool* is actually not that far fetched from our own recent professional research experiences in a teacher education program. For example, in late March this year we conducted focus group interviews with first year teacher candidates. When asked to define ICT the majority of them mirrored the following two responses: "...using technology as a tool to communicate concepts to my students" and "...any *tools* or software using technology" (Krug & Arntzen, 2008). In teacher education meetings, education professionals regularly called the following digital technologies *tools*: infrastructure (i.e., routers, hubs, cables), applications (i.e., dreamweaver, photoshop, etc.), social software (i.e., blogs, wikis, discussion forums), course management systems (i.e., Blackboard, Desire-to-Learn), and hardware (i.e., computers, projectors, smartboards, phones, handhelds) (Krug & Arntzen, 2008). This pervasive use of the term *tool* extends beyond our research site and province. The Canadian Office of Learning Technologies website describes digital technologies as *tools* that are expected to support and enable learning and networking (The OLT is a part of the Government of Canada's Department of Human Resources that partners with various Canadian organizations in building a culture of lifelong learning) (Stieber & Fricke, 2005). Beyond Canada, the UNESCO website refers to, "Tools such as community networks, social bookmarking, wikis and blogs, podcasting, digital story-telling, project based learning initiatives, video blogging and other new technologies, enable people to be producers of information" (Anderson & Weert, 2002). The National Center for Education Statistics from the U.S. Department of Education titled its statistical analyst report (2000), "Teachers' Tools for the 21st Century: A Report on Teachers' Use of Technology" (*Teachers' tools for the 21st century: A report on teachers' use of technology*, 2000). In our review of literature we found, for the most part, an unquestioning and over-use of *tool* in reference to digital technologies and ICT.

Learning theorists have suggested tool-use has contributed to the evolution of human language and cognitive development (Wertsch, 1985). Tool-use extends our sense of self-identity, social identity, and our experiences of social relationships within particular places. Education professionals use specific kinds of technologies (analogue and digital) and are influenced by particular characteristics of the technologies they use (Watson, 2001). Our social and cultural understanding of *tools* and complex digital technologies affect our ability to use them for learning (Pierson, 2001). The context and conditions of these understandings affect how we know when, where, and why ICT belongs in our educational practices.

Thus, we are still left questioning how these terms inform acceptance or critical engagement with these complex technological devices? Is overly simplified terminology helping or hindering educators' acceptance and accommodation of ICT into educational settings? Does the conflation of ICT to an overly generalized term provide educators the information they need to critically assess and discuss the educational merits of digital devices within the contexts of an educational setting? Does it prepare educators to discuss the social and cultural meanings and implications of ICT in their students' lives? What are the unseen and unanticipated human consequences of simplifying ICT to an instrumental description?

It has been our experience that teachers generally do not want to glorify any form of technology in their classroom (Lloyd & Albion, 2005). Using the term *tool* to talk about technology basically relegates it to a functional device making it more acceptable and less threatening. To date in our provincial research, we have found only a small number of teachers have actually taken a critical position to engage with complex technological devices to enhance learning for themselves and their students. One example is a group of teachers at a local elementary school that established a community of practice over the past six years to support the implementation of Smartboard technologies in their classroom. Their inquiry initiative started with a single teacher and her desire to use interactive technologies in her teaching. Remarkably other teachers began to request

similar technology for their classroom and began to discuss the importance of changing their pedagogical practices. The school now has a Smartboard in every room, but more importantly, many of the teachers are conducting professional inquiry about their methods of engaging students in learning experiences. These teachers are using complex technological devices for student learning and for themselves, but they have not taken up critical positions, which requires an informed understanding of the moral and ethical implications of these practices.

The above case suggests that by overly simplifying the terminology, this conceptual position might be helping educators' accept and accommodate ICT into their educational practices. However the above case also points to, what has been called, the hidden curriculum. In many situations, teachers are not conscious of, nor consider the consequences of, their use of instrumental language. We believe professional education is needed to assist teachers in troubling their own ICT perspectives and practices and with developing a critical position that will move them from "using ICT" to "engaging in efficacious learning with ICT" (Krug, 2006; Krug & Arntzen, 2008).

CRITICAL INQUIRY AND ICT LITERACIES

Preliminarily, we have found that the conflation of ICT to an overly generalized term does not provide educators with the information they need to critically assess and discuss the educational merits of digital devices within the contexts of an educational setting. We believe educators need opportunities to discuss the social and cultural meanings and implications of ICT in their own and in students' lives. The unseen and unanticipated human consequences of simplifying ICT to an instrumental description has the potential to *deskill* teachers and inadequately prepare students to engage in discourse about the pervasive influence of digital technologies in their lives. We realize that our short answers to the above questions need more information and we intend to follow up on this inquiry in another paper.

In our research we continue to refine our questions to guide our inquiry into how and why education professionals are over-using the term *tool* to represent various forms of ICT. Our preliminary analysis of this research shows that education professionals are ill prepared to engage with digital technologies to enhance their own and their students' ICT literacies. As a consequence of over-simplified language, education professionals no longer sense a need to question, understand, or critically assess a particular form of knowledge or pedagogical practice. We suggest many education professionals are becoming deskilled in relation to information and communication technologies because they tend not to question the functional and decontextualized use of the term *tools*.

Government policies and administrator expectations assume educators will use digital technologies in their teaching. Grounded on unchallenged assumptions and expectations, an instrumental understanding of ICT as a *tool* may smooth the way for limited use of ICT as a means to an end. In this situation learning is conceived as occurring as a discrete activity, separate from the use of digital technologies. Laptop computers and data projectors are merely a replacement for the overhead projector and acetate transparencies.

In *Do Digital Literacies Include Programming?* McAnear (2008) wrote, "Starting back in the early days when all you could do with a computer was program it, through the early days of computer software, many of us thought that to take full advantage of this tool we would need to develop programming skills. As word processors, databases, and spreadsheets developed, computer educators started to question this idea. 'You don't need to be a car mechanic to know how to drive one,' we reasoned" (p.5). It is this *all or nothing* conceptual view of using ICT that we are arguing needs to be challenged and changed.

In our own classroom practices with educators and teacher candidates, we have found that by engaging in critical inquiry about ICT literacies we have been able to reduce deskilling and anxiety by encouraging comfort and curiosity. By discussing the moral and ethical affects of ICT on societies, educators begin to understand the need to take responsibility for their own learning about and with ICT.

As they engage in ICT infused learning activities, they recognize the importance of working together, learning together, and discussing issues as they arise. We would say, then, that if programming the computer provides opportunities for the users (educators and students) to generate knowledge and become active participants in learning, then computer programming is an ICT literacy (within that context) that needs to be considered an important attribute of the curriculum. Notice here we are not advocating for all educators to become computer programmers. We are suggesting that it is important to assess the relevance of the skills and competencies needed to program a computer. Will these provide the user “the ability to make digital technology do whatever, within the possible, one wants it to do—to bend digital technology to one’s needs, purposes, and will, just as in the present we bend words and images?” (Prensky cited in McAnear, 2008). An educator’s professional knowledge generation should be directed toward enhancing their own and student learning. ICT literacies should be attained through a continuing process of self-efficacy and responsibility to improve learning, productivity, and performance. ICT literacies should include engagement with the social and cultural implications of the presence of ICT in our lives. Education professionals need the ability to use ICT to engage learners in problem-solving and decision making in face-to-face (F2F), hybrid, and online distance education (ODE) settings. Perhaps, educators should engage in ICT knowledge generation where they strive to not only know: (a) what problems can be solved by technology; (b) what technology can solve their problems; and (c) how technology can solve their problems; but they also strive to know (d) how the engagement with ICT in our lives are contributing to formations of much broader sustainable and unsustainable ecological relationships. We know that emerging issues are not static. We have also learned that knowledge of ICT in educational contexts cannot be acquired in a one-off professional development session. Rather, educators must understand that their professional ICT learning will need to include personal and professional development as life-long study.

One of the most difficult concepts to teach is adopting a critical position in relation to inquiry about digital technologies, not only in one’s personal life but also in one’s professional life as a teacher. In a course dealing with curriculum design, development and assessment in virtual spaces the class meets once a week for three hours. Each class is comprised of theoretical, pedagogical, and hands-on experiences and part of the course assessment is linked with an interactive weblog (blog). Students (teacher candidates) are required to contribute their own thoughts, observations and experiences on a set of topics (i.e., the use of cell phones in class for learning; copyright laws in relation to teaching, and cyber-bullying and ICT) and each others’ postings outside of class, as well as provide links to online sites and resources they feel are beneficial to the class. Most topics deal with some moral and ethical issue of ICT and education.

In a class conversation about cyber-bullying, students started by identifying cyber-bullying as an important issue and then searching on the Internet for characteristics on how cyber-bullying has been interpreted. They exchanged information on a variety of perspectives using the course weblog. In a summary they reported that cyber-bullying is “when a child, preteen or teen is tormented, threatened, harassed, humiliated, embarrassed or otherwise targeted by another child, preteen or teen using the Internet, interactive and digital technologies or mobile phones.” (<http://www.stopcyberbullying.org>). In an online search, they found that in Canada, cyber-bullying has significantly increased. In 2007, this problem affected thirty-four percent of high school youth compared to twenty-seven percent of them reported suffering cyber-bullying in 2005. Students

identified the following factors that have influenced the development of some cyber-bullying issues such as, 1. Cyber-bullying is hard to prosecute – not actually an offence unless specific threats are made, 2. Schools have to be sure that material was sent from school computers otherwise the problem is beyond their legal scope, 3. Schools have been successfully sued by parents for invasion of privacy and for over reaching authority and for stepping in to address cyber-bullying when it occurred outside of school time. Internet Service Providers are reluctant to become involved stating – “we’re not censors”, and this position has been supported by advocates for free speech. Students made suggestions on addressing the issues. For example, What can educators do? 1. Take reports seriously and act on them, 2. Work with students and parents – become educated on what it is, how to respond, and the effect that it has, 3. Allow and encourage anonymous reporting of cyber-bullying sites, 4. Encourage and support students who speak out against bullies, 5. Make cyber-bullying part of school/classroom contract and bullying policy.

ICT literacies also include one’s competencies and confidence in knowing about how and why ICT moral and ethical issues affect societies. Morals and ethics are grounded in notions of responsibility and accountability. “In most societies, a system of laws codifies the most significant ethical standards and provides a mechanism for holding people, organizations, and even governments accountable” (Laudon, Laudon, & Traver, 1996). ICT ethics are not exceptional from the above-mentioned view of ethics. In a world where ICT has come to define how people live, work, and play, complex digital technologies have critically affected our social and cultural values. ICT moral and ethical issues such as cyber-bullying, identity security and privacy, and health and ergonomics are now important topics for educators and students to have an informed view of when using ICT. We believe continuing inquiries into broader forms of social responsibility that recognize the influences of ICT on linguistically and culturally diverse social contexts (globalization, internationalization) are also needed.

CONCLUSION

Finally, we believe that the language we use as educators to discuss ICT in educational contexts influences our production of meaning-making and values, as well as our taken-for-granted assumptions about using ICT to enhance learning and our ability and desire to engage with ICT across the lifespan. Walton and Banaji (2004) report findings that examined the effects of essentialist linguistic labels on perceptions of preferences. They found that the very manner attitudes are expressed can affect their status and evaluation (Walton & Banaji, 2004). Our concerns are based on the idea that educators and students should be active rather than passive learners with ICT. The curricular conundrum we outlined extends well past the simple substitution of terms (*tool* versus complex digital device) and educators ability to recognize the advantages of the means and ends of using ICT for student learning. We believe this will be an ongoing curricular conundrum that requires educators to engage in professional education. Educators and students need opportunities to inquire into the changing complexity of social and cultural contexts that condition why and how ICT literacies are important in education and societies.

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