Editorial

There are three themes that permeate the education literature at the moment. One is the need for 21st century skills to equip youth with the necessary tools to succeed in the new millennium, which of course is well underway after 13 years. As currently articulated, this means knowing how to access content knowledge efficiently and effectively and to acquire inquiry/problem-solving skills that are meaningful, adaptable, and integrative. The second is the importance of developing creative, collaborative, communicative, and innovative learners who are culturally sensitive, globally aware, and who behave in ethically responsible ways. The third is the need for developing digital literacy to keep pace with the exponentially burgeoning digital world that offers vast promise, but at the same time demands a critical stance to ensure that the power of these tools is used responsibly in what Gardner (2012) terms "good work."

Technology is playing a critical role in how curricula are being developed and implemented. This is reflected in a huge movement in many countries to create STEM (science, technology, engineering, and mathematics) curricula to prepare students for lifelong learning and the demands of the future. Others have proposed that this acronym should be expanded to that of STEAM (science, technology, engineering, arts—language, visual and performing—and mathematics) if educators truly wish to embrace creativity and innovation in all its forms (Catchan, 2013).

In addition, pedagogies are being re-thought as learning how to learn becomes paramount in inquiry learning and problem solving. An example is the trend towards the "flipped classroom" where "fact learning" is relegated to independent work on the part of the learners and frequently accessed electronically, the lecture-style of transmission learning is eliminated, and classrooms become hives of activity, exploration, application, discussion, reflection, and collaboration. There is no doubt that technology has helped to facilitate this, and to widen the possibilities for teaching learning and connection. At the same time it has created new problems around issues of accessibility, safety, and accountability.

The wide range of contributions to this issue tackles all of these areas and much more. We are pleased that our LEARNing Landscapes digital capacity allows our authors to show and illuminate their extremely interesting work in both visual and auditory ways. As in the past, the issue begins with the commentary from invited authors. All other contributions are arranged alphabetically, but for the purposes of this editorial are clustered thematically.

Commentary

Once again we are extremely grateful for the positive and enthusiastic responses we received from luminaries in the field who we invited to submit commentaries for this issue. **Seymour Papert** is a Massachusetts Institute of Technology mathematician, computer scientist, and educator. He is particularly renowned for the digital revolution he inspired through his work on Logo computer programming, and for research that focuses on how new technologies can support learning. **George Markowsky** is well known and respected Professor of Computer Science at the University of Maine. Over the years, Papert and Markowsky have collaborated on numerous projects related to technology and education. In their commentary, these authors challenge educators to move away from the practice of placing new technology in existing, and sometimes outdated, approaches to teaching and learning. They share the work they are doing for a new book entitled "The State of Learning," and while remaining optimistic about the potential for learning that digital technologies offer, they argue that the whole structure of schooling—the age segregation, and the curriculum content—needs to be rethought and revamped. It is only when this happens that the full potential and benefits of the digital technologies will be reaped.

Tom Snyder is a former classroom teacher, an award-winning software product designer, and founder of Tom Snyder Productions. In an engaging audiotaped interview, he describes himself as one of North America's first true "computer geeks." He traces his early interest in computers in the 1960s and 70s when computers filled entire rooms, and recounts how his life with computers evolved and the milestones he encountered along the way. He describes the huge influence the work of Vygotsky and Bruner had on him and how, as a result, he began examining how computer software might accommodate the fundamental human propensity for narrative and storytelling. He leaves the reader/listener with the final and important message that there is no good substitute for a great teacher, but that "there is a need to get more of them out there digitally."

Michael Fullan is Professor Emeritus at the Ontario Institute for Studies in Education at the University of Toronto and a former dean of education there. He is an accomplished and award-winning authority on educational leadership and change. He argues that there is a "push-pull" phenomenon operating in schools. The push consists of increasingly bored student populations as they travel through the grades, while there is also an irresistibly strong pull of students to the accessible, seductive, and exploding world of digital technology with which students interact largely outside of schools. He suggests an extreme overhaul of schools is demanded, with particular attention to what he calls "the new pedagogy." This not only requires basic structural and policy changes, but also includes a fundamental need for teachers and students to be learning partners, for a shift in the role of teachers from facilitator to that of "change agent or activator," and for a much more dynamic and integrated use of technology. His final message is that while these changes may be both messy and daunting, they are mandatory if this new "learning agenda" is to be achieved.

Samuel Bradshaw-Truesdale is a grade-two student at Grenville Elementary School in Grenville, Quebec and truly a member of the digital age. His interview poignantly underscores just how naturally and easily the newest generation of school-aged children is able to use technology in engaging, enlightening, and novel ways. He is clearly ahead of some of his peers when it comes to technology, which is a credit to his school and family who have encouraged his inquiry and technological interests at home. Hopefully, the push-pull phenomenon that Fullan describes will not become a reality for Samuel as he proceeds in his schooling.

Fundamental Parameters of Our Digital World

Daiute's article can serve as an interesting introduction to this issue of LEARNing Landscapes. She postulates that the three fundamental dimensions of digital technologies are interactivity, symbolic flexibility, and the vast array of available information and illustrates these with interesting examples. She suggests that the development and implementation of these dimensions are critical if the global potential of technology is to be realized and matters of questionable use are to be eliminated. She argues that socio-constructivist pedagogies and democratic practices are the cornerstones for engaging students in interactions that are meaningful, as well as for promoting respect for diversity and both inter- and cross-cultural understanding. She underscores that much of the responsibility for doing this resides in the hands of educators.

Digital Possibilities in Classrooms and Schools

Tarchi, **Chuy**, **Donoahue**, **Stephenson**, **Messina**, and **Scardamalia** have developed a "knowledge building" and "knowledge forum" approach using technology in a senior kindergarten and grade one class. This process is comprised of observation, experiments, reading, reflections, and ongoing discussion. The students learn how ideas can be developed and refined collaboratively and then preserved, synthesized, and deepened by recording their thoughts and further reflections in a communal electronic database. Over time, the students learn how to access the technology, add to it, and develop and share their ideas. These authors show with examples how authentic and democratic learning can be scaffolded and developed effectively among very young children. **Strong-Wilson**, **Gilman-Smith**, and **Bonneville** describe how a grade six teacher who became committed to using technology during a four-year "learning with laptops" project sustained and expanded this commitment and transferred it effectively to a primary grade class with the help of her former grade six students who acted as mentors. These authors suggest that it is the intersection of learning networks, digital tools, and creative spaces that can produce teacher agency and sustained change. **Minnigerode** describes how two sixth-grade girls enhanced their interest in STEM curricula, became more involved and engaged, and developed self-efficacy while learning how to design and produce a video game entitled "Don't Give Up." The video was a culmination of their inquiry into the topic of school dropouts and how their game would make players aware of the barriers to high school graduation and success. **Myer**, **Wade**, and **Abrami** documented the work of 21 elementary school teachers and their students in nine urban and rural schools in Alberta and Quebec as they migrated from "pencil and paper" student portfolios to electronic ones. The software used in these classrooms, ePEARL, is free and bilingual and available through The Centre for the Study of Learning and Performance based at Concordia University in Montreal. They found that in addition to teaching media literacy, the portfolios helped students to develop ideas, and to store, share, reflect on, and edit their work, as well as to collaborate and provide feedback to each other electronically. This electronic form of assessment, which includes visual and auditory documentation, facilitated parent participation and enhanced the teaching of cross-curricular competencies. **Hughes** and **Thompson** studied a class of adolescents aged 12 and 13 who used a host of digital devices to critique a variety of texts and share digitally their reflections on a secure classroom network about issues related to the role of the new media in their lives. They created and shared their own digital magazines and poetry which increased the level of engagement and led to new understandings about media. I would suggest that the push-pull tension of technology described by Fullan was mitigated by bringing their adolescent world into the classroom. **Pitman**, a high school physics teacher, shares a very interesting and personal

story of how with determination and ingenuity he was able to effectively engage and develop his students' knowledge of physics and problem solving. He shows with visuals how he did this by creating digital laboratories using computer video gaming software such as *Portal 2* and, by so doing, provided students with a "visual sandbox" for exploring physics. **Russell**, also a high school teacher, describes how his students studied the history of World War 1 by combining the traditional analysis of documents with the use of Google Earth. The technology allowed the students to plot the movement of Canadian soldiers during WW1, develop research skills, and understand more fully and empathetically the roles of soldiers and medical workers during this war. Using lenses of critical media literacy and critical pedagogy, **Garcia, Seglem**, and **Share** show with interesting examples how high school youth and pre-service teachers can become more critical consumers of texts by creating their own media texts using a variety of digital technologies. **Hicks**, **Turner**, and **Stratton** share the writing development of a pre-service teacher as she was encouraged and scaffolded into the world of digital storytelling. They suggest that digital storytelling increases the complexity of the writing task and the communicative propensity of the work and that technology cannot be divorced from the understanding of both craft and substance. This creates interesting avenues for yet additional demands on both teachers and learners that merit further study. **Foulger**, **Ewbank**, **Carter**, **Reicks**, and **Darby**, a team of varied educational stakeholders, tackle the issue that schools are facing as social media permeates classrooms everywhere. Rather than trying to eliminate social media from schools, they support the development of policies and practices in schools and school districts that promote innovation, safety, and accountability. They urge policy makers to check existing laws and legislation to avoid duplication and to ascertain the adequacy of these in the face of fast-changing technology. They add that another level of protection is frequently provided in social networking tools. If we are to truly attend to the danger of Fullan's push-pull phenomenon, then surely social media should be incorporated with forethought and care into school systems.

The Role of Technology in Differentiating Instruction and Meeting Special Needs

It is not surprising that the adaptability inherent in various forms of technology can be used to enhance the nuances of differentiated learning and the responses of educators to the special needs of students. **Parr** describes her eight-month study of 28 grade five students who were using text-to-speech technology (TTST) to facilitate their reading, decoding, and comprehension. She shows with poignant examples how important it is to match technology with the needs of each student and the ways each learns best. She argues that TTST is never a substitute for a skilled reader;

it is simply a tool that can be used effectively for some learners and discarded at the appropriate moment. **Golos** and **Moses** discuss how deaf and hard of hearing preschoolers increase their literacy behaviours and skills when exposed to educational videos that are presented in American Sign Language and incorporate visual strategies. They share interesting suggestions on how teachers can enhance the viewing time and integrate effective follow-up activities.

Contexts Using Digital Technology for Locally Relevant Topics and Issues

Walker and **Arrighi** share how participatory video (PV) was used in Ethiopia and Uganda in a "train-the-trainers" model. This experience fostered empowerment among the participants because they were creating and taking ownership of knowledge and information. Also, it encouraged critical thought and civic engagement. The mastery of this technology and process of production provide participants with tangible and accessible ways to communicate among themselves as well as with those in other contexts. They suggest that PV has utility in all learning contexts, and in a development setting it has excellent potential for producing narratives that will target and reach key stakeholders and help to effect change. **Malmberg** and **Maull** describe their very interesting work with 75 teachers and their 5,500 students from 22 US states and Puerto Rico who participated in the Global Learning and Observations to Benefit the Environment (Globe) Program. This initiative was designed to support educators, students, and scientists in inquiry-based Earth system investigations with support from the From Learning To Research (L2R) program. L2R provided the necessary professional development for teachers via webinars so that their students could engage effectively in the scientific process and develop their understandings by networking and sharing with other classrooms both locally and more distantly, as well as by communicating globally with scientists using Skype. The project culminated in the L2R Virtual Conference for which students uploaded videos of their projects and shared their reports. The lessons learned have now been incorporated into the second iteration of this program.

The Virtual Classroom: Potential and Issues in Online Teaching

Ferrario, **Hyde**, **Martinez**, and **Sundt** describe their involvement in online, synchronous university courses using Adobe Connect, Blackboard Collaborate, or Cisco WebEx that permitted individual, visual broadcasting via a webcam, audio connection through a Voice over Internet Protocol, and a chat box for texting/typing during discussions. Their work suggests that online time works differently—sometimes

slower, sometimes faster. Moreover, online teaching requires as much, if not more, preparation and familiarity with the tools, and more structure than they initially anticipated. They found that by front-loading, or "flipping" much of the fact-based learning via digital tools such as Voicethread, they were able to change more traditional lectures into "lecturettes" augmented with visuals and animation which heightened and sustained engagement. The students were able to view the asynchronous materials ahead of time, which enabled them to spend the majority of their time in breakout or plenary sessions. These authors were able to put to rest the idea that online teaching is static and impersonal. Their results demonstrated that the online learning under these kinds of conditions equals and can even surpass that of face-to-face instruction. **Graham** discusses her experience of an online, 12-week reading course that she conducted with eight elementary and middle school teachers using Elluminate and Blackboard systems. She uses the ebb and flow of the tides as a metaphor for how she adapted and changed during this experience and relates how sharing personal histories, negotiating assignments, and having weekly discussion threads contributed to the efficacy of the course. **Passmore** and **Morrison-Beedy** examined the experiences of 16 nursing faculty members from four major state universities while developing online courses for their students. They discovered that in addition to knowing how to use the technology, it is very important for course planners to understand and incorporate the fundamentals of adult learning theory as a basis for developing courses. **Imholz** and **Goldman** suggest that designers of online curricula are committing the same kinds of mistakes that have been made historically in curricula designed for school settings. They explore the advantages of several design methods and propose a four-step design process and an evaluation rubric to increase the effectiveness of online courses. Finally **Cho**, **Ro**, and **Littenberg-Tobias** explore thoughtfully the potential in using Twitter and Web 2.0 as mechanisms for building professional learning communities (PLCs), which increasingly have been shown to be a very powerful type of professional development. They suggest that these technologies can increase and extend the potential for dialogue among educators and provide tools for teacher peer-coaching. As well, they can increase educators' access to information sources and expand and diversify their networks. These authors articulate systematically the various features and functions of the tools themselves—tweets, hashtags, mentions, retweeting—and the access and interface capabilities. They suggest, however, that focusing only on the materiality of these tools is too narrow a perspective. Instead, the focus should be on the sociomateriality of technologies by directing attention to values, contexts and relationships that shape use in order to get a better grasp of how online PLCs can grow professionally, be sustained, and effect change.

Invited Article

It seems fitting to conclude with **Robert Lawler**'s invited article. Longtime friend and colleague of Seymour Papert and Marvin Minsky, Lawler graduated from MIT with a PhD in Artificial Intelligence and Education, a combination that suggests why his interests focus on natural learning and constructed personal knowledge. He shares in great detail the strategy learning that occurs in a game of tic-tac-toe and how learning occurs when the relationships among the elements of the game interface with cognitive change. In a second detailed analysis he shows the process involved in mastering the solution for a Rubik's Cube. It is by trying to look inside mental processes that he is able to argue for the need to consider very carefully what role representation plays in problem solving. In the current world of burgeoning technology that can support many forms of representation, this need merits further attention.

LBK

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