Editorial

The Polytechnic Difference

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The world is changing at a breakneck pace. Technological advances—particularly in the areas of biotechnology, robotics, and artificial intelligence—are transforming the ways in which people explore, interact with, and make sense of the world around them (Mayer-Schonberger & Cukier, 2013). Businesses, societal norms, communication patterns, entertainment consumption, and information curation are wildly different today than they were even a decade ago. In a relatively short period of time, technological devices have moved from the external environment (e.g., laptops, tablets, phones) to physically connected wearables (e.g., Go Pro camera, Google Glass, iWatch) to internally embedded devices (e.g., Radio Frequency Identification Devices, or RFIDs, and medical implants). Smartphone biometrics and thumbprint data are used routinely, every day, all over the world. A recent estimate suggested that over half of the world's population accesses information, services and social media from their handheld devices (Saylor, 2012). The enormity of data that is collected, analyzed, and used by technology on a daily basis is truly staggering (Mayer-Schonberger & Cukier, 2013).

This hyper-connected, data-rich world is changing the game, metaphorically and otherwise, and along with it, the ways in which we prepare for and engage with employment. Technology has already begun to replace unskilled labour, and similarly will serve to replace many cognitive functions in the workplace. As Friedman (2014, p. SR11) observed, "this access to data means that people and organizations can instantly replicate what is working on a global scale and instantly improve what isn't working—whether it is eye surgery techniques, teaching fractions,

or how best to operate a G.E. engine at 30,000 feet." The impact of these technological changes on the workforce goes beyond the usual hype. As recently recognized by The Conference Board of Canada (Alexander, 2018), technology is fundamentally changing the nature of work, and the speed of this transformation outpaces humanity's current ability to respond and adapt.

In response to this changing environment, employees will need to develop skills synonymous with adaptability, creativity and creative thinking (Mayer-Schonberger & Cukier, 2013). In their recent book, *Big Data: A Revolution That Will Transform How We Live, Think and Work*, Mayer-Schonberger and Cukier (2013, p. 137) argue that in an age where information and data are so abundant, the vital skill required "is the knowledge to extract wisdom from [the data]". Clearly, the requirements of graduates of higher education need to be reevaluated in this information era; students will need to develop different kinds of mindsets, skills and talents for the 21st century (Greenstein, 2012). This includes not only academic outcomes, but also non-academic ones, such as persistence ("grit"), self-regulation, engagement, creativity and motivation (Pea & Jacks, 2014). The value proposition of a post-secondary education can no longer focus on the delivery of content; information is all around us.

This has implications not only for what post-secondary education is teaching to its students, but also for the ways that it is doing so. As noted by Laurillard, Oliver, Wasson, and Hoppe (2009, p. 291):

> Education has a role in preparing people for work—traditionally for the industrial environment, but now for the knowledge economy, and that must affect both what and how students learn. ...education has to learn to adapt faster, in line with the rate of change in the worlds of work and leisure.

Indeed, the unprecedented access to information in today's society has blurred the lines between formal and informal learning and education, precipitating questions about the relevance of existing teaching and learning models in higher education. Opportunities that were once unimaginable are now available to

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both educators and students alike. As noted by Saylor (2012, p. 8):

> Mobile technology can bring the nation's best teachers and top experts into every classroom, and improve the quality of education while freeing-up budgets. Skilled engineers can be trained for the cost of a few hundred dollars a year instead of tens of thousands. In developing nations, where approximately one-fourth of children never finish primary school, and one billion people remain illiterate, mobile computing will spread education where it hasn't gone before.

There is no doubt that higher education is facing a complex and uncertain future (Vibert & Shields, 2003). Traditional models, approaches and ideas about teaching and learning will need to transform. This is evident in the words of a recent report by The World Economic Forum (2016, p. 7), which argues that "government and businesses will need to profoundly change their approach to education, skills, and employment, and their approach to working with each other," and is further echoed in a report commissioned by the Ontario Government that calls upon educators to ensure students have access to quality learning experiences that are adaptable and appropriate to the individual learner's needs and to the needs of society (Ontario Government, 2016). Although higher education is often thought to live at the "forefront of cutting edge practice," Loughran (2013, p. 5) observed that "for many reasons it struggles to live up to that expectation."

The Polytechnic Model of Education

Enter the polytechnic. Structured to be nimble and responsive to the needs of industry (Pratt, 1997), and with a history of eschewing rigid models of education in favour of flexible, independent learning (Doern, 2008; Pratt, 1997), many would agree that polytechnic institutions are uniquely positioned to thrive in the information era. From the Greek "*Poly-teknos*"— "skilled in many arts"— a "polytechnic" education is characterized by its breadth of options. The model emphasizes an applied approach, spanning a wide range of comprehensive programming, including technologies and skilled trades. Credentials are awarded in programs ranging from apprenticeships and certificates through to advanced degrees, all of which are delivered in an experiential, hands-on environment. The programming offered in polytechnic education is also explicitly designed to respond to the changing and specific needs of local economies, thanks to its close ties to industry. Polytechnic programs are directly informed by industry partnerships, and provide symbiotic opportunities for students to engage in work-integrated learning, applied research, entrepreneurial endeavours and international learning opportunities (Böckerman, Hämäläinen & Uusitalo, 2009; British

Columbia Institute of Technology, 2018; Humber College, 2018; Polytechnics Canada, 2018).

But to really appreciate what is unique about this approach and what makes it so well-suited for today's world, it helps to look to the past. Institutes of polytechnic education have long been in existence, although their formations and names have varied (e.g., colleges of professional education, institutes of technology, institutes of applied science, and institutions of Technical and Further Education, Skolnik, 2016). Steeped in history, formal polytechnic education in technical and industrial training can be traced back to Moscow, Russia as early as 1763 (Fuller, 1894/2015). In France, between 1825-1865, the polytechnic was celebrated as it "led the world in the practical applications of science instruction to the improvements of arts, trades and manufacturers" (Fuller, 1894, p. 5). The United States followed in 1861, with the establishment of technical institutions across the country, including noteworthy institutions such as MIT and Caltech. Polytechnics also arose across the United Kingdom and Europe in the mid 20th century, as part of the 'differentiation of higher education' movement (Gellert, 1991). The Canadian story, of course, is much more recent, with polytechnics appearing in a harmonized way in the post-secondary sector in 2003 (for a review of the Canadian context, see Doern, 2008).

Since their inception, polytechnics have had a mandate to meet the immediate needs of society, as informed by their ongoing integration and collaboration with industry. This has required—and inspired—industrial innovation; one does not have to look far to see the significant impact of polytechnics on both local and global economies. As an example, for hundreds of years, "the superiority of polytechnic work has been evident at world expositions" (Paris and Chicago World Fairs) and polytechnics have been credited with developing the skills required for the design and the construction of roads, railways and bridges (Fuller, 1894) that have joined people and nations. More recently, polytechnic students have been credited with inventions such as a payroll software system, thought-controlled home appliances and prosthetic arms and social innovations such as Femme International, which is dedicated to empowering African women through feminine hygiene management (more information on each of these projects is listed at the conclusion of this paper). As the world evolves, so does the learning, curriculum and innovation within polytechnic institutes.

At the same time, bridging the divide between industry and education has kept polytechnics at the forefront of pedagogical experimentation. In serving the needs of a diverse body of students with such a broad range of topics and credentials,

polytechnics have had to "accommodate growth, accept new kinds of students, offer them new kinds of courses, create new structures of study, pioneer new forms of governance, recruit new kinds of staff, and so on" (Burgess & Pratt, 1971, as cited in Pratt, 1997, p. 10). Freed from the traditional educational framework, thanks to their emphasis on applied and experiential learning, polytechnics—like all innovators— "surf on the edge of chaos" (Veletsianos, 2010), challenging the *status quo* out of necessity but also out of curiosity. As such, polytechnics have a long history of pioneering innovative, flexible, student-centered approaches to learning (Doern, 2008; Pratt, 1997). Although individual polytechnics are distinct in their stories of creation, context and structure, common to all—across the sector—is the noble pursuit to provide hands-on, practical training and education suitable to the needs of learners and the community as a whole. Unwavering in their purpose, polytechnics have been steadfast in their commitment to preparing students for an increasingly complex and unpredictable work environment. As Pratt aptly noted (1997, p. 319): "The polytechnics' experience shows that considering what students might need after their higher education tends to produce different answers to the question of course design."

So why is this model of education so befitting for the world of today? How are polytechnics positioned to respond to the dynamic and rapidly changing environment? Intrinsically, the educational process in the polytechnic model of education, both then and now, assumes the task and responsibility of developing competent individuals ready to take their position in the profession (Ushatikova, Rakhmanova, Kireev, Chernykh, & Ivanov, 2016). Both in their responsiveness to the ever-changing needs of society, as well as those of their learners, Polytechnics have a proven record of innovative pedagogy, focused on problem-solving, that has uniquely prepared them to meet today's volatile reality. Moreover, in responding to the dynamic nature of the world's problems, polytechnics have crafted a networked ecosystem that brings educators, researchers and students together to work in interdisciplinary teams to solve very real problems, in ways that are distributed yet connected (De Courcy, 2015). "Education, innovation, and training are interwoven; learning moves seamlessly between inquiry, experimentation and skill development in both cognitive and non-cognitive domains, creating an instrument for workforce development and innovation" (De Courcy, 2015, p. 5). It is this approach to learning that epitomizes the Polytechnic Difference.

The Vision for JIPE

A scholarly journal is a place to find evidence to inform one's practice. Our vision for *JIPE* is to be more than that. We want this journal to be a place to find inspiration; where readers not only learn about "what is" (Hutchings, 2000), but are inspired by what might be. What is *possible*. As we move forward, *JIPE* will feature papers that describe innovative teaching and learning practices that push the boundaries of traditional approaches to learning and demonstrate the impact of industry-integrated activities, both of which have been hallmarks of polytechnic education since its origins. As noted, polytechnics have always had a reputation for innovative and responsive teaching, Polytechnic educators are therefore deserving of their own scholarly space to disseminate their pedagogical innovations, question what innovation is, in the context of today's polytechnic model of education, and challenge learning and teaching methods and practices in this information era. With the creation of this journal, we hope to inspire larger conversations about what it means to educate in today's higher education system.

The variety of contributions featured in the journal are also reminiscent of the polytechnic approach, with its range of options. Like the pathways, credentials and choices offered by polytechnics, *JIPE* offers a breadth of options for educators to share and consume the scholarship of teaching and learning literature. The journal features more traditional full-length empirical and review papers as well as "bite-sized" Brief Reports and Innovation Spotlights. All share the rigour of the peer-review process. Finally, the journal is online and open-access following the polytechnic tradition of education for all, with particular regard to scholarly teachers (Trigwell, Martin, Benjamin, & Prosser, 2000) and practitioners (Bjork & Solomon, 2012; Davis, Lewenstein, Simon, Booth, & Connolly 2008).

This inaugural issue features an invited commentary on the future and place of polytechnics in Canada. It also contains reports on innovative pedagogical approaches, including an innovation spotlight highlighting the use of Lego robotics in the classroom and a brief report on internship experiences among polytechnic degree students. Finally, there is a full-length empirical paper on how to support male students in a traditionally female-dominated program, and a brief report describing faculty engagement with research at a polytechnic institute in Alberta. You will find that the polytechnic identity, with its innovative, student-centered integration of theory and practice, is evident throughout the pages of this volume. We hope that you enjoy it.

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Thought-controlled home-appliance device: http://www.asiaone.com/health/poly-students-invent-device-helps-disabled-control-home-appliances-through

Thought-controlled prosthetic arm: http://www.tnp.sg/news/singapore/ngee-ann-polytechnic-students-invent-mind-controlled-prosthetic-arm

Femme International: http://humber.ca/today/news/femme-international-continues-work-girls-kenya