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TEN GUIDING PRINCIPLES FOR THE USE OF TECHNOLOGY IN LEARNING

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INTRODUCTION

Educational institutions at the secondary, college and university level, service and technology providers from the public and the private sectors, are investing significant funds, time and energy in technology for learning.

It may not always be clear how or even whether this investment adds sufficient value to our education system, and in some cases, it may not. It is not given, for example, that "one laptop per child" results in significant gains in learning outcomes.

There is a critical need to articulate the fundamental guiding principles to drive decisions and policy making with respect to technology in learning.

The following set of guiding principles related to the use of technology for learning and supporting education is gleaned from a variety of sources.

It is most likely that decisions by administrators, faculty, instructors, learning designers, policy makers and funders are implicitly driven by these principles. Explicitly identifying them makes it more likely to be consistent and focused on their achievement.

THE MEANING OF TECHNOLOGY IS PROBLEMATIC

As faculty, administrators, and policy makers, one of the key issues is the definition of just what is meant by technology, specifically as it relates to learning. We need to be clear about what we mean.

Learning technologies are those methods and practices used to learn and to facilitate learning. It is the way we learn and the way we teach. It includes the tools we use and the instructional designs we apply.

Technology in learning refers to the tools – such as the hardware, software, networks, web applications (apps) -- and the processes – such as the methods and strategies used for instruction, assessment, tracking student learning, the design of our educational organizations, learning management systems– in short, the way we do things in education.

TEN FUNDAMENTAL PRINCIPLES FOR USING TECHNOLOGY IN LEARNING

The following principles are intended to provide a (far from definitive!) guide for reflecting on the purpose and use of technology in learning.

These ten principles are:

1. Adding value
2. A pedagogical focus
3. Quality
4. Sustainability
5. Access
6. Scalability
7. Sharing
8. Choice
9. Continuous, lifelong learning
10. Customization

1. Adding Value

The choice of any particular technology, be it a tool or a process, must be based on the principle it adds value to the task at hand. The value must be explicit, that is, stated clearly as the rationale for the choice, and be defensible. Values may include efficiencies, effectiveness, robustness, reliability, usability, student engagement, flexibility or success.

The choice must be based on some form of evidence that demonstrates or explains the (inherent) value. We are often too quick to adopt a new technology, be it hardware, software, or a new design, without fully understanding or explaining to others why this new technology is better than what we have been using.

For example, research to date suggests it is not the device per se that can make the difference, but instructional design.

- Technological enhancements in education are both created and selected for the value they add, and this value is made explicit and is defensible.
- Careful scrutiny and research are applied to the choice of technologies to ensure the impact is understood and monitored.
- New technologies for learning are developed within a framework of 'value adding' – the contribution a technology can make to learning is fundamental to the way it is presented so claims may be scrutinized.

2. A Pedagogical Focus

The major mandate for technology in learning must be on learning – its content, delivery, support, assessment, interaction and results.

- Too often networks, software, hardware, apps – the 'tools' – are designed for purposes other than learning, or designed by those who have little understanding of the concepts of good pedagogy. There is a need, of course, for the administrative, productivity-oriented technologies but there is an urgent need to respect the implications of pedagogy on the selection of tools (hardware and software), on bandwidths, on security of data and privacy, on access to networks and data, on choice and individual needs.
- Choices of educational technologies must be based on sound principles of learning. Does the online learning environment adapt to a wide variety of pedagogical philosophies and methods? Does the course design match the learning objectives with course activities and learner assessment? Dose the hardware standards prevent instructor choice of delivery methods?
- There can be a synergy between the tools used and the cognitive processes engaged in learning. Databases, for example, can be used to prompt learners to examine the interrelationships, the organizational patterns, and the codification systems of data itself. Hyperlinking technology and adaptive systems can generate new forms of interactivity between the student and the content displayed.
- Educators must be extensively consulted when educational hardware, software, or networks are designed and selected.
- A decision to adopt a particular set of technologies must also not inhibit pedagogical innovation.

3. Quality

Quality teaching, learning, programs and delivery are demanded by students and investors in education. The infrastructures must enable quality, not inhibit it.

- Quality is defined by specific criteria and standards. By making explicit the criteria and standards in our choices and use of technology in learning, it is more likely these standards can be met. This also helps us to recognize that standards are not universal and that different standards are needed for different contexts.
- Explicit standards must be established through research and discussion when issues of quality arise. We can create professional standards, contractual standards, and standards based on the needs and wants of learners and instructors.
- Individualized expectations must be recognized and standards of quality applied to match diverse needs.

- Quality standards can be applied to input (e.g., technical specifications for hardware; entrance criteria for students), process (e.g., standards for delivery, standards of design) and output (e.g., certification standards).
- Quality standards of certain matters must be frequently reviewed as enhancements are made rapidly to some products and processes.

4. Sustainability

New technical infrastructures at education and training providers are adding costs, and hopefully value, to educational enterprises. These costs include the costs of maintaining the technology and ensuring equitable access to technology.

Support systems, training, upgrades, new functional requirements (e.g., databases, cloud services, support systems, apps) add to the budget. Sustaining these new costs, and thus the programs and functions, is critical. While long-term projections with respect to 'hard' technologies, finances, and new innovations are difficult to make at times, it is valuable to recognize that sustainability – be it for programs, hardware, or new processes – can be calculated and planned.

Risk factors can be analyzed. Time projections can be made explicit, and then adapted as necessary. Policies can be established to support the principle of sustainability and the context in which it applies.

- Programs need to be less dependent on economic vagaries, where possible. One-time funding can be attractive as an incentive to get going, but plans are required to ensure ongoing costs can be sustained.
- There is a need for longer-term revenue streams and multiple funding sources to offset cycles in the economy.
- Multi-purpose products and services can be created to encourage departments and education and training providers to share costs. Shared services, open educational resources (OERs), and collaborative program and course development are all examples of this.
- Knowledge and talent with respect to hard and soft technologies becomes a critical resource for a field that is changing so rapidly. Poor advice is costly. Faculty and instructors need professional development and support to make extensive and effective use of technology.
- Cost-effectiveness is a function of value. Is the value added by a specific technology (hard or soft) worth the cost? Is the value itself clear? This needs to be systematically calculated and evaluated on a periodic basis.
- Sustainability is a function of investment related to returns, in terms of both financial and human returns. In education, the returns, particularly the benefits to society, are often long-term and

somewhat intangible, but there are returns. Continued investment in education can be increased, as these returns are made more visible and public.

5. Access

A dominant value in Canadian society is education provides an opportunity for everyone to be successful, to fulfill themselves, and to contribute positively to society. Public schooling is legislated in every province and territory as a universal right and the expansion of post-secondary education is aimed at ensuring increased access to, and success in, higher education for all who wish to pursue learning.

Restrictions to formal learning activities can result from distance and remoteness, physical barriers, social and psychological barriers, inappropriate programs or lack of programs, lack of 'seats' available, financial barriers, readiness factors, and other conditions that prevent access by learners to formal learning opportunities.

- Access to learning must be the least restrictive possible. Bringing learning opportunities to all learners through the Internet must be a priority of all levels of government, education and training providers, and industry.
- Personal versus public benefits and costs must be respected, but access to learning must not be restricted to only those with the ability to pay.
- There are a multitude of educational delivery systems for distributed learning, such as audioconferencing, videoconferencing, web conferencing, TV, radio, web-based learning environments, social media and DVDs. The appropriateness of the media is a function of the learning goals, as well as the preferences and circumstances of the learner. The Internet can provide broad functionality across a variety of learning systems and as such is very scalable. Extensive access to the Internet, with appropriate bandwidth speeds, across all regions of Canada must be a prime goal of governments and industry. Indeed, in some jurisdictions (e.g. Finland), it is regarded as a basic human right.

6. Scalability

Efficiencies can be created when processes, programs, infrastructures, and any component or technological element can be shared and expanded without radically altering the core purposes of the resource or program.

Scalability refers to networks that can be connected to other networks and thus expanded; software that is compatible with relevant other software; educational content, programs and courses that can be shared or transferred across departments, programs, distance or education and training providers; educational resources that can be

used for multiple applications; and learning management systems that can expand as student numbers and courses grow.

- Scalability needs to be considered in the technological architecture of all systems – hardware, networks, software, educational programs, apps and services. The interoperability benefits can reduce costs, prolong usability, extend usability, and facilitate cooperation.
- Scalability is also a means by which innovation can be encouraged and enabled – instructional teams can add a software component to a learning management system using the capacities embedded in such systems.

7. Sharing

Sharing is a principle based not only in social good and altruism, but also in pragmatism. Education and training providers that learn to share and cooperate can reduce costs and improve quality in a number of technological areas.

- Community and cooperation are essential features of the knowledge economy. Online courses are expensive to create. Increasing learner enrolments through partnerships between departments or education and training providers can reduce costs, increase viability, and permit low demand courses to be offered more frequently.
- Partnerships may be created on any number of fronts, joint programs or services across several education and training providers are examples that enable economies of scale or leverage. The key to successful partnerships is often in the details: common purpose and values; defined positions and decision-making processes; positive interpersonal relationships and trust; clear goals, roles, responsibilities, and structure; commitment at all levels; flexibility and adaptability; and clear legal and financial liabilities.

8. Choice

Technology in learning, while hardly a new phenomenon, is still in need of evaluation and examination.

- Individual differences amongst learners, instructors and education and training providers, and within society and the workplace, must be respected. Choices of technologies, for both tools and processes, can support and promote differences.
- The responsibilities inherent with choice must be made clear.
- Diversity must be valued, though balanced with principles of efficiency.
- Preference for a single approach (e.g., face-to-face vs. online; public vs. private; direct instruction vs. constructivism, etc.) must

be discouraged and the benefits of differences enjoyed.

- Evidence based decisions must drive investment decisions at the education and training provider and policy level.

9. Continuous, Lifelong Learning

The principle of lifelong learning makes inherent sense to most, yet its practice is challenging.

- The paradigm for learning as a lifelong endeavour must be built into the structure of education and training providers and the workplace. Learning and changing must be more highly valued in all we do.
- Learning must be seen as personal and continuous, not lockstep, institutionalized, and always formalized.
- We treat change as events, scheduling major overhauls of business processes, government policies, and educational reforms. For learning to be continuous, we must shift our thinking and our practices on both a personal level and on an education and training provider level, so change is a process, a technology of continuous learning.

10. Customization

One of the advantages technologies bring to learning is the ease with which we can customize programs, courses and services to individual learners. Now, with the advent of artificial intelligence and machine learning, we can adapt learning systems to be responsive both to the needs of learners and their performance.

Learners are diverse, with individual needs in terms of their goals, the pace at which they learn, the modes of communication they prefer, their motivations for learning, the stimulations they respond to, the prior learning aptitudes they bring, physical and sensory differences (e.g., sight, hearing) and the manner in which they can demonstrate what they know and can do.

Our learning delivery technologies and our course designs can be tailored to meet the needs of individual learners.

- The needs of individual learners, as well as the diverse needs of individual professions, businesses, industries, cultures and society at large, must be accommodated, as appropriate. There are limits, in terms of economies, course requirements, time and access, but there is so much more that can be done with the aid of tools and process technologies to improve the quality of education for each learner.

A SPRINGBOARD FOR FURTHER REFLECTION AND DISCUSSION

Investing in technology in learning can either be a Pandora's Box or a thoughtful, rational and tremendously valuable process. The essence of technology must be that it adds value. This fundamental belief underlies of our principles.

These ten guiding principles may help faculty, instructors, learning designers, administrators and funders to develop a comprehensive vision and strategy for technology in learning. They may also be a springboard for reflection and discussion.