

Strategic Directions for ICT in Education

**The Ontario Knowledge Network
for Learning**

June 2001

Executive Summary

As the 21st century unfolds, the integration of information and communication technologies (ICT) in education is transforming how, when, what, and where we learn. The Government of Ontario is committed to ensuring that Ontarians, no matter where in the province they live, have access to high-quality learning programs throughout their lives. It is therefore crucial to the success of today's and tomorrow's learners that the province-wide integration of technology in educational institutions be made a priority.

Many of Ontario's educational institutions are already implementing bold new ICT initiatives that enhance the opportunities for quality education and skills training for students in our public schools (K–12) and postsecondary institutions, and for lifelong learners. However, the adoption of technology across the province is uneven. Given the rate at which technology is transforming our economy, Ontario now needs a province-wide vision and a coordinated ICT strategy to ensure that every citizen is equipped for successful lifelong learning.

In this report, the Ontario Knowledge Network for Learning (OKNL) outlines the strategic directions it believes are needed to ensure the province's future success in ICT-enhanced education. These directions were guided by four principles:

1. Students come first.
2. Our success depends on collaboration.
3. People make the difference.
4. We will be publicly accountable.

Based on these guiding principles, and on consultations with a wide variety of education and business partners, OKNL has identified six goals for ICT-enhanced education, and will implement a set of strategies to ensure we achieve each goal. Our goals are a call for the education sector, businesses, and the people of Ontario to get involved in transforming the way we live, learn, and work.

Goal 1: All learners will have access to ICT-enhanced education.

Goal 2: Educators will have the knowledge and skills they need to integrate ICT into their teaching with confidence.

Goal 3: Learners, educators, administrators, and support staff across the province will have equitable access to ICT tools and resources.

Goal 4: Ontario will become a world leader in research and development in ICT-enhanced education.

Goal 5: Education-business partnerships will be formed to support ICT-enhanced education.

Goal 6: ICT will transform relationships among learners, educators, businesses, and community members across the province.

Our goals are based on the belief that transforming learning with technology means more than simply putting computers in classrooms. Improving students' access to technology is essential, but technology is of little help if students or their teachers don't know how to use it, or if it is not used in the pursuit of learning. The real change takes place when ICT becomes a tool that broadens the horizons of all learners and educators, by providing them with new skills and connecting them with a new world of ideas and learning resources. It is such a transformation that is at the heart of our vision for ICT-enhanced education in Ontario.

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1. Introduction: Creating a World-Class Education System

In its report *New Skills for the New Millennium: An Agenda for Quality Education* (Fall 2000), the Ontario government stated that:

The goal of our education reform is to ensure that students in Ontario receive the best quality education possible. We are responding to what students, parents, taxpayers and employers told us needed to be done. Every player in our education system — from our schools to our colleges and universities, and those who offer training programs — need to focus on one thing: putting students first.¹

During the past six years, Ontario's education system has achieved a reputation for excellence based on its commitment to reform. Since 1995, the Ministry of Education and the Ministry of Training, Colleges and Universities (referred to hereafter as "the ministries") have forged ahead with reforms that put students first. In particular, they have committed to ensuring that learners have access to the knowledge and skills they will need to succeed in today's changing economy.

In the elementary and secondary sectors, reforms have focused on:

- increasing classroom spending and ensuring that funds allocated to the classroom are spent there
- introducing a new curriculum to ensure that students are properly prepared for success in the workplace or in postsecondary education
- introducing improvements to special education
- developing standards for teaching time and class size
- increasing accountability through the introduction of regular province-wide student assessments, a teacher-testing program, and school and school board report cards

- developing strategies allow parents to be more involved in their children's education.

In the postsecondary system, major reforms have included:

- introducing new ways of funding universities and colleges to encourage innovation, promote improvement, and ensure that they respond to the real needs of learners and employers
- increasing accountability through the requirement that postsecondary institutions report annually on the success of their programs
- encouraging partnerships among universities, colleges, and employers to ensure that postsecondary programs prepare students for jobs in high-demand areas (for example, the high-tech and automotive sectors)
- investing in new student places.

The Ontario government also recognizes that "in today's changing world, the need for education never ends."² Colleges, universities, training centres, and the private sector are responding to the needs of learners who want to continue their education after they have left the traditional education system and entered the workforce. As a first step in developing programs that meet the needs of these *lifelong learners*, the government is investing in TVOntario's Lifelong Learning Challenge Fund to help finance interactive on-line training programs.

With a solid commitment to quality reform, our educational institutions have already taken bold steps and, in doing so, have set the stage for further exciting new directions. As the 21st century unfolds, new technologies are transforming how, when, and where we learn. One of the most important new directions is the integration of information and communication technologies (ICT) in education, both in traditional contexts like schools

and postsecondary institutions and in more informal settings like workplaces. (*ICT* in an educational context refers to technologies such as CD-ROMs, instructional video materials, and on-line learning resources [information technologies] and e-mail, Web sites, and video conferencing [communication technologies], and the range of adaptive technologies available to address access issues for learners with special needs). The ministries signalled their commitment to technology by creating the Ontario Knowledge Network for Learning (OKNL) in spring 2000. OKNL's role is to oversee the development of a vision and plan of action for integrating ICT in education in Ontario.

Soon after creating OKNL, the ministries held a two-day symposium on the integration of ICT in education with a wide variety of partners in education, including *educators*, parents, students, and representatives of the private sector. (*Educators* include both teachers at the primary, secondary, and postsecondary levels, and trainers in the workplace.) After broad-ranging discussions, a draft vision was created for the integration of ICT in lifelong learning. Participants argued strongly for an inclusive approach to planning and implementing the provincial ICT strategies. In response, OKNL created six working groups to refine ideas for a vision, to establish goals, and to recommend strategies for action.

The groups were organized around six themes that arose from discussions during the symposium:

- learners' expectations and assessment
- educators' roles and responsibilities
- learning environments and resources
- infrastructure requirements and development
- the needs and responsibilities of parents and the community
- funding and governance.

Symposium participants agreed that these themes represented the critical factors that would need to be researched further before an effective plan of action could be formed.

Between September and November 2000, the working groups consulted with many education partners across the province. Some of the groups also commissioned research to explore certain parts of their mandate in more detail. Each group reconvened in November to review the accumulated input and research and to create its final report. OKNL received these reports in December 2000 and shared them with representatives of the ministries for discussion.

This document is the distillation of the invaluable work carried out by OKNL's six working groups. Their dedication to completing a complex task within tight deadlines was admirable, as were their many innovative ideas and their commitment to reaching out to as many stakeholder groups as possible. *Strategic Directions for ICT in Education* presents our vision for the integration of technology in learning: a blueprint for an Ontario where all students have access to quality learning that is enriched by cutting-edge technologies. (*Access* means that any learner, regardless of ability, will be able to fully understand content and learning expectations through the use of ICT, and will be able to participate fully in interactive learning activities.) At the heart of our vision is a commitment to supporting Ontario's goals of equity,

excellence, and high achievement for all learners.

The people of Ontario are already members of a world-class learning community in which students come first. The time is right for further bold steps to

ensure that Ontario's education system also becomes a world leader in the integration of ICT in learning. The continuing competitiveness of our system and the achievement of our students depends on it.

2. Transforming the Way We Learn in the 21st Century

A Vision for the Transformation of Learning Through ICT

From the earliest days of the computer, innovative educators and administrators have understood the potential for technology to aid learning. In Ontario, many schools, colleges, universities, and training centres have already begun to integrate information and communication technologies into the programs they offer. Some examples of the innovative use of ICT are presented in the sidebar on this page, and numerous others – both from Ontario and from other jurisdictions – may be found throughout this report.

All partners in education – including educators, students, and parents; school board administrators and trustees; college and university board members; business and community partners; and the ministries – have recognized the integration of ICT in education as a central goal. However, at the beginning of the 21st century, the use of technology in educational institutions across the province is uneven. Given the rate at which technology is transforming our economy and many of our educational institutions, Ontario now needs a common vision and a coordinated technology strategy to ensure that every citizen is equipped for successful lifelong learning.

OKNL has identified the integration of technology and plans to implement it to ensure that we achieve our goal is based on the transforming learning means more than simply computers in classrooms; students' access to technology but it is of little help if teachers don't know how to use it in the classroom. Real change takes place when technology becomes a tool that empowers students and educators' horizons.

Interactive on-line learning: Westcreek Public School in Pickering (http://www.durham.edu.on.ca/s_links/schools/westcreek/index.html) is one of the first schools in Canada to use an innovative, Web-enabled homework system. Teachers send math assignments via e-mail to students who want to continue their work at home, and the students work on the projects through the Web site. The site includes software that tracks each student's progress and then sends this information back to the teacher. This feedback system helps the teacher to identify

them with new skills and connecting them with a new world of ideas and learning resources.

Achieving our ICT goals will require the help of all Ontario's education partners. Provincial leadership will be crucial at first, but we believe that the quality of our decision making will depend on input from education partners. The continuing improvement of our education system – and Ontario's continuing economic prosperity – requires all of us to become involved in the exciting changes that lie ahead. The role of OKNL is to ensure that the people of Ontario are well informed, and that they become involved in helping to put the province's technology plan into action, in evaluating it, and in making any changes that are needed along the way.

Guiding Principles for ICT in Education and Training

If Ontario's education system is to seize the potential that information and communication technologies have to offer, each stage of the process will require careful planning, implementation, and evaluation. As OKNL – along with its education, business, and community partners – shapes the future of ICT in education, we will be guided by the following set of principles:

1. Students come first.

- All our decisions will support the government's commitment to providing high-quality education and training programs and improving the achievement of learners (in this document, "programs" refers not only to courses offered in traditional settings like schools and universities, but also to less formal learning opportunities such as those offered by on-line education).
- We view technology as a tool to enhance lifelong learning, rather than as an end in itself.

The Ontario Knowledge Network for Learning

Innovative ICT Strategies in Ontario

Web-based resources:

The Ontario-based Cross-Canada Marsville Project let students follow the work of space explorers as they planned the first settlement on Mars. Students from across the country connected on-line with scientists and engineers as the students worked to design their own version of the Mars settlement. Student work was posted regularly on the Marsville Web site (<http://mars2001.enoreo.on.ca>).

Downloadable digital media:

The Royal Ontario Museum's Web site (<http://www.rom.on.ca>) includes an exciting interactive section for both children and adults. Learners can download programs such as a hieroglyphic translator, a Vietnam discovery adventure, and a project on biodiversity and species at risk, while teachers can access resources like the Whales Curriculum Materials teacher kit.

- We will strive to address the factors that limit equitable access to ICT (e.g., socioeconomic status, geography, special learning needs, language, race and ethnicity).
- We will respect Ontario’s publicly funded systems of elementary and secondary education (English, French, English Catholic, and French Catholic) and the mutual distinctiveness of the different types of postsecondary institutions (universities, colleges, and training centres).

2. Our success depends on collaboration.

- We believe that the effective integration of ICT requires all levels of our education system to forge a broad range of partnerships, and our communications and decision-making processes will reflect this belief.
- Wherever possible, we will support collaboration among all education partners. Collaboration will ensure that all partners are part of the decision-making process, and that the “fit” between ICT and the school level, in the home, in postsecondary institutions, and

3. People make the difference.

- New technologies make a difference only if we have a fully trained in the 21st century quality professional workforce.
- To fully integrate ICT into our education system, we require us to create new relationships that support a *learning environment*. This includes resources, content, and practice. *Learning environments* include not only the classroom but any setting where learning takes place through ICT. For example, the workplace, e-learning, remote sites, and video conference link.
- Developing and implementing a plan for the integration of ICT in our education system, and evaluating its success, will require capable and

E-mail: John Paul II Catholic High School in London (<http://ldcsb.on.ca/schools/jjp2/>) uses the popular ePALS program. This free Internet program links learners across the world through e-mail and other e-communication tools such as voice, video, and chat rooms.

Wireless Internet access: At J. W. Walker Elementary School in Fort Frances (<http://walker.rdsb.com>), every student uses a wireless laptop computer. In class, students work on-line to complete projects in math, languages, and geography, among other areas. Their finished products may involve computer-generated slide shows, graphics, brochures, or e-mail.

informed leadership throughout the system.

4. We will be publicly accountable.

- We will strive to build public understanding, trust, and support through regular communication and through a commitment to including education, business, and community partners in decision making.
- Our work will take place in a framework that includes a clear definition of roles and responsibilities, as well as concrete strategies to evaluate, communicate, and respond to the changing needs of the education system.

Goals for ICT in Education and Training

The Government of Ontario is committed to ensuring that “Ontarians, no matter where they live, have opportunities to gain access to high-quality learning programs throughout their lives.”³ The speed with which information and communication technologies are becoming integrated into our lives, and into the fabric of Ontario’s economy, means we need to reevaluate our definition of high-quality learning. A highly skilled and well-educated workforce – currently one of Ontario’s competitive advantages – will be even more crucial in the future. To ensure success for all learners in the 21st century, it is time to take bold steps to integrate ICT into our definition of high-quality learning.

OKNL’s six working groups developed the following six goals for the integration of ICT in education. They are a call for the education sector, businesses, and people of Ontario to get involved in transforming the way we live, learn, and work.

Goal 1 – Access to ICT-Enhanced Education: Learners will be engaged in high-quality education and training programs that are enhanced by information and communication technologies, and they will acquire the range of knowledge and skills they will

need to be competitive in a knowledge-based global economy.

Goal 2 – Support for Educators:

Educators will have the knowledge and skills they need to integrate ICT into their teaching with confidence. A wide range of technical support and professional development will allow educators to incorporate ICT into all aspects of their practice.

Goal 3 – Access to Tools and Resources:

Learners, educators, administrators, and support staff will have equitable access to the tools (e.g., computers and other technology) and resources (e.g., training, software) they need to achieve *learning outcomes* and to make our education system more efficient. (*Learning outcomes* are expectations for student achievement that are set out in the provincial curriculum.)

Goal 4 – Research and Development in ICT-Enhanced Education:

Ontario will build on its reputation for first-class research to become a world leader in research and development in *ICT-enhanced education*. (*ICT-enhanced education* refers to the use of information and communication technologies to achieve teaching and learning objectives)

Goal 5 – Education-Business

Partnerships: Across the province, educational institutions will form mutually beneficial partnerships with both large and small businesses. Public-private partnerships will be guided by a set of standards developed jointly by the government, education, and business sectors.

Goal 6 – Transformation of Education

Relationships: Information and communication technologies will transform communication among learners, educators, businesses, and community members across the province, and will enable these education partners to collaborate in making the goal of lifelong learning a reality for all Ontarians.

These goals are discussed in more detail in the next section.

3. OKNL s Strategy for ICT in Education

Two major forces are changing the face of education in Ontario. First, the goals of education have shifted to focus on the success of all learners. Second, technology is bringing radical changes to the way we work and communicate with one another. An effective strategy for the integration of information and communication technologies will allow us to combine these two forces. The widespread integration of new technologies in education will help us ensure that all learners reach high standards of achievement.

In this section, we discuss the six goals, outlined in the previous section, that comprise our strategy for incorporating ICT in education. Each goal is directed at improving achievement levels in all three stages of the learning continuum: elementary and secondary education, postsecondary education and training, and the ongoing “lifelong learning” that takes place after individuals have left the traditional education system and entered the workforce.

Many factors will contribute to the successful integration of technology in the

classroom. However, it is clear from our consultations with over a thousand stakeholders in the past year that the province’s success will depend on taking action to realize these six key goals: ensuring broad access to ICT-enhanced education, providing appropriate support for educators, ensuring broad access to tools and resources, establishing Ontario as a world leader in research and development in ICT-enhanced education, developing education-business partnerships, and transforming relationships and communication among all members of our education community.

As we begin to implement our strategy and evaluate our progress, we will learn from the existing and emerging best practices of Ontario’s schools, colleges, universities, and training centres. We will also study the experiences of other Canadian and international jurisdictions. However, it is clear that our success will be built upon the solid foundation of Ontario’s present world-class education system and the innovation of our education partners across the province.

Goal 1: Access to ICT-Enhanced Education

Collaborative Composing Via the Web

Composers in Electronic Residence (CIER) is an exciting program facilitated by York University's Faculty of Education (<http://www.edu.yorku.ca/CIER/>). Music students throughout Canada and across the world send their own compositions electronically (as MIDI files) to an on-line conference site. Composers, teachers, and other students can then listen to these works, and the creative collaboration begins: Lively on-line discussions and workshopping of musical compositions take place, leading to an enhanced learning experience for all students involved.

Learners will be engaged in high-quality education and training programs that are enhanced by information and communication technologies, and they will acquire the range of knowledge and skills they will need to be competitive in a knowledge-based global economy.

We are on the verge of a learning revolution. Rapid advances in technology have already transformed the workplace and Ontarians, who are better informed than ever before, expect a similarly rapid response from educational institutions to the changes in their learning needs. To ensure that all learners are able to succeed and to compete with the best in the world, we must equip them with technological literacy for the future. The first steps toward this critical goal will include developing new learner expectations; enhancing the curriculum for all subject areas in schools, colleges, universities, and training centres; and developing ways to assess students' learning in the area of information and communication technologies.

New Learner Expectations

Information and communication technologies can – when their use is integrated in high-quality programs – enrich the educational experience for both learners and educators. Access to technological tools in the classroom – such as the Internet and e-mail teleconferencing and word processing and learning software resources on CD-R adaptive technology learning needs – in information and education educators to communicate with their peers in even other countries learners become skilled current and emergi

Canada's SchoolNet GrassRoots Program

Canada's SchoolNet (<http://www.schoolnet.ca>) is a federal government program that champions lifelong learning and the creation of world-class education resources through ICT and partnerships. SchoolNet leads the GrassRoots program, which funds innovative Internet projects undertaken by schools across Canada. This funding provides the kick start many classes need to acquire the technology or training necessary to develop Web projects

need to establish new learning expectations that will foster achievement in *information and technological literacy*.

Information literacy includes the ability to locate, critically evaluate, choose, apply, create, and communicate relevant information. These skills apply to all forms of literacy: the abilities to read, write, speak, and listen; and to access, use, and create all forms of content using conventional media (e.g., print or video) and digital media (e.g., digital video or hypertext on the Internet). Information literacy also includes numeracy – the ability to understand and solve problems that involve data and numbers.

Technological literacy is a crucial element of information literacy. It involves understanding the different types of technology and how to use each of them (e.g., conducting on-line research, using e-mail and other forms of telecommunications, choosing appropriate software to complete different tasks, and participating effectively in a video conference). Technological literacy is not an end in itself, but is increasingly an essential tool for success in all subjects of the curriculum, in preparing for the workplace, and in lifelong learning.

In addition to the mastery of information and technological skills, the new century demands new ways of learning that focus on the development of higher-order thinking skills. To ensure that our students become capable lifelong learners we must ensure that, from a very early age, they begin to develop skills in creative and critical thinking, problem solving, and decision making.

The success of students and adult learners in the 21st century will also depend on their ability to learn and work both independently and collaboratively. The workplace is becoming too complex for any one person in an organization to know everything. Many innovative, top-performing companies emphasize the

importance of teamwork. They succeed because they capitalize on the knowledge and skills of *all* their employees. While learners must be able to process and synthesize information independently, Ontario also needs citizens who can work effectively and with confidence in collaborative teams – our future success depends on our ability to learn and work together.

Enhancing the Curriculum

The integration of information and communication technologies in education will open a world of new skills and new ways of learning to the people of Ontario. But a real transformation of our learning environments will take place only when these technologies move from the periphery of learning to the centre. It is possible to install the necessary hardware, provide high-speed province-wide access to computer networks and the Internet, and even develop basic technological literacy in educators and students – and still fail to

actually improve learning.⁴ To ensure that Ontario does not fall into this trap, we must integrate technology and *digital content* into courses and training programs in ways that inspire creative and engaging learning opportunities (*digital content* refers to software, Web sites, and other content such as video, that is designed for instruction).

In our consultations with a wide range of education partners, we heard that while ICT can enhance traditional learning, it is not on its own a panacea that guarantees excellence in learning. How then do we ensure that the integration of technology leads to high achievement throughout the learning continuum? A large body of research points the way to success by showing how numerous powerful models of learning can be enhanced by the integration of new technologies.⁵ These models fall into four major categories, which are outlined in “Four Major Models of Learning,” below (in practice, more than one of these models will be combined at the same time in classrooms).

Four Major Models of Learning

1. In **traditional instruction**, a group of students or adult learners focuses on the educator, who leads the learning.

ICT enhances this approach by making high-quality digital content, the Internet, and other communication tools more readily accessible; improving the quality and impact of learning materials; and incorporating digital learning tools (such as word processors, spreadsheets, e-mail, and audio-visual equipment).

2. **Inquiry and problem-solving models** begin with a provocative question or challenge. Students acquire and analyze information to determine an answer, which they present to others for comments and revision.

ICT enhances the inquiry process by expanding access to relevant information in sources such as the Internet or computer simulations, by providing analytical tools, and by providing access to computer networks to enable communication with an audience beyond the classroom. (Computer networks are of two types: local-area networks consist of servers and workstations typically located in a single site, while wide-area networks consist of many interconnected sites — such as schools connected to each other and to the board office.)

3. **Collaborative project-based learning** engages students as a team to complete a learning project designed to lead to the attainment of learning outcomes set in the provincial curriculum.

Four Major Models of Learning

ICT enhances collaborative learning by making more information and resources available, and allows students to interact and share their work with others anywhere, at any time, through e-mail, conferencing, and sharing multimedia files. It also provides powerful tools for analyzing and integrating information, and for presenting results through multimedia formats.

4. Independent learning allows students to control the pace and scope of their learning as they freely seek information that interests them and stimulates them to continue learning.

Through digital networks, ICT makes more information available to learners and allows them to get peer feedback and on-line instructional help from anywhere in the world, at any time. It increases the learners' flexibility and control over the learning process, while providing tools for accessing and analyzing information and presenting their work at any stage to others.

Mobile Computing at Sheridan College

Students in the new Mobile Computing program at Sheridan College in Oakville (<http://www.sheridanc.ca/academic/mobile/>) can study anywhere and at any time, while developing the computer skills they will need in today's workforce. Students who enter the program are provided with laptop computers and access to a wide variety of computer-based research and courseware materials. Lessons are designed to incorporate the benefits of computer learning, such as enhanced opportunities for calculation, visualization, and communication. Learning tools include collaborative on-line work groups, Web-based research, and subject-area chat rooms. Course schedules, tests, assignments, and a variety of learning materials are available on-line. The classrooms are equipped with features that optimize ICT-enhanced learning, such as specialized furniture, large whiteboards, and overhead projection systems.

It is important to remember that traditional learning environments are enhanced, not replaced, by technology and digital content. The integration of technology in the classroom does not supersede face-to-face models of learning, but rather gives students and educators access to a broader range of learning options. The variety of technology and digital content includes:

- *computer-based learning* (learning through computer programs that may or may not be part of an institutional network)
- *on-line learning* (learning where content such as activities and reference materials is accessed not only through a network but also via the Internet)
- *e-learning* (learning where content is accessed via a broad range of electronic media that includes not only the Internet but also audio and video, CD-ROMs, and other software)
- *distance learning* (which incorporates not only e-learning but also other, non-electronic, resources such as books).

By combining the best features of these options with the proven strengths of classroom-based instruction, our education system will provide more flexible, higher-quality learning environments. This will enable the introduction of powerful new approaches to teaching and learning that increase the achievement of provincial learning standards throughout Ontario.

Appendix D illustrates the range of options for integrating ICT in learning in schools, colleges and universities, training centres, the workplace, and the community. Our goal is to ensure that students and adult learners across the province have an ever-expanding range of options for accessing instructional tools and content at any time (including outside of the traditional school/work day) and anywhere (in classrooms, libraries, training centres, or at home; and not just in cities and towns, but also in rural and remote areas).

Assessment, Improvement, and Accountability

Recent reforms in Ontario have made it easier to measure how well our students are doing, by enabling the comparison of their achievement with classroom, school, school board, and provincial standards for learning. In addition, student achievement data allows us to understand the strengths and weaknesses of our education system and to plan for improvement – our ability to accurately measure how well our students are doing today provides a guide to what we must do tomorrow.

However, as Ontario implements its plans to integrate information and communication technologies in education, it will be important to develop new tools to assess student achievement and the effectiveness of programs. In a recent

document outlining its ICT strategy, the United States Department of Education reported that “emerging research suggests that traditional paper-and-pencil assessments may no longer accurately capture the learning of 21st century students.”⁶ In contrast, assessment tools that integrate ICT can make truly individualized and *real-time student assessment* possible and can enhance our ability to use assessment to foster continuous improvement. (*Real-time assessment* refers to activities – such as a quiz delivered via CD-ROM or a Web site – in which the assessment is attached directly to the activity, providing the learner and educator with immediate feedback on the learner’s mastery of the task). Such tools will ensure that we always have answers to the questions, “Are we improving student learning?” and “Are we achieving our goals?”

As with all methods of assessment, the quality of ICT-enhanced assessment will depend on what we assess; how educators, administrators, and parents interpret the results; and how we use the results to plan for improvement. All education partners will need to collaborate in developing new approaches to student assessment.

The integration of ICT will profoundly change education in Ontario. We will need an *accountability framework* to guide ongoing evaluations as we set in place our technology plan in learning institutions across the province. (An *accountability framework* includes, among other things, a clear set of expectations [e.g., student outcomes] and definitions of who is responsible for what and to whom they are responsible.) Such a mechanism will ensure the ready availability of information about the achievement of our students and the strengths and weaknesses of our system, and so will help the public understand the impact of the technological revolution on educational institutions across the province. It will allow the various partners in education to document and respond to challenges and share information about successful initiatives and best practices, and will guide both local and system-wide improvements for the future. The aim of an accountability framework will be to evaluate and communicate how well we are achieving provincial goals for the integration of ICT in learning, and how well these goals are aligned with local initiatives and provincial standards for learning.

Goal 1 — Access to ICT-Enhanced Education

OKNL s priorities will be to:

- implement strategies to support the integration of information and communication technologies in instruction and assessment in all schools, colleges, and universities of our publicly funded education system
 - work with the ministries to modify provincial learning outcomes, curricula, and programs to ensure that students and adult learners:
 - acquire and use information and technological literacy skills
 - use technological skills to explore, inquire, ask pertinent questions, and solve problems through the use of audio-visual tools, instructional software, the Internet, and communication tools such as e-mail
 - learn both independently and with others and demonstrate collaborative skills
 - develop skills for lifelong learning
 - consult with a wide range of representatives in the elementary, secondary, and postsecondary education sectors to articulate a clear set of goals and standards for the integration of digital content in courses and training programs
 - facilitate the development and delivery of a full range of internationally competitive on-line courses in each sector of the education system
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Goal 1 — Access to ICT-Enhanced Education

- help school boards, postsecondary institutions, and business partners develop ICT-enhanced programs that help students make the transition from school to work or postsecondary learning
 - work with the Education Quality and Accountability Office and the Ministry of Education to develop and introduce ICT-enhanced assessment into provincial student assessment programs. In addition to province-wide assessments, ICT-enhanced assessment will include the capacity for individual assessments that allow students and adult learners to compare their progress against appropriate benchmarks
 - help schools and school boards develop improvement plans that include targets for the improvement of students' learning and their competencies with ICT
 - develop program evaluation strategies as part of an accountability framework, to allow the ministries to measure the progress of publicly funded schools, colleges, and universities in achieving our six goals for the integration of ICT in education. The evaluations will provide education partners with accurate and timely information on how educational institutions are progressing. The findings will be used to document best practices and to address any challenges that arise along the way.
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Goal 2: Support for Educators

ICT Resources for Teachers

Learning Disability Resource Community:

Still under development, the Learning Disability Resource Community (LDRC) is a virtual resource and meeting place for educators, learners, and parents whose lives are touched by learning disabilities. Information, research, training, and on-line instruction will be available through this Web site (<http://www.ldcommunity.org>).

In-school technology training:

Training is essential to ICT success. At Westcreek Public School in Pickering (http://www.durham.edu.on.ca/s_links/schools/westcreek/index.html), teachers meet every second week for technology-focused professional development. School staff teach each other new skills and share ideas on integrating ICT into classroom learning.

ICT Support for university faculty:

As universities work to keep pace with the needs of 21st-century learners, many faculty members need additional support to incorporate technology into their teaching and research. York University has established the Office of Technology Enhanced Learning (<http://www.yorku.ca/otel>) to provide training and technical support to faculty, as well as to serve as a research network for technology-related projects.

Educators will have the knowledge and skills they need to integrate ICT into their teaching with confidence. A wide range of technical support and professional development will allow educators to incorporate ICT into all aspects of their practice.

The increasingly central role of technology in education creates unique opportunities for educators. Our success in integrating ICT throughout Ontario's education system will depend in large part on our ability to change educators' professional practice. It will require many educators to adopt entirely new roles, relationships, and teaching strategies in the classroom. Such a significant change means we need to create a supportive environment for educators, while also promoting initiative, risk-taking, and professional collaboration.

It is important to remember that technology is already being used to good effect in the classroom. Many educators, either on their own initiative or with the support of their institutions and professional associations, have for years been acting on their understanding that ICT can improve learning and increase motivation in traditional classroom settings. These same educators understand that the full integration of ICT will transform all educational institutions.

It will take time to bring about all the changes to learning and teaching that we expect to see in an ICT-rich learning environment. The ultimate aim of this process (as we discussed under Goal 1) is to increasingly enhance education and training with ICT to achieve provincial and local learning outcomes. For educators to effectively use all the technological options that will be made available through the integration of ICT in learning, they will need to have mastered the use of ICT themselves, and to thereby understand its potential.

To bring about a significant change in teachers' practice will require changes to the curriculum and to methods of assessment, and an increase in ICT resources and technical and professional support. Such a change will require each level of Ontario's education system – provincial, local, institutional, and departmental – to align its policies and practices with those of the other levels. Then OKNL, in partnership with school boards, colleges, universities, and other partners such as business leaders, can take coordinated action to ensure that educators and educational leaders have access to high-quality professional development opportunities. This will be crucial if they are to acquire the new knowledge and skills they will need to effectively integrate ICT in education across the province.

Professional Development

Educators need instruction – whether face-to-face or on-line – in using information and communication technologies in their planning and teaching. In order to support the effective integration of ICT in learning, professional development must focus on student achievement. It must help educators understand and embrace an expanded definition of teaching practice, and give them the skills they will need to apply such practice. Professional development must emphasize not only an understanding of the teaching practices appropriate for ICT-enhanced learning, but also learners' use of ICT and the management of learning with ICT (e.g., ICT-enhanced assessment). It must also help educators to understand and use adaptive technologies with confidence to ensure that all learning environments are inclusive. Finally, it should help educators learn how to use ICT to connect with the larger community of educators (for example, through on-line discussion

ogy in classroom presentations. The site also links to lesson plans and class activities, to information on early-morning programming that can be used in the classroom or for professional development, and to resources for teachers of French as a Second Language.

SchoolNet s on-line educators forums:

Educators across Canada can connect through on-line conferences to discuss various education issues, and share knowledge and expertise (<http://www.schoolnet.ca>).

Teaching and Learning with Technology:

Teaching and Learning with Technology (<http://www.tlt.ab.ca>) is an Alberta-based project that provides guidance and professional development resources to teachers who are integrating technology into their classroom teaching. Examples of resources include e-mentors and on-line tutorials.

CBC teacher resource:

CBC4kids (<http://cbc4kids.ca/teachers/>) includes an on-line resource for teachers who want to learn how to use the Internet and World-Wide Web for classroom teaching. The site includes lesson plans in many subject areas, with suggested lesson strategies for using the Internet.

groups). Our goal is to create a range of professional learning opportunities and to create the tools that will allow educators to support each other as they develop technological skills and build and share instructional resources.

Researchers have found that educators move through several stages as they gain confidence in integrating technology into students' learning. Progress through these stages is smoothest when the training includes not only independent learning but also collaborative learning, in which educators have an opportunity to communicate with their peers who are learning about ICT and others who have extensive experience with technology. In addition, experiences in other jurisdictions have shown that professional development is most effective when it provides educators with a model for the types of learning experiences that we intend them to provide to Ontario's students and adult learners.⁷

As we set out to develop a provincial strategy for professional development, we need to recognize the differing needs of elementary and secondary schools, colleges, universities, and training centres, as well as the varying technological priorities of different regions of the province. Therefore we will need to gather input from representatives of each sector and all regions to ensure that all educators are provided with appropriate opportunities for learning. A first step will be for faculties of education, professional associations, school boards, colleges, and

universities to evaluate the types of professional development currently available to new and practising educators. The purpose of these evaluations will be to develop standards of practice for the use of ICT in education. Once standards have been set, all sectors, with help from the ministries, will need to change or augment their professional development programs to ensure that educators have access to high-quality programs. Only with such professional development will educators be able to ensure that all Ontario's learners are provided with appropriate opportunities for ICT-enhanced learning.

Leadership Development

The capacity for educational institutions to effectively integrate ICT in education will also require consistent leadership by senior staff and board members. Each institution will need to respond to Ontario's plan for integrating ICT in education, by establishing a long-term vision of learning and teaching for the 21st century. Senior *administrative leaders* – including directors of education, supervisory officers, deans, and department chairs – and elected board members such as trustees will need professional development to allow them to develop and implement an effective vision of ICT-enhanced education.

Table 1: Leadership Skills for ICT in Education

Education system leaders in both administrative/governance and educational roles who are responsible for the integration of information and communication technology must:

- develop a shared vision about how ICT will change teaching and learning practices
 - understand the use of ICT by learners, the management of learning with ICT (e.g., ICT-enhanced assessment), the teaching practices appropriate for ICT-enhanced learning, and the skills of professional collaboration
 - align instruction and resources throughout each learning institution to support change
 - ensure that change is consistent throughout the organization
 - support educators as they move through the various stages of transforming their practice
 - manage relationships with both public- and private-sector partners (e.g., senior school board staff, private-sector technical support services) so that educators receive the support and professional development they need.
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Supporting ICT Leadership in Schools

School administrators need training and support to become ICT champions, or leaders, in their schools. The School Administrators Technology Integration Resource (SATIR) is a non-profit on-line resource for principals and vice-principals. SATIR, which is based in Alberta, provides a bilingual clearing house for free, high-quality ICT leadership resources, which are easily searchable and accessible through its Web site (<http://www.satir-ritas.org>).

The *educational leaders* of elementary and secondary schools, colleges and universities, and training centres will also play a critical role in the integration of technology in the classroom. Principals and department heads in the elementary and secondary sector, and departmental chairs in colleges and universities, need to think about the meaning of ICT for their organizations, and to establish ways of using technology to transform learning and teaching. To effectively carry out these roles, educational leaders in each sector of our education system will – like administrative leaders and educators – require support and ongoing training.

Now is the time to introduce new expectations for administrative and educational leaders. Hiring criteria should be expanded to include a list of ICT competencies and the ministries should encourage those who provide leadership training in the elementary/secondary, college, university, and training sectors to add ICT competencies to their programs, and to develop on-line independent and collaborative study modules for their members.

Goal 2 — Support for Educators

OKNL's priorities will be to:

- develop a description of the goals, standards, and practices for ICT in each sector of Ontario's education system and distribute this information to all education partners
 - consult with the Ontario College of Teachers, faculties of education, school boards, and representatives of teaching federations to develop a range of professional development activities that are based on clear standards of practice and that model effective strategies for integrating ICT in instruction and assessment
 - publish a collection of innovative teaching and assessment strategies for the integration of ICT in learning, and distribute them to educational institutions and professional associations to help leaders and educators plan for change
 - consult with the Ontario College of Teachers and faculties of education to establish standards for ICT competency for pre-service teachers
 - work with members of Ontario's Teacher Testing Program to ensure that the training, recertification, and testing of elementary and secondary teachers will include opportunities for teachers to demonstrate their practice in relation to standards for the integration of ICT into students' learning and its assessment
 - ensure that on-line programs and professional development opportunities are combined with learning opportunities provided by in-school *integration educators* in elementary and secondary schools (*integration educators* are designated teachers within a school who receive specialized training in the integration of ICT into students' learning and provide ongoing professional development and assistance to teaching staff)
 - support the continuation of Centres for Excellence in Teaching with Technology in postsecondary institutions and, where required, support the creation of new centres, to design professional development programs for new university and college educators
 - work with associations representing directors of education, trustees, supervisory officers, and deans of colleges and universities to facilitate the creation and delivery of specialized leadership development and professional support tools that will help leaders of educational institutions plan for and develop the integration of ICT
 - work with representatives of Ontario's principal and supervisory officer associations to add ICT requirements to principals' (OPC, OCPC) courses and supervisory officers' (OASBO) courses
 - work with the ministries to ensure that three to five days of training on planning for, and evaluating the effectiveness of, ICT integration will be provided to principals, supervisory officers, college and university department heads, and board members over a three-year period
 - facilitate the expansion of centres for educator and leadership development — such as the Ottawa Centre for Research and Innovation (OCRI) and Project North — to provide quality on-line and classroom-based programs across the province.
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Goal 3: Access to Tools and Resources

Innovative Distance Education and Training Programs

Education and training for remote communities:

In many small and remote communities, computer networking can be difficult and many homes are not connected to the Internet. Contact North (<http://www.cnorth.edu.on.ca>) comprises 145 distance education and training access centres located throughout Northern Ontario and beyond. The centres provide access to education and training, via audio- and video-conferencing and the Internet, to residents of small and remote communities. Contact North partners with local schools and postsecondary institutions, and with other educational organizations such as TVOntario.

Learners, educators, administrators, and support staff will have equitable access to the tools (e.g., computers and other technology) and resources (e.g., training, software) they need to achieve learning outcomes and to make our education system more efficient.

The provincial and federal governments, as well as individual educational institutions, have already made substantial investments in Ontario's ICT infrastructure. (An *ICT infrastructure* refers to the technological tools such as computers, printers, and networks that will underpin the integration of ICT-enhanced education, and also to such elements as technical support and professional development.) Over the past six years, for instance, the number of computers in our classrooms and access to the Internet have increased steadily. However, it is also true that some educational institutions – especially many of our elementary and secondary schools – are using outdated computers and have little or no Internet access. Technology-rich educational institutions, in which the integration of ICT is possible, are still not the norm across the province. The future success of our students and adult learners demands that OKNL continue to work in partnership with both public- and private-sector partners to build an infrastructure for equitable access to ICT. Equitable access to these tools and resources in every sector of our education system will expand the resources for teaching and learning, enhance the variety of learning options, improve c

Achieving the goal ICT will require O comprehensive inf hardware (e.g., cor networks), softwar upgraded facilities electrical supply at networks), and an support services (e

Internet skills training for northern youth with disabilities: Youth with disabilities in northern and remote parts of Canada have special distance learning needs. To meet these needs, Cambrian College of Applied Arts and Technology in Sudbury (<http://www.cambrianc.on.ca>) has partnered with the Easter Seal Society, the Ontario Trillium Foundation, and Canada's Office of Learning Technologies (part of Human Resources Development Canada). The partnership has established an ICT-enhanced school-to-work

will also require educators and administrators to understand that accessibility entails more than simple access to computer hardware and software. To ensure equal access we must consider the needs of learners with disabilities as we make decisions about infrastructure standards. An effective infrastructure will mean that everyone, from students to administrators, in our education system will be able to use computers linked to networks (including the Internet) through fast and reliable connections that allow them to access rich digital content and tools for learning or working. It will also mean that educators and administrators can get the help they need, when they need it, through access to technical support staff and on-line support services.

Tools for Learning and Teaching

The decisions we make about ICT tools and resources must be guided by the educational goals of learners. For example, it will be important to develop a set of province-wide standards for the computers and other hardware, software, and training that are the components of ICT in the classroom. No matter where or when our students are learning, the technological tools and resources they use to achieve their goals must be compatible. Such standards will guarantee consistency in learning opportunities and ensure that all our investments in ICT are sound. It will be equally important to ensure that the standardization of tools serves to *increase* the potential for flexibility and creativity in the classroom, rather than to impede it by imposing a single solution that works in some cases but not all.

Setting standards for an effective ICT infrastructure requires us to ask many questions. The first question – even before such questions as “How many computers?” – is: How will we use ICT to enhance learning? If our answer to this

question results in a vision of learning that includes students and adult learners using ICT in all subjects at any time, then we will need to develop a long-term strategy to invest in high-quality hardware and software, the modernization of facilities, and technical and learning support. We must also ensure that in planning our future ICT infrastructure, we do not compromise the investments that have been made to date – our goal is build on and enhance the current tools and resources, rather than to create new standards that make past investments obsolete.

The development of our ICT infrastructure will require careful planning, including input from both private- and public-sector partners. It will also need to transcend a narrow focus on the number of computers available to learners to encompass factors such as:

- the current competencies and needs of students and adult learners, and of educators, staff, and administrators
- the types of technology available in classrooms, learning labs, and administrative offices
- the quality of educational institutions' high-speed connections to computer networks and the Internet
- the availability of training and technical support
- the availability of on-line technical and learner support services
- existing levels of community access

- options for who will deliver instructional content, on-line courses, and on-line professional development
- privacy standards required for networked applications (e.g., accounting or student information systems) and on-line documents.

Each of these factors will have an impact on standards and timelines for implementing an effective ICT infrastructure, as well as on Ontario's overall vision for education in the 21st century. By developing standards for each of these parameters, we can achieve a sustainable strategy for investment in hardware, software, facility renewal, and support services. In doing so, we will ensure equitable access to ICT for learners in educational institutions and communities across the province.

Digital Resources for Learning and Teaching

The key to gaining the maximum benefit from ICT is easy access to high-quality digital content. Digital content comes in many forms (see Table 2). Learners can, for example, access subject-specific information through the Internet or complete a course from start to finish on CD-ROM. For teachers, digital content may take the form of on-line lesson plans or training opportunities. While teachers will continue to use many non-digital resources to stimulate learners, the new technologies allow both students and educators to be producers as well as consumers of information on a much greater scale than before.

Innovative Digital Learning Resources

Healthcare training: A school of nursing in Indianapolis, USA, has developed an interactive, multimedia CD-ROM to help teach undergraduate health professionals to administer medication.

Nature and Wildlife Online Field Guide: A project of eNature.com, this on-line field guide contains information, audio clips (bird songs and calls), discussion groups, and images of North American nature and wildlife (<http://www.eNature.com>).

Table 2: Types of Digital Content

Content

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<p>Instructional Content</p> <p>Primary Sources</p> <ul style="list-style-type: none"> Multimedia clips Streamed video Museum collections Library collections Diaries Letters Government records Speeches <p>Secondary sources</p> <ul style="list-style-type: none"> Textbooks Reference works Data files Periodicals Three Dimensional Maps Databases 	<p>Teacher Preparation Materials</p> <ul style="list-style-type: none"> Units or lessons Projects Tutorials Activities Professional training modules <p>Student Products</p> <ul style="list-style-type: none"> Desktop movies Student projects Art Music Drama Collaborations <p>Other</p> <ul style="list-style-type: none"> Contests Games Themes Awards
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Tools

<ul style="list-style-type: none"> Word processors Presentation software Web page design software Calendar makers Spreadsheets Card makers Drawing programs 	<ul style="list-style-type: none"> Layout and design software Calculators Search engines Lesson plan templates Geographical information systems Digital cameras Personal digital assistants
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Communications

<ul style="list-style-type: none"> E-mail Chat rooms Bulletin boards Video conferencing 	<ul style="list-style-type: none"> Synchronous discussion Webcasts Streaming media Threaded discussions
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Canadian Digital Content for Learners

Canada's Digital

Collections: From the Canada's Digital Collections Web site (<http://collections.ic.gc.ca>), learners can link to more than 400 sites that celebrate Canada's history, geography, and culture and its achievements in science and technology. On-line education resources, such as curriculum units and classroom activities, are also available.

Canadian Virtual War

Memorial: This multi-media database contains records on the 116,000 Canadians and Newfoundlanders who have died in war service since Confederation. The public can submit digital images and memorabilia about these Canadians via the Web site (<http://www.virtualmemorial.gc.ca>). The site allows Canadians of all ages to learn from one another and to build a dynamic Canada-wide Web site from the grassroots up.

With the recent explosion in the availability of digital content, the success of education systems is increasingly measured by the quality of learners' access to digital resources and tools. The experience of other jurisdictions tells us that education systems that use high-quality ICT resources for knowledge-building through lifelong learning will become world leaders in today's "knowledge economy." Therefore education systems, including Ontario, must ask themselves: Do the resources include high-quality content that is designed and selected according to exacting standards? Do learners have access to the cutting-edge tools they need

to retrieve and use content in innovative ways? Are the tools and resources designed to ensure access by as many groups of learners as possible (e.g., Francophone and International Language learners, learners with disabilities)?

Ontario is already in a strong position. Hundreds of commercially developed learning titles (including learning software) are currently in use in our educational institutions. In addition, many postsecondary institutions are beginning to develop digital learning products both for internal use and for sale to wider markets. And distance learning in Ontario is being transformed as the ministries work with

public- and private-sector partners to develop innovative on-line courses that will enhance learning options.

Ontario is strongly positioned in other, complementary, areas, too. Our province has a wide variety of institutions – in addition to schools, colleges, universities, and training centres – through which our citizens can pursue lifelong learning. A huge inventory of learning resources can be found in our museums, art organizations, and government agencies, as well as in the private sector. Ontario is rich in creative talent and cultural resources, and is an important centre for the multimedia industry.

With all these assets, Ontario has the potential to be a world leader in the movement toward ICT-enhanced learning. As a bilingual and multicultural society, we are well positioned to provide ICT products and services to countries around the world. By building partnerships among institutions, we can seize the opportunity to establish Ontario as a world-class provider of tools and resources for the new, knowledge-based global economy.

Nonetheless, at present, access to quality digital content – like access to the *tools* of technology – is still uneven across the province. It is also true that Ontario’s education system has yet to capitalize on the full range of options that are available for students, adult learners, educators, and other education partners to access and use digital content. The options include:

- content and practice tools for teachers
- teacher information
- on-line curriculum
- business information for parents, and community information centres
- general information reports and publications
- information on colleges, universities, and training and community information centres
- individual classroom and course information

Cyber Camp: In Pic Mobert First Nation, workers with the First Nations Community Access Program ran a successful Cyber Camp, at which almost a third of the community was registered. (<http://cap.ic.gc.ca>)

- home-school communication (e.g., e-mail, discussion groups)
- digital library
- on-line courses.

The continuing development of high-quality digital content will require the formation of effective partnerships that include educational institutions, libraries and other cultural organizations, and other public- and private-sector partners. It will also require the development of accessibility standards consistent with the W3C, IMS, and Canadian “Common Look and Feel” guidelines⁸ The goal will be to draw on the expertise of all partners – to combine, for example, the research capacities of educational institutions with the resources of the private sector.

Building Communities

The ability of educational institutions to thrive – even to survive – can depend on their ability to adapt quickly to the rapidly changing realities of today’s global knowledge economy. This means that Ontario’s schools, colleges, universities, and training centres must reinvent themselves as a highly adaptable set of interdependent institutions that work together to maximize resources and capitalize on the momentum for change that can be spurred by collaboration. In such a flexible system, the learning continuum from the early years to lifelong learning will become seamless, allowing students and adult learners to find the pathways for learning that match their education and career goals throughout their lives.

As our educational institutions collaborate with one another to create a seamless learning system, they must keep in mind that learning is no longer the sole domain of the formal educational system. The people of Ontario will continue to learn throughout their lives as part of their jobs and in the community. For example, an initiative led by the federal government has resulted in the creation of Community Access Centres (CACs) across the country. Located in schools and

ICT in the Community
Community Access Centres: A network of 16 Community Access Centres is located in libraries across Oxford County (<http://cap.ic.gc.ca/english/3401.shtml>). Anyone in the county can check on their taxes, access government forms and services, take high school or post-secondary courses, or tap into community programs — without being put on hold or driving across the county. The centres also offer computer training and information on employment and careers, business and entrepreneurship, and health promotion.

community centres, CACs are equipped with technology labs for training and for community use. As well as improving access to technology and learning services, CACs promote the value of lifelong learning and enrich whole

communities through community and economic development projects that link schools, businesses, and social or cultural service agencies.

Goal 3 — Access to Tools and Resources

OKNL s priorities will be to:

- develop an ICT infrastructure plan to ensure that both students and educators across Ontario have equitable access to quality educational hardware, software, and support services
 - develop a partnership among representatives of public and private bodies to collect data on the current state of Ontario s ICT infrastructure and to set targets for future infrastructure development
 - bring together research and subject specialists in each of the education sectors, along with other private- and public-sector partners, to develop standards and instructional models for digital content in learning. Standards will ensure that ICT tools and resources are evaluated on criteria such as educational value, cost-effectiveness, barrier-free design, and the breadth and consistency of technical and learning support
 - facilitate the creation of a consortium of private- and public-sector partners to design advanced Web-based learning tools, assessment tools, and support systems (such as support for educators)
 - give educators incentives, and facilitate the creation and delivery of specialized courses, to encourage the development of innovative learning tools and resources
 - oversee the development of a provincial e-learning system that will include an extensive menu of digital content (e.g., digital libraries), instructional software databases, and on-line services (e.g. technical services and professional development)
 - provide incentives to public- and private-sector organizations to encourage the development of digital content and learning tools for learners with special needs and for culturally diverse communities
 - explore the most effective strategies for distributing digital content and tools via the World-Wide Web to ensure that Ontario s students and adult learners have access to seamless learning opportunities in high-quality and secure digital environments
 - develop a network of community learning centres in existing schools, colleges, and universities (modelled on existing Community Access Centres) to provide learners of all ages with access to ICT-enhanced learning services and communications.
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Goal 4: Research and Development in ICT-Enhanced Education

Centre for the Study of Computers in Education

This centre, located at York University, is Canada's only formal university-based centre focusing on research related to the use of computers in teaching (<http://www.edu.yorku.ca/csce>). The centre partners with schools, government, and industry to provide collaborative, multi-disciplinary approaches to research problems. One recent project is the Hands On IT project, which aims to bring computer technology and new teaching methods into the classroom. Hands On IT was operated in collaboration with The Learning Partnership and school boards in the Greater Toronto Area, with support from the Ministry of Education and the private sector.

Ontario will build on its reputation for first-class research to become a world leader in research and development in ICT-enhanced education.

Through initiatives such as the Ontario Research and Development Fund and university "centres of excellence," the Ontario government is investing in a high-performance university research environment.⁹ The Communications and Information Technology Ontario Centre of Excellence – an organization devoted to building university and industry partnerships to strengthen the performance of ICT industries – is one of the many innovative outcomes of our government's commitment to making Ontario a major economic player in the 21st century. These existing research initiatives will provide an excellent foundation for Ontario to build on, and will allow the province to focus more directly on research that supports the effective integration of information and communication technologies in education. In the words of the Research and Technology group of the Ministry of Energy, Science and Technology, "Innovation is the key to future economic success, and research and development is the vehicle that will get us there."¹⁰

To ensure that the potential of these present ventures is realized, the Ontario government – through various ministries – will need to make a concerted effort to continue its support of collaborative research and development initiatives focused on enhancing the province's ability to meet its goals for education. An ongoing program of quality research will increase our understanding of the benefits for students and will increase our understanding of the tools and new opportunities required for the effective use of ICT and will lead to the development of new tools and new opportunities for development.

TeleLearning Network of Centres of Excellence

The mission of the TeleLearning Network of Centres of Excellence (TeleLearning NCE) is to research, develop, and demonstrate effective teaching through distance education; support the development of a knowledge economy and a learning society in Canada; and transfer the resulting knowledge into Canadian organizations, educational institutions, and companies. TeleLearning NCE (<http://www.tellearning.ca>)

Ontario's research efforts must be substantial and long-term, and must focus not only on the development of digital learning resources but also on a larger picture that includes learning expectations, assessment practices, new relationships between educators and learners, institutional development, professional development, infrastructure requirements, partnerships, and the potential for ICT to aid community building and improve communications among all education partners. As we discussed under Goal 1, a rigorous research agenda will also help us to understand the impact of ICT on learning and to support success by sharing best practices among educational institutions and other partners (such as parents and community representatives).

A wide-ranging research agenda that focuses foremost on learning and teaching will provide a valuable foundation for:

- the development of new models of learning and teaching that can take advantage of new technologies
- the development of rigorous standards and policies to stimulate and guide the development of quality e-learning products and services
- strategies to help educators and educational leaders understand and implement research findings in the classroom
- innovation, including action research for educators
- assessment and evaluation of research initiatives and results and the provision of feedback for improvement.

The province must fund collaborative research that will address some of the challenges inherent in attempting to implement an initiative of this scope. The experiences of other jurisdictions have taught us that factors such as income, age, race, ethnicity, physical ability, and geography create a "digital divide"

between people who have and those who do not have access to technology and to the skills they need to use it in their everyday lives. And in Ontario, a recent study found that “while generational differences may be waning, those with lower incomes and lesser educational attainments continue to be seriously underrepresented among Internet users. These groups are already disadvantaged in terms of their access to and participation in continuing education; their comparatively low level of Internet use may further reinforce this pattern.”¹¹ In a province as large and diverse as Ontario, we cannot afford to proceed with a vision for ICT in learning without understanding and developing strategies to address the barriers that stand in the way of equitable access for all.

Public demand for the integration of ICT in education is growing rapidly both in Ontario and around the world. Jurisdictions that learn how best to capitalize on the potential of new technologies for learning will have a competitive advantage in the marketing of products and services. Equally important, they will have a better-trained workforce and their citizens will have excellent opportunities for lifelong learning. For these reasons, now is the time for Ontario to further its commitment to becoming a world leader in research and development in the *e-learning industry* (the *e-learning industry* comprises for-profit and not-for-profit organizations that develop and market new tools and software for teaching and administration in schools, colleges, universities, and training centres).

Goal 4 — Research and Development in ICT-Enhanced Education

OKNL s priorities will be to:

- develop a provincial agenda for research in e-learning, and link this initiative with other Canadian and international research initiatives
 - establish a provincial strategy and standards for collaborative research to support the alignment of research among schools, colleges, universities, and training centres
 - fund a series of strategic research projects that will:
 - study the impact of ICT on educators practice and learners achievement
 - increase our understanding of, and develop strategies to address, the digital divide in Ontario
 - identify innovative standards and instructional models for a variety of e-learning environments through collaborative research initiatives, which will include representatives of both public and private sectors
 - ¥ determine how best practices in improving community access to ICT tools and resources can be transferred to other contexts to support lifelong learning throughout Ontario.
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Goal 5: Education-Business Partnerships

Across the province, educational institutions will form mutually beneficial partnerships with both large and small businesses. Public-private partnerships will be guided by a set of standards developed jointly by the government, education, and business sectors.

As we noted earlier, Ontario has a wide variety of institutions – in addition to its schools, colleges, universities, and training centres – that can contribute to its citizens’ lifelong learning. They include public-sector organizations such as libraries and museums. However, for our vision of ICT in learning to become a reality we will also have to look to the role that alliances

with the private sector (including non-profit companies) can play. Small and large businesses, as members of our education communities, have for many years been forging partnerships with educational institutions. With the transformation of societies and economies catalyzed by the technological revolution, such public-private partnerships have emerged as a cornerstone of innovation in science and technology all around the world.¹² The question we must answer, therefore, is: How can we maximize the beneficial effects of education-business partnerships on Ontario’s goals for ICT in lifelong learning?

Characteristics of Beneficial Education-Business Partnerships

In its brief entitled *Ethical Guidelines for Business-Education Partnerships*, the Conference Board of Canada states that Canadian employers and educators support education-business partnerships that:

- enhance the quality and relevance of education for learners
 - mutually benefit all partners
 - treat fairly and equitably all those served by the partnership
 - identify clearly defined roles and responsibilities for all partners
 - provide opportunities for all partners to meet their shared social responsibilities toward education
 - recognize and respect each partner’s expertise, and acknowledge and celebrate each partner’s contributions through appropriate forms of recognition
 - are consistent with the ethics and core values of all partners
 - are based on the clearly defined expectations of all partners
 - are based on shared or aligned objectives that support the goals of the partner organizations
 - allocate resources to complement — not replace — public funding for education
 - measure and evaluate the performance of the partnership to ensure continuous improvement
 - are developed and structured in consultation with all partners
 - involve individual participants on a voluntary basis.¹³
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Girls TV Camp Promotes ICT Career Path

The Women's Television Network (WTN) knows that its future success depends on finding highly skilled ICT employees. In response to this need, WTN has partnered with schools in Manitoba, British Columbia, Ontario, and Nova Scotia to create Girls TV Camps (http://www.wtn.ca/foundation/girls_camp.shtml). Young women who attend these camps receive hands-on technical training and undertake on-line research in ICT and broadcasting topics. A high percentage of the young women go on to pursue similar technical training after school. This successful education-business partnership was the Manitoba winner of the Conference Board of Canada's Industry Canada — CanConnect Award.

In fall 2000, members of OKNL's Learning Environments and Resources working group met with business representatives across the province to discuss the role of education-business partnerships. These consultations revealed a belief among business representatives that such partnerships are essential to Ontario's economic prosperity and the quality of our education system.

Education-business partnerships are not just about private investment or donations to schools and postsecondary institutions. At all levels of our education system, partnerships have the potential to improve learning in two distinct ways: first, they make the knowledge and skills that students and adult learners acquire more relevant to the world of work, and second, they improve the quality of school-to-work transitions for learners of all ages. In short, both small and large businesses can play an important role in shaping our approach to integrating information and communication technologies in learning. In doing so, they will help educational institutions to increase learners' employability, entrepreneurship, career opportunities, and personal fulfillment.

Effective education-business partnerships emerge when all partners have a clear understanding of the goals and benefits of partnering. There is a difference, for instance, between a company simply donating goods and services and that same company working collaboratively with an educational institution to achieve mutually beneficial goals. Therefore, to create a network of effective education-business partnerships that will underpin Ontario's vision of ICT in learning, the education sector must first learn where our goals

align with the goals of businesses of all sizes and in a wide variety of industry sectors and communities.

In Appendix B we list some of the innovative not-for-profit partnerships that are already in place across Ontario, and in Appendix C we provide a table of possible roles that businesses can play as partners to educational institutions. These resources illustrate the many benefits of education-business partnerships:

- Benefits for students and adult learners include access to new skills, expanded resources and tools in classrooms, and opportunities for work experience.
- Educators can benefit through professional development opportunities that help them to master new ICT skills and to make their teaching more relevant to the workplace.
- For business partners, collaboration with educational institutions enhances public relations; raises the company's profile; and increases employees' motivation, learning, and participation in volunteerism.

Education-business partnerships will be a cornerstone for the success of our plan to integrate ICT throughout our education system. Some exemplary partnerships are already in place. Our goal is to build on the lessons learned in these alliances, with the result that education and business partners will have greater opportunities to collaborate on mutually beneficial projects that put students first and help to build a world-class education system and economy in Ontario.

PEBBLES Partnership Links Hospitals and Classrooms

PEBBLES (Providing Education by Bringing Learning Environments to Students) is an exciting education-business partnership that combines video conferencing and robotics to allow students in hospital to take part in activities in their classroom (<http://www.ryerson.ca/pebbles>). The project's goal is to overcome the isolation felt by students in hospital, and to ease their transition back into the classroom. A robot, stationed in the student's home classroom, transmits a live, audio-visual image of the class to the student in hospital. The student can control the movement of the head of the robot to get different views of the classroom. Meanwhile, in class, the teacher and students see a live, audio-visual image of the student's face. PEBBLES is led by Ryerson Polytechnic University, Toronto, in partnership with government, non-profit agencies including the Hospital for Sick Children, Toronto-area schools, individual donors, and private companies.

Goal 5 — Education-Business Partnerships

OKNL's priorities will be to:

- develop incentives and strategies to increase the involvement of business and not-for-profit partners in setting Ontario's strategic directions for ICT in learning.
 - identify effective business strategies that contribute to the development of ICT tools and resources for use in Ontario's educational institutions and for commercial sale, and share these findings with industry groups.
 - work with representatives of the education and business sectors to develop province-wide guidelines that promote the development of mutually beneficial partnerships.
 - work with the Conference Board of Canada and representatives of Ontario's education and business sectors to publish an on-line best-practices idea bank and implement a provincial awards program to celebrate education-business partnerships that support the integration of ICT in learning.
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Goal 6: Transformation of Education Relationships

Information and communication technologies will transform communication among learners, educators, businesses, and community members across the province, and will enable these education partners to collaborate in making the goal of lifelong learning for all Ontarians a reality.

U.K. Fosters ICT Debate through Web Site

In the United Kingdom, the Department for Education and Employment is investing billions of dollars to support ICT-enhanced education. Knowing that teachers are key to the successful integration of technology in the classroom, the government has emphasized two-way dialogue with teachers about ICT issues.

Classroom of the Future road shows were held in seven British cities, where teachers explored how education and technology can work together, considered possibilities for the future, and debated technological issues. The British government continues to solicit information from teachers and to encourage debate through a Web-based on-line forum (<http://futureclass.ngfl.gov.uk>).

The integration of new tools for learning and communication in education has the potential to transform relationships among Ontario's educational institutions and their partners. The creation of community learning centres, described under Goal 3, will break down the boundaries of learning: students and adult learners will be able to work independently or collaboratively any time and anywhere.

As barriers to learning break down, so too can the boundaries of communication. E-mail, the World-Wide Web, video conferencing, and teleconferencing all offer new options for educational institutions and the boards and ministries that govern them to communicate better with staff, board members, learners, parents, and members of local and distant communities.

A Vision of ICT-Enhanced Communication

Many of Ontario's educational institutions have embraced information and communication technologies as a way of communicating more efficiently with staff, students, and members of the community. The increased access to information that results serves to strengthen the accountability of our education system, and has the potential to increase participation in education and enthusiasm for change.

However, effective communication requires more than a one-way transmission of information. Education is a shared responsibility, which means that all partners, from staff to community

members, need to know their input in the decision-making process is valued. Likewise, realizing the potential of ICT to transform communication will require more than simply increasing access to the technologies themselves. In our province-wide consultations with parents, community members, and business representatives, we heard clearly that a *vision* of effective two-way communication will be a prerequisite for transforming the roles and relationships in learning communities, as will be a commitment to ensuring that all education partners have the information and skills they need to use the new tools. As it develops a communication strategy to inform and include all our partners, OKNL will work with its partners to clarify such a vision.

It is important to note that while the power of ICT as a tool for communication and shared decision making will be an essential element of our communication strategy, our success in reaching all our partners will also require our continued attention to more traditional forms of communication.

Keeping Parents In Touch with Schools

School Link project keeps parents in the loop:

School Link is a pilot Internet project, designed to facilitate more frequent and effective communication between parents, teachers, and school administrators. Coordinated by the Ottawa Centre for Research and Innovation (OCRI) (<http://www.ocri.ca>), School Link also involves the Ottawa-Carleton District School Board and several private-sector information technology companies. The pilot project aims to demonstrate the feasibility of providing practical, secure communications and services over the Internet between schools and parents. Confidential information, such as grades and attendance records, will be securely accessible by parents. The major benefit of the project is that more frequent communication between schools and parents (other than simply through occasional report cards) means that problems or other issues can be addressed in a timely manner.

Addressing the Needs of Parents

Parents have told us they want to have meaningful input into their children's education. We are setting consistent expectations for school councils and school boards and giving parents the stronger voice they have been asking for.¹⁴

Of all the education partners discussed in the previous section, none is more crucial than parents. In its *School Improvement Planning Handbook* (November 2000), the Education Improvement Commission concluded that "parental involvement is one of the most significant factors contributing to a child's success in school. When parents are involved in their children's education, the level of student achievement increases."¹⁵ The new regulations for school councils, introduced in December 2000, are examples of the Ministry of Education's commitment to giving parents a stronger voice in their children's education.¹⁶

The integration of information and communication technologies promises to further enhance the role of parents and community members in their schools and school boards. ICT can increase the involvement of individual parents, school councils, and networks of parents across the province. In fact, our consultations with parents revealed a belief that ICT will empower the parent community as a whole.

But parents will become more powerful only if they have an active voice in planning, implementing, and evaluating the strategies for the integration of ICT at the school, board, regional, and provincial levels. So our vision for integrating ICT in learning must embrace parents' right to receive information and to be part of the decision-making process. In addition, we will work with parents to develop innovative ways to provide them with the knowledge (e.g., what ICT is and how it will improve learning) and skills (e.g., using the Internet and e-mail for communication or to access on-line learning resources) they will require to be

part of the process and, more importantly, to embrace ICT as one of the many tools available to meet their own and their children's educational goals. Our success in this area will be indicated by the active involvement of more parents in the education system: parents accessing Web sites and electronic networks, parents communicating directly with teachers and principals, parents giving input into school and school board decisions, parents getting involved in classroom activities, and parents helping students with their assignments. Other signs of success will be parents knowing more about their children's progress and having a positive attitude toward the school system as a whole.

School Web site connects parents and teachers: The more parents know about their children's school, the more active they may become in their child's education. At Westcreek Public School in Pickering (http://www.durham.edu.on.ca/s_links/schools/westcreek/index.html), parents have password access to the school Web site, which allows them to visit teachers' Web pages and read about upcoming assignments and projects. They can also access information such as the school calendar, librarian-recommended books and videos, and school council activities. Parents can also e-mail questions or concerns to teachers or administrators.

Goal 6 — Transformation of Education Relationships

OKNL's priorities will be to:

- develop a long-term communications plan to keep parents and community members informed about, and involved in, the development of Ontario's strategic plan for the integration of ICT in education
 - work with the ministries and with educational institutions to develop communication strategies that ensure, through the use of both ICT and more traditional means of communication, that parents and community members are informed and have an active voice in local educational issues
 - facilitate the creation of a partnership among the Education Quality and Accountability Office (EQAO), the Ministry of Education, district school boards, schools, the Ontario Parent Council, and school council representatives to develop school and board improvement planning strategies for the integration of ICT in learning
 - conduct a study to determine what knowledge and skills parents and community members need in order to become more involved in the decision-making process concerning our ICT strategies, and to be able to use ICT as a tool for learning *and* for greater involvement in education processes
 - identify and implement innovative training programs for parents and community members, to support their active role as partners in education processes
 - give special attention to understanding the needs of parents and community members who live in rural and remote areas of the province, as well as the needs of Francophone, International Language, and First Nations communities, and people with disabilities.
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Appendix A: OKNL Working Group Members

Working Group 1: Educator Roles and Responsibilities for ICT

Chair: Dr. Catherine Henderson,
President, Ontario College of Art and
Design

Joan Andrew, Assistant Deputy Minister,
OPS Restructuring Secretariat

Peter Askey, Superintendent of Program,
Thames Valley District School Board

Dr. Christian Blanchette, Director
Teaching and Learning Support Service/
University of Ottawa

Dianne Grieve, Principal, Clark Boulevard
P.S., Peel District School Board

Linda Palazzi, Coordinator, Membership
Services Department, Ontario College of
Teachers

Tony Tilley, Senior Vice President
Academic, Post-Secondary Education,
Seneca College of Applied Arts and
Technology

Walter Stewart, Market Development,
Education Research and Development,
SGI International

Dr. Jean Watters, President, Laurentian
University

Working Group 2: Learning Environments and Resources

Chair: Dr. Stan Shapson, Vice President of
Research and Innovation, York University

Dr. Tom Carey, Director, Centre for
Learning and Teaching through
Technology, University of Waterloo

Blair Dimock, Director of New Media and
Strategic Planning, TV Ontario

Bill Hogarth, Director of Education, York
Region District School Board

Pat Lang, President, Confederation
College

Constance Legentil, Representative,
OSAPAC

Michael Ridley, President, Ontario
Libraries Association

Art Willer, President, ITAC Ontario

Tony Vanderwoude, CEO, Pearson
Education Canada

Working Group 3: Learner Expectations and Assessment

Chair: Joan Green, CEO, Education
Quality and Accountability Office

Gerry Connelly, Executive
Superintendent, Toronto District School
Board

Dr. Linda Grayson, Vice-President,
Operations, Ryerson Polytechnic
University

Patti Haskell, Former Director of
Education, Waterloo District School
Board

Dr. Thérèse Laferrière, Professor, Faculté
des sciences de l'éducation, Université
Laval

Trevor Owen, Program Director, Writers
in Electronic Residence (WIER)

Dr. Marlene Scardamalia, Professor,
Centre for Applied Cognitive Science,
OISE/University of Toronto

Rob Schock, Vice President, Rogers
iMedia

Working Group Secretariat: Dorothy
Gossling, Dr. Robert Kennedy, John
Killer, Ken Stief

Working Group 4: Infrastructure

Chair: Dr. Bonnie Viney, Superintendent
of Human Resources/Business and
Learning Technologies, Ottawa-Carleton
District School Board

Dr. Christian Blanchette, Director,
Teaching and Learning Support Service,
University of Ottawa

Peter Bruce (Ministry Lead), Director,
Technology and Business Solutions,
Community Services Cluster, Information
and Information Technology

John Hindle, Senior Consultant, Business
and Learning Technologies, Ottawa-
Carleton District School Board

Barb McNally, Vice-President, Ottawa Centre for Research and Innovation (OCRI)
Dave Miller, Project Manager, Data Delivery, Ottawa-Carleton District School Board
Jacinthe Mutchmore, Directrice ressources informatiques, La Cité collégiale
Anne Nash (Secretariat), Principal, Anne Nash and Associates
Wayne Shimada, Director, Instructional Technology, Algonquin College
Wendy Stark, IT Director, Carleton University

Working Group 5: Parent and Community Needs and Relationships

Chair: Lorna Costantini, Chair, Niagara Catholic Regional School Council
Jan Burke-Gaffney, Director, Hamilton Family Network; Editor, *Network* Newsletter; Director, Family Alliance Ontario; board liaison for Canadian Association for Community Living
Angelo Di Ianni, Director of Education, Niagara Catholic District School Board
Paul Goulet, Consultant; former representative, Ontario Parent Council
Jim Lang, President, Lang & Ackroyd Productions, Inc.
Lamar Mason, Co-Chair, Ottawa-Carleton Assembly of School Councils; member, Special Education Advisory Committee, Ottawa-Carleton District School Board
Conrad R. Morin, Manager, Neway Cleaners and Launderers, Hearst, Ontario

(a division of North Star Linen and Uniform Service of Kapuskasing, Ontario)
Ted Palmer, Executive Director, Business Education Council of Niagara (BEC)
Alain Larocque, president of a French public elementary school council; board member, Parents-partenaires en éducation; member of EQAO advisory committee

Working Group 6: Funding and Governance

Co-Chair: Geoff Hare, Vice-President, Infrastructure Strategies and Communications, Ontario Superbuild Corporation, Ministry of Finance
Co-Chair: William Forward, Assistant Deputy Minister, Training Division, Ministry of Training, Colleges and Universities
David Trick, Assistant Deputy Minister, Post Secondary Education Division, Ministry of Training, Colleges and Universities
Barbara MacPherson, Senior Policy Advisor, Colleges Branch, Ministry of Training, Colleges and Universities
David Kennedy, Director, Information, Communication and Technologies Branch, Ministry of Economic Development and Trade / Ministry of Energy, Science and Technology
Nancy Naylor, Director, Education Finance Branch, Ministry of Education
Project Support: Sue Lantz, Lantz and Associates

Appendix B: Not-for-Profit ICT Partnerships in Education and Training

Elementary and Secondary Schools

ContactNorth: <http://www.cnorth.edu.on.ca/>

Creating Barrier-Free Broadband Learning Environments <http://www.barrierfree.ca>

Curriculum Services Canada and the Curriculum Foundation: <http://www.curriculum.org>

Educational Computing Organization Ontario: <http://www.ecoo.org>

Educational Computing Network of Ontario: <http://www.ecno.org>

Education Network Ontario: <http://www.enoreo.on.ca>

Learning Disabilities Resource Community <http://www.ldcommunity.org>

Ontario Council for Technology Education: <http://www.teo.on.ca/>

Providing Education By Bringing Learning Environments to Students (PEBBLES) <http://www.ryerson.ca/pebbles/main.html>

SchoolNet: <http://www.schoolnet.ca>

Special Needs Opportunity Window (SNOW) <http://snow.utoronto.ca>

TV/TF Ontario:

- OECA School Councils Site: <http://osc.oeca.org/>
- PDOnline: <http://www2.tvo.org/pdonline/>
- TV Ontario Online: <http://www.tvo.org/firstclass/mainframe.html>
- Ontario Educational Software Service: <http://www.tvo.org/oess/>

Training, Colleges, and Universities

Association for Media and Technology in Education in Canada: <http://www.amtec.ca/>

College University Consortium: <http://www.cou.on.ca/cucc/Welcome.html>

CON*NECT: <http://www.acaato.on.ca/connect/>

Lifelong Learning Challenge Fund: <http://www.tvontario.org/llcf/>

Network for the Evaluation of Training and Technology: <http://socserv2.mcmaster.ca/srnet/evnet.htm>

The Node Learning Technologies Network: <http://node.on.ca>

Office for Partnerships for Advanced Skills: <http://www.opas.com>

Ontario Universities Application Centre: <http://www.ouac.on.ca>

Office for Learning Technologies: <http://www.teo.on.ca/>

Ontario Innovative Trust: <http://oit.on.ca>

Ontario Strategic Skills Initiative: <http://www.est.gov.on.ca>

Appendix C: Potential Roles for Education-Business Alliances¹⁷

Roles for Education-Business Alliances	
Learning	<ul style="list-style-type: none">• Contributing to a vision for lifelong learning in Ontario• Eliminating barriers to employment• Guidance and career planning• Apprenticeships and cooperative education• Postsecondary education–work programs• Workplace education and training
Teaching	<ul style="list-style-type: none">• Linking education and work: teacher intern opportunities• ICT professional development• Development of classroom materials based on Ontario’s curriculum
Infrastructure	<ul style="list-style-type: none">• ICT tools for schools, colleges, and universities• Connecting schools, colleges, and universities• ICT support services: technical and user support• Development and supply of high-quality digital content
Research and Development	<ul style="list-style-type: none">• Development of new models of learning and teaching that take advantage of new technologies• Development and supply of quality e-learning products and services• Strategies to help educators and educational leaders understand and implement research findings in the classroom• Innovation, including action research for educators• Assessment and evaluation of research initiatives and results and provision of feedback for improvement

**Parent and
Community
Involvement**

- Community and economic development initiatives
 - Working with parents to help students reach their education and career goals
 - Community Learning Centres
 - Using ICT to build community-business partnerships, to share market information
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Appendix D: ICT-Enhanced Learning Options

Integration of ICT	Learning Examples	Important Features
ICT integrated with traditional classroom instruction	<ul style="list-style-type: none"> • Using computers to complete and present assignments using applications such as spreadsheets, word processors, and presentation software • Searching for information on the Internet and via software (e.g., encyclopaedias on CD-ROM) • Using simulations to study phenomena that cannot be accessed directly in the classroom (e.g., astronomy) • Using communication technologies to work with learners in other locations • Working outside class time, either independently or in teams on collaborative assignments • Accessing an institutional Web site from home or the library to receive and return assignments • Using software designed for learning-specific knowledge and skills • Using computers that are equipped with adaptive technologies to ensure that learners with special needs have access to learning materials, tools, and other resources 	<ul style="list-style-type: none"> • Increases access to a variety of information sources • Requires large quantities of high-quality interactive digital content for best results • Requires flexible access to networked devices • Can be unrewarding if learners do not have the skills or tools to take advantage of increased access • Combines interpersonal interaction in the classroom with opportunities for interaction with peers from different backgrounds and from different places around the world • Allows learners with disabilities to participate in mainstream classroom activities and to access on-line learning

Integration of ICT	Learning Examples	Important Features
Mixed-mode delivery (on-line and classroom-based learning)	<ul style="list-style-type: none"> • On-line modules designed for remediation or enrichment • Courses that combine classroom-based and on-line learning components • On-line courses from individual institutions • On-line modules or courses shared among two or more institutions 	<ul style="list-style-type: none"> • Flexibility: any place, any time, any pace • An enriching complement to classroom-based instruction • Improved support for students with special needs and students who require alternative learning formats • Opportunities for inter-institutional collaboration • Requires high-quality, interactive instructional design to motivate and retain learners • On-line learner-centred experience adds considerable educational value
Virtual Learning	<p>On-line or distributed learning for accreditation:</p> <ul style="list-style-type: none"> • Virtual institutions • Shared network • Course-sharing consortia 	<ul style="list-style-type: none"> • Same as above • Requires well-designed interactive on-line courses • Requires access to high-quality hardware (e.g., computer, modem) • Can attract learners from around the world

Appendix E: Components of Professional Development for ICT in Learning¹⁸

Activity	New Knowledge and Skills
Participating in awareness-raising activities	<ul style="list-style-type: none"> • Understanding the scope of current and emerging technologies • Understanding the academic, social, and economic impact of information and communication technologies
Gaining learning and teaching skills	<ul style="list-style-type: none"> • Learning the applications of ICT to the curriculum • Moving from integrating ICT into curriculum activities to developing new classroom routines that promote new roles for educators and learners • Implementing new learning models such as collaborative projects, problem-solving activities, and inquiry-based learning • Participating in the creation of knowledge-building communities in the classroom, school, and community
Collaborating	<ul style="list-style-type: none"> • Building networks with colleagues and other professionals • Participating in learning communities of peers and colleagues that view professional growth as part of lifelong learning • Creating research studies to investigate the effectiveness of various approaches to integrating ICT in learning
Using information and communication technologies in learning	<ul style="list-style-type: none"> • Using basic software tools to produce electronic documents • Installing and using peripheral tools • From sending e-mail messages and attaching files to creating a conference list and obtaining an e-mail address for a new user • Accessing different resources available on a network and editing electronic resources • Accessing and responding to messages within electronic conferences • Managing student documents, creating electronic marking sheets or portfolios on the network • Accessing or restricting access to files on a network

Endnotes

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- ¹⁵ Education Improvement Commission (November 2000). *School Improvement Planning Handbook*. p. 10.
- ¹⁶ "Ontario Strengthens Parental Involvement in Schools."
- ¹⁷ Based on examples from *Business and Education Best Practices Idea Book*.
- ¹⁸ Adapted from the International Standards for Technology in Education (ISTE) and National Council for Accreditation of Teacher Education (NCATE). *ISTE Recommended Foundations in Technology for All Teachers*. <http://www.iste.org/standards/ncate/found.html>

**Ontario Knowledge Network for Learning
15th floor, Mowat Block
900 Bay Street
Toronto ON
M7A 1L2**

**Telephone: 416 314-1466
Fax: 416 325-9473
Email: oknl@edu.gov.on.ca**