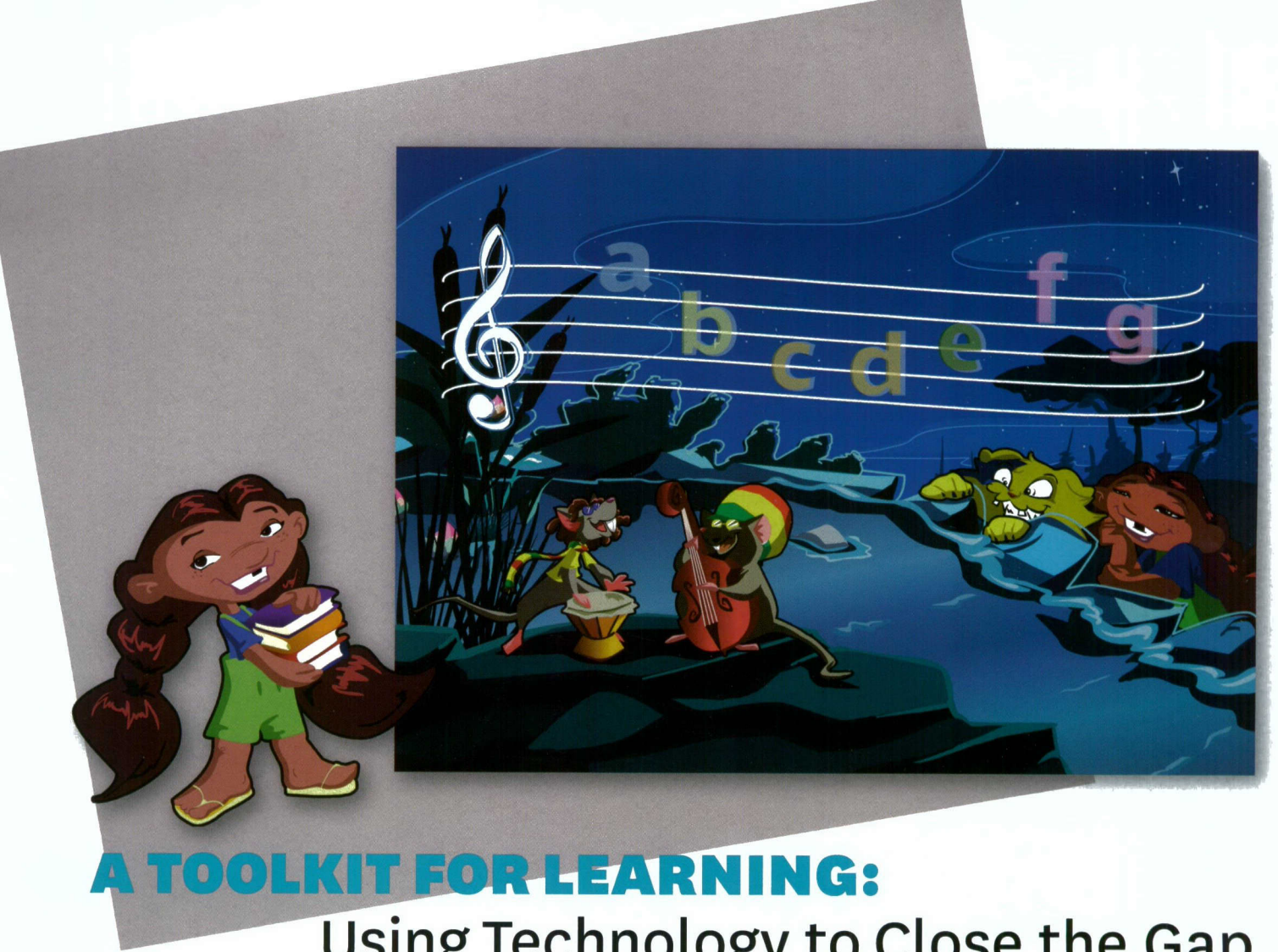

A TOOLKIT FOR LEARNING: Using Technology to Close the Gap

PHILIP C. ABRAMI

We Canadians can be proud of many things. Among them is the quality of the education we provide to our children. On international examinations, Canada regularly scores among the best countries in the industrialized world, implying that virtually all our youth must be leaving school well prepared for life in the Knowledge Age.

No large system can ever be perfect and our education system is no different. It is not surprising, therefore, to learn that there are still youngsters leaving school early and children who, by the time of secondary school graduation, do not meet accepted standards for essential competencies including literacy, numeracy, and scientific reasoning.

THE STATE OF LEARNING IN CANADA

How well, then, is Canada really doing in terms of preparing our children? The Programme for International Student Assessment (PISA) is a triennial international survey of the knowledge and skills of 15-year-olds, and the product of collaboration among participating countries and economies through the Organization for Economic Co-operation and Development (OECD). Approximately 470,000 students from 65 countries, making up close to 90 percent of the world economy, took part in PISA 2009. The average performance of Canadian students was in the upper quartile on the PISA measures of reading.[1] By itself, this result seems encouraging.

EN BREF Le Centre d'études sur l'apprentissage et la performance (CEAP) est un centre montréalais d'excellence de la recherche qui se consacre à générer de nouvelles connaissances en éducation au moyen de la recherche et de la mobilisation de savoirs, en partenariat avec des praticiens en éducation qui collaborent relativement à des outils, des techniques et des stratégies visant l'efficacité de l'enseignement et de l'apprentissage. Malgré l'intérêt provincial et fédéral manifeste pour l'apprentissage électronique, il n'existe pas de preuves uniformes ou substantielles de son efficacité – en particulier sans que soit portée une attention étroite à l'importance des caractéristiques pédagogiques de l'élaboration des didacticiels. L'apprentissage ne comporte pas de panacées technologiques rapides ou faciles, mais la technologie d'éducation peut constituer un puissant outil lorsqu'elle est bien conçue, attentivement validée et bien instaurée. Les chercheurs du CEAP ont élaboré un premier ensemble d'outils cognitifs de pointe faisant partie de la boîte à outils de l'apprentissage, lequel privilégie l'acquisition de compétences essentielles, dont la littératie, la numératie, le questionnement et l'autocontrôle. Ces outils sont offerts sans frais pour compléter et appuyer l'enseignement en classe.

Nevertheless the same report noted that about 10 percent of the Canadian students tested performed at or below Level 2, the baseline level "at which students begin to demonstrate the reading skills that will enable them to participate effectively and productively in life."[2] About 30 percent of Canadian students could not perform at Level 3, the level that involves comprehension and interpretation of moderately complex text. Such basic difficulties, played out across the nation, have a significant impact on the economic well-being of all Canadians. Statistics Canada estimates that a one percent increase in the Canadian literacy rate would drive a sustainable growth in Gross Domestic product of $18.4 billion annually.[3]

In Canada, the school dropout rate has declined slightly over the last decade.[4] This is laudable but not a cause for complacency. Indeed in some areas of the country, there is cause for alarm. In my hometown of Montreal, citizens were shocked to learn that, among francophone males, the dropout rate was over 60 percent.[5] Think about the implications of that for a moment. School dropouts make up 43 percent of welfare recipients;[6] and it is well documented that adults without a high school diploma earn substantially less over their lifetimes than other Canadians.

In a report on the state of learning in Canada, the Canadian Council on Learning elaborated on the importance of essential competencies and the challenges of dramatically improving our nation's literacy skills.[7] These skills are particularly important in the increasingly multicultural, multilingual context of present-day Canadian classrooms. Furthermore, research has documented the importance of children developing solid literacy skills early and succeeding at school from the outset. Students who are not reading at grade level by Grade 3 are especially at risk of failure in a variety of subject areas. Instructional approaches need to focus on early prevention and continuous support rather than later remediation. Later remediation, no matter how extensive and costly – because it is initiated after years of student frustration and failure – cannot succeed as well as early intervention.

It has never been the case that money alone solves problems unless it is invested in equal amounts in human and physical resources

IMPROVING THE STATE OF LEARNING IN CANADA

It is clear what needs to be done, why it needs to be done, and when it needs to be done. The last pieces of the puzzle are by whom and how. This is where the research, development, and dissemination activities my colleagues and I are engaged in at the Centre for the Study of Learning and Performance (CSLP) come in.

The CSLP is a provincially funded and internationally recognized research centre of excellence composed of academics, staff, and students from eight post-secondary institutions in Quebec and with administrative headquarters at Concordia University. The mission of the CSLP includes not only the generation of new knowledge about education through research but also the mobilization of knowledge in partnership with educational practitioners by collaborating around the tools, techniques, and strategies for effective teaching and learning. At the CSLP, we take seriously the concept of evidence-based practice as an important means to improve the teaching and learning of essential competencies, with literacy skills at the top of the list. Finally, we look towards the development of educational software as the means by which teachers might improve their instructional practices and students might acquire the essential competencies for learning throughout school and beyond.

My colleagues and I have studied the state of e-learning in Canada and noted the strong provincial and federal interest in e-learning as a means to address educational challenges of all types and at all levels.[8] Yet we also know that there is neither uniform nor substantial evidence of the effectiveness of e-learning, especially without careful attention to the importance of pedagogical features in the design of educational software.

In 2006, we cautioned that:

> In education, there is the mistaken view, repeated over the generations: 1) that technology represents a "magical solution" to the range of problems affecting schools and learners; and 2) that money for technology alone, thrown in large enough quantities at the problems of education, will affect the kinds of changes that are required to produce a well-informed, literate and numerate citizenry. It is probably true that the wide range of electronic technologies (including those that provide access to the Internet) that are now, and will remain available stand a better chance of affecting educational change than the technologies of film, television, learning machines, intelligent tutoring systems, etc. However, it has never been the case that money alone solves problems unless it is invested in equal amounts in human

and physical resources....It is arguable that the education of Canadians would be better served by more emphasis on preparing and training practitioners to use technology effectively than rushing to adopt the "technology du jour".[9]

About a decade ago, my CSLP colleagues and I accepted the challenge of tackling the performance gaps in the development of schoolchildren's essential competencies. We began by developing an early literacy tool, progressed to developing an electronic portfolio tool that teaches students self-regulation learning strategies, built the foundation for an inquiry tool that develops information literacy, and have now begun work on a numeracy tool. Design and development remain guided by several core principles. Each tool must:

- be based on the best available theory and research;
- require input from educators, pedagogical consultants, and IT professionals;
- be engaging for teachers and students and technically easy to use;
- use embedded pedagogical support;
- be flexible and adaptable in different instructional contexts and for different learners;
- be validated for learning and other outcomes using the best research designs; and
- be available to the educational community *without charge*.

At the same time, we also realized that training and follow-up in the use of these tools was essential if we hoped for wide-scale adoption and effective use.

"From conversations with our implementation teams and other teachers we see during various workshops we have heard positive feedback about ePEARL and especially the support videos and handouts. Many teachers use ePEARL with their students for student-led conferences. Teachers are thrilled with the wizard that guides students through the learning process of planning, doing, and reflecting. Many do much of this work offline in the classroom outside of ePEARL using the planning worksheet that you have provided....I look forward to our continued collaboration on ePEARL – it's a winner!"

Personal communication from C. Prokopanko, Coordinator, Literacy with ICT, Manitoba Education, March 3, 2010).

THE LEARNING TOOLKIT

Technology is not a magic elixir that can cure learning ills on application. There are no quick or effortless technological panaceas for learning, but educational technology can be a powerful tool when it is well designed, carefully validated, and properly implemented.

At the CSLP, we have developed an initial set of state-of-the art knowledge tools as part of the Learning Toolkit (LTK), which promote the development of essential educational competencies, including literacy, numeracy, inquiry, and self-regulation.[10] They are powerful and flexible tools, each with a unique focus and strength, which both supplement and support classroom instruction. To see demonstration videos and to explore the tools please go to http://doe.concordia.ca/cslp/under Knowledge Mobilization.

ABRACADABRA, or ABRA, promotes the teaching and learning of English reading and writing skills among youngsters, especially those at risk of school failure. It consists of 32 instructional activities and 17 stories that combine to create hundreds of challenging and engaging tasks for learners at a broad range of difficulty levels. A French prototype of ABRA has recently been released, and instructional and assessment modules are continually being expanded and refined. ABRA has been the subject of numerous validation studies including a large-scale pan-Canadian randomized controlled trial.[11] ABRA has documented positive and substantial impacts on alphabetics, fluency, comprehension, and writing.

In ABRA, choices abound in terms of the story genre selected, the literacy sub-skill to be learned, and the difficulty level of an activity. These choices afford great flexibility to teachers and learners; the game-like interactive activities ensure a high degree of engagement, turning the hard work of learning how to read into an enjoyable time of learning success. Teachers may focus on whole-class instructional activities, small group work, or individual remedial or enrichment activities. They may elect to focus on contextualizing activities by emphasizing the ABRA stories first since there is no prescribed order for engaging in activities. See the screen capture to have a glimpse at ABRA's engaging environment.

ePEARL is a web-based, bilingual (French, English) electronic portfolio designed to scaffold and support student self-regulation – including planning, doing, and reflecting – as a key learning strategy for knowledge acquisition. It also serves as a multimedia container for student work, whether that work is text, audio, video, images, or some combination thereof.

Its four levels of sophistication make ePEARL age-appropriate for students from early elementary school through post-secondary education. The subject of two longitudinal, pan-Canadian studies, ePEARL is the only electronic portfolio in the world that has documented learning gains as well as changes in students' learning habits.[12]

ePEARL features include personalizing the portfolio; setting general or task-specific goals; creating new work via a text editor and/or audio recorder or linking to work created elsewhere; reflecting on work; sharing work; obtaining feedback from teachers, peers and parents; evaluating personal motivation; editing work and saving revisions as a new version; and sending work to a presentation portfolio for archiving and exporting. ePEARL also contains a rich collection of video vignettes to assist students and teachers to understand and use both the tool and the self-regulated learning processes it is designed to strengthen. ePEARL is intended for use in all school subjects; we are currently trialing a version for use by The Royal Conservatory of Music as part of piano studio teaching.

Inquiry Strategies for the Information Society in the Twenty-First Century (ISIS-21) is designed to develop lifelong inquiry skills by helping teachers, students, and librarians refine their abilities to undertake successfully the meaningful and critical exploration of important topics. The key phases of inquiry supported by ISIS-21 include developing and refining a guiding question; identifying evidence from a multiplicity of sources; evaluating the evidence for quality, credibility, and scope; and critically synthesizing the relevant, best quality evidence. The latest addition to ISIS-21 is an interactive game designed to help students learn more about the tool and the steps in the inquiry process. Teachers and their students in several schools in Quebec are piloting ISIS-21 for the completion of term-long projects during the winter 2011 term.

MATHKNOW, a numeracy tool, is currently in the initial stages of design.

All the tools are improved and expanded bi-annually. For example, future plans for ABRA include greater focus on second-language learners, older students, and adults who are experiencing reading difficulties.

Finally, all the tools in The Learning Toolkit are in the service of research as well as application. They can and do help develop a deeper understanding of the processes and techniques they are designed to support.

SCALABILITY AND SUSTAINABILITY

We do not want the LTK to be our best-kept secret. My CSLP colleagues and I want to expand it, refine it, and make it much more widely used. Developing evidence-based software is only the beginning of improving the educational performance of Canadian youth. Working with teachers, administrators, and policymakers, we want to turn the fruits of our research and development into wide-scale practice. There is no cost in doing this but great cost in not doing it. ●

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