

A Summary of “Review of E-Learning in Canada A Rough Sketch of the Evidence, Gaps, and Promising Directions”

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Abstract

The review of the current literature on e-learning on which this summary is based was conducted under a contract with the Canadian Council on Learning.¹ The review develops an argument catalogue to encompass public, research, policy, and practitioner perspectives, assesses what is incomplete in the various literatures, explores what works (best practices), and provides a vision for promising new lines of research. The review focused on the role of e-learning in early childhood learning, elementary and secondary learning, post-secondary learning, adult learning, and health and learning.

Introduction

Ever since Thomas Edison declared in 1922: “I believe that the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks” (quoted in Cuban, 1986: 9), there has been a search for technologies that can improve teaching and learning in educational settings. Educational radio, television and videotape, computer-assisted and computer-based instruction, intelligent tutoring systems, videoconferencing and interactive video, multimedia, the Internet, web-based instruction, e-learning, university portals, on-line libraries and databases, learning management systems, on-line student services and, more recently, blogs, wikies, personal digital systems, and MP-3 players, represent but a partial list of technologies that have been variously touted as panaceas or as major revolutionary applications of learning technologies.

According to Jamie Rossiter (2002), all of the digital technologies mentioned above are encompassed under the commonly used term “e-learning.” He defined e-learning as the development of knowledge and skills through the use of information and communication technologies, particularly to support interactions for learning – interactions with content, with learning activities and tools, and with other people. It is not merely content related, nor limited to a particular technology, and can be a component of blended or hybrid learning. (J. Rossiter, 2002; also 2005 in an address at the CCL Workshop on E-Learning). It was with this definition, a contract for a review from the Canadian Council on Learning, and a newly developed review methodology called an argument catalogue that we undertook the project described here. A version of the report was published in a forthcoming special issue of the *Canadian Journal of Learning and Technology* (Abrami et al., in press).

Methodology: What Is an Argument Catalogue?

An argument catalogue (Abrami et al., 2006) is a systematic compilation of views of a topic from various documented sources as they relate to a particular topic:

- the print media (i.e., an expression of the general public's exposure);
- policy-making documents;
- practitioner documents;
- scientific compilations and reviews of research; and
- empirical evidence gathered from the results of primary research studies.

An argument catalogue provides a rounded perspective of all relevant views, as well as the evidence contained in the research literature of the field. Another major purpose is to look for gaps and overlaps in different constituencies. Ultimately, we envision that the findings from an argument catalogue can be fed back into the community – the lay public, policy makers, practitioners, and researchers – to provide information, help in the development of government and institutional policy, aid practitioners in their day-to-day professional duties, and suggest promising new avenues for future research.

Developing the Argument Catalogue

The stages in developing an argument catalogue are as follows.

Stage 1: Formulate the purpose and research question(s).

Stage 2: Locate and retrieve documents.

Stage 3: Include and exclude documents.

Stage 4: Create an argument catalogue codebook.

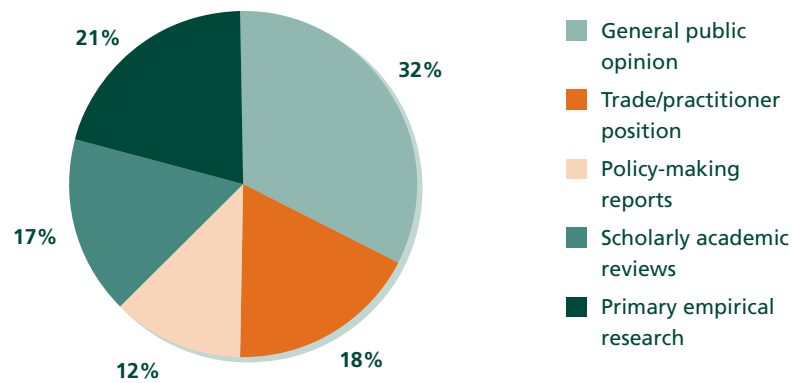
Stage 5: Code the documents.

Stage 6: Analyze and interpret the data.

Stage 7: Disseminate the results.

A total of 2,042 items were identified through on-line searches within the literatures of policy documents, public opinion (newspaper) articles, practitioner (trade) articles, scholarly reviews, and Canadian empirical studies. A subset of 1,146 items was reviewed with 726 items included. Reviewers counted positive, negative,

FIGURE 1
Relative Proportion of Each Document Source



Source: Abrami et al. (2005).

and neutral messages in each body of literature. The major messages were also extracted from each document. Figure 1 shows the relative proportion of each of the document sources that were retrieved and analyzed.

Our mandate from the CCL required that we look at documents across a variety of theme areas, including adult education, early childhood education, elementary/secondary education, post-secondary education, and health and learning. We encountered a disproportionate number of documents across these themes. Figure 2 shows the distribution of the 726 documents.

What We Found: Results from the Literature

Public Opinion (as expressed in the print media)

- E-learning is a rapidly growing field in education.
- E-learning provides greater access to educational programs.

- Funding the high costs of e-learning may divert resources away from other educational priorities.
- There is some concern about potential negative impacts of e-learning on the development of children's creative skills.
- Teachers and classrooms will remain essential in the world of e-learning.

Policy Documents

- Policy makers are mostly in favour of e-learning.
- There is a need to bridge the gap between theory, research, and practice.
- Technology should be introduced and used only in appropriate contexts.
- There are four major reasons for using e-learning: economic competitiveness, educational attainment, increased access, and as a catalyst for educational change.

Practitioners

- E-learning increases accessibility, flexibility, and opportunities for learning.
- E-learning requires careful attention to instructional design, pedagogical planning, professional training, and fiscal support.
- We need new policies and strategies to meet the emerging social demands of educational technology.

Reviews of Research

- The reviews of e-learning range from neutral to positive; it is at least as effective as traditional instruction.
- We need to address design issues and new strategies for teaching and learning.

- Effective e-learning requires the presence of immediate, extensive, and sustained support.
- There is an absence of strong empirical evidence to support the use of e-learning.

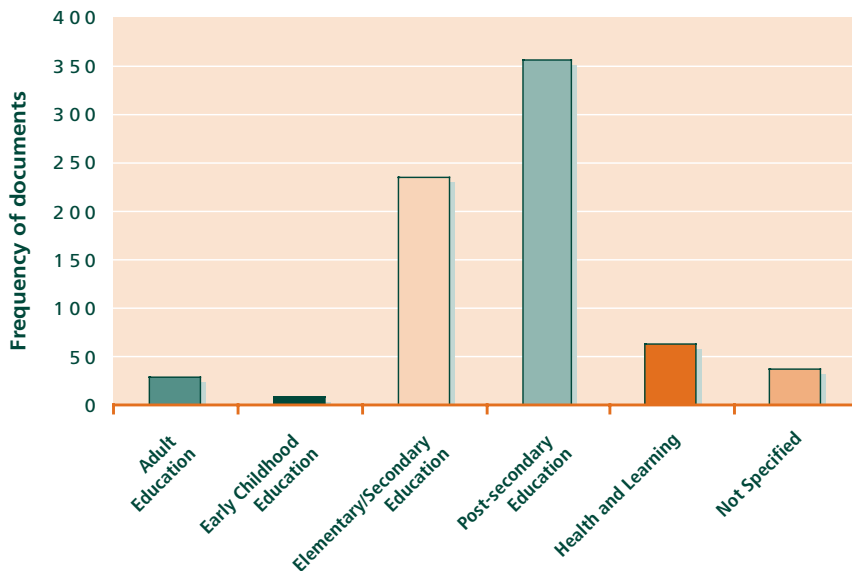
Primary Research

- Some learners are better prepared to use e-learning effectively than others.
- Effective instructional design for e-learning does not resemble traditional pedagogical methods.
- Teachers require professional development and training to use technology effectively.
- Collaborative methods afforded by on-line technologies facilitate the development of higher-order thinking.

- E-learning provides students who have a disability with previously unavailable educational opportunities.

In reviewing the documents, we extracted seven major themes and then rated the magnitude of the positive perceived impact on a 0-1.0 scale. Figure 3 shows the results of this analysis. The two lowest were the effect of e-learning on attrition/retention of students in courses and programs and the impact of e-learning on the cost of education. Four of the highest impact ratings (i.e., achievement, satisfaction, communication, and meeting social demands) directly reflect the impact of e-learning on the goals of education. Flexibility, among the most highly rated, reflects on issues of accessibility to education and feelings of empowerment that technology affords learners.

FIGURE 2
Frequency of Documents Across the CCL Theme Areas



Source: Abrami et al. (2005).

Quantitative Summary of Canadian Primary Research

The primary e-learning studies from the Canadian context that could be summarized quantitatively were identified. We examined 152 studies and found a total of seven that were truly experimental (i.e., random assignment with treatment and control groups) and 10 that were quasi-experimental (i.e., not randomized but possessing a pre-test and a post-test). From these studies, we extracted 29 effect sizes or standardized mean differences, which were included in the composite measure.

A standardized mean difference, or effect size, expresses the difference between an experimental group and a control group in units of standard

deviation (SD). An effect size of +1.0, for example, tells us that the treatment group exceeded the control group by 1 SD. Conversely, an effect size of -1.0 tells us that the control group outperformed the treatment group by 1 SD. An effect size can be interpreted as a percentage of gain for one group over another group. For an effect size of +1.0, about 84 percent of the treatment participants performed at or above the mean of the control participants (50th percentile), or a gain of 34 percent. This is considered a large effect size (Bernard and Naidu, 1990).

The mean effect size was +0.117, a small positive effect. Approximately 54 percent of the e-learning participants performed at or above the mean of the control participants (50th percentile), an advantage of four percent. However, the heterogeneity analysis was significant, indicating that the effect sizes were widely dispersed. It is clearly not the case that e-learning is always the superior condition for educational impact.

Overall Generalizations from the Analysis of Retrieved and Coded Documents

- Remarkable consistency emerged across the sources of literature and, to a lesser extent, across the CCL theme areas of early childhood learning, elementary and secondary learning, post-secondary learning, adult learning, and health and learning.
- E-learning is generally believed to have positive impacts, especially on achievement, motivation,

communication, learning flexibility, and meeting social demands.

- Perceived impacts of e-learning are higher for distance education, where technology use is required, and lower for face-to-face instructional settings.
- Perceived impacts of e-learning are higher for network-based technologies than for non-networked technology integration in educational settings.
- Pedagogical uses of technology, student applications (i.e., students using technology), and communication applications had a higher impact than instructional or informal uses.
- Student-centred applications of technology are believed to be more effective than teacher-centred

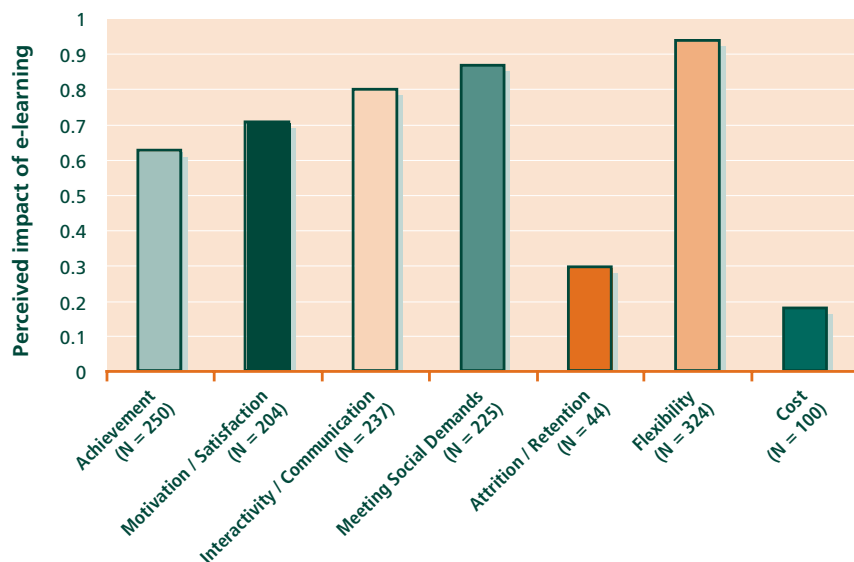
applications used for delivery of information.

- Compared to issues of course design and infrastructure/logistics, the issue of professional development received little attention.
- Technology is mostly used for communication and presentation purposes.
- Canadian research on e-learning is mainly qualitative in nature, offering little experimental evidence to identify “what works” in e-learning settings.

Discussion

The results of this study do not unequivocally support e-learning, but they are positive and encouraging. Anyone who is sensitive to the delicate balance that public organizations

FIGURE 3
Perceived Impacts of E-learning



Source: Abrami et al. (2005).

strike between scarce resources and the laundry list of needs that allow them to fulfill their mission knows that waste is the enemy of fiscal responsibility. In educational organizations (i.e., schools), too much of anything comes at the expense of something else, possibly of equal or greater importance. So it is with the acquisition of e-learning technologies. Technology and its support, in human and material terms, is expensive, so there exists a serious need to know what really helps learners learn, how it works, and when it works. It is also important to know how the learning technologies are perceived in government circles (policy makers), by teachers and administrators (practitioners), developers and researchers, and the general public who support schooling through tax dollars. This study looked at these joint perspectives through an examination of the various literatures in which the impact of e-learning, broadly defined, has been discussed.

The following is an excerpt from our report to the CCL. It is quoted here because it expresses, very succinctly, an important message, based on our findings, which we would like to convey.

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 effect 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 that are now available stand a better chance of effecting educational change than the technologies of film, television, learning machines, intelligent tutoring systems, etc. However,

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it has never been the case that money alone solves problems unless it is invested in equal amounts in human and physical resources. We found among the many coded variables that might be classified as support for e-learning, that reference to professional development ranked the lowest across all document types and CCL theme groups (11.16% of all documents examined). By contrast, nearly half of the documents we examined (47.8%) referred to infrastructure and logistical support for e-learning. 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 a rush to adopt the “technology *du jour*” (p. 36).

Comments on our Methodology

Overall, the messages of the literatures converge, with e-learning perceived and demonstrated as having a positive impact on learning in the Canadian

context. However, here are the caveats to this outcome, which relate largely to the 90-day time frame we were afforded for producing the argument catalogue. First, we were unable to survey the complete literature. Second, we were unable to pursue each theme extracted from the literature for the depth of perception and opinion. Third, because of the time constraints,

we were unable to establish the reliability of the extraction process and the coding of themes and positive or negative impressions. Last, we were unable to deal effectively with the importance and overlap of opinion, especially in articles from the popular press. For instance, is an article that appears in a local daily newspaper (e.g., *The Gazette*) as important as an article that appears in a national magazine (e.g., *Macleans*)? And should an item picked up by a wire service and featured in newspapers across Canada be judged as important as a story that does not receive national coverage?

Finally, a review such as the one we have produced and reported on here needs to be disseminated to the various constituencies (i.e., the public, practitioners, policy makers, and researchers) from whose sources the data were derived. The 47-page technical report, available on the CCL Web site, will not be read by even a fraction of the body of Canadians who are concerned about and interested in this topic. We established CanKnow, the Canadian Network for Knowledge

Utilization, as a dissemination arm of the Centre for the Study of Learning and Performance. We intend to take a targeted approach to dissemination by producing specialized results and interpretations, in readable and non-technical prose, for different audiences. Our first dissemination document (*Knowledge Link*, Volume 1, Number 1, April 2006) provides a succinct, point-by-point overall account of the findings of this study. Future efforts include dissemination through public presentations, articles in practitioner journals and magazines, and debate in professional forums, such as the upcoming special issue of the *Canadian Journal of Learning and Technology*.

We began this project with the intention of providing information for Canadians, with various levels of interest and concern, about the state of e-learning in Canada. In the process, we also pilot-tested the methodology originally envisioned for an argument catalogue. While, by our own admission, the product is imperfect, we are convinced that this form of systematic review has the potential to reveal aspects of important issues that normally go unaddressed in research reports and scholarly reviews. Because we believe this pilot-test has successfully demonstrated the value of our intended approach, we look forward to a process of continuous refinement of the methodology and the development of outlets for raising awareness across various audiences.

Note

- 1 The Canadian Council on Learning funded the state-of-the-field review upon which this article is based, under a contract to Abrami, Bernard, Wade, and Schmid. The opinions expressed herein are solely those of the authors. Inquiries should be directed to Dr. Robert M. Bernard, Centre for the Study of Learning and Performance, Concordia University, 1455 DeMaisonneuve Blvd. W., Montréal, Quebec, H3G 1M8. <bernard@education.concordia.ca>

References are available on our web site at <www.policyresearch.gc.ca>.

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