

Critical Thinking

Can Computational Technology Improve Students' Historical Thinking? Experience from the Virtual Historian[®] with Grade 10 Students

*Dr. Stéphane Levesque, Ph.D.¹
Associate Professor
History Education
The University of Western Ontario*

Introduction

There is much talk these days in educational circles around the use and role of hypermedia and computer technology in history and social science education. The recent development of web-based programs (WebQuests, virtual exhibits, online simulations, Flash animations) in particular is a digital innovation that is now regarded by technological aficionados as a perfect medium to achieve the goals of constructivist, inquiry-based learning. Because of their structure (open, communicative, multi-modal) and power (cheap and easy to operate, familiar to students, great diversity of sources, online access to database and animations), these programs have been the subject of many lively school discussions, professional development sessions, articles, and magazine coverage.

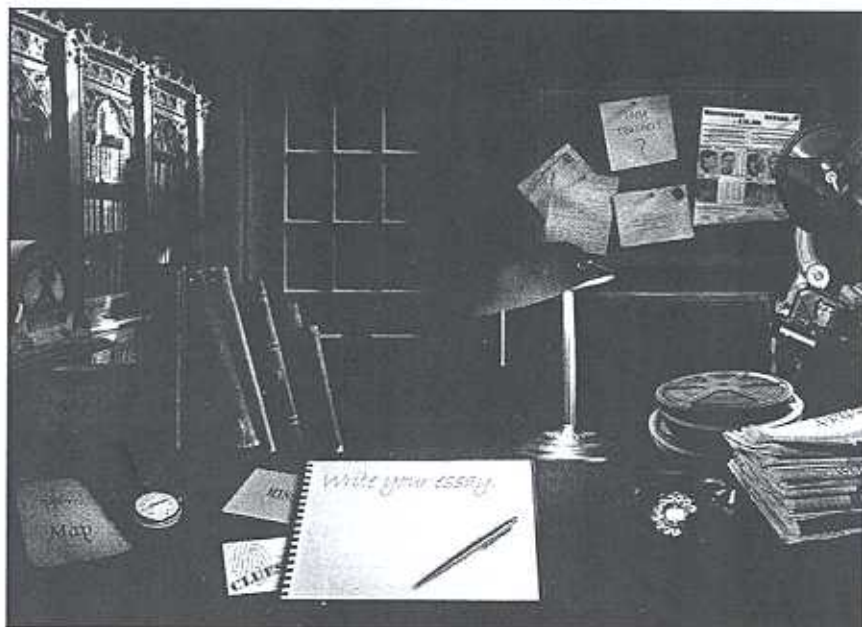
Yet very few empirical studies have been conducted on the real impact of these programs on students' learning. Much of what is available comes from limited or unrealistic activities having little resemblance with current Ontario practice and curriculum. The goal of our experimental study was therefore to investigate the role and impact of a digital educational program (the Virtual Historian[®]) on students' historical thinking and reasoning about Canadian history. The purpose was to examine whether the use of the Virtual Historian[®] improves the learning of a significant episode in the Cana-

dian history curriculum: The October Crisis, 1970.

Two grade 10 Canadian history classes from Southwestern Ontario participated in this experimental study. The experimental group was made up of one class of voluntary participants ($n = 22$) for whom the topic was presented and learned exclusively from the Virtual Historian[®] in a computer lab for three periods (see Figure 1). A control group of one class with the same history teacher ($n = 22$) did not utilize the Virtual Historian[®], but instead learned about the October Crisis from three lessons based on classroom materials (textbook readings, Power Point presentation, teacher's notes) and some additional secondary

sources on the topic (recent news clippings and videos) and access to the Internet. Both classes had the same overall average (70 percent) before the experiment. All students were Canadian, primarily English-speaking in the academic stream of the Canadian and World Studies program. As a performance assessment, all students had to write a culminating essay on the October Crisis using the following question: In your opinion, was the Canadian government's decision to invoke the War Measures Act reasonable at the time of the October Crisis? To complete their essay, students in both groups were provided with a worksheet developed by the teacher (based on the curriculum expectations) on how to write an argumentation.

Figure 1
The Virtual Historian Library (The October Crisis, 1970)



Findings

Table 1 presents data on the experimental and control group concerning their understanding of the subject-matter, discipline, and metacognition. For both groups, students increased their comprehension of the October Crisis of 1970 (specific dates, location, actors involved, law invoked, consequences of the law for Canadians, reasons to use terror/violence by FLQ, and significance of the October Crisis in history), and their understanding of history (what history is, how historians study the past, value and validity of different interpretations of the October Crisis).

Yet, the results from this study provide clear evidence that using the Virtual Historian[®] as a digital educational program can increase more significantly students' understanding of the subject-matter and their ability to think and write historically. Indeed, the gain score on pre- and post-test for the experimental group (8.50) is statistically higher than the gain score of the control group (7.64). The performance gap between the experimental group (14.80) and control group (8.64) on the argumentative is even greater thus suggesting that students who used the Virtual Historian[®] produced more sophisticated and coherent essays (present clear thesis and arguments supported by appropriate evidence, consider historical perspective, and judgement on the issue) those in the latter group. Results from standard deviations on the post-tests and essays also indicate that the Virtual Historian[®] helps produce more consistently positive outcomes among students who used the program, but there is no clear evidence of an effect on students' perceptions of learning (metacognition).

Table 1³
Mean numbers and standard deviations for each variable by group

| Variables | Control Group | | | Experimental Group | | |
|----------------|--------------------|---------------------|----------------|--------------------|---------------------|----------------|
| | Pre-test Mean (SD) | Post-test Mean (SD) | Gain Mean (SD) | Pre-test Mean (SD) | Post-test Mean (SD) | Gain Mean (SD) |
| Tests | 2.17 (1.20) | 9.81 (2.41) | 7.64 (2.58) | 4.12 (2.47) | 12.45 (1.32) | 8.50 (2.97) |
| Essay | - | 8.64 (4.43) | - | - | 14.80 (2.52) | - |
| Meta-cognition | - | 2.30 (0.88) | - | - | 2.86 (0.88) | - |

Discussion

It can be argued that if knowledge comprehension and historical thinking and literacy skills can be sustained by classroom teaching, the use of the Virtual Historian[®] as a digital educational program can help produce even more sophisticated thinking in the discipline among high school students. However, the data from the tests and essays also reveal challenging findings and implications for history education. As students in the control group were not directly exposed to primary sources about the October Crisis, it is predictable that few used historical sources for crafting their essays. Here it is worth noting that their essays were not evaluated on the number of historical sources referenced but on their ability to use multiple sources critically in the writing of an argumentation. So the problem with the control group is of a different order. It is the limited reference to and use of classroom material, and the heavy reliance on website content ("Wikipedia" in particular) that must be scrutinized. Students' essays look as if they were crafted independently from the three lessons they received on the subject-matter. Despite the fact that the teacher presented the assignment

and worksheet at the beginning of the unit of study, students seem to have taken very few notes in class and largely ignored textbook readings, teacher's lessons, Power-Point presentation, and secondary sources brought to class. The great majority of essays appear to have been created entirely at the end of the week of study when students were provided with some additional time to write their essay and access the Internet. One could hypothesize that the material presented in class (mostly informative) and the approach taken by the teacher did not convey significant meaning to students from the control group. As such, they only used classroom learning as background knowledge for crafting their argumentation, not as relevant sources to support their claims.

On the contrary, students in the experimental group used extensively the sources (primary and secondary) provided to them in the Virtual Historian[®] library. They essays display important features of sophisticated understanding of the October Crisis and the discipline. But the type of sources and the analytical approaches used here still pose problem. Without any exception, all essays used exclusively print sources from the library

(e.g., Cabinet Minutes, confidential letters, and newspaper articles) or from the additional web resources included in the Virtual Historian[®] library (e.g., Library and Archives Canada website). Although students had access to, and examined several visual artifacts and dynamic texts (news clips, digitized photographs, a satellite map, and historical poster), they considered them exclusively as computer entertainment, not as pertinent evidence about the October Crisis. Similarly, the analytical approaches taken by students also need further evaluation. Many have problems understanding that sources must be questioned and analyzed in order to be used as historical evidence (what Sam Wineburg calls the "sourcing heuristic"). Too often, the answers in the tests and the arguments presented in the essays reveal a limited ability to read beyond factual knowledge. Sources continue to be regarded as "pictures of the past" (direct access to the truth) not as "historical evidence" to be selected and analyzed critically, as pointed out in the Virtual Historian[®] embedded scaffolds.

This study confirms that the Virtual Historian[®], as a digital educational program, favours engagement with the subject-matter and focuses their attention on the resolution of an historical investigation. As one student puts it, "It's way better than reading from a textbook or other websites you can't be sure of." Another student goes further by arguing that "instead of being taught the topic, we learned it without [teacher] support, which I think

helped me more in overall knowledge."

The computer-based, non-linear learning environment of the program also raises issues for history educators. Teaching for historical thinking and inquiry using technology is a long, complex and arduous process likely to put teachers at odd with curriculum objectives, pressing content coverage, classroom material, and even with their own assumptions about history and learning. Access to the Internet and a computer lab are necessary but insufficient conditions for doing digital history. Teachers must also have a deep constructivist sense of what it means to design lessons, teach diverse classes, and engage students in meaningful and enduring understanding. This study supports the conclusion that such programs can impact students' learning and thinking about the past, but should be regarded as one factor – and not the only one – needed to advance sophisticated historical thinking in 21st century education.

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² See, for instance, Daniel Cohen and Roy Rosenzweig, *Digital History: A Guide to Preserving, Gathering, and Presenting the Past on*

the Web (Philadelphia : University of Pennsylvania Press, 2006). Available from : <http://chnm.gmu.edu/digitalhistory/>; Andrew Milson, 'The Internet and Inquiry Learning: Integrating Medium and Method in a Sixth Grade Social Studies Classroom,' *Theory and Research in Social Education* 30, 3 (2002): 330-353; Andrew Milson and Portia Downey, 'WebQuest: Using Internet Resources for Cooperative Inquiry,' *Social Education* 65, 3 (2001): 144-146; George Lipscomb, 'Eight Graders' Impression of the Civil War: Using Technology in the History Classroom,' *Education Communication and Information* 2 (2002): 51-67; John Saye and Thomas Brush, 'Scaffolding Problem-Based Teaching in a Traditional Social Studies Classroom,' *Theory and Research in Social Education*, 32, 3 (2004): 349-378; and Donald Spaeth and Sonja Cameron, 'Computer and Resource-Based History Teaching: A UK Perspective,' *Computers and the Humanities*, 34 (2000): 325-343.

³ Participants for this study were not randomized. Although pre-test scores between the control group (2.17/20) and the experimental group (4.12/20) were different, MANOVA results still reveal a large, statistically significant effect of the Virtual Historian on the combined dependent variables (post-test, metacognition, and essay), Pillai's Trace = .452, $F(3, 34) = 9.37$, $p < .001$, $\eta^2 = .45$. All tests and essays were coded independently by two raters.

