

What Does the Eye See? Reading Online Primary Source Photographs in History

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Abstract

This exploratory study looks at how a sample of preservice teachers and historians read visuals in the context of school history. The participants used eye tracking technology and think-aloud protocol, as they examined a series of online primary source photographs from a virtual exhibit. Voluntary participants (6 students and 2 professional historians) were recruited at a bilingual Ontario University in fall 2011. From this group, the authors used a purposive sampling of three participants who represented the novice-intermediate-expert spectrum and whose results displayed typicality among other participants with similar educational backgrounds.

For the most part images are subservient to the written text, rarely taken seriously on their own terms. This is a mistake. It is not enough to teach *through* pictorials without also teaching *about* them. (Werner, 2002, p. 425)

The world is visually saturated. Twenty-first century students who populate history and social studies classrooms in many regions around the world are known as digital natives because they have grown up with a host of new technologies—including laptops, tablets, smartphones, video games, and social networking software—that make effective use of all sorts of visual sources (Brumberger, 2011).

The current student generation is not only more exposed to these technologies but has developed new thinking skills, many of which are visually oriented, according to Marc Prensky (2001), who coined the term *digital native*. Following this view, some have argued that digital natives are remarkable visual learners with high visual and digital literacy competencies (Coats, 2007; Jones-Kavalier & Flanigan, 2006).

In *Educating the Net Generation*, Oblinger and Oblinger (2005) claimed that “the Net Gen are more visually literate than earlier generations; many express themselves using images” (p. 2.5). Indeed, from digital cameras to smartphones and interactive websites like Pinterest, picture-taking has become for students a spontaneous mode of expression and an affordable *passe-temps* to preserve and share memories.

Photographs have always provided powerful images of human life captured in a particular moment in time. Many teachers during the 1980s can remember using popular magazines like *National Geographic* to take up the social contexts of its stories but, more importantly, for the richness (and limitations) of the cultural contexts of its photos. In this media-driven society, photographs are now regarded as visual representations of personal experiences and identities that supply authentic evidence of having been there.

Like the dramatic personal images shared online following the terrorist attacks in New York City, photographs make it possible to tell evocative stories about oneself and about the “actual situations” as one lived through them. They are, as Roland Barthes (1980) put it, anything but an antiphon of “Oh look,” “See,” and “Here it is” (p. 5).

Pictures, as illustrated in this article, also serve another critical function in the visual culture: They provide important pedagogical snapshot for others to imagine being there, to situate their own contemporary lives within the course of what Siegfried Kracauer (1969) called historical time. Today’s textbooks, virtual exhibits, and multimedia classroom presentations are clear evidence of this visual shift in the presentation of educational content to students.

School resources are now characterized by a montage of texts, paintings, charts, maps, photographs, Prezi presentations, and other visuals that enrich the learning experience. For Werner (2002), this multimedia shift across the curriculum acknowledges that digital natives “live in a visually saturated environment, and that visual texts are not just useful tools for learning about the world; increasingly they *are* the social world [for them]...” (p. 401).

Although the arguments of Prensky on digital natives’ skills have become popular even among textbook publishers, surprisingly little empirical evidence exists to support these claims. As Bennett, Maton, and Kervin (2009) observed, the digital native arguments “have been subjected to little critical scrutiny, are undertheorised, and lack a sound empirical basis” (p. 776) and even, perhaps, more so within the contexts of history education. The result is that history educators have (a) little research evidence suggesting that digital youth are indeed “visual experts,” and (b) a relatively limited amount of research on the various pedagogical strategies history teachers use to effectively teach students to become visually literate learners in a digital world.

In these circumstances, what can educators do to enhance students’ capacity and agency for critically reading visual texts? History educators and researchers are just beginning to ask such kinds of curricular and pedagogical questions. In response to such questions, as the research in this paper illustrates, growing up as a digital native or digital youth does not necessarily equate to becoming technologically savvy or pedagogically competent in terms of a student’s capacity to read critically and use digital visual sources in the history classroom (Corrigan, Ng-A-Fook, Lévesque, & Smith, 2013).

Taking Up Visual Literacy in the Disciplines

The notion of visual literacy is far from new and uncontested (see Debes, 1969; Selfe, 2004). For Brumberger (2011), “the richest definitions [of visual literacy] include both an interpretative and a productive component” (p. 21). Such definitions suggest that the ability to read visual material is not by itself sufficient for developing visual literacy competencies within history education.

Instead, students must also learn the various disciplinary knowledge and skills necessary to produce and think critically about the visual texts they encounter in the classroom or when touring a virtual exhibit. This complex literacy process, thus, implies that readers have agency, that is, the *authority* and *capacity* to engage with pictorial texts (the word *text* in this article refers to cultural artifacts beyond merely typographic ones).

Today’s visual sources, whether print or online, come in many different forms and are consumed for a plethora of reasons and purposes. One does not read the photos of a friend on Facebook in the same way as, for example, Paul Revere’s 1770 engraving of the Boston Massacre. The issue is not that one strategy is right and the other is wrong. Each strategy is pertinent for understanding and responding to the contexts of the task in question.

To become a critical visual reader, history students must develop their capacities to question how such texts were produced and what roles particular disciplinary domains of knowledge can play in contextualizing various forms of visual sources. Although basic literacy skills (e.g., decoding, skimming, and understanding the main idea) have long been regarded as vital to an educated citizenry, growing research now suggests that critical readers need complex and flexible ways of thinking and knowing about subject matters (Boscolo & Mason, 2001; Britt, Perfetti, Van Dyke, & Gabrys, 2000; Segall, 2002).

“Traditional efforts to encourage every content-area teacher to be a reading teacher by pressing them to teach general-purpose strategies,” as Shanahan and Shanahan (2008) contended, “have neither been widely accepted by teachers in the disciplines nor particularly effective in raising reading achievement on a broad scale” (p. 57). Part of the pedagogical challenge for history educators is the limitation of general literacy skills that readers possess to negotiate the increasingly complex discursive and disciplinary programs of study they now encounter in high schools, colleges, and universities.

Although students may learn about different genres and vocabularies in school subjects, the lexical distinctions are often blurred in class by a common instructional tongue that detaches texts and knowledge from respective disciplinary domains of knowledge. Consequently, “in our zeal to arrive at overarching models of reading,” as Wineburg (2001) observed, “we often ignore qualities of the text that give it shape and meaning” within differing disciplinary regimes of study (p. 79).

One solution proposed by some scholars is to develop disciplinary specific strategies for literacy instruction (Moje, 2008). Such an emphasis would highlight “the ways of thinking and knowing in a discipline as key to learning how to reason, read, write, and discuss” (Monte-Sano, 2011, p. 213). Indeed, domains of knowledge, such as history or science, foster particular ways of thinking and knowing. Different disciplines also encourage specific ways of reading and communicating ideas. How does one come to read and think critically about texts, particularly visual texts, in the domain history?

Situating Historical Literacy

The theoretical framework of this study is grounded in the emerging literature in the field of historical literacy (Lévesque, 2010; Seixas, 2008; Taylor 2004). Historical literacy is a concept that has been used loosely in the past in reference to the mastery of content knowledge (Gagnon, 1991). Recently, the term has been considered more broadly, not only for learning historical content, but also in reference to the interpretive skills of learners (Lee, 2005; Lévesque, 2010; Taylor, 2004; VanSledright, 2012).

Over the last two decades, researchers in history education have attempted to map out the discipline-specific strategies and skills and a set of criteria and language that historians use to make sense of the residua of the past. They have problematized the power of generic literacy skills in terms of their limitations for developing a student's interpretive skills for analyzing and synthesizing historical narratives and the respective primary and secondary sources utilized to construct them (Barton, 2008; Counsell, 2004; VanSledright, 2002; Wiley & Voss, 1999; Wineburg, 1991).

In response, these scholars have established that the process of reading, writing, and thinking about historical texts is neither natural nor generic. Rather, it is based on disciplinary methods for reading and interpreting sources that are utilized by historians. As Monte-Sano (2011) observed, "Few studies of writing are rooted in the historical perspective....There is often little content in content area research, but rather an emphasis on literacy strategies that cut across content areas" (p. 217).

In fact, a shared assumption among history education scholars and educators is that historical literacy is a unique pathway for broadening human capacities to analyze critically and synthesize collective and individual understandings of the past. Several studies suggest that professional historians read sources in different ways than do students or the general public. The difference, as Wineburg (2001) concluded, can be traced to their "sweeping beliefs about historical inquiry, or what might be called an epistemology of text" (p. 76).

For most citizens, whether here in Canada or elsewhere, reading historical sources amounts to discovering factual information from "bearers of information," whereas historians engage historical evidence as a "conversation," asking key questions about the nature of the sources in terms of the intent of their authors—what Wineburg (2005) has termed humans' capacity for "sourcing heuristic" (p. 76).

Historians' disciplinary expertise is composed of several different competencies for reading, writing, and thinking historically about the past and making effective use of historical knowledge in relation to key disciplinary concepts like historical evidence, continuity, and change and historical perspective (Lévesque, 2008; VanSledright, 2011; Wineburg, 2008). They learn to do so through their academic training and membership with the wider community of historical inquiry (Bain, 2000; Seixas, 1993).

Understanding Visual Literacy Within History Classrooms

The goal of school history is not to create miniature historians or to offer high school students a head start for academic careers. At the same time, students cannot become sophisticated critical readers and historical thinkers if they have no exposure to what it means to do history (VanSledright, 2004). Too often what they see in history classrooms is the end product of historians' work that, in turn, is represented in textbooks and lectures, which typically pass in class for the one "true" account of history.

Such traditional forms of historical accounting are not enough, however. In order for history students to develop their historical literacy competencies, educators must create pedagogical spaces for them to engage the processes of making meaning of the past—and its residua.

Primary source photographs have long been recognized as a valuable form of evidence about distant places and people. Since its invention in the 19th century, photography has provided historians with a powerful tool to explore the visual dimension of the past—from war casualties to workers' social conditions to children's schooling experiences.

Many historians and history educators tend to regard visuals as a more accessible form of historical evidence with which students may learn about the past (Levstik & Barton, 2008). Yet, as U.S. historian James Curtis (2003) confessed, the faith in the realism of the photographic image is still very much grounded in the belief that a photograph is a mechanical reproduction of reality. Although from this realistic perspective, pictures are direct windows into the past, offering the viewer a privileged access to what really happened back then, this view of visual sources can be highly misleading. Meaning is never spontaneously transmitted by simply looking at a photograph.

If a picture is worth a thousand words, as the old adage goes, viewers then need to know how to analyze it in order to develop a historical interpretation of the situation depicted. As Barthes (1980) observed in *Camera Lucida*, the “click” that closes the camera's artificial eye and the “little hole” through which the photographer operates are always absent from the visual. This picture-taking process can artificially lead the viewer to glue together the *here-now* and *then-there* (pp. 9-10).

As Trachtenberg (1989) put it, “The idea of the camera has so implanted itself that our very imagination of the past takes the snapshot as its notion of adequacy, the equivalent of *having been there*” (p. 12). Meaning is never direct, though; it is only created by analyzing how the particulars of the visual relate to the one another and reveal explicit and implicit messages about the past and its photographer. In this sense, historians and students of history need to read photographs in the same way as other sources of evidence that enable construction of a historical narrative. Although history is highly dependent upon print records and written accounts, visual sources play an important role in making sense of the past and constructing evidence-based accounts, and particularly so for modern accounts of history.

Unfortunately, professional historians have been rather silent on the process of using and reading visual sources. Because most of their work takes place within a community of inquiry bound by academic rules of practice, few historians explain to students or educators how they use the relics and visual records that stand in as representations for the past. Most of what students learn in the history class is still in the form of written accounts.

Another equally important problem for educators is related to the ways visual sources are treated by historians. While society has become increasingly visually driven in response to the demands of a socially networked knowledge economy, most professional historians, as Brown argued, continue to have an “anti-ocular bias,” using visual sources “as a rubber stamp for their findings in text” (as quoted in Desai, Hamlin, & Mattson, 2009, p. 21). History educators are, thus, left inferring how experts and students alike make sense of visual texts (see Epstein, 1994; Gabella, 1994; Levstik & Barton, 1996).

VanSledright (2012) has established that people, both students and historians alike, use “reading protocols” when engaged with texts (p. 201). Relying on the works of Scholes (1989) and Derrida (1967), he claimed that protocols include “strategies and skills for making sense of texts, as well as criteria for judging those texts to be more or less adequate for accomplishing the various tasks readers set for themselves (or have set for themselves in the case of adolescent readers in school)” (p. 222). These strategic ways of reading are supported by an epistemology of text and shaped by a reader’s own mental framework (Rüsen, 2005; Wineburg, 1991).

An assumption of this study is that readers bring various reading protocols to bear on the photographs, depending on their prior epistemological stances. As VanSledright recognized, multiple disciplinary protocols have been established for reading texts in history, including visual texts, but some are more powerful than others, as they yield deeper understanding of the past.

Defining fully satisfactory ones is always tentative. We used an inductive-deductive research process to generate different reading portraits for visuals initially informed by the theoretical work of VanSledright (2012), who has established that historical learning is not just about the accumulation of substantive factual knowledge about the past.

It also involves procedural and metahistorical knowledge that shape the discipline of history. More specifically, these can be divided into three broad categories presented in Table 1: epistemic framework and assumptions, metahistorical organizing concepts, and reading and thinking strategies. The findings of VanSledright and others (Lee & Shemilt, 2003) provided useful justifications and evidence that students can acquire understanding of various forms of knowledge.

To understand more precisely how people read visuals in the context of school history (the verb *read* refers to how they make sense or give meaning to visuals), we conducted an exploratory study with a sample of preservice teachers and historians using eye tracking technology and a think-aloud protocol to observe participants as they examined a series of online primary source photographs that are part of a virtual exhibit. The goal of the study was to explore how preservice teachers and historians, alike, make sense of historical photographs and consider, from a didactic point of view, what their experiences say about disciplinary-specific visual literacy practices.

Methodology

Overview of Study

This study is a part of a larger, Canadian-funded research project designed to help educators develop pedagogical strategies to make effective use of digital technologies in their history teaching. To accomplish this objective, the first phase employed a comprehensive survey that examined 124 preservice teachers’ perceptions of the digital literacies they employed to construct historical knowledge (Corrigan et al., 2013). Moreover, the survey examined students’ experiences with the use of technologies to teach and understand history in elementary, high school, and university classrooms.

Table 1
Portraits for Reading Visual Texts in History

Characteristics	Protocol 1	Protocol 2	Protocol 3
Epistemic framework and reader assumptions	<p>Visuals are pictures of the past (unmediated direct access to past realities)</p> <p>Visuals are not seen as authored or created by someone (they show the past)</p> <p>Visuals provide factual information (some more detailed than others)</p> <p>Accuracy is tied to how realistic they show the past</p> <p>Reliability is straightforward (windows to the past)</p>	<p>Visuals are illustrations of the past (mediated access to past realities)</p> <p>Visuals are authored with personal viewpoints</p> <p>Visuals provide manifest and later information to illustrate viewpoints</p> <p>Accuracy is difficult, a matter of personal opinions (some are right, others biased)</p> <p>Reliability is constructed but only a matter of "opinions"</p>	<p>Visuals are historical evidence (conversational access to past realities)</p> <p>Visuals are authored and contextualized in time</p> <p>Visuals provide evidence for particular inferences and historical interpretations</p> <p>Accuracy is provisional, tied to criteria, rules, and warranted claims</p> <p>Reliability is constructed, selective view of the past by photographer</p>
<p>Historical thinking concepts</p> <ul style="list-style-type: none"> - Consider significance of the photos and events - Identify elements of continuity or change - Use photos as evidence - Take historical perspective - Understand the construction of photos (events and actors) 	<p>Limited/no use of metahistorical concepts in reading the visuals and providing answers to WebQuest</p> <p>"Passive historian"</p>	<p>Some use of metahistorical concepts in reading the visuals and providing answers to WebQuest</p> <p>"Practical historian"</p>	<p>Extensive use of metahistorical concepts in reading the visuals and providing answers to WebQuest</p> <p>"Critical historian"</p>

Table 1 continued

Characteristics	Protocol 1	Protocol 2	Protocol 3
Reading strategies	Reader has <i>limited</i> power to interpret visuals (source speak by themselves) Reading is unidirectional (from source to reader, text simply accepted as authority) Instrumental reading of visuals to find manifest information (“readerly” texts) Limited intertextual reading (within image, across images, between image/text) Limited hypertextual reading (invoke/refer to other sources, webpages, and prior knowledge)	Reader has <i>some</i> power to interpret visuals (sources are decoded) Reading is bidirectional (reader creates some meaning, accept/reject the text) Iconic reading of visuals (serve to show/evoke images of the past) Some intertextual reading (within image, across images, between image/ text) Some hypertextual reading (invoke/refer to other sources, prior knowledge for similarities/contrasts)	Reader has <i>power</i> to interpret visuals (agency to create multiple readings) Reading is bidirectional (reader questions/discuss/extends text messages) Narrative reading of visuals (impute temporal storyline to images to interpret it in time and space) Extensive intertextual reading (within image, across images, between image/text) Hypertextual reading (invoke/refer to other sources, webpages, prior knowledge in context)

This subsequent phase used eye-tracking and think-aloud methods to study students’ and historians’ ($n = 8$) historical thinking and digital literacies. Eye tracking and think-aloud methods were used to observe participants as they negotiated a WebQuest examining the historical content of a virtual exhibit on Canadian residential schooling called [Where Are the Children?](#) (See [Appendix A](#) for background on the topic of residential schooling. **Editor’s Note:** Website URLs are included in the [Resources](#) section at the end of this paper.) The WebQuest approach has been used commonly in social science education as a way to provide learners with a guided inquiry-learning environment (see Lipscomb, 2003; Milton, 2002).

In a followup to this phase, participants were given further professional development and an opportunity to practice their newly acquired historical thinking skills using digital technologies. They traveled to an Algonquin First Nations reserve in northwestern Québec to do history by constructing life history narratives of elders’ educational experiences on and off the reserve. The participants gathered primary source interviews with elders and then used oral history technologies, like the Canadian online software [Stories Matter](#), to construct digital media texts.

The two historians were recruited after the completion of the experiment with the student participants. As such, they did not attend the teacher education workshop on historical thinking nor did they complete the online survey.

Apparatus

We used the Applied Science Laboratories (ASL) EYE-TRAC 6 desk-mount model to track eye movement, paired with a PC and 17-in monitor. This configuration offered an unobtrusive way to observe participants' navigation of digital environments in the sense that, if participants were not told they were being eye tracked, they would not be aware of the process. Using the eye tracker, we recorded participants' pupil diameter and eye movements via pupil-corneal reflections with an infrared reflection source, which is accurate to within .50 of visual angle (ASL, n.d.).

Participants

For this phase of the study, we recruited voluntary participants (6 students and 2 professional historians) at a bilingual Ontario University in fall 2011. Student participants were approached during class time in their history didactics courses and were also part of our larger study on digital technologies in history education. Student participants who volunteered to be a part of this and subsequent phases of the study met with researchers outside of class time and were given opportunities for professional development beyond their history didactics course.

The 6 students were in their first semester of a 1-year bachelor of education degree with various undergraduate backgrounds in the social sciences. More specifically, the students (1 female, 5 males) were all in their early 20s and had taken at least three undergraduate courses in history, but no specific course in Aboriginal history. (Aboriginal is the legal term for indigenous communities across Canada. See Aboriginal Affairs and Northern Development, Canada, 2012.)

Participants completed an online questionnaire that included some demographic data. As the questionnaire was anonymous, it was impossible to connect survey results with data from subsequent phases of the study.

All participants were registered in the B.Ed. program to teach history at the intermediate level for the province of Ontario (grades 7-10).

The two historians (one female, one male) were senior professors at the university recruited personally by the researchers for the project. The female historian specialized in women's history with interests in the history of teachers. The male historian was teaching and working in the field of antiracism in education with a specialty in Chinese Canadian history.

Procedure

Prior to this phase of the study, we conducted 90-minute professional development workshops for all four history didactics courses at our institution to help students develop historical thinking skills using digital technology. Each workshop began with a 15-minute survey to provide a baseline regarding students' digital and historical literacies. The remainder of the workshop introduced students to key concepts in historical thinking (see Lévesque, 2008), and also to various virtual exhibits and the [Virtual Historian](#). Virtual Historian is an online educational resource that provides a wealth of lesson plans that can

be used to teach historical thinking, including ones that incorporate digital technology. At the end of the workshop, students were given the opportunity sign up to participate in this and a subsequent phase of our research project.

During this phase of the study, participants were invited to our lab to participate in a WebQuest using the virtual exhibition *Where Are the Children?* A virtual exhibition, also referred to as an online exhibit, is an exhibition whose venue is displayed in cyberspace. Unlike physical exhibitions, online exhibits are not restricted by time and space. They can provide visitors with virtual experiences and animations around a thematic narrative approach to subjects.

This virtual exhibit on Canadian residential schooling was produced by the Legacy of Hope Foundation. The exhibit, designed in Flash animation, presents users with a virtual environment where they can interact with various learning objects on the experiences of Aboriginal children in Canadian residential schools during the 20th century.

We chose this particular exhibition for two reasons. First, this study was part of a larger funded project on digital history and educational technology and involved a significant component on Aboriginal education in Canada. Second, the virtual exhibit of the First Nations' Legacy of Hope Foundation was recognized by [The History Education Network](#) as the best online resource for teaching students about the Indian Residential Schooling system in Canada.

Prior to beginning the WebQuest, participants were introduced to think-aloud protocols (TAPs) and eye-tracking methods. Next, participants were asked to perform tasks and answer questions throughout the WebQuest while verbalizing the content of their thoughts (not the processes used to generate them). The verbalizations recorded during the task were transcribed verbatim. Each participant completed the WebQuest—which lasted between 30 and 60 minutes, depending on the pace of each participant—individually in the lab under the supervision of the research team. All participants were required to give informed written consent prior to the start of the experiment. To preserve the identity of participants all the names in this article are pseudonyms. No participant knew about the virtual exhibit or had access to the website prior to this study.

The WebQuest was designed with both open-ended and closed questions that challenged participants to draw upon their digital and historical thinking skills to answer questions ranging from basic to more complex. Following are examples of the tasks and questions presented to participants (see [Appendix B](#) for the full WebQuest protocol):

- Why do you think Chief Shingwauk believed that residential schooling would be beneficial to his people?
- [From the interactive bookcase] Find and name the goals of the federal government policy for Aboriginal education.

The WebQuest was designed in such a way that it was possible to answer the questions with a limited background knowledge on the history of residential schooling using only the information contained within the virtual exhibit. Since many of the questions were open-ended, however, having access to historical background knowledge gave the opportunity for some participants to make more connections between the virtual exhibit and their prior knowledge and, thus, provide more nuanced answers.

To observe our participants as they navigated the WebQuest, we used a multimethods approach, incorporating both eye-tracking and think-aloud methods. The eye-tracking

data were collected in an unobtrusive manner by a desk-mounted device that allowed participants to move their heads freely and sit at a computer as they regularly would. When participants first arrived in the lab, the eye-tracking device was calibrated using a 9-point standard calibration procedure, and then the participants began the WebQuest. The eye-tracking data were used as an objective measure of human thought process; that is, eye-tracking technology revealed what objects (headline, photograph, caption, or photo credit) in a virtual exhibit attracted the participants' attention, for how long, and in what order. We could also infer processing difficulty, because the duration of fixations (the point at which the eyes are stable compared to their position in the head) correlates with cognitive functioning (Duchowski, 2007).

Additionally, throughout the WebQuest participants were asked to verbalize their thoughts as they worked through each question. The TAP approach differs from introspection, as it requires participants to articulate their problem-solving processes in the moment, not minutes or days later where their thinking would be susceptible to lapses in memory (Wineburg, 2001).

Eye-tracking is often coupled with verbal protocols, for as Holsanova (2006) explained, specific cognitive processes cannot be directly inferred from a fixation on a particular object in a scene. For instance, a fixation (the point at which the eyes stop moving and are able to process information) may indicate any number of processes, such as recognition, liking, disliking, or puzzlement. Thus, "overt verbal and visual protocols can, in concert, elucidate covert mental processes" (p. 254), which is why we chose this multimethods approach as a means of data collection.

Toward the end of the WebQuest, we asked participants a question that focused on educational experiences of Aboriginal youth presented in a series of 10 black and white photographs taken by religious and state authorities in various residential schools across the country between 1900 and 1950. These historical photographs, presented one at a time in a slideshow embedded within the virtual exhibit, offer evidence of the particular learning environments within these institutions, the kinds of pedagogical activities students were exposed to and, perhaps more interestingly, the messages that school administrations, administrators, and teachers wanted to present to the public and governmental authorities.

(The design of the *Where are the Children?* virtual exhibit has been updated since our study. The slideshow with 10 scenes from residential schooling no longer exists in the same format as our participants viewed it. These photos are now a part of the exhibit, but no longer together as a slideshow. [See an example of the photos that our participants viewed.](#))

Since this question was posed at the end of the WebQuest, participants could not only use their prior knowledge but could draw connections among these 10 photographs and the other elements of the virtual exhibit that they had explored leading up to this question. Prior to accessing the photographs, we presented the following open-ended question to participants: "Based on the following 10 classroom photographs from the virtual exhibit, what kind of education do you think Aboriginal kids received in school?"

We read the questions of the WebQuest aloud to eliminate unnecessary participant eye movements away from the computer monitor. Although the eye-tracker is equipped with an automatic head-tracker, such eye movements away from the monitor could potentially hinder the accuracy of the ocular calibration.

Data Analysis

A mixed methods approach was adopted to code and analyze the data. We recorded two complementary sets of data during the experiment: verbatim transcriptions of participants' thoughts and answers (qualitative) and eye-tracking of their ocular engagement with the virtual exhibit (quantitative). By doing so, we were able to capture both the expressed mental processes of reading through the think-aloud protocol and the distinctive ocular behavior metrics of participants on the computer monitor photographs.

During the first cycle of coding, transcripts from the TAPs were coded using provisional coding (Saldana, 2013), which drew from the literature, pilot study fieldwork, and previous research findings to form a provisional list of codes. As data were collected, these provisional codes were revised, modified, deleted, and expanded to take into account new research findings. A major source of our provisional codes was derived from VanSledright's (2012) Epistemic Framework for reading protocols in history (e.g., context of the source, authorship, historical thinking concepts, reference to other sources, and reading strategies).

During eye-tracking, several measurements are coded and analyzed. Gaze point is a measurement of the point-of-gaze (where the participant is looking) of a subject, as measured by the eye-tracker at a specific point in time. This data is sent from the eye-tracker to calculate fixations. Fixation refers to a relatively stable eye position within some threshold of dispersion over a short duration (in milliseconds). Eye fixations on a computer screen are a relevant metric for evaluating information processing in online reading. Fixations represent the instances in which most information acquisition and processing occurs. The total number of fixations is often used in eye-tracking studies as an indicator of processing difficulty.

Scanpath is the spatial arrangement of a sequence of fixations (gaze points) on a stimulus. Scanpaths present details on the succession of fixations and their duration, thus providing a sequential gazetrail revealing the pattern of eye movements during an observation period. Eye-tracking on webpages has been the focus of several recent studies in computer technology, Web design, and psychology, and has proven to offer powerful complementary data that help researchers understand users' motivations, strategies, and cognitive processes (see Duchowski, 2007; Pan et al., 2007). To make sense of these data, we calculated descriptive statistics regarding these metrics, including the following:

- Fixations over 200 milliseconds: number of fixations per photograph, average number of fixations across 10 photographs, average length of fixations across 10 photographs, and range of the length of fixations across 10 photographs.
- Duration: amount of time spent per photograph, range of time spent per photograph, and average time spent across 10 photographs.

For research purposes, we set the minimum duration of fixation at 200 milliseconds (0.20 sec), considering that saccades (rapid eye movements between fixations) take between 20 and 200 milliseconds. Saccades direct the fovea (region of the retina specialized for high-acuity vision) onto an object or region of interest which enables subsequent high-acuity detailed visual analysis at that location. In normal viewing, several saccades are made each second and their destinations are selected by cognitive brain processes. Vision is dependent upon the information taken in during fixations between saccades, as no useful visual information is taken in while the eyes are making a saccadic movement.

We employed magnitude coding, used for intensity (Saldana, 2013), to code these data into categories, including high, medium, and low. The second cycle of coding involved pattern coding as a metacoding strategy to pull together “a lot of material into a more meaningful and parsimonious unit of analysis” (Saldana, 2013, p. 210). Data were synthesized across quantitative (eye tracking) and qualitative (TAP) analyses to form meta-analyses. We then built a progression model of historical literacy developed from our analyses, which included the metacodes passive historian, practical historian, and critical historian (see Table 1).

In order to illustrate the progression model of historical literacy, we selected 3 participants using a purposive sampling approach (Cohen, Manion, & Morrison, 2013) from the initial group of 8 participants whose data we had analyzed. These 3 participants represented a range of developing and more-developed competency levels, and their results displayed typicality among other participants with similar educational backgrounds. The 3 participants whom we chose to be represented in our model included 1 with a bachelor’s degree with a minor in history (passive historian); 1 with a master’s degree in cultural studies with an undergraduate minor in history (practical historian); and 1 with a doctorate in the history of education with a specific focus on Chinese Canadian history (critical historian).

Limitations

As eye-tracking generates tremendous amounts of data, it is typical for small-scale exploratory pilot studies such as this to use small sample sizes for feasibility. The goal here is to generate plausible hypotheses, not generate a *p*-value (Holmqvist et al., 2011). Thus, we recognize that the study’s small sample size limits the generalizability of the findings. However, using a small sample allowed us to pursue a greater depth and breadth of understanding regarding each participant’s conscious mental processes (expressed through the TAP data) and their subconscious ones, as well (expressed through eye-tracking data).

Moreover, our study’s exploratory, small-scale design combining both eye-tracking and verbal protocols has generated a large amount of data that, at the same time, generated a holistic account of the participants’ engagement with the virtual exhibit. This approach, in turn, has facilitated our conceptualization of a progression model of historical literacy.

Another limitation of our study is that we focused exclusively on one question toward the end of the WebQuest regarding a slideshow of 10 residential school photographs. Additional questions could have been analyzed, as well as additional digital history websites or virtual exhibits. We also could have used different historical inquiry questions (e.g., *Why are these pictures framed this way? What do these photographs tell us about the past?*), and these questions could have prompted participants to engage differently with the sources and potentially adopt other distinctive reading protocols. These questions and approaches point to the dearth in literature surrounding this topic and may prompt additional studies examining the ways in which students and historians alike engage with digital historical artifacts.

Results

Following the work of VanSledright and others (Lee & Shemilt, 2003), we examined some of the participants’ ideas about epistemic knowledge and assumptions about history and texts, metahistorical knowledge of history, and reading and thinking strategies employed to make sense of historical texts. Based on the findings, we created three portraits of the

participants (Ivan, Julie, and Tom) to describe three different approaches and models of reading visual historical texts that emerged from the study: the passive, practical, and critical reader (see [Table 1](#)).

The three portraits generated from the findings should not be regarded in a Piagetian model of ladder-like steps of individual learning. Yet, these three portraits facilitate conceptualization of the range of pedagogical situations likely to be encountered when learners engage in visual historical learning tasks using such resources as a virtual exhibit.

Understanding the Passive Historian: A Portrait of Ivan

Ivan was a B.Ed. student in our teacher education program with a minor in history. Despite the fact that he had limited knowledge of residential schooling and no experience of the exhibit, he completed the WebQuest swiftly. When asked about the kind of education that Aboriginal kids received in residential schools, he simply answered the question by providing factual information retrieved directly from the 10 visuals.

As he observed from the first photograph presenting young Métis students posing in a garden outside the school, “For the first one, uh, I would say gardening, and this would be, I guess, primary education.” The same type of instrumental reading was offered by Ivan with other residential school photographs: “This would be some sort of religious education” (Photo 2) and “...This is a shop class. Carpentry” (Photo 7).

Learners who fit this portrait would approach visual sources in a closed text-reader relationship, thereby positioning themselves as passive readers with a realistic epistemic frame of reference. For them, visuals provide unmediated access to past realities, providing readers with manifest information about the past under consideration. The click of the camera, to use Barthes’ (1980) idiomatic expression, is absent from their reading assumption. Visuals are not authored or created by authorities for particular purposes. They convey direct meaning in the form of historical facts to be found.

For example, Ivan’s reading of Photo 4, which presented a school teacher posing with her Métis students in front of the blackboard, reveals his approach to historical texts (see Figure 1). He said, “There is some sort of literacy” taking place in class, based on his observations of the scripts on the blackboard. Because he “can’t quite see what’s on the board,” Ivan was left with little for drawing inference about residential school education, in general, and this classroom, in particular. No attempt was made to look at how other parts of the visual—such as the disposition of the classroom and desks, differences in heights and ages, students’ facial attitudes, dresses, and body expressions—could provide evidentiary clues about the type of education that these kids received or what the photographer wanted to portray (i.e., the implied storyline).

Because of this instrumental reading strategy, Ivan had limited power to interpret the sources as historical evidence and question their origins, contexts, and authorship. This lack of engagement with the sources also prevents passive readers of history from developing kinds of historical perspectives that might afford them pedagogical opportunities to empathize with the social, cultural, educational, and emotional settings that shaped the lives of the Métis students depicted in the photos. Instead, the visuals are read exclusively for the manifest details they convey to readers. (See [Appendix C](#) for more data on Ivan’s reading of the images.)



Figure 1. *Where Are the Children?* virtual exhibit – Photo 4

Equally interesting, Ivan had limited intertextual reading of each source; that is, he was unable to compare and associate the various parts of the photograph (human faces, dresses, objects, scripts, etc.) and consider how the descriptive caption at the bottom of the photograph provided additional or even, at times, contradictory details about the visuals.

Eye-tracking data corroborated these findings. On average, Ivan spent 15.8 seconds per visual (minimum 6.0 s and maximum 25.8 s), with a limited number of 20 eye fixations on average per image (minimum 9 fixations and maximum 34). More specifically, the number of eye fixations on Photo 4 (Figure 2) is relatively low, with 31 fixations overall but with only 4 fixations of more than 250 milliseconds.

Eye-tracking studies (see Duchowski, 2007) have suggested that visual knowledge acquisition takes place during longer, stable eye movements on an object of interest (stimuli)—what is referred to as importance weightings. Ivan's fixations were attached exclusively to restricted instances on the blackboard scripts and student faces. No direct attempt was made to fixate on other parts of the visual or to read carefully the caption below the photograph and use it to make sense of the image. The same pattern was found with the other visuals of the series.

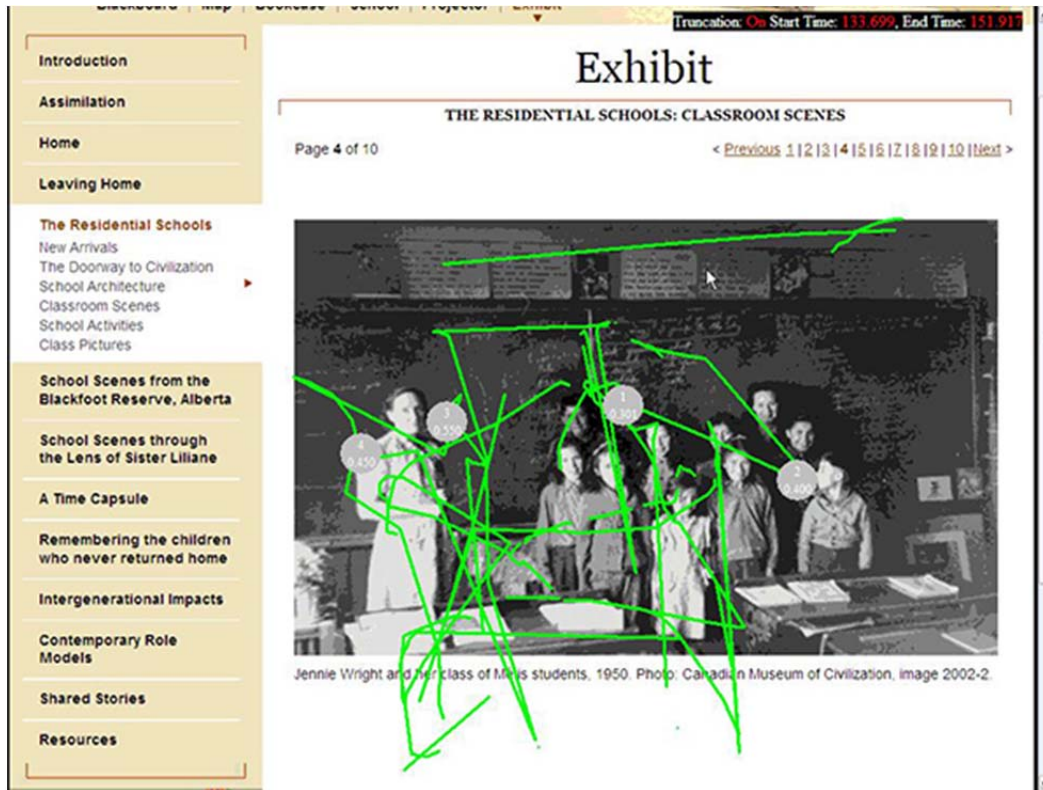


Figure 2. Ivan's eye-tracking with fixations and scanpath.

The scanpaths of Ivan, which show the sequence of eye fixations (gazetrail line on the eye-tracking) on the overall stimulus, showed dispersed patterns of eye movements during his observation, thus suggesting an incoherent skimming approach to the visuals. In the same way, Ivan also displayed limited hypertextual reading of the sources. Each visual text was read independently without making effective use of or reference to the other visuals of the website as a means of comparative analysis and a way of situating them in a larger historical framework. In no instance did he indicate invoking prior knowledge acquired in other parts of the virtual exhibit to make sense of the 10 photographs, nor did he consider the actions taking place in the larger context of the time.

Bruner (1996) claimed that images are “stopped action frames in narrative” (p. 158). They encapsulate a particular moment in time that had a past, a present, and an implied future. Readers like Ivan are unable to infer a temporal timeline to these photos to understand what led to this particular moment (the causes), what followed (the consequences), or what the larger implied story was from which the visual came. Each photograph would be treated independently without an understanding of the overall nature of the virtual exhibit.

Understanding the Practical Historian: A Portrait of Julie

Not all participants displayed an instrumental reading of the sources. Julie, a B.Ed. student with a master's degree in cultural studies and minor in history, appeared more engaged and took greater authority as a reader to go beyond the manifest information

contained in the visuals. Readers who more closely espouse this second protocol would display greater responsibility for reading carefully the visuals and looking beyond the facts in order to infer hidden knowledge from different parts and elements of the photographs.

For instance, Julie read attentively the caption of Photo 1 and then stated that the Aboriginal kids “were taught how to tend what would be a typical Saskatchewan garden.” Then she went beyond the plain visual script to say, “I mean, I don’t know, maybe the food was for the school?” Thus, she suggested that students not only learned *about* subjects (such as gardening) but were practicing gardening as a means of subsistence in Canadian residential schools. This interpretation represents a significant departure from the previous reader, because Julie seemed to know implicitly that visuals provide mediated access to the past to provide readers with associative meanings (in this case, gardening is associated with subsistence agriculture).

Julie adopted the same reading approach to other visuals from the exhibit. For Photo 4, which portrays a school teacher and her Métis students (see [Figure 1](#)), she noted,

This picture looks a bit more relaxed, a little less formal than the others. Um, I can’t really see...it’s not really distinguishable what they’re learning on the board beside them, but the environment looks a bit more friendly and relaxed in that one.

Like Ivan, Julie was unable to make sense of the writing on the blackboard. This did not prevent her from suggesting that the learning environment “looks a bit more friendly and relaxed.” Although she did not explain further, this interpretation appears to have been informed by her reading of the classroom setting and students’ look and posture in relation to the other visuals.

Julie’s reading of Photo 4 presented other distinctive characteristics. She made both intertextual and hypertextual readings of the visuals. For every photograph, Julie carefully read the details within the image (caption, pictorial details, scripts, etc.) to see how they were related to the whole and how they helped her understand manifest and latent meanings.

For instance, on Photo 5 ([Figure 3](#)), which shows five students writing on the blackboard underneath a prominent sign saying “Looking Unto Jesus,” she noted, “This one’s interesting. Actually, because it talks about penmanship but the title is Looking Unto Jesus.” This apparent contradiction between the photo and caption led Julie to infer that perhaps the goal of education was the “integration of religion into the curriculum and overall structure of the school.”

In order to arrive at this implied message, viewers like Julie read the visuals with some authority and sense of historical perspective that afford them opportunities to see possible alternative messages and meanings—not exclusively the manifest one presented in terms of facts. In other words, photographs are considered as sources of information *about* the past, not direct windows to the past. (See data from Julie’s reading in [Appendix D](#).)

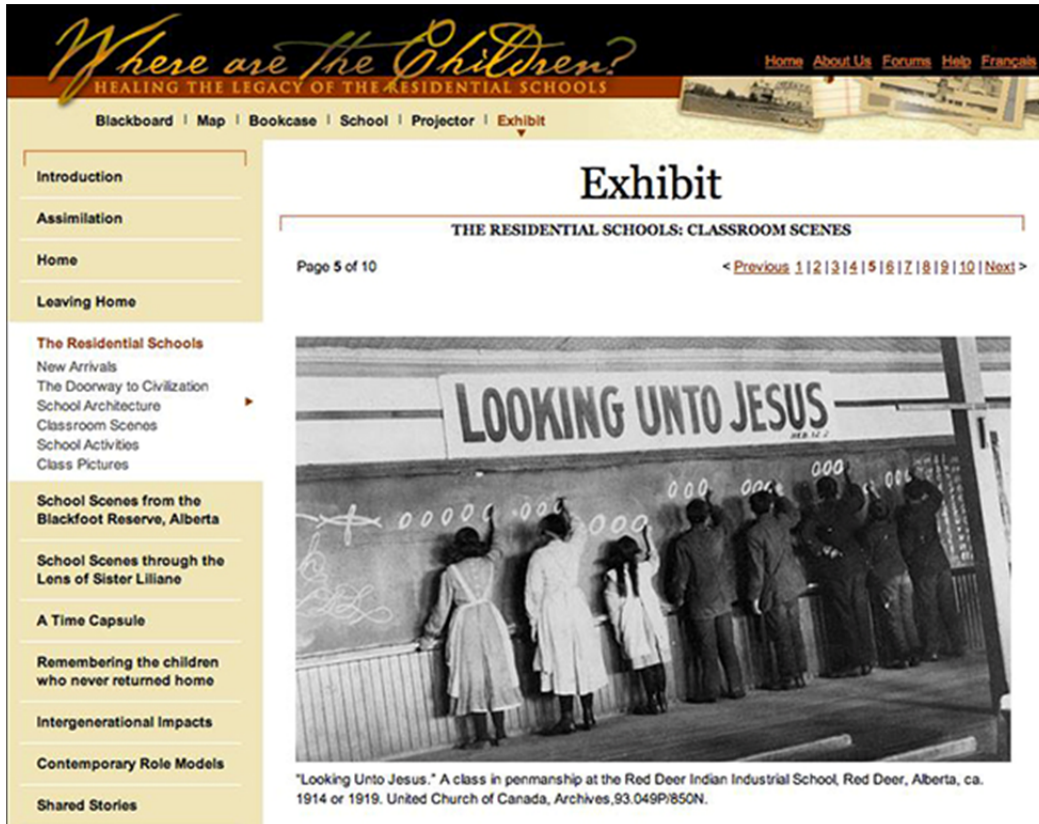


Figure 3. *Where Are the Children?* virtual exhibit – Photo 5

Beyond intertextual reading, Julie also invoked other sources or images from the virtual exhibit (hypertextual reading) and used them at her advantage to compare and contrast the messages by making such statements as “a little less formal than the others” (Photo 4) and, “This one’s quite a bit different from the other ones” (Photo 7). By doing so, Julie situated each residential school photograph within the larger historical framework and the respective knowledge she gained from her experience visiting and reading other pages of the virtual exhibit.

The data from Julie’s eye tracking provide further support for the findings in Figure 4. Unlike Ivan, Julie read each image carefully. Overall, she spent on average 40.7 seconds per visual (minimum 18.3 s and maximum 60.7 s) compared to only 15.8 seconds for Ivan, which represents more than twice the time spent reading each photograph. This increased visual attention was also translated into the number of eye fixations per visual.

On average, we found 50 fixations over 200 milliseconds for each source (minimum 28 fixations and maximum 89). For example, when looking at Photo 4, she had 46 fixations of a minimum 250 milliseconds (all her fixations were more than 200 ms) on the visual. Many of these fixations were part of fixation groupings, which indicate that Julie had engaged with the source beyond visual skimming and focused persistently and repetitively her attention on various parts of the image.

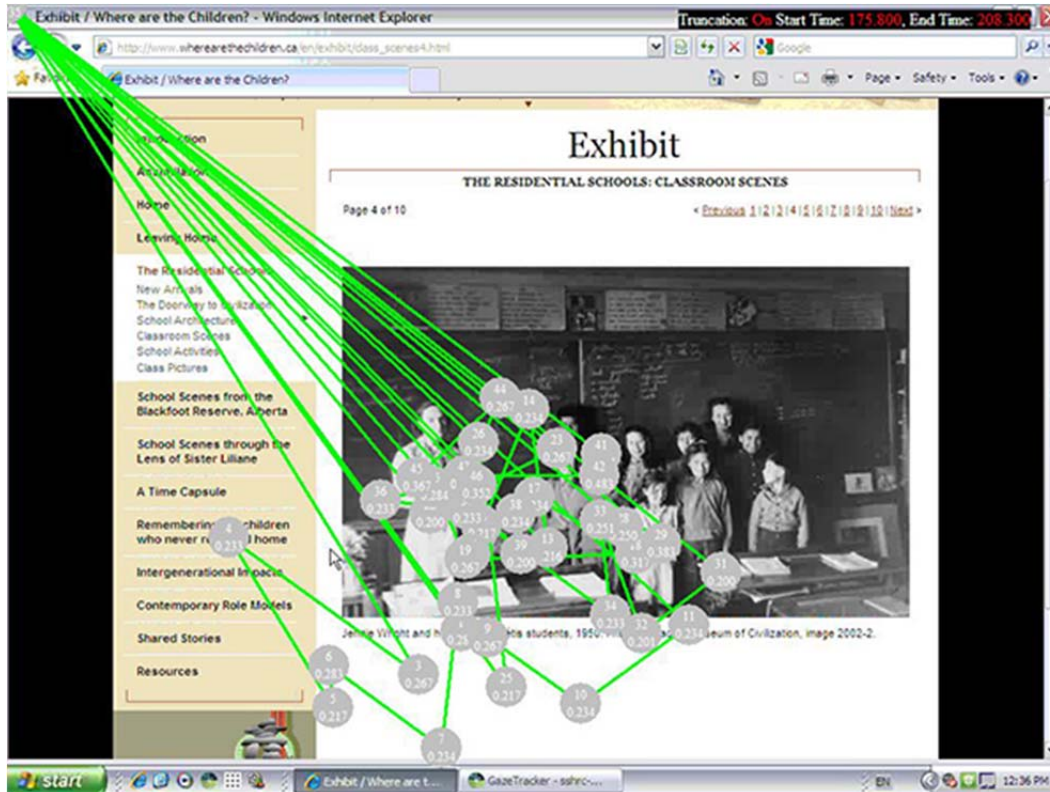


Figure 4. *Julia's eye-tracking with fixations and scanpath.*

In fact, when looking at her scanpath, she had an interesting back-and-forth gazetrail between the caption and the pictorial elements of the photograph (starting with the caption and then with the facial expressions and scripts). Moreover, the number of fixations on textual scripts was relatively low compared to the number of fixations on the individuals and the caption, thus suggesting that Julie focused most of her visual attention on pictorial elements she used to take a historical perspective and infer personal meaning. Overall, Julie engaged in a more focused, attentive, and comprehensive reading of visuals with greater understanding of historical thinking within the digital environment.

Understanding a Critical Historian: A Portrait of Tom

Tom, the Canadian historian who specialized in Chinese Canadian history, confessed at the beginning of the study that he had limited experience with virtual exhibits. Although he knew about residential schooling, a subject he typically introduced to students in his graduate courses, this particular exhibit from the Hope Foundation was unknown to him.

Interestingly, Tom took great authority to go beyond the manifest information conveyed by the photographs and offered personal evaluations of their historical meaning. Like Julie, he looked at the visuals as sources for possible inferences about the past. Tom noted the following from the first photograph presenting Métis kids in a garden: "This is an education that emphasized usable skills like gardening, vegetable growing, and farming."

Tom was able to generate an associative meaning from the visual source and suggest that the presence of students in the garden was linked to vocational education to prepare Aboriginal kids for practicing specific trades in Canadian society.

What distinguished Tom from the other participants in the study was his ability to look at the historical photographs with a contextualized understanding (a big picture) of the virtual exhibit on Canadian residential schooling that he used to imagine and read each source in time and place. Photographs for this exhibition were taken in different residential schools across the country managed by various religious congregations during a period extending from the early 1900s to the 1950s. Throughout his reading of sources, Tom was aware of this important historical contextualization necessary to explain what was going on in school at these particular moments in time.

When reading Photo 3, for example, Tom implicitly referred to the previous photos and claimed, "This is a similar photograph, only it's with the moderators of the United Church of Canada, 1932. So it's a different religious crew..." Tom also made an important but subtle distinction between Photo 6 (Catholic school in Québec) and Photo 7 (Protestant school in Manitoba) with a connection to Photo 1 (students posing in the garden): "This is a carpentry class, from 1910, uh, in a Brandon School, the United Church archives, so it's a United church class. So again this emphasis is that it's agricultural school like in the picture in the first photograph."

Equally interesting, Tom's ability to read the photographs with a big picture in his mind enabled him to infer a possible time period to other visual sources from the exhibit. In Photo 9 (Aboriginal children praying before bedtime), the date of the photograph is not indicated either in the photo or in the caption. Yet, Tom could deduce a possible historical period: "This is an Anglican Church. It doesn't give the date but I would say this is probably 1940s, 1950s." Tom was able to make this inference because he read the bits and pieces of the source, not in factual isolation, but in relation to time and place associated with other sources from the exhibit.

Beyond the contextualization of sources, Tom's assumptions about visuals as historical evidence are revealing. Ivan was in a closed relationship with the texts. Meaning was unidirectional from the source to the reader, so there was no point in trying to read beyond the manifest information. Julie assumed greater power in the relationship, started to question the sources, and looked at how different bits and pieces could yield possible meaning. Tom drew upon his prior historical knowledge and thinking competencies to engage with the sources imaginatively, so that the differing visual texts became part of a larger interpretive shared experience.

For Tom, photographs were more than "lifeless strings of facts," as Wineburg (2001, p. 74) put it. Instead, they represented human artifacts, each with its unique personal texture, shape, and voice that lay waiting to be uncovered. Tom's reading was populated with instances of this coconstruction of meaning between the reader and text, often talking directly to the visuals during the think-aloud session with assertions like, "Looking at the picture...I assume they're teachers...but not sure," and inquisitive statements, such as, "Everybody is practicing apparently writing zeroes on a board. Why? I have no idea, if they're practicing writing zeroes...or this is a form of detention or something?"

One of the most telling instances of coconstruction of knowledge occurred with Photo 4, in which the school teacher posed with her Métis students in front of the blackboard (see [Figure 1](#)). Tom made this intriguing remark: "I don't know, quite know, what to say with this one.... I notice that they're Métis, so I don't know if that means they are in a

residential school or others were not....” This is a completely different answer than the previous participants who made direct connections to the noticeable details of the photo.

Instead Tom took his reading beyond the factual details by implying something “behind the source”: the Indian Act of 1876. Indeed, residential schools were created under a 19th-century Canadian statute, otherwise called the “Indian Act,” that concerned registered Indians, their bands, and the system of Indian reserves. Under this piece of legislation any child identified as Indian in Canada was required to attend Indian residential or vocational schools. However, the Métis people of Canada (of mixed ethnocultural backgrounds) were never acknowledged in the Indian Act, so by law, Métis students were not required to attend residential schools.

When Tom said, “I don’t quite know what to say with this one,” he was, possibly, not referring to the unreadable script on the board (as did Ivan) but to another document, the Indian Act. In fact, Tom confirmed this assumption in the debriefing session, and argued that the Act is still “one of the most racist pieces of legislation” in Canada.

Critical historians (readers) like Tom not only read sources in reference to other historical texts, like supplementary photographs or historical information contained elsewhere in the virtual exhibit, they do so by invoking prior historical knowledge. This element is crucial for historical literacy. Tom, the historian, was able to read the photograph differently than the other participants, because he could draw on his historical knowledge and thinking competencies to provide a wider understanding of residential schooling than could the preservice teacher candidates.

Tom’s eye tracking data (Figure 5) offered supporting evidence of his critical reading approach ([Appendix E](#)). Unlike other participants such as Ivan, Tom had read the sources beyond visual skimming. Much like Julie, he spent on average 42.3 seconds per visual (minimum 22 s and maximum 122 s). This visual attention is also correlated with the number of eye fixations per visual. On average, he had 43 fixations over 200 milliseconds for each source (minimum 26.1 s and maximum 67.1 s). On Photo 4, for example, he had 69 eye fixations, including 27 of them of a minimum 0.25 second of visual attention.

As with Julie’s eye-tracking, many of Tom’s fixations are part of fixation groupings, thus suggesting consecutive and recurring visual attention to specific parts of the photograph. These groupings, however, were not consistent with the ones present in Julie’s eye-tracking. Tom seems to have placed less visual attention on human figures and greater focus on other pictorial and textual elements of the photograph, such as the writing on the blackboard, wall posters, and student material (on the desks). Still, his focus on students (see fixation points 15-17) were clearly identified on the eye-tracking and can potentially explain why Tom stated in his think-aloud that “given the height difference and age differences in the children, it would be like in rural school with multiple grades going on....”

His scanpath on the picture also presents interesting findings. Data from the gazetrail indicate that Tom first focused his attention on the lower part of the photograph (Fixation 1) and then moved his attention rapidly to the caption and to other parts of the visual in a back-and-forth reading pattern. Although the overall number of fixations for Tom was smaller as compared to Julie, his scanpath showed a high level of visual engagement and information processing. In fact, Tom was able to construct more contextualized and detailed historical interpretations of each photograph because of the reading protocol he brought to the visual sources. (See [Appendix E](#) for additional data on Tom.)

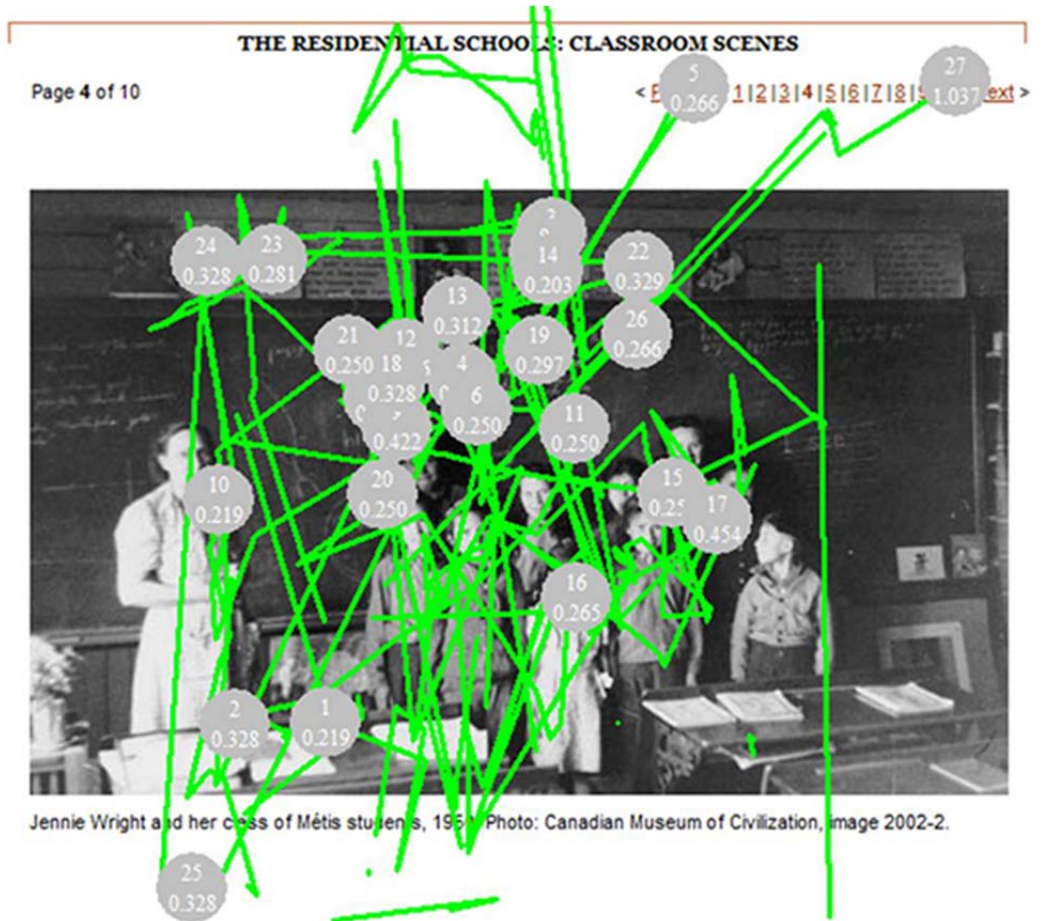


Figure 5. Tom's eye tracking data.

Discussion and Conclusion

These three portraits—passive, practical, and critical—are relevant in history education because they exemplify common ways of reading visual texts in education and offer possible insights on the different strategies teacher education students and historians might utilize when making sense of websites, virtual exhibits, or photographs as historical evidence with students. In turn, such reading approaches can potentially enable young readers to navigate more successfully and intelligently the study of history within the ever-evolving digital contexts of the 21st century.

Indeed, visual texts, as the ones presented in this virtual exhibit, permeate our educational environment because educators often assume that historical images are more accessible illustrations and lend themselves to greater knowledge comprehension than do standard texts. This is a mistake. Visual sources convey multiple meanings, and discipline-specific competencies in historical literacy are required to interpret them critically as sources of evidence that inform the different historical narratives in history classrooms.

If a picture is indeed worth a thousand words, it is not so clear what these thousand words mean to readers in history classes. As the participants of this study talked their way through the experiment, they offered a broad range of answers to our initial question pertaining to what these photographs tell us about the education of Aboriginal children who lived (or did not) at residential schools. These answers provide additional evidence regarding how some student teachers and historians read online visual sources in the form of historical photographs. They also offer a number of conclusions and further beginning points for research that uses eye-tracking software and that attempts to make sense of the different reading patterns that inform the necessary competencies now constituting historical literacy within the digital economy of the 21st century.

Understanding Multiple Reading Patterns

First, our research indicates that there is no standard reading pattern for making sense of visual historical texts. Both the verbal explanations and eye-tracking data of participants demonstrated that photographs can be read in many different ways. Unlike traditional written texts, which follow established reading pattern, the interaction between the reader and a visual is different, because the image is there all at once and fills the page (or the computer monitor). As such, it is not clear whether the reader's understanding and responses all happen holistically or consecutively.

What part of the picture do the reader's eyes go to first and in what order? Participants answered these questions differently during our experiment, depending on their preconceived ideas about visual sources and technology. While some started their reading with pictorial aspects of the visual (notably human faces), others focused their initial attention on scripts (such as the caption).

That being said, the analysis of data suggests that the number and duration of eye fixations on visuals is a necessary but not sufficient condition for making sense of primary source photographs in history. Indeed, there were clearly differences in the performances of participants like Ivan and Julie when looking at their responses and eye-tracking. The time spent on the photographs, as well as the gazetrail between the various visual components, are directly linked to the overall quality of their analysis. Participants who skimmed through the visuals in a few seconds did not offer detailed and sophisticated readings of the photographs, looking predominantly at manifest features emerging from each source, as evidenced by their eye fixations and gazetrails.

The duration and number of fixations on visuals is no guarantee of participants' performance for our WebQuest. Indeed, when comparing the eye-tracking results of Tom and Julie, we found similar figures. Both spent considerable time looking at each of the 10 photograph (40.7 sec on average for Julie vs. 42.3 sec for Tom) and both inferred meaning by reading the various parts of each visual consecutively and holistically as found in their gazetrails. However, Tom was able to generate more nuanced and historically significant inferences from the visuals than Julie. These data suggest that visual attention is clearly important but not sufficient for sophisticated reading of historical sources from a virtual exhibit.

Understanding Digital Youth as Historical Immigrants

Indeed, a key result from our research is that the two student teachers born during the technological revolution of the 1990s did not perform any better than the historian in his late 50s. A critical historical reader may have brought something to the WebQuest task that others did not.

Historians like Tom often have deeper knowledge of history and make effective use of historical thinking. Moreover, they can situate the sources (in term of continuity and change and significance) in a larger historical context. For example, Tom was able to reference other sources that were outside the historical content of the virtual exhibit. Wineburg (2007) contended that when readers are faced with historical texts, they (instinctively) make sense of content and ideas in reference to available information in their memory—what he calls “spread of activation” (p. 7).

In our activity, we can suppose that each photograph prompted our participants to read it in reference to prior knowledge. Therefore, readers like Tom had more agency to interpret the visuals, because they could draw on vast experiences and historical memories of residential schooling.

Related to this spread of activation of historical information in memory is the use of historical thinking. It is now established in the field of history education and Canadian provincial curriculum policies that disciplinary concepts like historical significance, causation, contextualization, and sourcing habits of mind serve as key criteria that guide readers’ engagement with historical texts (see Ontario Ministry of Education, 2013). Key questions (e.g., Who produced the source? For what purpose? In what historical context? Why is this photo part of the exhibit? What was it like to be an Aboriginal student?) orient viewers’ approaches to texts and ways of reading sources as historical evidence that yield information about the past.

This thinking is far from intuitive, however, and takes time to develop. Professional historians have more experience and opportunities to exercise it. Consensus in Canadian education is growing that historical thinking represents a crucial element for developing historical literacy (see the [Historical Thinking Project](#)).

Understanding the Google Reflex as History Educators

The cognitive challenge of this experiment was amplified by the fact that print text was part of each primary source image and integrated into an electronic text for an online exhibit on residential schooling. This complex digital literacy setting, which combined images, texts, and animations within a virtual exhibition, may help explain, in part, the difficulty of conducting such empirical research in history. Other studies have found similar results when comparing the reading of texts, photos, text with photos, and webpages (see Walsh, 2006; Walsh, Asha, & Sprainger, 2007). In fact, a key finding from our study is that participants did not necessarily recognize the unique learning environment in which they performed the WebQuest. Participants, for instance, were sometimes frustrated with the WebQuest and asked, “Where is the search engine?” because they could not intuitively find immediate answers to our questions.

This “Google reflex” to look for a search engine within a virtual exhibit shows the challenges for readers immersed in subject-specific virtual environments. Online exhibitions such as *Where Are the Children?* are not designed like any other information websites. They offer computer users an organized narrative with a display of selected source items embedded within a subject-specific domain (e.g., residential schooling). Increasingly, visitors to virtual exhibits are provided with an intuitive human-computer interface (often designed in Flash©) based on well-known metaphors, which render the user experience more enjoyable and interactive.

In our study, though, participants did not necessarily appreciate the structure and format of the virtual exhibition with selected items and embedded storyline. This unexpected

conclusion calls for a better presentation and explanation of what online exhibitions are designed for. What is interesting about our findings is the existence of different ways—passive, practical, and critical—of engaging with a virtual exhibit in relation to their implications for education. Clearly, teachers cannot take digital technology for granted. Virtual exhibits can offer powerful tools for doing history, but teachers need to structure the scope and sequencing of their lessons to afford students opportunities for developing historical thinking while visiting virtual exhibits like this one.

Pedagogical Implications for Taking Up Visual Historical Texts With Students

One key challenge for educators in the field of history education is to find successful strategies from research findings to embed into their teaching practice. Although limited in scope, our study has three important implications for teaching history with visual sources.

Prior Knowledge Assumptions About Visual Texts. Our findings suggest that some learners read visual primary sources in a virtual environment with preconceived ideas about images and the Web. On the one hand, there is no clearly established reading pattern among participants in our results, suggesting that readers approach visuals in a variety of ways. Unlike a standard print text, the image is there all at once and fills the page (or the computer monitor). As such, it is unclear how readers will read it, as so much depends on personal assumptions about the texts. Is the image showing the past as it was? Does it “speak” and offer historical evidence, or is it simply a visual illustration? What parts of the image should be looked at? In what order? How readers answer these questions directly affects their engagement with the sources.

On the other hand, content on the Web is not structured in a simple, coherent way. The historical information that users access through a search engine like Google can be radically different from a virtual exhibition that presents a subject-specific experience of historical texts, images, and animations. However, learners do not necessarily acknowledge the particular medium that delivers the message. Just as historians do not read a history textbook in the same way as they would read a personal diary, so it is with online historical content.

History educators must take into account more seriously how they use or encourage students to make use of visuals in the history classroom. Too often, electronic slideshows or unit projects favor the inclusion of visual texts to enrich the learning experience without thinking about how learners will read them. In their book *History as Art, Art as History*, Desai, Hamlin, and Mattson (2009) contended that students are “not only familiar with visual symbols and communication, but are often the target of this messaging.” “Visual imagery,” they continued, “statures their daily existence, and they are perhaps more likely to learn about history from television, film, video game, and photographs than from reading” (p. 5).

The Need to Expand and Break Down Images in the History Classroom. Visual primary sources are more than things or icons. The meanings of these historical texts emerge during the interaction between the visual and the reader. Too often, however, students have an instrumental reading of the image without considering the larger context from which the visual is taken. As Bruner (1996) observed, images are “stopped action frames” in a narrative (p. 158). To understand what is taking place in a photograph, viewers must look at both the antecedent as well as the consequence of the actions being (re)presented.

This narrative view of visuals implies that readers must expand the reading of an image to look at the larger historical context from which it is emerging by asking what larger issues, values, or events an image presents and how it represents people of the period.

The reading of visual texts also implies a close inspection and decoding of the various parts of an image. Because the visual is there all at once, readers must consider carefully the many elements that compose it (e.g., persons, objects, buildings, scripts, captions, etc.). We found that passive historical readers in our study spent a relatively short time reading the digital images. Their eye-tracking data also showed little engagement with the various parts of the sources.

Educators should teach students how to read the elements and generate inferences from them. For instance, students should consider what the caption says about the image and how the caption orients the reading of the image. They should also consider whether there is a date and reference for the photograph and, if so, whether this information helps contextualize the source in time.

Through such kinds of pedagogical questions, readers learn how to infer knowledge from the visual. They also realize that a visual source is a complex text with multiple messages and meanings that are often coded by the medium. One possible strategy is to break down the image into pieces of a puzzle and ask students to analyze each piece separately and then collectively so as to focus their visual attention on how the elements fit together. Also, when constructing WebQuests, teachers need to consider where they ask students to reflect on how they direct their eyes when navigating and searching through the webpages of different virtual exhibits.

The Photographer and the Click of the Camera. Like any other text, visuals are authored. They were created by photographers who wanted to convey particular messages about the events and actors of the time. Choices were deliberately made in conceptualizing and producing the images by focusing on particular scenes or in arranging the scenes and positioning the actors to perform in a certain way. All these choices were made on assumptions, goals, and values of different kinds.

Many participants in our study read the sources and instinctively looked through the photographs without questioning the authors, their intentions, and the rhetorical devices used to portray the past. Even when there was a caption accompanying the visual, as in the virtual exhibit on residential schooling, readers were naturally prompted to see it as a window to the past. Photographs, whether print or online, present a unique set of challenges to readers. Unlike primary source documents, such as letters and memoirs, photographs often conceal their authors. As Barthes (1980) observed, “A photograph is always invisible: it is not it that we see” (p. 6).

Teachers must encourage students to develop a form of reflexive reading (Werner, 2002, p. 417), which calls for evaluative meaning and self-awareness of the visual texts. Critical reflexive readers recognize, evaluate, and potentially contest the ways in which visuals position the readers. They do so by raising questions: In what position is the reader placed (e.g., the teacher, the inspector, the student, the parent)? In what roles? (For example, as participant in the event? As witness? As sympathizer?) What strategies and devices were used to create the desired effect? What impact do present-day perspectives and values have on the ability to read this image from the past?

Textbooks, multimedia presentations, and other didactical material in history classrooms are crowded with visual sources used to represent, illustrate, or enrich the words and

learning experience of students. For the most part, visuals continue to be illustrations and pictures of the past rarely taken as texts that need to be analyzed critically on their own terms. If the purpose of history education is to prepare students to become critical citizens of their political community and the world, then results from this study offer additional justifications for teaching historical literacy.

One step in this direction is to map out the landscape that represents the various reading protocols students and historians use to make sense of visual historical texts. Empirical studies in England (Lee, 2005; Lee & Shemilt, 2003) and the U.S. and Canada (Lee & Friedman, 2009; Seixas & Peck, 2008; VanSledright, 2012), are attempting to build such a map that could be used to understand more effectively how students make progression in their learning of history. In a modest way, this article aims to continue and contribute to this scholarly conversation.

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Resources

Where Are the Children? - <http://wherearethechildren.ca/en/exhibition/>

Historical Thinking Project - www.historicalthinking.ca

The History Education Network - www.thenhier.ca

Stories Matter - <http://storytelling.concordia.ca/storiesmatter/>

Virtual Historian - www.virtualhistorian.ca

Where Are the Children? - <http://www.wherearethechildren.ca>

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Appendix A Canada's Residential School System

The "residential school" system refers to Canadian educational institutions that included industrial schools, boarding schools and student residences created by the federal government as part of its assimilative policies (e.g., Indian Act) directed at Aboriginal peoples from the 1880s onward. The government pursued compulsory schooling as a means of Canadian educational and societal assimilation. The Canadian government collaborated with Christian missionaries to operate these schools and encourage Aboriginal self-sufficiency and religious conversion. The harsh and also abusive regime within these schools provoked strong resistance, both by Aboriginal parents and students. By the mid-20th century, it became obvious that residential schools were ineffective and Aboriginal protests helped to secure a change in policy. In 1969 the decision was taken to close the residential schools. The last school officially closed in 1996, the same year the Royal Commission on Aboriginal Peoples presented its final report. On 11 June 2008, the Canadian prime minister, on behalf of the government of Canada, offered an official apology to all former students of Aboriginal residential schools in Canada by recognizing that "this policy of assimilation was wrong, has caused great harm, and has no place in our country." See Smith, Ng-A-Fook, Berry & Spence (2011).

Appendix B WebQuest Protocol

Welcome participants to the lab meeting room.

Present them with the University ethical consent form that outlines the purpose of the study as well as their voluntary participation in this study without any effect on their studies.

Have them sign the form and attribute to each participant a research code associated with their name.

Explain to participants that they will be completing a WebQuest in the lab observation room.

Ask the participants if they know what a WebQuest is. Explain that they will be visiting a website on Canadian residential schooling entitled "Where are the children?"

Ask them if they have ever visited the site. If so, place participants in a separate category for coding and analysis.

Tell them that they will answer a series of open-ended questions and that there are no simple "right or wrong" answers to the questions but only personal ways of navigating the site and generating ideas on residential schooling from the website.

Explain to participants that we will be recording two sets of data during the experiment: verbatim of their think-aloud and eye-tracking of their ocular behaviour on computer monitor.

Remind participants that think-aloud protocol is a technique used to allow researchers to understand, at least in part, the thought process of a participant as he or she performs a task.

Remind the participants to express clearly whatever they are thinking or doing during the experiment.

Explain to participants that we will also record eye-tracking data. Tell them that the infrared system is mounted on the desk and does not interfere with or damage the pupils of the participants.

Tell them also that after a short calibration process with the technician, they will perform a simple task to test the procedure and recording system.

Remind the participants that they are free to ask questions or decide to stop the experiment at any point during the WebQuest.

Ask the participants if they have any question before we start. If not, guide the participants to the observation room and prepare them for the calibration process with the technician.

When completed, have the participants navigate the computer desktop and think aloud as they do so to record some data. If successful, open the web browser and take students to the website.

Read the following note to students: "Because this virtual exhibit is designed in Flash© do not sure the 'back' function of your web browser to return to a previous page. Instead, follow the instructions and use embedded tools from the exhibit. Doing otherwise will force you out of the Flash application."

Then ask the following:

- In your opinion during what period did the residential school system operate in Canada?
- Why do you think Aboriginal chief Shingwauk believed that residential schooling would be beneficial to his people?
- Using the interactive map, locate the "Mohawk institute residential school" and identify the survivors who provided oral history accounts.
- From the interactive bookcase, find and name the goals of the federal government policy for Aboriginal education.
- From the virtual exhibit, find the "classroom scenes." Based on the following 10 classroom photographs what kind of education do you think Aboriginal kids received in school?
- From the virtual exhibit "Time capsule," compare the two photographs of Thomas Moore. What has changed? What has remained the same? What does this tell you about residential schooling?
- Was this virtual exhibition useful for you to learn about the history of residential schooling?
- Are there elements, tools, or content that you really liked or did not like in the virtual exhibit?

**Appendix C
Ivan's Reading**

Protocol Instructions: (Classroom scenes section of website). "Now there are 10 photos. So look at each photo and tell me, what kind of education Aboriginal children received from these photos?"

Eye-Tracking Data		Sources	Reading Protocol
Duration of (in sec.)	Number of Fixations (min 200 ms)		
25.8	9	Photo 1: Aboriginal children standing in rows by a garden outside Anglican Lac la Ronge Mission school, Saskatchewan, August 1909.	For the first one, uh, I would say gardening, and this would be, I guess, primary education.
14.2	11	Photo 2: Aboriginal children and staff assembled outside Kamloops Indian residential school, British Columbia, 1934.	This would be some sort of religious education.
11.0	11	Photo 3: Aboriginal children gathered around a reverend for the planting of a tree outside Coqualeetza residential school, British Columbia, 1932.	The third one, uh, also some sort of religious education.
18.2	31	Photo 4: School teacher posing with her Métis students in front of the blackboard, 1950.	Fourth one, there is some sort of literacy, um... I can't quite see what's on the board.
16.4	31	Photo 5: Class in penmanship with students writing on the board, Red Deer industrial school, Alberta, 1919.	Same, this is, uh, "Looking unto Jesus." But I can't quite... it's penmanship I guess. They're practicing strokes.
11.6	20	Photo 6: Aboriginal children sitting in rows at Fort George Catholic Indian residential school, Québec, 1939.	Uh, they're praying here, so I think, or appearing to do so. So again, it's some sort of religious education.
15.8	34	Photo 7: Aboriginal students in carpentry class at Brendon Indian Industrial school, Manitoba, 1910	Ah, this is a shop class. Carpentry.
19.1	22	Photo 8: Cree children sitting in rows with teacher at the back of class at Lac La Ronge Mission school, Saskatchewan, 1949.	Again, from the caption, I assume this is... so they're going through the Old Testament.
6.0	15	Photo 9: Aboriginal children praying before bedtime in the	Um, they're praying

		dormitory, Anglican school, Yukon, n.d.	before bed time.
19.7	15	Photo 10: Aboriginal students standing outside Calgary industrial school, Alberta, 1900	Um, more religious training, it says right there. Um, again, Christian education. Habits of self-discipline.
15.8	20	Average	

**Appendix D
Julie's Reading**

Eye-Tracking Data		Sources	Reading Protocol
Duration (in sec)	Number of Fixations (min 200 ms)		
44.0	71	Photo 1: Aboriginal children standing in rows by a garden outside Anglican Lac la Ronge Mission school, Saskatchewan, August 1909.	Yeah, so I guess they were taught how to tend what would be a typical Saskatchewan garden. I mean, I don't know, maybe the food was for the school?
38.5	28	Photo 2: Aboriginal children and staff assembled outside Kamloops Indian residential school, British Columbia, 1934.	Okay, so the photo suggests it was quite orderly and disciplined, I suppose, and had some kind of religious education because there's nuns and priests on the side.
42.5	61	Photo 3: Aboriginal children gathered around a reverend for the planting of a tree outside Coqualeetza residential school, British Columbia, 1932.	Um, so... . Okay, so I guess this one reinforces the idea that there was some sort of religious aspect to learning, in this case the United Church was learning. So again, I guess there's some formality going on, Other than that, I can't tell.
32.5	46	Photo 4: School teacher posing with her Métis students in front of the blackboard, 1950.	This picture looks a bit more relaxed, a little less formal than the others. Um, I can't really see...it's not really distinguishable what they're learning on the board besides them, but the environment looks a bit more friendly and relaxed in that one.
53.0	77	Photo 5: Class in penmanship with students writing on the	So this one's interesting. Actually, because it talks about

		board, Red Deer industrial school, Alberta, 1919.	penmanship but the title is "Looking Unto Jesus." Um, I mean, there's a sign about that prominently displays that title but, um, integration of religion into the curriculum and overall structure of the school. Um, it's pretty prominent.
30.1	29	Photo 6: Aboriginal children sitting in rows at Fort George Catholic Indian residential school, Québec, 1939.	... Um, so again, very formal school setting, there's a nun at the back, Um, you can see at the back there's religious figures around the back. You get the impression that religion was an important part of education.
34.5	39	Photo 7: Aboriginal students in carpentry class at Brendon Indian Industrial school, Manitoba, 1910	This one's quite a bit different from the other ones. More the sense that they're at a track school rather than a formal school setting with no religious symbols, and it looks more like a workshop than a school.
60.7	30	Photo 8: Cree children sitting in rows with teacher at the back of class at Lac La Ronge Mission school, Saskatchewan, 1949.	... Um, so there's less religious symbols, they're less obvious in this one, um, which I guess it's not surprising. It's a United run school but it still looks very formal and Catholic.
18.3	30	Photo 9: Aboriginal children praying before bedtime in the dormitory, Anglican school, Yukon, n.d.	Next one. Um, again, religious instruction, prayer then sleep at the school so there is some separation from their community.
52.5	89	Photo 10: Aboriginal students standing outside Calgary industrial school, Alberta, 1900	So, in this case the caption doesn't seem to necessarily correlate so well with the photo, so from what the others talking about, religious instruction. Um, don't know what precisely I'm looking at in this photo besides a group of school children.
40.7	69.4	Average	

**Appendix E
Tom's Reading**

Eye-Tracking Data		Sources	Reading Protocol
Duration (in sec.)	Number of Fixations (min 200 ms)		
26.1	21	Photo 1: Aboriginal children standing in rows by a garden outside Anglican Lac la Ronge Mission school, Saskatchewan, August 1909.	OK, so the first photograph shows the boys and the girls lined up in front of a school's garden. So this is an indication that emphasizes, looks to me like early twentieth century, oh late nineteenth century it says. So this is an education that emphasized usable skills like gardening, vegetable growing, and farming.
42.0	22	Photo 2: Aboriginal children and staff assembled outside Kamloops Indian residential school, British Columbia, 1934.	It's a picture of when everybody in 1934 and in the county school and a school photo, there are two priests sitting in front, there is [sic] nuns on the right, so it also emphasizes the religious nature of education people got. Judging from the photo, it looks like there are girls dressed in white, so it's probably their first communion, which would also explain the white shirts of these little boys as well, and they all have their hands in prayerful poses, so it's all about religion.
33.2	36	Photo 3: Aboriginal children gathered around a reverend for the planting of a tree outside Coqualeetza residential school, British Columbia, 1932.	This is a similar photograph, only it's with the moderators of the United Church of Canada, 1932. So it's a different religious crew posed both Catholic and Protestant. Looking at the picture, at least two other men, they have got priest collars. I assume they're teachers but not sure. So, it's religious education.
47.0	69	Photo 4: School teacher posing with her Métis students in front of the blackboard, 1950.	This other one of 1950, a group of Métis students. Um, I don't know, quite know what to say with this one. It looks not dissimilar to any other classroom in rural Canada during that period, um, except given the height difference and age differences in the children, it would be like in rural school with multiple grades going on, um, in this particular case. I notice that they're Métis, so I don't know if that means they are in a residential school or others were not...or others were not.

44.1	35	Photo 5: Class in penmanship with students writing on the board, Red Deer industrial school, Alberta, 1919.	Again here, this is a 1919 picture of the Red Deer Industrial School. Everybody is practicing apparently writing zeroes on a board. Why? I have no idea if they're practicing writing zeroes or this is a form of detention or something. They're under a big sign that says, "Looking unto Jesus." So again, this is emphasizing the idea this is a religious-based education. The other interesting thing in this photo is the segregation between the girls and the boys. Even here, in this photograph, you have the girls on one side and the boys on the other.
47.3	28	Photo 6: Aboriginal children sitting in rows at Fort George Catholic Indian residential school, Québec, 1939.	This is a school, a Catholic school in Quebec in 1939. So again, here this is, uh, the kids are sort of being sitting at their desk and they have their hands folded in front of them. So part of what's going on is this idea that kids have to be, um, that's a way of controlling them? So always sitting quietly, their hands in front of them, so they're not getting into any trouble. Again, there is a nun in the back so it emphasizes the religious nature of school but also the severe discipline.
34.1	55	Photo 7: Aboriginal students in carpentry class at Brendon Indian Industrial school, Manitoba, 1910	This is a carpentry class, from 1910, uh, in a Brandon School, the United Church archives, so it's a United church class. So again, this emphasis is that it's agricultural school like in the picture in the first photograph. The idea is they're learning practical skills but also sort of low-level skills and pangender skills, so the boys here are learning carpentry. I assume girls learned things like sewing and so forth.
52.0	51	Photo 8: Cree children sitting in rows with teacher at the back of class at Lac La Ronge Mission school, Saskatchewan, 1949.	Um, so here is one from 1949, the subtitle is "Thou shalt not tell lies." Um, it looks like this is mislabelled. Oh, actually, never mind. Um, I don't know where this "Thou shalt not tell lies" comes from. But again, it's the boys tend to be sitting in groups, the girls tend to be sitting together, again, suggesting this is a fairly tradition-orientated school.
31.5	29	Photo 9: Aboriginal children praying before bedtime in the dormitory, Anglican school, Yukon, n.d.	This one is the boys in dormitory scene. They're praying. This is an Anglican Church. It doesn't give the date but I would say this is probably 1940s, 1950s. So again, the children are all in dormitories and the children are being taught various forms of Christian religious practice in their every waking

			moment, and they conclude by saying their prayers before going to bed.
67.1	122	Photo 10: Aboriginal students standing outside Calgary industrial school, Alberta, 1900	And finally, we have this picture of a group of boys in coveralls. Um, this is from 1900. So the thing explains that they did daily religious stuff and so forth. And the idea is to make them good Christian men. It's interesting that there is one boy, and he seems to be wearing a tie. He doesn't seem to be a First Nation. There are a number of boys in the picture who don't appear First Nations; most likely, the children of the teachers of the school.
42.3	46.8	Average	