



Rapport de recherche

PROGRAMME ACTIONS CONCERTÉES

Promouvoir la littératie numérique auprès des élèves du secondaire : un projet de recherche-action collaborative

Chercheur.e principal.e

Julie Corrigan, Department of Education, Concordia University

Cochercheur.e.s

Kim McDonough et Heike Neumann, Department of Education, Concordia University

Collaboratrices ou collaborateurs

Andrea Barrios, Collège Saint-Paul; Caroline Dupuis, Commission scolaire English-Montréal

Établissement gestionnaire de la subvention

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PART A - RESEARCH CONTEXT

1. Research Problem

Nowadays, anyone with a smart phone and internet connection can publish whatever they wish rapidly and widely. Therefore, it is no wonder that youth struggle with knowing which information to trust. Knowing how to evaluate online information plays a key role in the academic success of students, across multiple subject areas and disciplines, particularly as they advance throughout their secondary and post-secondary education. Whether it be a high school science project debating the safety of vaccinations or a doctoral history dissertation involving the analysis of digital archives to corroborate accounts, evaluating online information is crucial to students' academic performance. Indeed, research has demonstrated that information evaluation and academic performance are importantly intertwined. For example, evaluation processes are implicit in reading to learn, discriminating reliable from unreliable evidence, and communicating the claim-plus-evidence structure in argumentative writing (Wiley et al., 2009). Furthermore, these evaluation processes empower students to make important decisions regarding their political, social, and economic lives. Without evaluation skills, students are forced to rely on the judgements of others, who may have agendas at odds with the students' own values or best scientific evidence. Indeed, a lack of ability to evaluate credibility allows disinformation to spread, jeopardizing democracy (Wineburg et al., 2016).

Despite its importance, the ability to evaluate the credibility of online information--or what we call Critical Online Resource Evaluation (CORE)--remains a challenge for students (Kiili et al., 2018). For example, many students have

misconceptions regarding how to evaluate online information, relying instead on superficial strategies that do little to differentiate between information and disinformation (Corrigan, 2018; Forzani, 2016). Furthermore, in one study of 1,434 seventh graders in the United States, the ability to critically evaluate online information was shown to be the most difficult online research skill among locating, synthesizing, communicating, and evaluating (Forzani, 2016). Similarly, a 2018-2019 study of 3,446 American high school students conducted by the Stanford History Education Group unveiled a number of troubling findings regarding how youth evaluate online information. Students across the educational spectrum from middle school to college struggled to perform “even the most basic evaluations of digital material.” For example, two thirds of students could not tell the difference between news stories and ads (set off by the words “Sponsored Content”) and “[n]inety-six percent of students did not consider why ties between a climate change website and the fossil fuel industry might lessen that website’s credibility” (Stanford History Education Group, 2019, p. 3). While there is limited research on the Quebec context, one province-wide study of first year undergraduate students entering Quebec universities found that students were “ill-equipped” to evaluate online information, finding that only 23% of students were able to identify credibility indicators for online information such as currency, authority, and site sponsorship (Mittermeyer, 2005).

2. Research Questions

In light of the need to raise students’ ability to think critically in online spaces, we designed interventions with Quebec teachers for Quebec students aimed at improving students’ ability to evaluate the credibility of online information. Specifically, we designed interventions targeting students enrolled in English

Language Arts (ELA) and English as a Second Language (ESL) at the secondary level. In this context, we posed the following research questions across three separate, but interconnected, studies:

A. Case Study: Prior to our interventions being developed, we asked about what practices Quebec secondary school teachers were currently using (if any) to teach students about evaluating information in online spaces? What barriers and supports do they perceive in their teaching of evaluation skills? What contexts and resources would teachers perceive as supportive in teaching these skills? These questions were addressed by Ingrid Stockbauer (2023) in her SSHRC funded master's thesis.

B. Multiple Regression Study: Previous studies have sought to account for the variance in students' digital literacy performance more broadly—or CORE performance more specifically—using a number of variables related to individual and school differences. Such studies are important for identifying insights that can help target and customize educational interventions to and for a specific population. However, to our knowledge, none of these studies have examined the factors that account for CORE performance in the Québécois—or even Canadian—context. Additionally, there are a number of factors for which previous studies have failed to take into account. Therefore, the purpose of our study was to predict which school and individual level factors account for variances in CORE performance among secondary students in a large, urban centre in Quebec, Canada. Specifically, we asked: (1) What is the relationship between students' scores on a CORE evaluation and a variety of individual (gender, race, socioeconomic status, language spoken at home) and classroom (public/private schooling, prior exposure to CORE instruction,

language of instruction, and grade level) variables? (2) How much of the variance in CORE scores can be explained by these individual and classroom variables?

C. Evaluation Study: Finally, we evaluated whether or not the intervention actually succeeded in improving students' CORE performance. Furthermore, we wanted to know how to improve the intervention in subsequent iterations. In this study, we investigated: (1) Did the CORE intervention lead to improvements in students' online evaluation scores from the pretest to the posttest? (2) How were students' online evaluations reflected in their written responses? How did the nature/quality of students' written justifications change from pretest to posttest? (3) Was the intervention implemented with fidelity? If not, how could we improve the implementation in the future? (4) How could the intervention be improved to ensure greater satisfaction and performance in the future? The third and fourth questions were specifically addressed in the master's thesis research of Maria Jimenez Fernandez (2023). Master's student Curtis Triol is also currently in the process of writing up the results of his action research study wherein he implemented the intervention in his own grade 9 history class to evaluate whether the CORE intervention led to gains among his students.

3. Objectives

To determine whether the interventions improved practice, our study began by exploring current instructional approaches through classroom observation and teacher interviews. Following this, researchers and teachers collaborated on the design and implementation of the interventions, considering both current practice and recent empirical and theoretical research. To test whether these interventions indeed improved practice, we compared students' performance over time and

observed their practices in the classroom (i.e., via formative and summative assessments and classroom observation). We strategically chose to focus on the dimensions of information literacy and critical thinking in the *Digital Competency Framework*--in the context of evaluating online information--to achieve robust and actionable results regarding this complex cognitive task.

PART B - POTENTIAL SOLUTIONS RELATED TO THE RESULTS, RESULTS AND IMPLICATIONS OF YOUR WORK

Our Message to the Ministry of Education

During the needs analysis phase of our study, we discovered many ways to best support Quebec secondary teachers in their teaching of CORE skills.

Stockbauer's (a member of our research team; 2023) SSHRC funded master's thesis covers these themes in detail, and we offer highlights here.

Teachers told us that teaching the digital competencies and their related elements are simultaneously every teacher's responsibility and no teacher's responsibility. Therefore, they often assumed that students would learn these skills from teachers in another subject. Teachers saw digital competencies--such as CORE--as a peripheral, not central, aspect of the curriculum. Teachers were more preoccupied with the competencies of the curriculum that they were required to evaluate, as per the *Quebec Education Program*, and especially the ones that are evaluated during provincial testing (i.e., reminding us of the mantra: if you test it, they will teach it, and students will learn it). The Ministry might consider broadening the literacy construct in provincial testing to include test items related to digital literacies, as has been seen in other jurisdictions such as PISA (2021). Furthermore, if the Ministry sees digital competencies as vital skills for students' success, they should become a compulsory part of the curriculum. Time will tell if Quebec's new Culture and Citizenship in Québec (CCQ) course will mitigate this issue. Although, as one teacher noted, the CCQ course is everything but the kitchen sink (i.e., sex ed, media literacy, sociology, ethics, culture) and that this course might be too broad to address the specifics of CORE and other digital competencies.

In general, teachers noted that while they had the technology to teach CORE, they lacked the training and curricular resources to do so. Teachers noted that for the most part, their schools and classrooms were equipped with the technology (i.e., stable internet connection and tablets for students) needed to teach CORE (although, we note that we did not involve teachers from rural and remote areas in our study). However, teachers said that they felt ill-prepared to teach students about anything beyond superficially evaluating online information. They did not personally feel confident in this skill themselves; furthermore, courses in their Bachelor of Education and subsequent teacher training did not address such issues, nor did one-off professional development activities (with few exceptions). Teachers were left to their own devices to find and implement instructional and assessment strategies regarding evaluating online information. Also, they felt that even when they did have the resources to implement CORE, they lacked the time to give consideration as to how they could thoughtfully integrate it into their Learning and Evaluation Situations (LESs). This meant that, in general, teachers welcomed the opportunity to receive training on implementing CORE and the support that this grant provided (i.e., paid release time for training, reflecting with teachers from different schools, reflecting on their own teaching of digital literacies).

Our Message to Quebec's Secondary Teachers

In teaching students to evaluate the credibility of online information, we encourage teachers to look beyond superficial checklists, mnemonics, and heuristics. For example, some teachers in our study told us that they use checklists such as the Currency, Relevance, Authority, Accuracy, and Purpose, or CRAAP, checklist. Our research has found that while this does give students an easy

mnemonic for a quick evaluation of an online source, it doesn't encourage the deep evaluation that is required to differentiate between sources--often very compellingly and professionally presented--of more dubious, nefarious, or unreliable information.



We call these *slippery sources*, alluding to the notion that these sources use deceptive tactics--such as cherry picking scientific evidence to make their claims and not

being forthcoming about their true identities or purposes--to deceive the reader. Take for example this website from the [Beef Cattle Research Council](http://www.beefresearch.ca), ostensibly a trustworthy research source, which is in fact written on behalf of a lobby group for the beef cattle industry. While the source does not necessarily make false claims, it does select only the claims about eating red meat that are complementary. A more balanced source would have stipulated that, while red meat does have certain nutritional qualities, studies have found that regularly consuming larger quantities can lead to heart disease and certain types of cancer (Crippa et al., 2018). When faced with such slippery sources, strategic evaluation skills are required to differentiate fake from factual sources.

Furthermore, many teachers revealed that they relied on simple heuristics or mantras, rather than strategies that support critical thinking in online spaces. For

example, teachers in our study told us that they regularly tell students never to cite or source *Wikipedia*. Meanwhile, such crowd-sourced encyclopedias are actually a recommended way of fact checking information. For example, if you are investigating the credibility of a certain organization or publication, you could use Wikipedia to find out what others have written about it. Furthermore, a study in the journal *Nature* found that Wikipedia was as accurate as *Encyclopedia Britannica*; Wales, 2005). Furthermore, professional fact checkers advocate for using *Wikipedia* as one of a number of fact checking tools (including [Snopes](#), [PolitiFact](#), among [others](#)). Plus, in another one of our studies about how experts perform online evaluation, we noted that many experts consider Wikipedia as a great tool to gather background information.

So, if teachers should not rely on checklists, mantras, and simplistic heuristics, what options are there? Through the funding provided by this FRQ-SC action concerté grant, we developed a series of [open access lessons](#) for secondary students, aligned with Quebec's ELA and ESL curriculum, designed to teach students to think critically about how they evaluate online information. These lessons covered the span of the online inquiry process including identifying a problem, locating information, evaluating information, to the final step of synthesizing and communicating information (Figure 1). They also included the explicit teaching of cognitive and metacognitive strategies such as identifying confirmation bias (when people select information that confirms our existing beliefs and values; Lord, Ross, & Lepper, 1979) to lateral reading (a strategy involving leaving the website you're reading to fact check the information across other websites; Wineburg & McGrew, 2019).

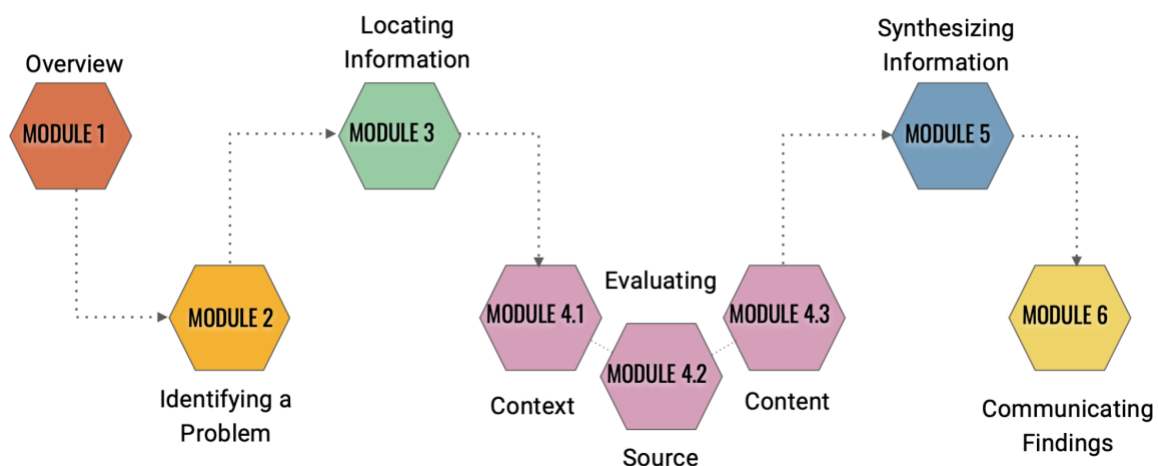


Figure 1. The CORE lesson progression to teach online inquiry.

These lessons are modeled after the Critical Online Resource Evaluation or CORE framework, so-named due to critical role evaluation skills play throughout our lives (Figure 2; Forzani, 2019; Forzani et al., 2022). CORE is a constellation of knowledge, skills, and attitudes that involve a holistic, multifaceted approach to evaluating online information requiring the evaluation of content, source, and context. Content refers to evaluating *what* the author has written (i.e., the claims, evidence, and reasoning presented in the text). Although we acknowledge that evaluating the content of online information is difficult for non-experts, we argue that it is both necessary and feasible. It is necessary because using strategies such as lateral reading (“leaving a site after a quick scan and opening up new browser tabs in order to judge the credibility of the original site”; Wineburg & McGrew, 2019, p. 1) alone might amplify readers’ echo chambers as search engine algorithms potentially lead to their uncovering more of the same biased material. It is feasible because, in this study, we observed students evaluate content, using a variety of strategies (e.g., evaluating the type of evidence), with promising results. Source refers to evaluating who wrote the text (i.e., author and/or publisher and their credibility as

author/publisher, including, for example, their reputation, education, experience) and why they wrote it (e.g., to inform, to sell, to persuade). Finally, context refers to evaluating when (date of publication), where (e.g., URL), and how (e.g., genre or platform, such as on TikTok, or in an online newspaper or scientific journal) the text was written. And the evaluation of these--content, source, and context--are interconnected with students' prior knowledge, beliefs, and values; metacognitive practices, argumentation practices, and habits of mind (Forzani et al., 2022).

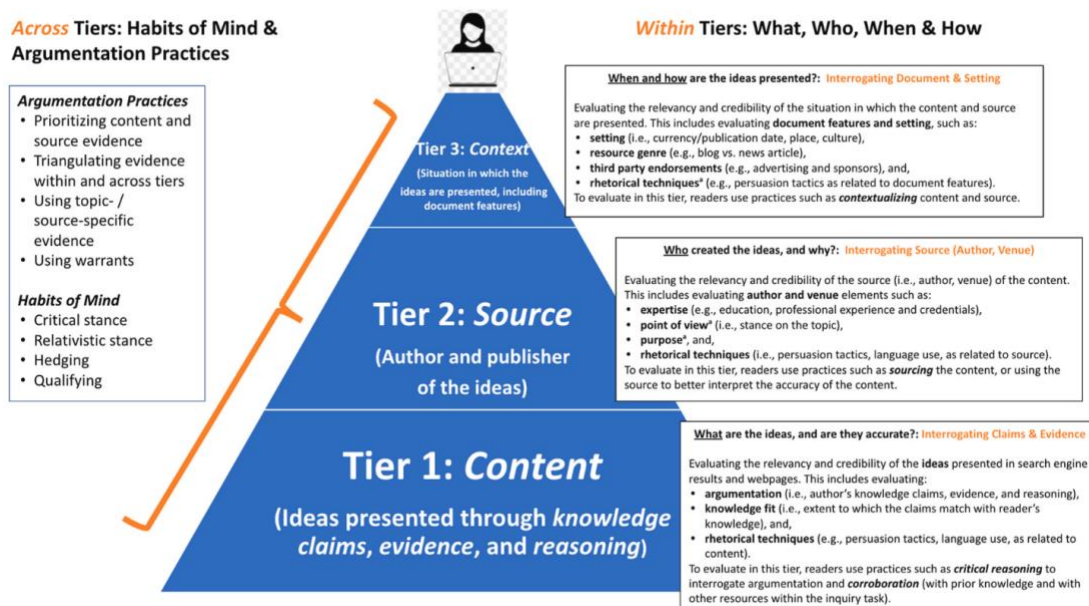


Figure 2. The three-tier CORE framework (Forzani et al., 2022)

However, these skills alone are insufficient for evaluating the credibility of online information. They must be supported by metacognitive practices that enable students to critically evaluate information, despite the well-documented phenomenon of my-side bias (Perkins et al., 1991) or confirmation bias (Lord, et al., 1979). In other words, people naturally gravitate towards information that supports their entrenched beliefs and values. Thus, no amount of instruction will be productive if

students do not concomitantly develop critical habits of mind (Forzani et al., 2022), including flexible thinking (i.e., the ability to change one's mind, when confronted with better evidence; Barzilai & Zohar, 2012) and assuming a proactive, critical stance towards information. The lessons we developed are designed to prompt students to reflect on their own confirmation bias during the process of online evaluation.

PART C - METHODOLOGY

A. Case Study

In order to gain an overview of current CORE practices in Quebec secondary classrooms, we conducted in-depth interviews with teachers ($n = 11$), classroom observations ($n = 45$), focus groups with students ($n = 2$), and assessed students CORE skills ($n = 88$). In addition, we conducted an environmental scan to identify the materials and resources available to Quebec secondary school teachers in English. These data were analysed using thematic analysis using the mixed methods data analysis software called Dedoose. We triangulated findings across teacher, student, and research participants. Based on the findings from the exploratory case study, we designed the CORE lessons.

B. Multiple Regression Study

Participants. Secondary school students ($N = 106$) were recruited from a large urban centre in Québec, Canada in Grades 9 (10.4%), 10 (42.5%), and 11 (47.2%) from four diverse (English/French; public/private) classrooms, representing a broad diversity racially (person of colour 15.1%; preferred not to identify 22.6%, and white 52.8%), linguistically (61.2% with a language spoken at home other than English alone), and gender (22.6% preferred not to say/no response; male 34.0%; female 43.4%) of students. Measures. *Individual Differences.* To measure individual differences, students were invited to complete a demographic questionnaire that included items regarding gender, race, socioeconomic status (using postal code dissemination area as a proxy for median income), and language spoken at home. *School & Classroom Differences.* To examine school and classroom differences, we

collected data on school type (public/private), prior exposure to CORE instruction (high/low), language of instruction (English/ESL), and grade level. *CORE Evaluation and Scoring* (i.e., dependent variable). In the CORE evaluation, students were asked to evaluate information during an online reading task in an open Internet environment. LimeSurvey was used to administer two versions of the CORE evaluation both relating to health science topics—one on artificial sweeteners and the other on red meat—which were counterbalanced. The evaluation begins with the following scenario: “Your school committee is revising their cafeteria menu. They have asked for students’ advice. A friend shared with you three resources on (red meat/artificial sweeteners) and health. First, you will skim and evaluate the articles. Then you will write an email to your school committee sharing your advice. Students were provided with three hyperlinked online resources (e.g., blog, website, online news) of varying credibility. Each version of the evaluation consisted of the same four tasks, two of which were analyzed in the present study: (1) To assess students’ prior topic knowledge, the first task on the CORE evaluation asked students in an open-ended format, “What do you know about (red meat / artificial sweeteners) and health?” Students were awarded one point for every correct idea unit that they made about red meat / artificial sweeteners and health. (2) To determine whether students could correctly identify the less credible online resource, students were provided with hyperlinks to three texts to evaluate and were asked “To what extent is resource (name of resource) trustworthy?” They indicated the degree to which they considered the resources to be trustworthy by using a slider to choose a numerical value from 0 (not trustworthy) to 100 (very trustworthy). Then, to assess students’ CORE performance (whether students could evaluate the credibility of online resources), we asked students, “In point form (list form), explain why you chose this

rating.” Scoring. For each tier of content, source, and context, we scored students’ responses as follows: No/unclear indicator = 0 points; one indicator, with no specificity or specific evidence, with no indicator = 1 point; one indicator, with at least one specific piece of supporting evidence = 2 points. There was no maximum number of points (i.e., the more indicators and specific pieces of supporting evidence that students gave, the higher the score). Scores were aggregated to determine an overall CORE score. Analysis. We ran a sequential multiple regression to predict CORE scores from the individual/school-level variables.

C. Evaluation Study

We used a pre/posttest design to examine the effectiveness of our CORE materials using two counter-balanced CORE evaluations on health-sciences topics (Figure 3). The evaluations required the reading of various online sources on red meat and artificial sweeteners and the completion of four tasks that asked students to (1) state their prior knowledge, (2) rank online sources according to credibility, (3) provide justifications for their credibility rankings, and (4) communicate findings from those sources in a writing task. We recruited secondary school students from schools in the greater Montreal area and obtained parental consent and student assent from 128. Of these, 88 completed both the pre- and posttest. In addition to completing the pretest, our student participants also completed a demographic questionnaire. Participating teachers then used our CORE modules in their English L1 and L2 classrooms. All lessons were observed by research assistants using an observation protocol developed to determine the teachers’ fidelity of implementing the intervention. Pre- and posttests were scored (see Regression study above) by trained raters. Differences between pre- and posttest scores were analyzed using a

two-way mixed ANOVA. Finally, student and teacher participants completed post-intervention questionnaires and some participated in focus groups or interviews to solicit their feedback on the CORE modules to guide future revisions.

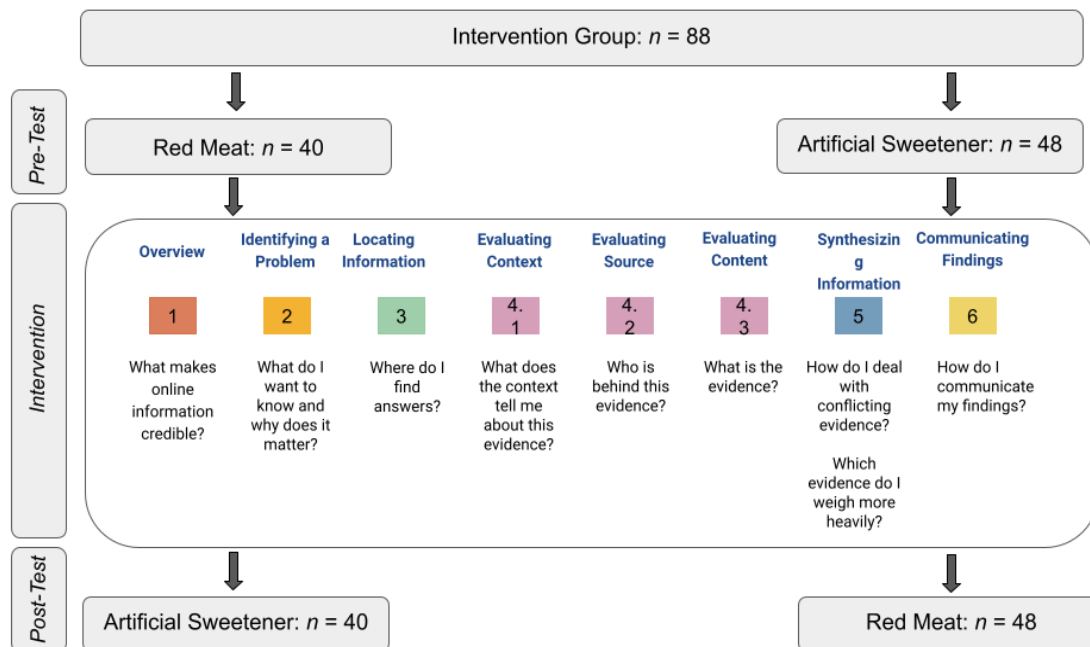


Figure 3. Research Design

PART D - RESULTS

A. Case Study

The case study began with an environmental scan of the Quebec landscape focusing on materials available to teachers for CORE--in other words, we wanted to understand what resources were already available, and what could be done to improve them/increase teachers' awareness of them. This included a systematic review through an extensive search of the websites of every English school board, media literacy websites, as well as informal discussions with subject matter experts (SMEs) such as a professor of journalism and a professor specializing on information literacy.

The environmental scan revealed that while a number of resources were available to Quebec teachers (e.g., via school board websites or media literacy websites), these resources were often disconnected from the competencies that teachers are expected to evaluate for a given course, as per the *Quebec Education Program*. In other words, these resources were rarely aligned with the curriculum. There were some notable exceptions with media literacy organizations that did provide curriculum-aligned resources, including MediaSmarts ([“Canada’s Centre for Digital Media Literacy”](#)), [CIVIX-Quebec](#) (“strengthening democracy through civic education”), and [Ctrl-F](#) (“Digital media literacy”). However, these resources either did not explicitly focus on CORE, or when they did, they did not account for the whole of the inquiry process, focusing instead on discreet skills and strategies.

In addition to the environmental scan, Quebec secondary teachers were interviewed to understand their varied approaches to teaching CORE (for more details, please see Stockbauer [2023]). Participants from both public and private

schools were selected based on their interest in the study, the grade level they taught, and the subject matter. Within-case and cross-case analysis revealed an overall understanding and acceptance of the importance of CORE in its basic definition. Further, several patterns were observed across cases such as common approaches to teaching CORE. Some obstacles hindering teachers were uncovered including gaps in government curriculum documents such as the *Quebec Education Program* (QEP) and a lack of time for teachers to adequately prepare and plan to teach materials that they are generally self-creating. Other strengths, weaknesses, opportunities, and threats (SWOT) that were revealed during this analysis are summarized in Figure 4.

SWOT Analysis of Findings from Strands 1 and 2

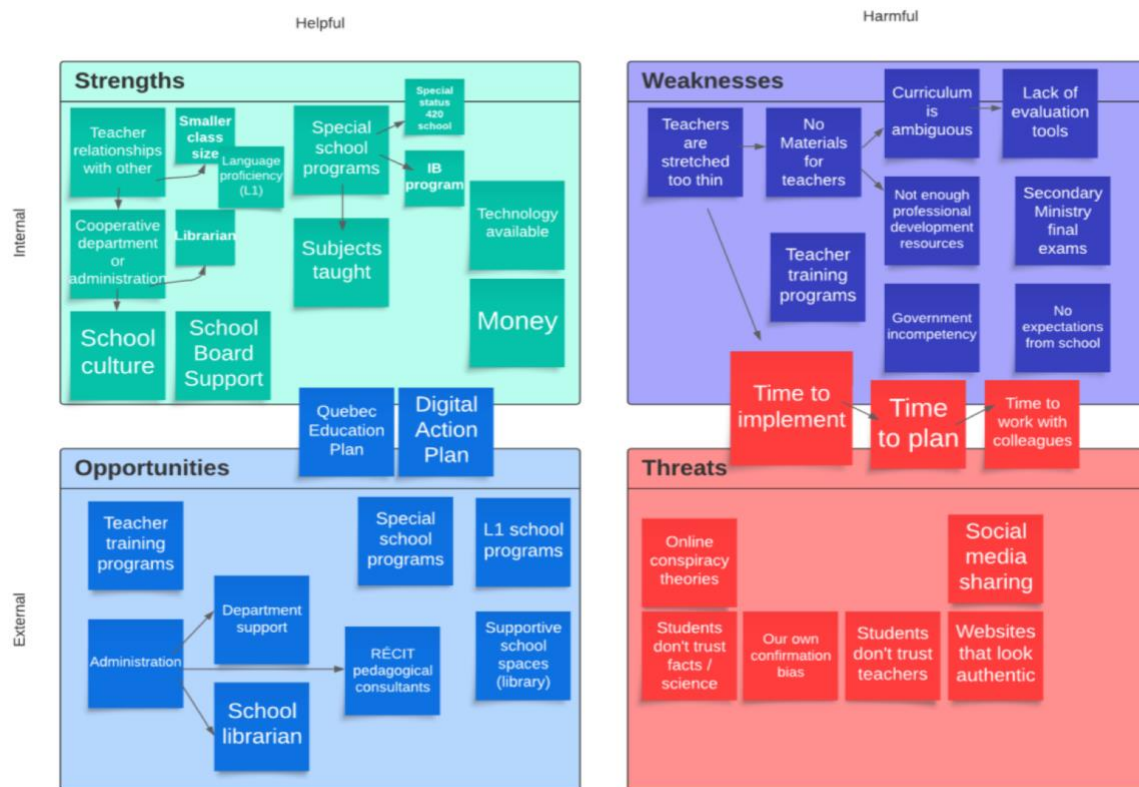


Figure 4. SWOT Analysis Findings. Stockbauer (2023), p. 102.

B. Multiple Regression Study

We began by running a Pearson's product-moment correlation to assess the relationship between CORE performance and independent variables concerning both individual and classroom level differences. The relationship between CORE scores was significant for the following: gender, $r(79) = .29, p < .01$ (small, positive correlation); time in test, $r(103) = .26, p < .01$ (small positive correlation); and, prior topic knowledge $r(103) = .34, p < .01$ (moderate positive correlation). However, for these variables, the relationship between CORE scores was insignificant: prior CORE knowledge $r(101) = .03, p = .738$; race, $r(69) = -.13, p = .280$; and, family median income, $r(64) = .05, p = .706$ (Table 1).

Table 1.

Descriptive Statistics and Correlations for Study Variables

Variable	1	2	3	4	5	6	7
1. CORE Score	—						
2. Prior CORE Knowledge	.03	—					
3. Gender	.29**	-.09	—				
4. Race	-.13	.11	-.19	—			
5. Median Income After Tax (DA)	.05	.53**	-.05	.31*	—		
6. Time in Test	.26**	.03	.21	-.32**	-.01	—	
7. Prior Topic Knowledge	.34**	-.15	.11	-.08	-.22	.14	—

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Subsequently, we ran a sequential multiple regression to predict CORE scores from gender, time in test, and prior topic knowledge (the variables that were significant in RQ1). The multiple regression model statistically significantly predicted CORE scores, $F(3, 77) = 6.353, p < .001.$, adj. $R^2 = .17$, a moderate effect size

according to Cohen (1988). All three variables added statistically significantly to the prediction, $p < .05$ (Table 2).

Table 2. Results of multiple regression analysis.

Multiple Regression Results for Pretest Total Score

Pretest Score	β	R^2	ΔR^2
Model 1		.08	.07
Gender	.29*		
Model 2		.20	.17
Gender	.22**		
Time in Test	.23**		
Prior Topic Knowledge	.23**		

* $p < .05$

Implications. In the Québec context, gender and prior topic knowledge continue to play a significant role in predicting students' success in CORE, which corroborates the findings of previous studies. Conversely, neither race nor SES predicted students' CORE scores, although this could be attributable to the relatively small sample size. Further research is needed to dis/confirm these findings. We believe that our study is one of the first to examine the role of time in test, which contributed significantly on its own and to the overall model. This study will guide us in further revising CORE interventions responsive to the Québécois context.

C. Evaluation Study

As Table 3 shows, our student participants attended three different public and private English and French-medium schools, and their teachers taught English as a Second Language, English Language Arts, or History. Our student participants

showed a certain linguistic and ethnic diversity and most attended public schools (see Table 4).

Table 3. Class Characteristics

Teacher Pseudonym	Type of School	Language of Instruction	Grade	Length of Class (in minutes)	Subject	Number of participating students
Amy	Private	French	Grade 11 (Sec V)	75	English as a Second Language (ESL)	12
Chris	Private	English	Grade 9 (Sec III)	55	History	10
Malena	Public	English	Grade 11 (Sec V)	55	English Language Arts (ELA)	27
Kasey	Public	English	Grades 10 (Sec IV)	55	ELA	39

Table 4. Demographic Characteristics of Participating Students

	N = 88	%
Gender		
Female	46	56.1%
Male	36	43.9%
Language		
English	41	50.0%
English and/or French and other	15	18.3%
Both English and French	10	12.2%
Other	8	9.8%
French	8	9.8%
Racial Identify		
White	56	68.3%
Self-Identified as a Person of Colour	16	19.5%
Don't know/Prefer not to say	10	12.2%
School Type		

Public	64	78.0%
Private	18	22.0%
Grade		
SEC 3 / 9th grade	9	11.0%
SEC 4 / 10th grade	25	30.5%
SEC 5 / 11th grade	48	58.5%

The first significant finding of our study is the effect of our intervention on students' CORE skills. We first examined the data for outliers and decided to remove three and then checked the data to ensure the assumptions underlying an ANOVA were all met. The findings of our ANOVA showed that the intervention had a significantly positive effect for students in private schools while for public school students, the effect was significantly negative. Specifically, there was a statistically significant interaction between the school type and intervention (pre/posttest) on evaluation scores, $F(1, 83) = 19.485, p < .001, \text{partial } \eta^2 = .190$. Evaluation scores were not statistically significant on the pretest between private ($M = 9.24, SE = .99$) and public schools ($M = 9.02, SE = .57$). However, the results were statistically significant on the posttest between private ($M = 12.38, SE = .89$) and public schools ($M = 6.48, SE = .51$).

As can be seen in Figure 5, the intervention created an ordinal interaction (Widaman et al., 2012) based on school type (private vs. public), meaning that the private school students received a more intense benefit from the intervention than public school ones. More specifically, the private school students had a significantly positive improvement while the public school students had a significantly negative deterioration of their scores.

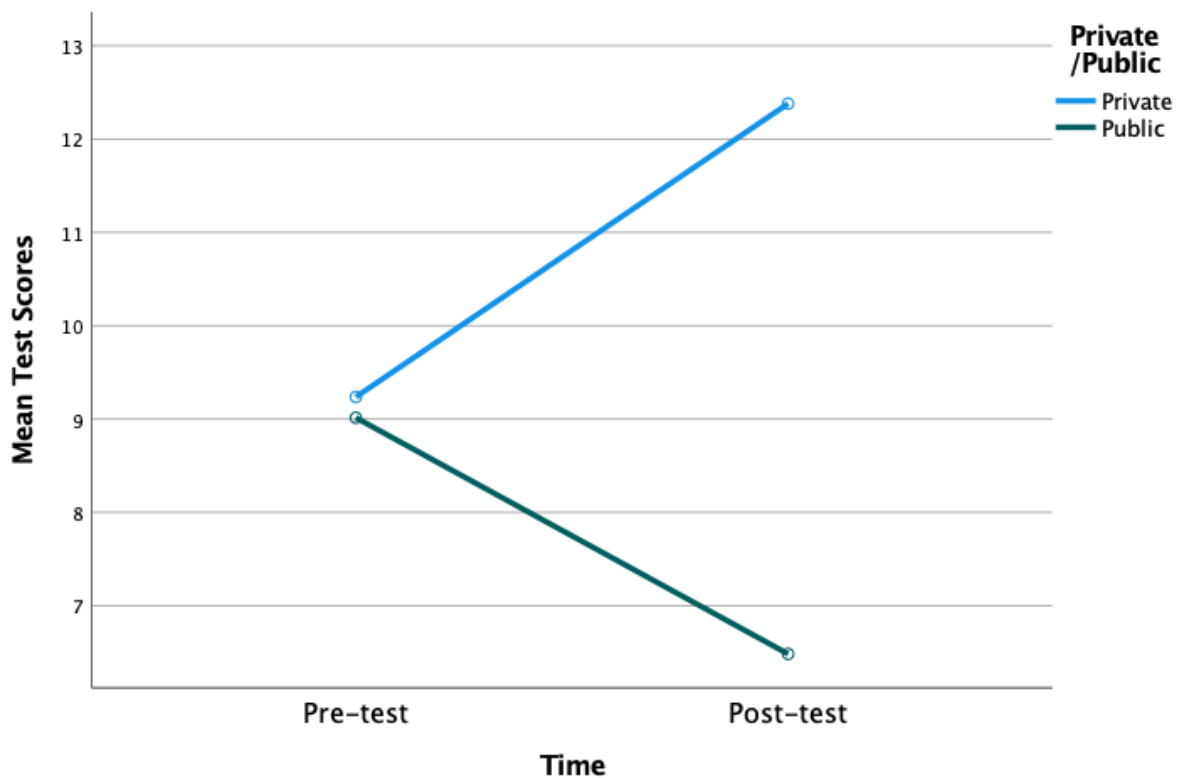


Figure 5. Interaction of the Intervention on School Type

To explain this result, we looked at the notes from classroom observations, which suggested that public school students lost motivation during the posttest as it was not graded causing them to rush through the posttest in order to work on other, graded assignments. While we considered omitting the results of the public school students due to what appeared to be systematic error in the administration of the posttest, we ultimately chose to include these results because they have additional implications. Namely, the results indicate that it is important for the results of pretest and posttest to be reflected in a student’s grade in some way. Students have limited time and attention in school and are therefore savvy to prioritizing tasks that count for grades over those that don’t. Further, these results indicate the importance of collecting mixed methods data (e.g., students’ projects) to evaluate an intervention, in addition to test scores.

A second key finding is how our intervention changed the nature of students' rationale for their ranking of credibility of sources. In terms of students' scores, we found the greatest increase between pretest and posttest scores for students evaluating the *source* tier of the CORE framework, in comparison to *content* and *context*. In the following example, we can see a rationale for why website (noted to be biased by our expert panel) from Splenda lacks credibility:

the publisher/ the company Health Consumer Products... [are] automatically biased because they are trying to sell a product tied to [artificial sweeteners] and therefore they are presenting their information in a way that may intice [sic] the audience to buy their products rather than presenting unbiased information.

The way in which students critique the credibility of websites has also changed. As is evident in the excerpt below from the posttest version on artificial sweeteners, the student identifies the Splenda website as lacking credibility due to its conflict of interest (i.e., selecting only the studies that support the safety of its product), the student also demonstrates hedging (attempting to weigh at least two sides of the issue; Forzani et al., 2022) by demonstrating the more credible characteristics of the Splenda website:

[The author] presents multiple sources and different information that are on the topic of artificial sweeteners, which is good because it shows that other [researchers] have come to the same conclusion that they are trying to present.

The first significant contribution of our project is that now there is a series of lessons CORE that teachers can adapt to their own needs, classrooms, and students. The materials are in the process of being revised based on the outcomes of our research and feedback from our participating teachers and students. In addition, we are continuing to work on disseminating these open access lessons to a

broader audience. We have done this by establishing relationships with MediaSmarts and LEARN Quebec.

The second contribution of our project is that we have evidence that our CORE modules work. When students took the posttest seriously, their evaluation scores show significant improvements of their CORE skills. We also demonstrated a notable, qualitative shift in particular in terms of their rationale for elements related to the CORE tiers. In other words, students not only are better at assessing credibility, but they are also better at explaining why a site is credible or not, which will help them in the future to assess online information and engage with others about the online information they encounter.

PART E - RESEARCH AREAS

As the first intervention of its kind in the Quebec context, we learned that CORE (Critical Online Resource Evaluation) instructional modules aimed at improving students' ability to evaluate online information can indeed improve students' performance. Further investigation is needed to evaluate the intervention using a larger sample size, in addition to using two-group designs (i.e., with a control group). It will also be important to understand the developmental trajectory of students' digital skills across the grade levels in order to best design a curriculum that is age-appropriate.

We also learned that there are a number of contextual factors in the Quebec educational landscape that both support and limit the ways in which teachers approach the teaching of CORE. For example, Quebec's *Digital Competency Framework* signals to teachers the importance of digital skills such as CORE. However, as the skills are cross-curricular, they are simultaneously every teacher's responsibility and no teacher's responsibility. Further research is required to understand whether the province's new Culture and Citizenship in Quebec course will fill this gap, or whether the course is too broadly framed to meet the requirement for these specific skills.

Finally, we must not forget to address how teachers and students in rural and remote and other under-resourced regions--potentially those in the far North and in First Nations communities--are supported in terms of the *Digital Competency Framework* and the competencies outlined within.

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