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Descriptive Analysis of the E-Textbook Situation in Quebec
Portrait des manuels scolaires numériques au Québec

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Des usages numériques multiples et variés en contexte québécois

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Article abstract

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Abstract

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Keywords

E-textbook, digital resources, added value, high school system.

Résumé

Dans cette étude, nous décrivons et comparons les ressources présentes dans les manuels numériques disponibles au Québec dans cinq domaines disciplinaires entre 2015 et 2018. Pour y arriver, nous avons analysé 133 manuels numériques de la première à la cinquième secondaire à partir de différentes grilles d'observation. La valeur ajoutée du numérique a été évaluée à partir de trois catégories : l'architecture textuelle (intertextualité, hypertextualité et hyperliens), la multimodalité (vidéos, images et animations) et l'interaction (rétroaction et activités interactives). Les résultats démontrent que 50% des manuels sont une version digitalisée (PDF) de la version originale. L'autre moitié propose une version numérique bonifiée. Pour conclure, nous proposons une réflexion sur les potentialités du manuel numérique au secondaire.

Mots-clés

Manuels numériques, ressources numériques, potentialité, valeur ajoutée, niveau secondaire.

Digital shift in the classroom

At the turn of the new millennium, many schools made significant technological changes by integrating technologies on a large scale. One of the most significant projects, and the first in Canada, was the initiative of the Eastern Townships School Board in 2003, where they widely distributed one laptop per student, totalling about 5,600 laptops (Karsenti and Collins, 2012). While it "bring[s] the world into [the] classroom" (p. 140), some argue that we often have to "[adapt] the curriculum to the computer rather than the computer to the curriculum" (Earle, 2002, p. 8). One obvious case is that of e-textbooks. While they need to be analyzed in a more global context (political, social, and pedagogical) (Lebrun et al., 2002) as a medium of change, it may be difficult to follow technological trends. For Lebrun (2006), the textbook is intended to be a cultural object «participating in the cognitive and social organization of knowledge» (translated from p. 3). As such, it is «the vehicle for a system of values, ideologies and culture» (Robles, 2008, translated from p. 14).

In 2018, Quebec proposed the "Digital Action Plan", in which many different measures are implemented to ensure a large-scale transition to digital education resources (MÉES, 2018). In fact, objective 2.2 explicitly states that the government wishes to "strengthen the connection between the use of digital resources, autonomy and student success" (p.38). Moreover, the digital version of textbooks has become more essential in 2020 amidst the COVID-19 pandemic. While online courses took over from physical presence, digital resources became more accessible for every student who couldn't access the paper version of their textbooks. In reaction to this crisis, most publishing houses have opened their digital platforms to provide access to textbooks and workbooks. But what content do students have access to? To what extent does the digital offer bring added value compared to paper versions?

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At first, publishers proposed a digitized (PDF version of the paper) rather than a digital version of the textbooks, as we have observed with traditional book-to-e-book versions (Chesser, 2011). Therefore, in the digitized version, e-textbooks contain text, pictures, tables and any pedagogical content that the paper format can support. Nowadays, we observe more advanced e-textbooks, in which we can expect hypertext, video and audio. These could be viewed as enriched e-textbooks (Université du Québec, 2013).

In fact, while many studies have been conducted on textbooks in education (Issitt, 2004; Jadoulle, 2019; Lebrun, 2007; van den Ham and Heinze, 2018), there have been few studies on e-textbooks at the K-12 level. We mostly observe theoretical papers that give a prospective analysis of the pedagogical potential of digital components (Eshet-Alkalai, 2012; Rodriguez Rodriguez et al., 2015) or of the use of e-textbooks in higher education (Al-Qatawneh et al., 2019; Baker-Eveleth & Stone, 2015; Millar & Schrier, 2015).

In the following paper, we first propose a general overview of the textbook situation in Quebec settings, and more precisely the impact of the transition to digital forms. Following that, we define the use of textbooks and elaborate on different theoretical frameworks. We present our methodological framework (data and analysis approaches), the results, and conclude by discussing the implications of our results.

Summary of the results on the digital textbook

E-textbooks for high school students have not been studied in their many forms. More studies on e-textbooks have been conducted at higher education levels. Evidently, we can learn from those results. Giacomini et al.'s results (2013), based on a sample of 728 undergraduate and graduate students, showed that students do see the potential of e-textbooks in terms of sharing and note taking, accessibility and access to a large quantity of information ("learning ecosystem," p. 8). Furthermore, the lower cost of e-textbooks was the first reason to use them. However, in this study, the e-textbook was available as part of an open access course.

Digital transition

Little to no empirical research has been carried out on the digital version of textbooks, although the digital shift is well under way in schools. Since 2012, laptop projects appear to have been replaced by the rapidly growing presence of iPads in schools, with limited empirical studies to corroborate this change. In fact, the first large-scale studies conducted in Canada, by Karsenti and Fievez, did not emerge until 2014. Since then, many studies have examined the potential, the advantages and limits, and the barriers to implementation of iPads in the classroom. Results tend to conclude that the advantages surpass the disadvantages after the students used the iPad for one year (Karsenti and Collin, 2015). However, some studies had more mixed results (Margolin et al., 2014) and decided to switch to other technologies such as Chromebooks for example (Murphy, 2014). However, whether it is in Quebec, Los Angeles, or Europe (Balanskat et al., 2013), we are seeing a digital shift toward a one-to-one ratio (one digital device per student), which brings back the question of e-textbook issues: do digital textbooks provide new opportunities for students in a one-on-one context?

E-textbook challenges and issues

The early days of the digital textbook were rather modest, limited to a copy of a paper textbook that exploits hypertext, the presentation often approaching the printed book. It differs from digital books in that it has a learning purpose. Since then, we can only observe the greater diversity of the material, offering a variety of supports (audio, video, etc.), didactic strategies (exercises, demonstrations, etc.), and epistemological stances (social constructivism, empiricism, etc.). Piccardo and Yaiche (2005) correctly state that « beyond the fascination with the textbook, we must ask ourselves how to fully exploit its potential» (p. 455). For Leroy (2012), the time has not yet come to abandon paper. He proposes to think in terms of complementarity rather than competition and substitution. However, he points out that some developments can be brutal, such as the share of books on digital media being 4% in 2012.

The digital textbook also raises the question of the reliability and sustainability of sources, considering the fragmentation of references. It is questionable to what extent information and communications technologies (ICTs) can help to change/build relationships between teaching cultures and learning cultures and to what extent they can help teachers and learners achieve the flexibility necessary to build an effective learning path within an authentic co-construction relationship of knowledge and know-how.

Education legislation in the province of Quebec (Canada)

By law, schools must provide students with the material they need to learn. Therefore, publishers and authors must follow a strict process in order to get their material into students' hands. All instructional packages (textbooks and notebooks) must receive government approval (Education Act, article 462) by the *Bureau d'approbation du matériel didactique* (Office for the approval of instructional materials) and schools must provide textbooks for every student, meaning that schools are the ones paying for the material. The criteria used are approved by the Ministère de l'Éducation and respect the orientations and content of its various educational programs.

Even if, in theory, it seems like a good way to manage the approbation of instructional packages for education, many exceptions to those rules exist in practice. For example, any editable partially editable material does not require approval, thus, the cost of such materials are borne by students. Resources such as exercise books, notebooks, or activity books belong to this category. Stakes are high for publishers, and this has an impact on school budgets: who pays for the resources? Digital resources seem to fall somewhere in between, where a publisher divides content into multiple units on one topic; in some cases, they complement textbooks (paper or digital). Therefore, even if a seal of approval appears in some digital textbooks, it is the paper version that has been approved, not the digital elements. Therefore, while the instructional package does exist in paper format, the digital version may provide access to only some parts of the contents or the full content in some cases.

Purpose of this study

Even if we expect much more from e-textbooks, students and schools are dependent on publishers who are responsible for developing and offering the material. In this situation, priorities for design are not clear: cost, editorial, pedagogical reasons, etc. While cost is an important concern when the time comes to choose between technologies, publishers may integrate existing resources in other contexts or promote other types of resources. Ideally, they should also evaluate the most appropriate digital approach for pedagogical content. For example, they could propose an interactive timeline to help situate historical events in time. However, we are still lacking a global portrait of the e-textbook offering in our educational system.

In this study, we will describe and compare the e-textbooks available in Canada (Quebec system) for five different subject matters (Science, Mathematics, Language Arts, Social Sciences and Religious Culture) in their digital components (multimedia, hyperlinks and interactivity). Our results will provide other education systems with a basis for comparison and reflection on the pedagogical potential of e-textbooks.

Related work

The textbook in education

Etymologically, the textbook is defined as «a book that is held in the hand» (Aubin, 2006). Choppin (1992) clarifies the terms «textbook» as well as «the book and publications that revolve around it (books or guides for the teacher, collections of documents, notebooks or exercise files, lexicons, activity collections [which] then always refer to a discipline, to a level, to a class...)» (p. 16). The definition proposed by Gérard and Roegiers (2009) also introduces the importance of the learning process in the relationship between the student and the textbook. Present in most Quebec classes, the textbook lives and evolves as the education system changes. The latest reform in Quebec in the early 2000s required the Ministère de l'Éducation, du Loisir et du Sport (MELS) to reconsider its evaluation and selection of textbooks. As a result, publishers have also had to adjust the content of their textbooks. However, this transition from an objective-based to a competency-based approach should have required significant changes to textbooks (from the enunciation of knowledge to the development of action skills). Several studies conclude that this transformation has not yet taken place (Lenoir, 2002; Lebrun, Lenoir and Desjardins, 2004). Not only does the research challenge the textbooks, but it also challenges the evaluation process by the MELS and its approval body, by demonstrating the dissatisfaction of the many players involved in the process: teachers, publishers, school administrators, parents, etc. (Lenoir, 2002.).

The textbook is the subject of conflict and tension: division between divergent schools of thought, varied research and teaching interests, financial and scientific interests, tension between designer and consumer, etc. All of this makes it a very popular object of study (Aubin, 2006). Thanks to new technologies, the very notion of textbooks is changing (Lebrun, 2007), creating an explosion in the supply of educational materials.

Leroy (2002, p. 9) stated that textbooks are part of students' lives and that textbooks help consolidate learning for students, going far beyond generations, subject matter, and time. Even though textbooks change with each reform in education, they are here to stay.

E-textbook analytical framework

Even if some studies have looked at the actual impact of e-textbooks in high schools, others have examined the potential of digital resources in e-textbooks to facilitate learning (Giacomini et al., 2013; Joannert, 2009; Regueira and Rodriguez, 2015).

However, we must first specify the concept of digitization and digitalization. The first one can be defined as "the process of changing from analog to digital form" (Garner IT glossary). Therefore, digitization transforms the traditional textbook into an electronic version, an e-textbook. This transformation operates mostly on information but does not work on generating new content. This is where digitalization takes form, with a restructuration of the content in a digital environment. In this context, it is not about a change in format, but more about a restructuration or even a redefinition of the medium, leading to innovation (Arestova and Alekseyev, 2019, Lefrançois et al., 2016; Gobble, 2018).

Many characteristics offered by by by by e-textbooks can be classified in ten features (Dobler, 2015, KERIS in Regueira and Rodriguez, 2014): textbooks, multimedia, references, dictionaries, data searches, hyperlinks, interaction, study management, evaluation, and authoring. In fact, compared to traditional textbooks, users should expect much more interactivity and resources in e-textbooks, which cannot be accessed without technology. However, these these these these features are more about the e-textbook environment than the content itself. The guide entitled «Guide de conception et d'utilisation du manuel numérique universitaire [E-textbook conception and usage guide]» (Université du Québec, 2013) also provides interesting leads for textbook analysis. We propose an initial summary of the different elements found in e-textbooks in Table 1.

Table 1

Categorization of e-textbook features

General tools for e-books	Content added-value resources	Evaluation added-value tools
Table of contents	Hyperlinks	Multiple-choice Questionnaires
Note taking and sharing	Videos	Feedback
References	Audios	Cloze questions
Search	Interactive images	Association quizzes
Study management	Interactive animations	Other types of evaluations

Proposed framework for this study

Our preliminary analysis showed that many elements are not related to digital textbooks per se, but rather to the digital textbook reading tool. We now come to propose a more precise framework, which allows us to focus to a certain extent on the functionalities, but above all on the integration of these functionalities with the pedagogical contents of the e-textbook.

The adapted analysis framework is divided into three categories: hypertextuality (internal and external), multimodality (video, images, animation) and interaction (feedback, activities, simulation). This framework excludes tools that target users and not content (note taking, note sharing, highlighting, etc.).

Hypertextuality refers to the link between text and another type of resource: documents, glossaries, multimedia or related websites (Keengwe, 2018, p. 184). Two types of links are observed in the e-textbook: internal hypertextual links (e.g., a link to another page or to resources produced by the publisher) and external hypertextual links (e.g., a website or an online document). In the digital format, these text-to-media links enable students use the resource in a nonlinear way. For example, Strickland (2009), in her essay titled "Born Digital", claims that "e-poetry is poetry requiring new reading skills". The need for these new reading skills is explained by Pokrivčák & Pokrivčáková (2002, p. 98), showing that readers must be able to read nonlinear or hypertextual digital texts. We could expect more needs for these skills in e-textbooks.

The second category is digital multimodality, which refers to our perspective to textual, iconic (images and pictures) and audio modes, but more importantly, the combination between those different categories. In theory, it's the use of a "multiplicity of modes […] which contribute to meaning" (Jewitt, 2013, p.141). In practice, the objective of multimodality is to enhance the learner's experience in multiple ways, for example video can be a combination of two or three (text/audio, images/audio, text/images/audio) elements (Lacelle et al., 2017). Moreover, we can see animation (e.g., maps with images/text that change over time), meaning the relation between two modes. The relation between modes (textual, iconic and audio) can contribute to building meaning for the learner. In an e-textbook, we could expect to see a variety of digital resources, but also a thoughtful combination of these modes.

Finally, the last category looks at the interaction between the user and the content of the e-textbook, such as quizzes with feedback, interactive activities or images, and simulations. Even though it is closely related to multimodality, we see interaction as a deeper user experience. For Hollingsworth and Narayanan (2016), learning interaction includes nonlinear navigation wh,ere learners can answer questions, interact with charts and graphs, play games, or complete self-assessments. These interactions are "essential for the next generation of e-textbooks" (p.17). Maynard and McKnight (2001) suggest that children can benefit from digital added value. In our analysis, we want to highlight the computer-human interactions when e-textbooks give feedback or enable learners to interact with learning activities (Dobler, 2015).

Method

Materials

Four main publishers offer students in Quebec instructional packages approved by the government: Chenelière Éducation, Grand Duc, ERPI-Pearson and Les Éditions CEC. While numbers vary (publishers remove and add new e-textbooks each year), we analyzed 133 available e-textbooks published between 2015 and 2018 in various forms (see section 3.1.1 for more details). While the initial intention was to analyze approved material only, the decision was made to keep all available material, mainly because there is no official approval process for digital formats. While this number could fluctuate over time, the sample should be considered as almost all e-textbooks available at the high school level. E-textbooks were analyzed for the five years of high school under the Quebec curriculum (Secondary 1 to 5), in five different subject matters: Language Arts, Mathematics, Science, Ethics and Religious Culture, and Social Sciences (Table 2).

Table 2

E-textbooks available in Quebec (French version) from Secondary 1 to 5

	Publisher A	Publisher B	Publisher C	Publisher D	Total
Science	7	10	4	3	25
Mathematics	3	6	12	5	26
Language Arts	2	10	17	10	39
Social Sciences	9	9	7	4	29
Religious Culture	5	2	4	3	14
Total	26	37	44	25	133

Note. We did not separate e-textbooks by levels because many of them cover more than one year.

E-textbook definition

Materials included in this study consist of activity books, handbooks, exercise books, learning guides, grammar books, etc. These are usually integrated in an instructional package, which includes a series of documents, with a teaching guide and a textbook in hard copy. However, in the digital format, the integration of digital resources in the instructional package can vary from publisher to publisher. For the purpose of the summary, all digital formats were considered to be e-textbooks. This decision was made on the complexity of having a coherent definition of the e-textbook as a basis for comparison. Hard-copy activity books usually propose exercises only. However, in the digital format, we found a hybrid format: exercises and theory. This format is becoming predominant in paper format as well. Moreover, even among publishers, the terminology tends to differ. Therefore, we considered every form of digital resources in this study, but we will discuss this further in the conclusion. Even though it could partially influence the interpretation of this study, we believe that including digital components can benefit all types of digital resources.

Only e-textbooks accessible to students were analyzed. We excluded teacher e-textbooks, digital materials used solely for the interactive whiteboard, online subscriptions for extracurricular activities, and extracurricular material that is only integrated in the teachers' guide or to be unlocked by the teacher. These resources largely depend on teachers' will to use them in the classroom, while e-textbooks are directly in the hands of the students.

Variables

Two observation grids were used to evaluate the technological content of each e-textbook: one toward digital content and one oriented toward pedagogical sequence. Inspired by Joannert (2009), Université du Québec (2013) and Regueira and Rodriguez (2014), three categories of criteria were first observed: general tools for e-books, added value content resources and added value evaluation tools. For each of these sections, we used several indicators related to their presence or absence (Table 1). The general tools refer to the e-textbook platform that can help students navigate through the content and study the subject matter. The added value content is in relation to multimedia resources. Finally, added value evaluation tools are associated with content such as quizzes, but also with interaction between teachers and students (e.g., submitting quiz answers).

Analysis

To analyze e-textbooks, we used a two-step process: a qualitative pre-analysis based on a random sample of five e-textbooks (one per subject) followed by a quantitative analysis of a larger sample. With the pre-analysis, in addition to theory, we were able to develop an analysis grid that led us to the adapted framework (see section *Proposed framework for this study*).

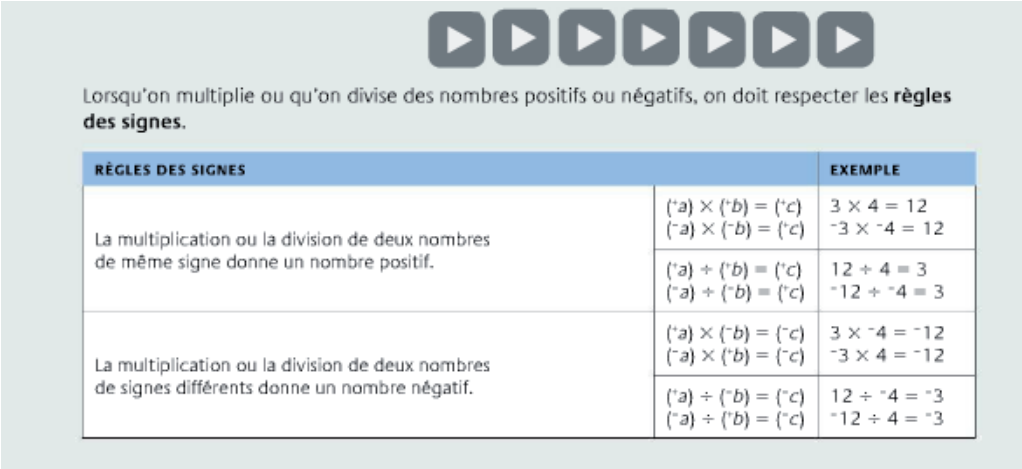
Qualitative criteria were applied to determine pedagogical values of randomly selected contents, based on different units for each subject matter. For example, for Language Arts, six categories were analyzed: grammar, syntax, conjugation, groups and functions, sentences, and lexicon. In the Social Sciences, we analyzed "Les désastres naturels" [natural disasters] and "La conquête et le changement d'empire (1760 - 1791)" [Conquest and Empire], all elements related to the Quebec education program.

Procedure

Preliminary validation was conducted on one subject matter (Language Arts) to validate the coding process. Throughout the first part of this process, the coder and the researchers held many discussions to validate the observation grid. It was decided to use multiple observation grids, from general to content-specific. The evaluator for the qualitative criteria is a specialist in the subject matter. The same process was applied to the other subject matters.

Results

Of the 133 e-textbooks analyzed, we categorized 52% of them as digital e-textbooks (with quizzes, videos, animation, hyperlinks, etc.) and 48% as digitized textbooks (PDF version of the paper). Mathematics and Science are the areas with the most digital resources (70%). Language Arts is the least digitized (~30%). We will emphasize digital e-textbooks in the results section, mainly because there is not much to say on digitized textbooks; no digital resources are available on them. In the vast majority of cases, this is an overlay of digital content on textual content from the paper version. In the case of Figure 1, you can observe seven *Play* icons over the table, without any explanations. These buttons open videos associated with the subject, without any introduction or contextualization. There are some examples where digital resources are introduced by the text, but this remains the exception rather than the rule (figure 2).



Lorsqu'on multiplie ou qu'on divise des nombres positifs ou négatifs, on doit respecter les **règles des signes**.

RÈGLES DES SIGNES		EXEMPLE
La multiplication ou la division de deux nombres de même signe donne un nombre positif.	$(^+a) \times (^+b) = (^+c)$ $(^-a) \times (^-b) = (^+c)$	$3 \times 4 = 12$ $^-3 \times ^-4 = 12$
	$(^+a) \div (^+b) = (^+c)$ $(^-a) \div (^-b) = (^+c)$	$12 \div 4 = 3$ $^-12 \div ^-4 = 3$
La multiplication ou la division de deux nombres de signes différents donne un nombre négatif.	$(^+a) \times (^-b) = (^-c)$ $(^-a) \times (^+b) = (^-c)$	$3 \times ^-4 = ^-12$ $^-3 \times 4 = ^-12$
	$(^+a) \div (^-b) = (^-c)$ $(^-a) \div (^+b) = (^-c)$	$12 \div ^-4 = ^-3$ $^-12 \div 4 = ^-3$

Figure 1
Icon overlay in an e-textbook (from publisher ERPI-Pearson)

Figure 2
Integration of video icon (from the publisher ERPI-Pearson)

Digital textbook reading tools

All reading tools offer similar basic functions: highlighting pen, note taking, interactive table of contents, search tools and bookmarking option. Some publishers offer some original tools: notebook (1 out of 4), adding external hyperlinks (2 out of 4) and internal hyperlinks (1 out of 4), hiding text for studying (2 out of 4), and recording audio notes (1 out of 4).

Hypertextualization

The students can navigate through the e-textbook with hyperlinks based on the platform environment. Navigation to internal resources (PDF, links to other pages, pop-up windows, etc.) is present in approximately half of the e-textbooks (55%). The internal hyperlink is the most used digital component, with 5,463 occurrences (44.9%) out of 12,164 digital components presented in Tables 3 to 5 (excluding quiz[1]).

Around 30% of e-textbooks offer external hyperlinks, whereas Social Sciences, Religious Culture and Science have the most (over 40%), representing up to 86% of the digital e-textbooks (Table 3). However, website origin varies considerably.

Table 3
External hyperlink in e-textbook

	E-textbooks with hyperlink (% of digital)		Number of hyperlinks
Sciences	10	38% (53%)	856
Mathematics	5	19% (29%)	127
Language Arts	8	19% (62%)	229
Social Sciences	14	48% (88%)	1116
Religious Culture	6	40% (86%)	690
Total	43	31% (60%)	3018

Note. The first percentage represents the proportion for the total sample, the percentage in parentheses represents the proportion of digital e-textbooks (see section 4).

We categorized 2,931 websites based on validity. Half of them (50.5%) are supported by the government of Quebec (institutional websites, museums, government funding, etc.) while the other half are from outside sources (France, USA, personal websites, YouTube, etc.). Although many of them are reliable (44% based on our criteria[2]), there is a large proportion of unreliable links. This suggests that e-textbook users must maintain a critical stance on proposed links, as they should with any information presented to them.

Multimodality (videos, animation, etc.)

Overall, in the digital e-textbooks (n=72), 63% proposed videos (original and from the Internet). Videos are not formally introduced in the text. Instead, they are inserted with an icon, or, in rare cases, beside the text. There is a total of 2,765 videos, where 1,007 are originals (by the publisher) and 1,758

are pulled from the Internet (Table 4). Animation is available in three subjects: Mathematics, Social Sciences and Science. In Mathematics, users can manipulate objects or exercises while in Science, users can view demonstrations.

Table 4

Videos and interactive images in e-textbook

	E-textbooks with videos (% of digital)		Number of videos	Number of original[1] videos
Sciences	13	50% (68%)	609	335
Mathematics	10	38% (59%)	498	489
Language Arts	4	10% (31%)	30	19
Social Sciences	13	45% (81%)	555	161
Religious Culture	5	33% (71%)	66	3
Total	45	(63%)	1758	1007

[1] Original videos produced by the publisher.

Interactions (feedback, activities, simulation)

Results showed that even though all e-textbook platforms offer common interactions with contents (interactive table of contents, annotations, etc.), only 39% have original interactive quizzes (Table 5). However, publishers are now offering an alternative platform for teachers, helping them build and propose quizzes to students (e.g., "i+ interactive" or "digital classroom"). Interactive images and activities are present in 35 e-textbooks (for a total of 973 occurrences).

Table 5

Interaction in e-textbook

	E-textbook with interactive questionnaire (% of digital)		Interactive images or animation (% of digital)		Number of animations/images
Sciences	18	69% (95%)	13	50% (68%)	286
Mathematics	10	38% (59%)	8	31% (47%)	172
Language Arts	11	26% (85%)	1	2% (8%)	2
Social Sciences	12	41% (75%)	12	41% (75%)	508
Religious Culture	3	20% (73%)	1	7% (14%)	1
Total	54	39% (75%)	35	25% (49%)	973

Some subject matters (e.g., Mathematics) displayed interesting interactive contents by allowing to manipulate different objects to learn concepts (e.g., calculating means, Figure 3) (Vermette et al., 2021). Science integrates lab animations while Social Sciences integrates an interactive timeline, but integration is limited to a small proportion of the e-textbook (Figure 3).

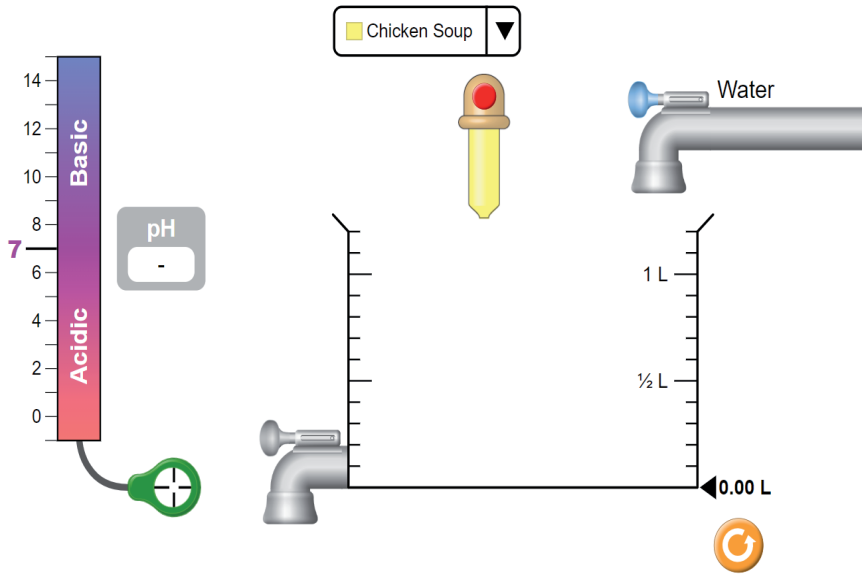


Figure 3
Animation from PhET project website

Considering these results, we have provided an extensive portrait of e-textbooks situation in our education system. The multidisciplinary perspective leads us to discuss the convergence and divergence between subject matter, and the according consequences.

Discussion

While we have observed that half of the e-textbooks take advantage of the digital aspect, some subject matters still struggle in the digital format (Boyer et al., 2017). Science, Mathematics and Social Sciences do propose a wider variety of resources. While half of publishers offer original material (around 50%), a similar proportion of online resources (video and animation) are found on external websites, thus not submitted to any official approval. While these resources are proposed by experts in the field, we can still debate the relevance of some resources (e.g., website from the private sector, YouTube, or with ad content). Such features would not be allowed in a hard-copy format.

Language Arts and Ethics and Religious Culture are not as technological. Despite a rich field of research and history on language art learning with technology (Chun et al., 2016; Kessler and Hubbard, 2017), it is surprising to see that the methods used in these Language Art textbooks do not integrate more digital resources. This could be partly explained by a certain lecture-based teaching tradition of language-related rules. Consequently, the digital textbook would, at least in part, reflect teachers' practices. Despite significant differences in the teaching of mother tongue skills, we note digital similarities in Ethics and Religious Culture (ERC). We have several hypotheses for the case of ERC that explain why the e-textbook is less attractive for publishers, which offers a limited range of functionality: 1) ERC teachers use resources external to digital textbooks rather than using e-textbooks; 2) the use of ERC textbooks may be more limited than in other subject areas; 3) teachers

use textbooks to prepare learning activities rather than using them with students (Sirois, 2017). These reasons can explain why investment in ECR e-textbooks is more limited.

As for Science, Mathematics, and Social Sciences, they are quite similar in numerical terms, but with observable points of divergence. In all three cases, we observe digital textbooks with very relevant uses: educational videos, interactive images and external links. However, there is a different predominance of resources depending on the disciplinary field: textbooks in mathematics emphasize the use of original videos and activities, those in science exploit more external resources and those in the social sciences gravitate toward digital cultural content, whether produced by official institutions (e.g., museums) or by experts in the fields (government-funded).

There are still aspects to work on in terms of the added value of digital technology. In mathematics, there is a complete lack of use of actual online data (sports statistics, Statistics Canada, etc.) for learning. Some studies suggest that this could be an effective strategy. Another way to utilize technology would be to integrate serious games in e-textbooks. Some researchers have found positive impacts of serious games in mathematics (Wouters et al., 2013).

In science, two areas are of concern: the lack of resources produced by Quebec-based institutions (e.g., Institut Armand Frappier) and the use of many online resources from abroad (USA, France). It would seem wise to take advantage of open access resources (such as the PhET website) and adapt and integrate them completely into textbooks, thus allowing offline consultation (Damphousse et al., 2019). Additionally, there are many scientific organizations in Quebec that could participate in the development of scientific educational resources, as is the case with cultural content.

The presence of digital cultural resources in digital textbooks is relevant and interesting. However, these resources are available free of charge on the Internet. Without real pedagogical integration, we wonder about the role that cultural organizations must play in the dissemination of this content. The preliminary results of Larouche et al.'s (2019) research show that with close collaboration between organizations and teachers, it is possible to achieve the integration of cultural content.

The use of external links also raises questions about the validity of content and copyright. Links to personal sites or to companies should be provided with adequate referencing for all resources (e.g., with a site factsheet). Third-party authors sometimes share content that does not belong to them (images and videos) or that is not verified. In this context, it is necessary to remain alert regarding content added to sites, since the latter do not necessarily carry validation processes.

Limits

One important limit of this study is the definition of an e-textbook. As previously stated, e-textbooks are not officially approved by the government, while their hard-copy versions are. Therefore, publishers propose various materials (learning notebooks, activity notebooks, etc.) that include digital content for the original textbooks or from the hard-copy activity notebooks. We also see that even with the same didactic set, material can vary between platforms (iPad, web version, etc.). These results appear later on in the study, but support one of the main challenges of this study, which is the absence of consistency in the digital environment. For example, we expect to see no multimedia content and more interaction (quizzes) in activity e-textbooks. Due to high variability, all material was analyzed

as comparable material. In our opinion, deeper reflection must be made on the digital format and the education legislation must be modified accordingly. While it is much clearer on paper (non-editable versus editable material), this distinction loses meaning in a digital format.

Conclusion

As we observed in our analysis, the integration of didactics-oriented technology is scarce. In fact, while most publishers offer classic interactive tools (interactive table of contents, annotation tools, videos, etc.) and some go further in integration (interactive animations, closed quizzes, etc.), almost none have re-examined the e-textbook as a ground-breaking medium. For example, most of them keep the same structure as the paper version: contents are oriented in a portrait format (8.5"x11"), same linear structure, etc.

Although we know more about the digital content of textbooks, we are still lacking knowledge in the uses in practice by students and teachers. In a meta-synthesis conducted by Samson, Roussel, Landry and Lemieux (2015), they concluded that in a post-secondary context, studies mostly explain perceptions or attitudes toward digital textbooks, neglecting the real pedagogical potential of the material (p. 32). Therefore, more studies should be made on the usage of e-textbooks, especially at the K-12 level.

Is digital beneficial only for some subject matters? Our results can only show that it is underutilized in some subject matters, such as Language Arts and Ethics and Religious Culture. The results suggest that clear and specific standards need to be established for digital content (original resources, online resources), expectations for indexing external content (data sheets) and integrating textbooks (contextualizing the digital resource in the manual). Moreover, in the context of digital textbooks, teachers must also adapt their teaching in the presence of new material.

The hope is that our results will clarify the current situation of French e-textbooks in Quebec and shed light on their place in this digital era. The ongoing COVID-19 pandemic highlights the importance of these digital resources, if only to facilitate access to content by all students. However, we should not limit ourselves to access to information as a means to foster learning. Digital resources must help students develop autonomy and favour student success (MÉES, 2018). We must rethink the digital offering to meet future needs, both for in-classroom and distance learning. If availability is limited and based more on technical aspects than on pedagogical ones, how should we rethink the e-textbook with regard to its potential, pedagogical needs, social implications and curriculum aspects?

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Notes

[1] Even though we did determine the number of e-textbook with quiz, we didn't report the number of quiz or question, because it was simply to difficult to determine a consensual definition. Some e-textbook have a test at the end, other are proposing proposing single question, and some are offering a variety of form of questions.

[2] These are: identification of the author, credibility and pertinence of the author, up-to-date website, compliance with the Quebec curriculum. Credibility and pertinence was mainly based on information accessible on the author (employer, experience in the subject matter, etc.). If no information is available, the credibility of the content can not be access by a student.

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