

Accessible digital learning resources: A jurisdictional scan

Abstract

What is an Accessible Digital Learning Resource?

Educational materials are one of fundamental components in classroom teaching in addition to the regular classroom teaching to help students attain their learning outcomes. When certain groups of students struggle to understand or access such materials due to disability issues, they tend to lose track of their learning toward the expected goal (National Center on Accessible Educational Materials, 2015). The type of disabilities, according to Crow (2008), Government of Alberta (2023b), and World Wide Web Consortium [W3C] (2018), includes impairment on visual (e.g., blindness), hearing (e.g., deafness), motor/physical (e.g., lost limb), and cognitive (e.g., learning). The mentioned disabilities can be temporary, permanent, and intermittent. It is important for educators to be mindful of students' disability conditions for effective and equal teaching practices.

Accessible learning resources are learning resources that provide equal perceivability, operability, understandability, robustness, and conformance across stakeholders (e.g., students, teachers, parents) students of all conditions (National Center on Accessible Educational Materials, 2015; W3C, 2018). Specifically, being accessible means the material can be acquired, engaged, and enjoyed by both students with- and without disability (National Center on Accessible Educational Materials, 2010). The definition extends to both print-based (physical) and digital format to support students' learning. Accessible digital learning resources involves both the outgoing aspect – aka content presentation (e.g., non-technical wording, age appropriate content, alternative format) and the receiving aspect – known as receiving and interaction (e.g., alternative navigation, adequate time, consistent understanding) (Camilleri & Camilleri, 2017; W3C, 2018). This format of accessible digital learning resources is especially important when technology has permeated into regular teaching practice to facilitate the delivery of teaching content and student-teacher interaction (Camilleri & Camilleri, 2017).

Current effort for digital accessible digital learning resources in Canada

Canada, as one of the G7 countries, has been investing efforts in promoting accessibility in learning resources in general such as Alternative Education Resources Ontario- AERO (Ontario Ministry of Education, 2023), and Accessible Resource Centre – British Columbia (ARC-BC) (Ministry of Education and Child Care British Columbia, n.d.). However, there is a lack of explicit guidance or recommendation on the development of digital accessible digital learning resources despite its increasing use due to the COVID-19 pandemic (Rodríguez & Pulido-Montes, 2022). For example, AERO has a dedicated section for alternative exam format (e.g., digital audio or electronic text), but there is no explicit guideline on the accessibility of digital learning resources in general.

Similarly for the online resources for students with disabilities in Alberta (Government of Alberta, 2023b), despite having recommendations on what students could do (e.g., identifying appropriate learning assessments, course load management, and financial assistance), such

recommendations are at the general level and aimed for post-secondary students. There is a lack of applicable recommendations on the development of digital learning resources for students with disabilities in kindergarten through grade 12 level (K-12). Further, the provincial learning resources websites for both current- (<https://learnalberta.ca>) and new curriculum (<http://new.learnalberta.ca>), despite having resources for the development of accessible learning resources for K-12 students, they are subject-specific and not entirely applicable for digital learning resources. For example, one of the few available resources is the “[Making mathematics concepts accessible to diverse learners video](#)”, which was aimed for parents and teachers to teach students who have different levels of mathematics competency instead of accommodating students with disabilities. There is also a lack of recommendations for developers on the making of accessible digital learning resources as well.

The mentioned lack of established guidelines for the development of accessible digital learning resources in K-12 could impede the best practice of learning and teaching in the province. This shortage could result in different accommodation practices among school districts that could disrupt the learning process of students with disabilities. As the first step to develop a guideline for accessible digital learning resource development according to the recommendation established by W3C (2018)’s web content accessibility guidelines, I conducted a jurisdictional scan across all provinces of Canada (Ontario – ON, Quebec – OC, British Columbia – BC, Alberta – AB, Nova Scotia -NS, New Brunswick – NB, Manitoba – MB, Prince Edward Island – PEI, Saskatchewan – SK, and Newfoundland and Labrador - NL), as well as its three territories (Northwest territories – NT, Nunavut – NU, and Yukon - YT) to examine the existing guidelines/solutions to the development of digital AEM. The guiding question for this jurisdictional scan is: “*what are the current efforts to establish the guideline for the development of accessible digital learning resources in K-12 education across Canada?*”. English data sources of provincial government and institution websites and online documents were searched to gather information on guidelines for the development of accessible digital learning resources.

Guidelines of Accessible Digital Learning Resources

Digital learning resources should be able to accommodate diverse educational environments and individuals (Kourbetis, 2013). The resources should be applicable to students of all condition, including those with disabilities in visual, auditory, physical, speech, cognitive, language, learning, and neurological (Rice & Ortiz, 2021; W3C, 2018); this accommodation covers both the outgoing and receiving aspect of learning. To make digital learning resources more practical in the actual context, developers should consider different aspects of accessibility during the development process while involving users with disabilities in the process as much as possible (Rice, 2018).

The following are the four characteristics of accessible digital learning resources:

- *First, ease of understanding of digital learning resources:* the resources should be easily perceivable and understandable by using non-text alternative format (text/audio record of visual elements), recording of sign languages, consistent presentation (e.g., font size, font style, and page organization), and avoid flickering text for photosensitive individuals

(Behling, 2017; W3C, 2018). Content of the digital resources should be simple while being able to convey content to students at the same time (Rice, 2017).

- *Second, affordability of accessible digital learning resources:* the technology should be affordable in terms of resources (e.g., financial, technological); that is, assistive digital learning resources such as hearing-aid, remote sign-language assistance, or word-prediction software should be freely available or can be subsidized for K-12 students at schools (de Witte et al., 2018; Young, 2014).
- *Third, technological accommodation of digital learning resources:* assistive technologies such as hearing aid or visual aid software such as text-to-speech should be available at large (Edyburn, 2004). Assistive software should have vocabulary support for jargon (Rice & Deshler, 2018).
- *Fourth, age and difference consideration in the development of accessible digital learning resources:* developers of digital learning resources should consider age of the targeted students. The nuance of accessibility is different across educational levels (i.e., K-12) due to their developmental differences. For example, students of lower age such as kindergarten may have more risk for developmental disabilities due to pre-term birth (Roberts et al., 2008). Students with higher age (e.g., 7-16 year old) may be more at risk of traumatic brain injury due to intensity of their physical activity (Schutz et al., 2010).

Lesson Learned

The Jurisdictional Scan for Accessible Digital Learning Resources in Canada

Jurisdictional scan is a research method that examines challenges and solutions of the subject matter across different areas/states/provinces to evaluate options and inform decisions in policy making (Kilian et al., 2016). Table 1 summarizes the availability of guideline for accessible digital learning resource development across all Canadian provinces and territories. Note that some data sources are applicable for both physical and digital resources, or applicable for both K-12 and post-secondary education. AB is the only province with recommendations on all four aspects of accessible digital learning resource development, followed by BC, ON, QC, and NS, MB, PEI, and YT have recommendations only on one aspect of the guidelines. Lastly, NT and NU are still lacking in the availability of guidelines for the development of accessible digital learning resources. This result indicates that most provinces have guidelines on the ease of understanding aspect and affordability aspect of digital learning resources. Manitoba, PEI, and the three Canadian territories are areas with considerable rooms to improve on the availability of the guidelines.

Table 2 summarizes guidelines from Alberta-based resources as identified in Table 1, as well as areas for improvements in each aspect of the guideline. For recommendations provided regarding the ease of understanding of digital learning resources, Centre for Teaching and Learning, University of Alberta and University of Alberta Library (2019) suggest that digital learning resources should adopt the universal design for learning by allowing students to learn and express their ideas in different ways, using universal design features such as dyslexic friendly font (e.g., Arial), as well as color blind-friendly colors. Government of Alberta (2018) also provides guidelines on the understanding of universal design for learning, which educators

could use in the development of digital learning resources. When designing digital learning resources, educators should learn about the needs of students with disabilities and adjust the course material accordingly to match both the intended learning outcomes and students' conditions (University of Lethbridge Teaching Centre, n.d.). Furthermore, the resources should be machine readable to accommodate text-to-speech, speech-to-text, or other kind of technological accommodations that students may use to aid their understanding of digital learning materials (University of Lethbridge Teaching Centre, n.d.). These examples make digital learning resources easier to understand and contribute to the understandability of accessible digital learning resources.

For recommendations regarding the affordability of accessible digital learning resources, the government of Alberta provides subsidies to promote and maintain inclusive learning environments (Government of Alberta, 2023a). Students with disabilities may reimburse expenses that are related to their use of digital learning resources such as augmentative and alternative communication specialists, assistive technology, materials, and resources. From the teachers' and learning resource developers' side, the government of Alberta also provides fundings for professional development to support students with low incidence disabilities. Furthermore, the government of Alberta also provides discounts for schools in the purchasing of Microsoft 365 suites that possesses accessibility functions such as read aloud and accessibility check (Government of Alberta, n.d.). The mentioned financial assistance contributes to the affordability of accessible digital learning resources.

For recommendations regarding the use of technological accommodation of digital learning resources, Government of Alberta (2018) encourages educators to use assistive technologies to support students in regard to their needs and disabilities. In fact, educators could use assistive functions such as text-to-speech, screen reader, alternative text, and tactile image enhancer to aid the presentation of digital learning resources (Centre for Teaching and Learning, University of Alberta & University of Alberta Library, 2019; University of Lethbridge Teaching Centre, n.d.). Educators could also consider using closed captioning and screen magnifying to make visual media with sound more accessible to students with hearing problems (University of Lethbridge Teaching Centre, n.d.). To aid students with cognitive challenges, educators could consider using mind-mapping software to assist students in the brainstorming and thought organization process, as well as speech-to-text function to aid students' interaction with the digital learning resources (Centre for Teaching and Learning, University of Alberta & University of Alberta Library, 2019; University of Lethbridge Teaching Centre, n.d.).

For recommendations regarding the consideration of age and difference in disabilities in the development of accessible digital learning resources, the Association of Independent Schools & Colleges in Alberta [AISCA] (n.d.) provides resources that could inform educators and learning resources developers of conditions and appropriate accommodations for students with several overlapping disabilities (known as low incidence disability). For example, the [low incidence resource website](#) from AISCA possesses direct links to inform educators of cortical visual impairment, the use of augmentative and alternative communication, or aided language stimulation strategy to use in the development of digital learning resources.

Areas for Improvements in Alberta

The discussed existing guidelines for the Alberta reveal areas for improvement that the provincial government could do to improve the existing recommendations for the development of accessible digital learning resources. Overall, data sources of the guideline are scattered across multiple sites. Centralization of the guideline to a single website or document could make it easier to be accessed by educators. An example could be the W3C (2018)'s website that summarizes the entire guideline within one web page. For the ease of understanding aspect, the provincial government could consider providing examples or templates of universally designed digital learning resources that educators could use to make the guideline easier to be understood. For the technological accommodation aspect, the government could provide examples of government-approved software such as *NaturalReader* that educators could use to enhance accessibility of their learning resources (University of Michigan, n.d.). For the consideration of age and difference in disabilities aspect, the government could consider making the guidelines more specific to each condition of the low incidence disabilities (e.g., significant cognitive impairment, multiple disabilities) to inform educators in supporting their students.

Key Messages

In the information age, education relies heavily on digital learning resources that can enhance the learning outcomes and experiences of students. Accessibility is a key factor that determines the quality and effectiveness of digital learning resources, as it ensures that all students can access and benefit from them regardless of their condition. However, there is a lack of clear and consistent guidelines for the development of accessible digital learning resources in the province of Alberta. This could lead to inconsistent practices and standards among educators and developers, and ultimately affect the learning and teaching quality. As the first step to develop a guideline for accessible digital learning resource for the provincial government, I conducted a jurisdictional scan across all provinces of Canada.

Figure 1 shows the results of jurisdictional scan at the Canada-wide level. Findings suggest that most provinces have guidelines on the ease of understanding aspect and affordability aspect of digital learning resources, with AB as the only province with recommendations on all four aspects of accessible digital learning resource development. This indicates substantial availability of guidelines for Alberta educators to develop accessible digital learning resources. Future step that the provincial government could take is developing the centralized guideline for the development of accessible digital learning resources as informed by the existing data sources, recommendations provided in Table 2, and additional literature as needed.

Figure 1.

The availability of accessible digital learning resources development guidelines

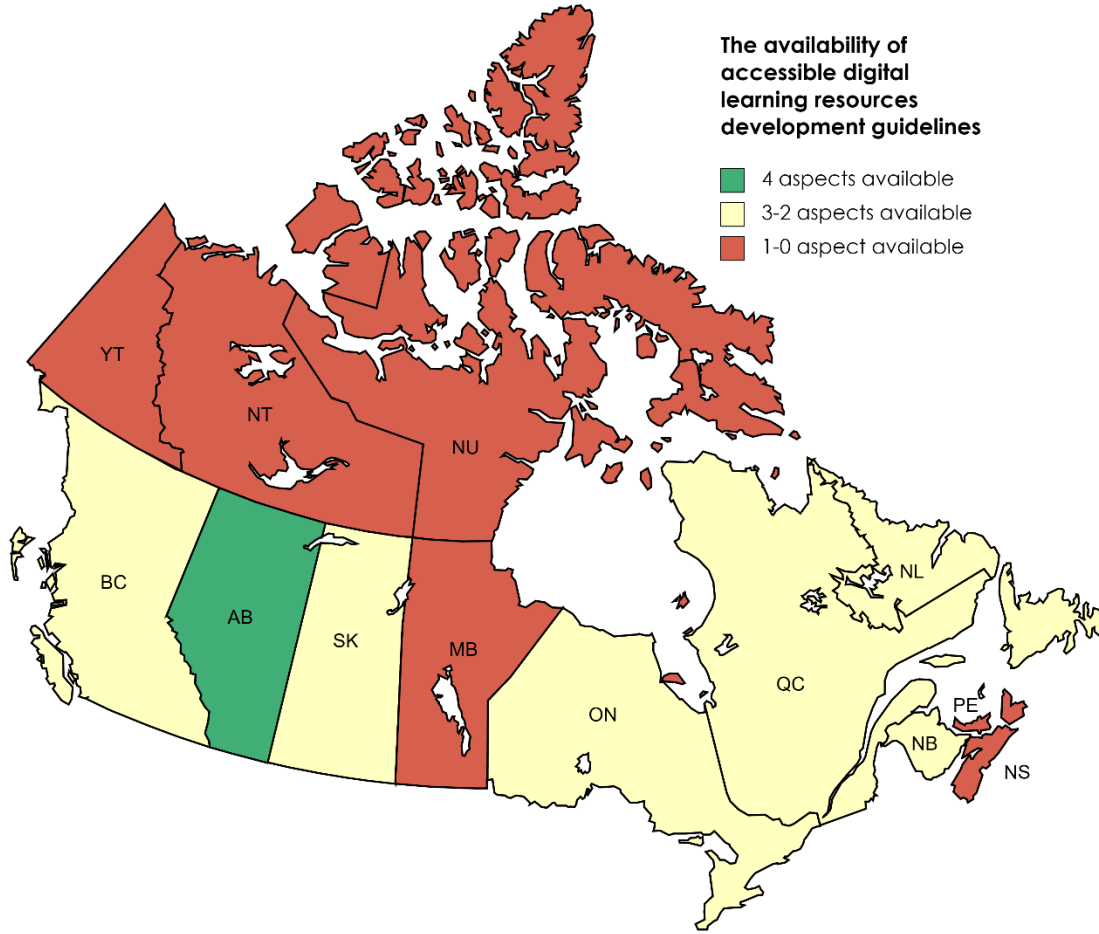


Table 1

Jurisdiction scan of accessible digital learning resources development guideline across Canadian provinces and territories

- Each cell represents data sources available for each aspect of recommendations for accessible digital learning resources.
- Data sources are English provincial government and institution websites.
- The color in each row (province) represents the availability of aspects of information, with green = 4 aspects available, yellow = 3-2 aspects available, and red = 1-0 aspect available.
- Refer to Table 2 for in-depth discussion of guidelines provided in the province of Alberta.

Component Provinces/Territories	Ease of understanding of digital learning resources	Affordability of accessible digital learning resources	Technological accommodation of digital learning resources (e.g., TTS, STT)	Age and difference consideration in the development of accessible digital learning resources
AB	Open education Alberta ¹ University of Lethbridge ² Government of Alberta ²⁷	Government of Alberta ^{4, 26}	Open education Alberta ¹ University of Lethbridge ² Association of Independent Schools & Colleges in Alberta ³ Government of Alberta ²⁷	Association of Independent Schools & Colleges in Alberta ³
BC	Ministry of Education and Child Care British Columbia ^{5, 8} University of British Columbia ^{6, 9}	StudentAid BC ⁷	University of British Columbia ⁶	N/A

ON	Council of Ontario Universities ¹⁰ Accessibility for Ontarians with Disabilities Act ¹¹	Ministry of Colleges and Universities, Ontario ¹²	Council of Ontario Universities ¹⁰ Ontario Human Rights Commission ¹³	N/A
QC	LearnQuebec ¹⁴	Ministère de l'Éducation, Québec ¹⁵	Gouvernement du Québec ¹⁶	N/A
NS	Government of Nova Scotia ¹⁷	N/A Post secondary only	N/A	N/A
NB	New Brunswick Department of Education & Early Childhood Development ¹⁸	New Brunswick Human Rights Commission ¹⁹	Department of Education and Early Childhood Development ²⁰	N/A
MB	N/A	Manitoba Education and Early Childhood Learning ²¹	N/A	N/A
PEI	Department of Education and Early Years Prince Edward Island ²²	N/A Post secondary only	N/A	N/A
SK	University of Saskatchewan ²³	N/A Post secondary only	University of Saskatchewan ²³	N/A
NL	Department of Education, Government of Newfoundland and Labrador ²⁴	N/A Post secondary only	Department of Education, Government of Newfoundland and Labrador ²⁴	N/A
NT	N/A	N/A Post secondary only	N/A	N/A

NU	N/A	N/A Post secondary only	N/A	N/A
YT	Government of Yukon ²⁵	N/A Post secondary only	N/A	N/A

Note. TTS = Text-to-speech, STT = Speech-to-text. N/A = Not available. Inclusion criteria: has to be provincially based, preferably governmental website. Has to have full or partial guidelines for digital AEM development. Has to be applicable to K-12 education.

References of the sources in Table 1

¹Centre for Teaching and Learning and University of Alberta Library (2019)

²University of Lethbridge Teaching Centre (n.d.)

³Association of Independent Schools & Colleges in Alberta (n.d.)

⁴Government of Alberta (2023a)

⁵Ministry of Education and Child Care British Columbia (2010)

⁶Natasha Boskic et al. (2006)

⁷StudentAid BC (n.d.)

⁸Ministry of Education and Child Care British Columbia (n.d.)

⁹Centre for Teaching and Learning, University of British Columbia (2019)

¹⁰Council of Ontario Universities (n.d.)

¹¹Kovac (2023)

¹²Ministry of Colleges and Universities, Ontario (n.d.)

¹³Ontario Human Rights Commission (n.d.)

¹⁴LearnQuebec (2021)

¹⁵Ministère de l'Éducation, Quebec (n.d.)

¹⁶Gouvernement du Québec (n.d.)

¹⁷Government of Nova Scotia (2020)

¹⁸New Brunswick Department of Education & Early Childhood Development (2015)

¹⁹ New Brunswick Human Rights Commission (2017)

²⁰Department of Education and Early Childhood Development (2015)

²¹Manitoba Education and Early Childhood Learning (n.d.)

²²Department of Education and Early Years Prince Edward Island (2016)

²³University of Saskatchewan (n.d.)

²⁴ Department of Education Government of Newfoundland and Labrador (n.d.)

²⁵Government of Yukon (2021)

²⁶Government of Alberta (n.d.)

²⁷Government of Alberta (2018)

Table 2

Summary of guidelines to develop accessible digital learning resources provided by Alberta-based sources.

<p>Province/Territories</p> <p>Component</p>	<p>Ease of understanding of digital learning resources</p>	<p>Affordability of accessible digital learning resources</p>	<p>Technological accommodation of digital learning resources (e.g., TTS, STT)</p>	<p>Age and difference consideration in the development of accessible digital learning resources</p>
<p>Guidelines for the development of digital learning resources</p>	<p>Adopt the universal design for learning (e.g., dyslexic friendly font, color-blind friendly color).</p> <p>Information on the universal design for learning is available in the provincial government website.</p> <p>Tailor the digital learning resources to students' conditions.</p> <p>Make the learning resources machine-readable.</p>	<p>Available funding to support the use of digital learning resources (e.g., alternative communication specialists, assistive technology, professional development for educators)</p> <p>Discount for Microsoft 365 suites provided by Alberta education.</p>	<p>The use of assistive technologies is encouraged in education.</p> <p>Use visual-oriented assistive functions (e.g., TTS, screen reader, alternative text, tactile image enhancer, close captioning) to aid students with visual disabilities.</p> <p>Use cognitive-oriented assistive function (e.g., mind-mapping software, STT) to aid students with cognitive disabilities.</p>	<p>Available resources to inform educators of low-incidence disability conditions and appropriate accommodations at: https://www.aisca.ab.ca/ecls-resources/low-incidence/.</p>
<p>Areas for improvements</p>	<p>Centralization of the guideline to a single website or document.</p>			

	Providing examples or templates of universally designed digital learning resources for educators	N/A	Provide examples of government-approved software such as <i>NaturalReader</i> to enhance accessibility of their learning resources	Making the guidelines more specific to each condition of the low incidence disabilities
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TTS = Text-to-speech, STT = Speech-to-text. N/A = Not available.

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