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Open curriculum for teaching digital accessibility

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In Ontario, Canada, universities are obligated under the Accessibility for Ontarians with Disabilities Act (AODA) to ensure that people with disabilities do not face barriers to education, and they are free from barriers in society more broadly. Those who produce online curriculum for postsecondary education in the province need at least a basic understanding of digital accessibility, and for some roles, like software or web developers, a level of expertise is required. However, finding people with the right knowledge, skills, and attitude can be difficult. This problem can be attributed to the fact that until recently digital accessibility skills have received little attention in post-secondary education. To address the issue, in 2015, with support from the Government of Ontario, we began several projects to develop digital accessibility curriculum. These efforts created a series of free Massive Open Online Courses (MOOCs) aimed at teaching digital accessibility skills to audiences ranging from office support workers, to managers, to developers, to digital accessibility specialists. The MOOCs ran between 2016 and 2019 and served more than 5000 participants, with more than 600 successfully completing the requirements for the digital badge(s) awarded. Following the MOOCs project, the content of the courses was converted into Open Educational Resources (OERs) that could be used as textbooks to support the introduction of digital accessibility topics over a range of subject areas, with encouragement for others to reuse the content to add accessibility related topics into their teaching. The OERs were downloaded more than 10,000 times between late 2020 and late 2022 and provided the base content for four open courses developed through OERU. In this article the pedagogy and curriculum for this digital accessibility training are described.

KEYWORDS

accessibility, digital, education, post-secondary, curriculum, online, open access

1. Introduction

As the 20-year anniversary of the Accessibility for Ontarians with Disabilities Act ([Public Law: Accessibility for Ontarians with Disabilities Act SO, 2005](#); [Public Law: Integrated Accessibility Standards Regulation. O. Reg. 191/11, 2016](#)) approaches, many organisations in the province of Ontario are seeking staff with accessibility expertise. A search of the Web will regularly turn up accessibility related employment opportunities in the province.

Though anecdotally there have been more people entering the field in recent years, most are self-taught or learned through courses offered by accessibility organisations such as WebAim,¹ Deque Systems,² or LevelAccess,³ among others.

1 WebAim, <https://webaim.org/services/training/>.

2 Deque Systems, <https://www.deque.com/training/>.

3 LevelAccess, <https://www.levelaccess.com/solutions/training/access-academy/>.

A market scan of Canadian and International postsecondary institutions we conducted in late 2020 (De Sousa-Hitzler, 2020), revealed *no Canadian universities are teaching digital accessibility as part of an Information and Communication Technology (ICT) program*, and only two internationally.^{4,5}

In 2015 we began a partnership with the Government of Ontario to produce accessibility instruction aimed at training the Ontario workforce in preparation for AODA coming into full force in 2025, and to help address the lack of formal instruction in Canadian postsecondary IT programs.

In this article we discuss the pedagogy and curriculum of the instruction developed.

2. Pedagogy in accessibility instruction

Four courses were created that would introduce accessibility knowledge and skills related to specific employment roles and offered as Massive Open Online Courses (MOOCs) through the Canvas Network.⁶ Each course had a set of explicit outcomes learners had to demonstrate, and upon successful completion earned a digital badge. The courses listed here, with their audience, are described further in the following sections.

- Professional Web Accessibility Auditing Made Easy (developers and quality assurance testers)
- Digital Accessibility as a Business Practice (managers, business owners)
- Web Accessibility for Developers (web developers)
- Introduction to Web Accessibility (general audience).

A variety of pedagogical strategies (Lewthwaite and Sloan, 2016; Sonka et al., 2021) were implemented throughout the courses to engage learners, support learner retention (Reich, 2014; Reich and Ho, 2014), develop creativity and transfer of knowledge, and raise awareness and empathy (Putnam et al., 2015) in learners for people who experience barriers on the Web. These strategies are discussed in the following section.

2.1. Storytelling

To add an element of reality to the learning experience, two of the courses situated learning around a storyline (Suwardy et al., 2013; Browning and Cagle, 2017; Landrum et al., 2019) involving a hypothetical company. In the auditing course, learners are introduced to “Lulu’s Lollipops,” a small company looking to support an advertising campaign for a disability organisation, thus needing to address the accessibility of their website to better support their new client. An actual Lulu’s Lollipops website⁷ was created as an example of an inaccessible site, that would later be

4 Information Accessibility Design and Policy (IADP) Certificate of Professional Development, <http://iadp.ahs.illinois.edu/>.

5 IAAP Nordic: The integration of Web Accessibility Courses in ICT Programs (IWAC), <http://www.iaapnordic.org/projekt/iwac/>.

6 Canvas Network, <https://www.canvas.net/>.

7 Lulu’s Lollipops, <https://de.torontomu.ca/wa/lulu/>.

audited as an activity in the course. Throughout the instruction references back to the storyline link elements learned to their potential application in a real-world scenario.

Similarly, in the business practices course, learners are introduced to the “Sharp Clothing Company,” a growing medium to large size company in Ontario that is implementing accessibility requirements of the AODA, and for compliance with international regulations. Again, each of the key topics covered in the course reflect on aspects of the company.

2.2. Role-play

In the auditing course learners take on the role (Lacanieta, 2022) of an external accessibility consultant and auditor as part of the storyline. Throughout the course interactions with the imaginary company introduce key knowledge and skills needed for the role.

In the business practices course learners take on an evolving role as part of the storyline, after being assigned the task of following up on a complaint about the accessibility of the company’s website. As the learner works through steps to address the complaint, the origin of the complaint leads back to the company’s business practices, or lack thereof, related to digital accessibility. The storyline builds on the learner’s initial role as a project manager assigned the task of addressing the complaint, working up to the role of “Accessibility Champion” for the company, educating him or herself on the various aspects of the business where attention to accessibility is required. Some of these aspects include:

- effectively communicating the benefits of digital accessibility,
- training staff relevant to their roles,
- building awareness through promotional activities,
- establishing an accessibility committee, and
- establishing accessibility quality assurance and procurement practices.

2.3. Experiential, real world, practical learning

Storytelling and role-play themselves are powerful experiential learning pedagogies (Burch et al., 2019) that add real world practical learning to the courses. Through both the auditing and business practice courses, practice activities are scattered throughout the instruction, using both context specific activities that help reinforce specific new knowledge or a new skill, and culminating activities, often used as assessments, that bring together collections of knowledge and skill into a practice.

All four of the courses make use of these types of reinforcement activities, both for purposes of building practical experience, and to make the instruction interesting.

One particularly impactful activity that was used early in each of the courses, was the introduction to screen readers, giving learners an opportunity to experience barriers firsthand (Ashton, 2018). For many it was their first time using the technology and encountering barriers in web content, often producing an “ah ha!” moment when

they suddenly take the abstract concept of accessibility and turn it into personal experience. The discussions that occurred around the activity produced statements like “I had no idea!” or “that was eye opening.” For many, the activity changed the way they think about accessibility.

Other such impactful activities include the meaningful link scan. Learners are given two identical web pages, the only difference being one with “click here” links, and the other with meaningful links that describe the links’ destinations. While timing themselves searching the site for a particular link, inevitably learners discover it takes much longer to find the right link on the “click here” version of the site, having to read through the surrounding text to find the link. While meaningless links are considered a barrier for many people with disabilities, learners come to realise they are also a barrier for able people as well, promoting the idea that accessibility improves usability in general for everyone (W3C., 2022a).

In the developer course, practical learning is also a significant component. After being introduced to screen readers early in the course, learners use that experience to test the accessibility of a series of 10 web-based widgets, like a slider, carousel, or a drag and drop list, among others. Initially an inaccessible version of a widget is introduced, with an opportunity to use the widget with a screen reader, only to discover it is unusable. Then the code needed to correct the barriers in the widget is presented and explained, followed by a short video demonstrating the screen reader interacting with an accessible version of the widget. The goal for learners then is to update the provided inaccessible code to produce a widget that operates with a screen reader as seen in the video. All the while, through the 10 widget activities, learners are creating a library they can reuse after completing the course to simplify the creation of accessible widgets.

The introductory course also contains many practical examples of both accessible and inaccessible web content. This course maps on to the W3C Web Content Accessibility Guidelines (WCAG 2.1) (W3C., 2018), presenting each guideline and success criteria in practical terms that explain, and demonstrate, why it is necessary to address them. In some cases, descriptive examples are provided, and where possible practical examples are included, that learners can interact with to either demonstrate accessibility or inaccessibility. The meaningful links activity, described above, is one such activity. Some of the others include:

- using tools like Amara⁸ to create captions,
- navigating a form with an irregular tab order using a screen reader,
- navigating through a showcase accessible website⁹ to discover how a screen reader interacts with the site,
- using a contrast testing tool to find colours that contrast well,
- and using a colour-blindness simulator to understand how poorly chosen colours can produce barriers.

Many more such activities are scattered throughout the courses, with the aim of producing experiences that learners will remember when they encounter similar scenarios in their own practice.

⁸ Amara Subtitle Editor, <https://amara.org/>.

⁹ Web Accessibility Auditing Showcase, <https://de.torontomu.ca/wa/showcase/>.

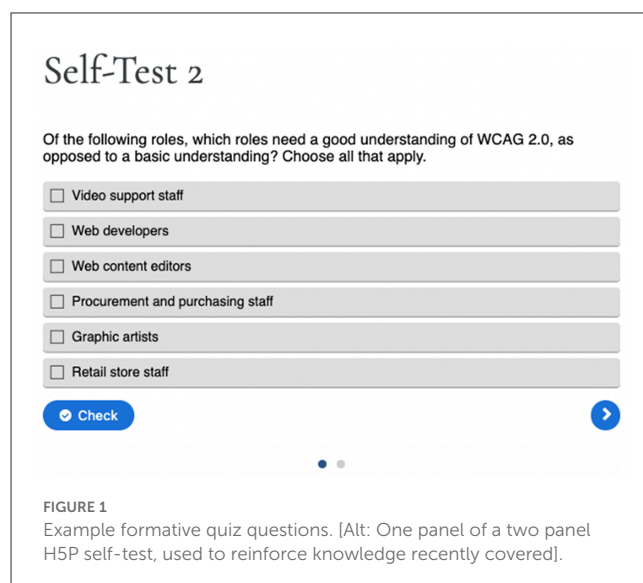


FIGURE 1

Example formative quiz questions. [Alt: One panel of a two panel H5P self-test, used to reinforce knowledge recently covered].

2.4. Formative assessments

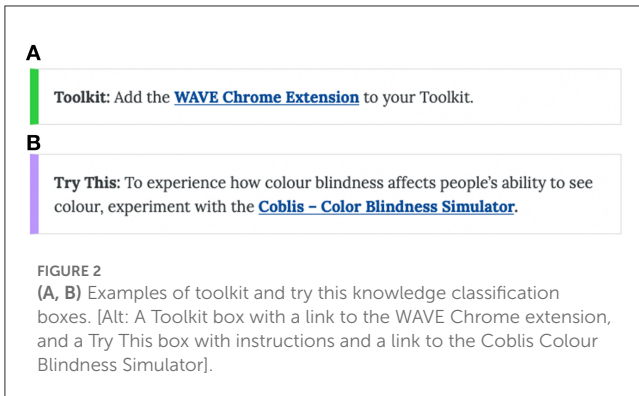
Formative assessments were another pedagogical strategy used to enhance learning (Baleni, 2015). Throughout the courses self-tests appear regularly to reinforce topics just covered. Questions are typically multiple choice or multiple answers, like that in Figure 1, focusing on reinforcing key concepts. Questions are created using H5P¹⁰ and embedded into the content at points shortly after key accessibility knowledge is introduced. Self-tests can be taken as many times as needed to answer all questions correctly.

2.5. Knowledge classification

Throughout the courses key information was classified by type. These types are used to allow learners to adapt the course to their needs. Each key element of information was presented in a coloured box, including a text label to indicate the type. Depending on the learner’s goals, they could choose to ignore information not relevant to them, like skipping over the technical boxes for those with less technical skill, personalising their own learning path (Sunar et al., 2015; Muhammad et al., 2016). Or they could just focus on Key Points and Toolkit items, to pull a quick summary and the key resources from the course. The types of information are listed below, with examples seen in Figure 2:

- Technical (light blue), often included code examples,
- Storyline (yellowish), the continuing Lulu’s Lollipops or Sharp Clothing Company storeys,
- Toolkit (green), a link to a tool, document, or reference etc., related to the learner’s role in the storyline of the course,
- Key Point (red), important information to commit to memory,
- Try This (purple), quick inline activities used to reinforce a topic or concept being discussed,

¹⁰ H5P, <https://h5p.org/>.



- Readings and References (dark blue).

2.6. Toolkit creation

Independent of classifying tools as described above, the Toolkit deserves additional mention. In the post-course surveys we ran, it became clear that the toolkit was the most valued outcome in each of the courses (Gay et al., 2017; Gay, 2018). Toolkit elements include things like:

- accessibility checkers,
- colour contrast testing tools,
- readability testers,
- markup validation tools,
- key references such as WCAG guidelines and techniques,
- the Web Accessibility Initiative's Accessible Rich Internet Applications (WAI-ARIA) specification (W3C., 2017), and
- best practice documentation, among others.

2.7. Compare and contrast

After learning about a particular aspect of accessibility (e.g., automated checkers), then often experiencing them (e.g., test a website with a checker), a “compare and contrast” activity (Karabiyik et al., 2022) may be included to induce critical thinking (e.g., do checkers produce the same results). Other examples include:

- comparing screen reader behaviour on accessible vs inaccessible web content discovering what makes web content accessible (or not),
- comparing different screen reader output when navigating the same web content discovering that assistive technologies can differ in how they interact or output information when navigating through accessible content.

The aim with these activities is to instil in learners that accessibility is often “grey” in that despite following standards, different combinations of web and assistive technologies may behave differently.

2.8. Goal and expectation setting

Each unit in a course begins with an introduction that provides a brief high-level overview of the key concepts covered, along with a listing of Objectives and Activities for the unit. Objectives typically refer to key measurable learning outcomes, worded using Bloom's taxonomy of action verbs¹¹ to indicate explicitly what learners are expected to “do” to demonstrate mastery.

3. Accessibility curriculum

3.1. Professional Web Accessibility Auditing Made Easy

The first course developed in the series was Professional Web Accessibility Auditing Made Easy, a 4-week, eight-unit online course. The audience for the course was primarily technical, with web development understanding, though not necessarily expertise. In addition to an introduction, the eight units are summarised below, including key learning outcomes and activities.

3.1.1. Course Outline for Professional Web Accessibility Auditing Made Easy

1. Introduction

- An introductory discussion of why digital accessibility is important, and the start of the Lulu's Lollipop storyline.
- **Activity:** Learners begin building their “Accessibility Auditing Toolkit.”

2. Aspects of Web Accessibility auditing

- A high-level introduction to accessibility auditing, touching on the key aspects to help learners develop a “big picture” of the topics covered in the course.
- **Activity:** Learners are introduced to a screen reader (i.e., ChromeVox, now called Screen Reader¹²), learn basic keyboard commands, and navigate web content with their computer monitor turned off, then discuss the experience in an open forum. They develop personal experience with barriers, and empathy for those who experience barriers day to day.

3. Introduction to WCAG

- An overview of the W3C Web Content Accessibility Guidelines (WCAG), covering the history, four principles, conformance requirements, success criteria and techniques, and 10 key guidelines to commit to memory.
- **Activity:** Learners participate in The WCAG Scavenger Hunt, where given a list of 10 barriers, they must identify the relevant WCAG success criteria, then choose

¹¹ Bloom's Taxonomy. <https://bloomstaxonomy.net/>.

¹² Chrome Screen Reader, <https://chrome.google.com/webstore/detail/screen-reader/kgejghpjefppelmljgcbhoipfn?hl=en>.

from the associated techniques one that will resolve each barrier. They develop experience using WCAG and its supporting documents.

4. Automated testing tools

- An introduction to automated accessibility testing tools, and colour contrast, text readability, and markup validation tools.
- **Activity:** Learners test a website with two different accessibility checkers, then compare the results from each. They develop an understanding of the limitations and variations between automated tools.

5. Manual testing strategies

- Manual testing strategies including Tab navigation, select all, code evaluation and repair, and media review.
- **Activity:** Learners are introduced to a range of plugins for the Chrome web browser¹³ that can assist with accessibility auditing activities, such as colour pickers, simulated screen readers, text to speech applications, and others. They learn about the breadth of other assistive technologies and testing tools available for browsers.

6. Assistive technology testing

- Common desktop screen readers are introduced, including JAWS,¹⁴ NVDA,¹⁵ VoiceOver,¹⁶ and again ChromeVox.
- **Activity:** Using ChromeVox learners identify accessibility features in web content that may be hidden from view. They learn to identify WAI-ARIA in web applications that add semantics to custom web elements like menus, tab panels, accordions, and other features.

7. User testing

- Understanding when user testing can or should be done, tester recruiting strategies are discussed, test protocols are developed to guide testing, and strategies for recording observations are introduced.
- **Activity:** Learners seek out organisations where people with disabilities might be recruited for testing accessibility and usability.

8. Web Accessibility reporting

- A walkthrough of an existing accessibility audit outlines its elements, with an introduction to informal reviews, and general, template, detailed, and follow up audits.

- **Activity:** Learners conduct an informal accessibility review of the Lulu's Lollipops website, document barriers and potential solutions, and draught an informal audit as an email sent to a client (i.e., Lulu). Learners receive professional feedback on their review to fill in any gaps.

9. Other accessibility standards

- Beyond WCAG, and AODA for the Ontario audience, other related W3C accessibility guidelines are introduced, as well as accessibility legislation from around the world.
- **Activity:** Learners investigate accessibility legislation in their jurisdiction. They compare local accessibility requirements with those in other parts of the world.

As one may gather from the course outline above, experiential learning plays a significant role in the instruction. Learners are placed in a simulated scenario where aspects of accessibility auditing are aligned with their implementation in a potential real-world situation, with a client planning to upgrade the accessibility of her website. And, with each main topic, a hands-on activity provides practical experience using the tools and strategies introduced. The culminating activity (Lulu's Lollipops informal audit) is intended to be an authentic assessment, having learners participate in an activity much like reality.

3.2. Digital Accessibility as a Business Practice

The second course developed in the series was Digital Accessibility as a Business Practice, a six-unit 3-week online course. The primary audiences were management, business owners, and web developers extending their role to IT Accessibility Specialist. In addition to an introduction, the six units are summarised below.

3.2.1. Course Outline for Digital Accessibility as a Business Practice

1. Getting started

- A basic introduction to digital accessibility, and a high-level overview of the topics covered in the course. The Sharp Clothing Company storyline is introduced.
- **Activity:** Learners begin work on their final project, creating an outline of key topics to build on as they collect information throughout the course for a digital accessibility policy. They also start a Toolkit for gathering the tools and resources introduced throughout the course.

2. Understanding the big picture

- The business cases for digital accessibility are introduced, types of disabilities and barriers are discussed, and local and international accessibility laws are compared.
- **Activity:** Learners write a 1 min "elevator pitch" designed to convince a senior manager that attending to digital

13 Chrome Web Browser, https://www.google.com/intl/en_ca/chrome/.

14 JAWS Screen Reader, <https://www.freedomscientific.com/products/software/jaws/>.

15 NVDA Screen Reader, <https://www.nvaccess.org/download/>.

16 Voiceover Screen Reader, https://www.apple.com/voiceover/info/guide/_1121.html.

accessibility will be good for business. They learn key speaking points and reasoning for digital accessibility as an organisational practice.

3. The committee and the champion

- Accessibility skills and knowledge across roles is discussed, the “Accessibility Champion” role is introduced, a person who will manage an organisation’s accessibility efforts and lead an Accessibility Committee.
- **Activity:** Learners assess their own characteristics to determine their fit for an Accessibility Champion role. They learn about the range of knowledge and skills needed by a person leading an organisation’s digital accessibility efforts.

4. Creating digital accessibility culture

- Digital Accessibility Culture is defined. A needs assessment is introduced to evaluate an organisation’s current level of accessibility and what remains to be addressed. Training strategies are introduced, to build awareness across an organisation. Organisational accessibility guidelines, quality assurance, and monitoring strategies are discussed. Change management models are introduced.
- **Activity:** Learners prepare a series of responses to common arguments used to resist change. They come to understand why people often object to change in their routines and provide well-reasoned arguments for digital accessibility related changes to processes and workflows.

5. Procurement and accessibility policy

- Elements of an accessibility policy are discussed in more detail in preparation for the final project coming due. Procurement practice are introduced in the context of local and international accessibility laws, and in the context of accessibility policy. Accessibility statements and claims are introduced. Strategies are discussed for evaluating product accessibility and contractor accessibility skills and knowledge and working with vendors when their products need accessibility attention.
- **Activity:** Learners evaluate accessibility claims for truthfulness, coverage, and compliance with relevant standards. They come to understand that accessibility statements are often subjective, often created by those who do not necessarily have expert understanding, and in worse cases can be deceiving.

6. Hiring accessibility staff

- Accessibility skills and knowledge for key roles including web developers and accessibility specialists are discussed in detail, to be assessed during hiring. Accessibility related interview questions and answers are provided for these and other roles. Hiring of people with disabilities is discussed as a benefit, creating an inclusive and diverse workforce.

- **Activity:** Learners search the web for accessibility related job openings and compare job descriptions from different organisations. They develop an understanding of what employers look for in accessibility professionals.

7. Final project

- **Activity:** Using the initial policy outline provided at the start of the course, learners fill in the details for each section based on what they have learned about digital accessibility as an organisational responsibility. They create a detailed policy for the Sharp Clothing Company (or for their own organisation) and come to understand that accessibility is a responsibility for all employees, and a policy provides guidance on responsibilities across roles and for an organisation.

Much like that in the auditing course, experiential learning plays a significant role. Learners again follow a storyline that simulates a real-world scenario where aspects of accessibility practice are applied in a realistic situation. With each main topic a hands-on activity provides practical experience using the tools and strategies introduced. Activities again are intended to be authentic assessments through the creation of an organisational accessibility policy. A series of 10 multiple choice and multiple answer self-tests are also scattered throughout units to provide formative assessments to reinforce learning and recall.

3.3. Web Accessibility for Developers

The third course developed in the series was Web Accessibility for Developers, a six-unit 4-week online course. The primary audience for this course is web developers and designers with prerequisite HTML and JavaScript experience.

This course has significantly more technical content than the auditing and business practices courses and adopts several developer technologies such as JSFiddle,¹⁷ PasteBin,¹⁸ and Github,¹⁹ among others, to aid with presenting and managing programming code. The focus of the course is on familiarising learners with WAI-ARIA, a W3C technology used to add semantics to customised web elements. Learners are provided with a prefabricated series of ten common widgets such as tab panels, collapsible menus, and slide carousels, among others. They fork the course files Github repository into a repository of their own, then clone the forked repository into a local development environment where they do their work. Each of the ten widgets are covered in detail, with examples of strategies that can be used to add WAI-ARIA semantics. Learners update the JavaScript used to control the functionality of the widgets, adding in keyboard operability to ensure screen reader users can operate the widget in a meaningful way. Completed widgets are committed back to the learner’s

¹⁷ JSFiddle, <https://jsfiddle.net>.

¹⁸ PasteBin, <https://pastebin.com/>.

¹⁹ GitHub, <https://github.com/>.

repository, and a tool called GitHack²⁰ is used to render the code into a usable form that can be assessed for its adherence to W3C WAI-ARIA authoring practices (W3C, 2022b).

In addition to background details about WAI-ARIA, the six units are summarised below.

3.3.1. Course Outline for Web Accessibility for Developers

1. Background

- Learners are provided with background information on types of disabilities and related barriers and on the relationship between WCAG and WAI-ARIA.

2. Course introduction

- Learners get set up with the technology used in the course. Guidance is provided on using Github, setting up the jQuery plugin developed for the course, and installing a screen reader for testing work before submitting it for marking.
- **Activity:** After completing the forking process to duplicate the course files repository, learners submit a URL for the successfully forked repository for a mark, ensuring they are set up to submit assignments via GitHub before proceeding further.
- **Activity:** Learners install the ChromeVox screen reader, then navigate a WAI-ARIA enabled Showcase accessible website and describe the screen reader's interactions with the site. They come to understand how WAI-ARIA makes navigating web content without sight meaningful.

3. Introduction the WAI-ARIA

- The WAI-ARIA specification is described in detail, introducing roles, states, and properties, discussing static vs dynamic WAI-ARIA, browser and screen reader support, and validating WAI-ARIA to ensure it is being used correctly.
- **Activity:** Using the screen reader, and examining code with a browser's inspect window, learners identify at least 5 static, and 5 dynamic uses of WAI-ARIA on a given website. They develop a practical understanding of how screen readers interact with WAI-ARIA.

4. Basic WAI-ARIA

- Focusing on static uses of WAI-ARIA, learners are introduced to landmark regions, live regions, alert roles, tabindex, and application and presentation roles.
- **Activity:** Given a static website developed for the course, learners implement landmarks for the site, and add alert roles to feedback messaging generated by the site. They

come to understand how landmarks are used to aid screen reader navigation, and how the alert roles ensure feedback is screen reader accessible.

5. Interactive WAI-ARIA (basic)

- A walkthrough of a basic toggle button widget provides a practice activity before working on the marked widget assignments. Learners are introduced to best practices for authoring suggestion boxes (i.e., autocomplete forms), tooltips, and progress bars. Video recordings of each widget being operated with a screen reader, shows the functionality to be duplicated in assignment submissions.
- **Activity:** Following the details introduced, learners retrofit a suggestion box, so it functions as described in the video example.
- **Activity:** Retrofit a tooltip.
- **Activity:** Retrofit a progress bar.

6. Interactive WAI-ARIA (intermediate)

- Continuing from the basic widgets, more complex widgets are introduced.
- **Activity:** Retrofit a slider.
- **Activity:** Retrofit an accordion.
- **Activity:** Retrofit a tab panel.
- **Activity:** Retrofit a carousel.

7. Interactive WAI-ARIA (advanced)

- Continuing from the intermediate widgets, yet more complex widgets are introduced.
- **Activity:** Retrofit a menu bar.
- **Activity:** Retrofit a tree navigation menu.
- **Activity:** Retrofit a drag and drop list.

Like the auditing and business practices course, authentic assessments are used as a summative evaluation of learners' understanding of WAI-ARIA implementation for common widgets found on the Web. In each case learners had to add semantics and keyboard operability to the widgets so they could be used effectively with a screen reader. With each activity they update the provided jQuery library, so by the end of the course they have a completed library for use in their own work, simplifying the implementation of widget accessibility when they are using these elements in their own web development projects.

3.4. Introduction to Web Accessibility

The fourth course developed in the series was Introduction to Web Accessibility, a six-unit four-week online course. This course is created for a general audience, though is also relevant for more technical audiences. No prerequisite knowledge is required.

The focus of this course is on building knowledge of the W3C Web Content Accessibility Guidelines (WCAG) and its supporting resources, with topics and activities outlined below.

²⁰ GitHack, <https://raw.github.com/>.

3.4.1. Course Outline for Introduction to Web Accessibility

1. Why learn about Web Accessibility?

- As a foundational course, topics start from the basics of web accessibility, introducing reasoning for addressing accessibility, business cases and laws from around the world, and describing barriers that people with different disabilities might experience on the Web.
- **Activity:** The screen reader activity introduced in the auditing course was duplicated for this course.

2. About WCAG

- An overview of WCAG introduces principles, guidelines and success criteria, conformance levels and compliance requirements, sufficient and advisory techniques, and the variation between WCAG 2.0 and WCAG 2.1
- **Activity:** The WCAG Scavenger Hunt introduced in the auditing course, is adapted for this course.

3. Perceivable

- Focusing on the WCAG Perceivable principle, learners are introduced to the first four guidelines. Success criteria for each guideline are outlined with reasoning and practical examples of their implementation, delineating between conformance levels to indicate their priority (i.e., A vs AA vs AAA). Throughout the content real world examples, and mini activities, are provided to help learners build practical experience applying WCAG.
- **Activity:** For creating closed captions, learners are introduced to the Amara Caption/Subtitle Editor, and the YouTube Studio caption editor, and create captions for a short video. They build a practical understanding of the process and effort required for captioning video, and for producing transcripts.

4. Operable

- Focusing on the WCAG Operable principle, five additional guidelines are introduced. Success criteria for each guideline are covered, with reasoning, examples, and mini activities to build practical understanding.
- **Activity:** To understand the limitations of automated accessibility checkers, learners conduct automated accessibility reviews using two differ accessibility checkers, on both accessible and inaccessible websites created for the course (Lulu's Lollipops and Showcase). They come to understand the variation between, and limitations of, various testing tools.

5. Understandable

- Focusing on the WCAG Understandable principle, three additional guidelines are introduced. Again,

success criteria for each guideline are covered, with reasoning, examples, and mini activities to build practical understanding.

- **Activity:** Learners write for the Web by taking complex, wordy, jargoned text content, and rewriting it so it meets the WCAG text readability guideline. They learn about writing for accessibility, with the aim of making content understandable on first read by a grade 9 student.

6. Robust

- Focusing on the WCAG Robust principle, learners develop an understanding of adaptable, interoperable, and compatible content that is functional across a range of devices, browsers, and assistive technologies. Learners are also introduced to the basics of WAI-ARIA.
- **Activity:** Learners use HTML validation tools to assess website markup for coding errors that may create barriers for assistive technology users. They learn about the effects of markup errors on both access with assistive technology, and the interoperability of content across a range of devices.

Like the other courses in this series, the activities are used as authentic assessments, to evaluate learners' understanding of WCAG, and in general their knowledge of the tools and resources available to evaluate and implement WCAG accessibility recommendations. Throughout the course a variety of hands-on mini activities add an experiential component to their learning, helping them understand from a practical perspective what accessibility and inaccessibility look like.

4. Discussion

Our aim for developing the courses described here was to create formal instruction on digital accessibility that could be taught as part of postsecondary technical programs but also in other subject areas where it would be relevant (e.g., design, publishing, business).

Following the end of the MOOCs projects, Pressbooks²¹ was used to convert courses into open textbooks, then they were released as Open Educational Resources (OERs)²² to encourage their reuse. The practical implications of releasing the courses as OERs are to simplify the addition of digital accessibility training into postsecondary instruction, and to reduce the expense associated with producing instructional content, activities, and assessments, ultimately helping remove barriers to developing and teaching digital accessibility skills and knowledge.

21 Toronto Metropolitan University Pressbooks, <https://pressbooks.library.torontomu.ca/>.

22 OER Accessibility Textbooks, <https://pressbooks.library.torontomu.ca/catalog/greggay>.

As a proof of concept using the books as embedded content, the four courses were replicated through OERU.²³ Readers are encouraged to visit the courses on OERU to see a practical implementation of the OER textbooks. Using the provided embed code with each of the OERs,²⁴ the OERU courses were assembled in a fraction of the time it would take to create them from scratch, in just days as opposed to months for typically course development projects.

Though to date the textbooks have been downloaded more than 10,000 times from our local OER repository, and there have been anecdotal reports of their reuse,²⁵ tracking their use is complicated by virtue of being OERs, having now been distributed through many such repositories over which we have no control. As digital accessibility instruction becomes more commonplace, future work on the impact of these resources could be more effectively assessed by looking at whether elements from the open textbooks are found in courses developed by others.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

23 OERU Web Accessibility for All Micro-courses, <https://oeru.org/web-accessibility>.

24 Example OER Iframe embedding code, <https://pressbooks.library.torontomu.ca/pwaa/back-matter/iframe-embedding-content-from-this-resource/>.

25 Web Accessibility Development, <https://alison.com/course/web-accessibility-development>.

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Author contributions

GG is the sole author of this article and played the lead role in the development of the courses and OER resources described here.

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