THE ROLE OF THE INTERNET IN TEACHERS' PROFESSIONAL LEARNING

A Pan-Canadian Exploratory Study

Photo credit: M. Campbell

Summary Report

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GLOSSARY

Teacher Professional Development (TPD)

Though there are many definitions of the *term teacher professional development*, for the purpose of this study, it refers to any formal (e.g., workshops) or informal (e.g., networking) activities that teachers undertake to enhance their professional knowledge (Borko, 2004). This is distinct to *teacher professional learning*, which refers to the emotional and cognitive processes that occur while teachers participate in professional development (Avalos, 2011).

Online Teacher Professional Development (oTPD)

Online teacher professional development refers to any professional development activities that occur in an online context, such as course modules and webinars, demonstration videos, and social media sites, to name a few (Beach, 2018). Online teacher professional development allows teachers to take control of their own learning, allowing them to interact with personally meaningful material at their own pace.

Self-Directed Online Learning (SDOL)

Stemming from self-directed learning, a branch of adult learning theory, *self-directed online learning* occurs when knowledge is constructed by engaging with multiple modes of digital information, including photos, interactive tools, and videos (Beach & Willows, 2014; Mayer, 2002; Song & Hill, 2007).

BACKGROUND

A key challenge facing teachers and researchers today is identifying effective, evidence-based literacy practices that stem from credible sources. This issue affects a majority of those in the field, with more than 90% of educators reporting that they engage in various forms of professional development each week (Campbell et al., 2017).

Over the last two decades, the demand for informal learning opportunities has spurred educational institutions and organizations to refine existing learning platforms and develop new technologies for self-directed learners (Beach, 2020). The number of teachers engaging with online learning environments is rapidly increasing, with one study estimating that teachers spend between 1-3 hours per week participating in online communities (Trust, 2012). Informal learning in online environments has been characterized as having a participatory culture, with users consuming content at their own pace, and even creating, evaluating, and re-writing it themselves to better suit their students' individual needs (Dunlap & Lowenthal, 2011).

Despite its demonstrated benefits, there has been limited research on how elementary teachers engage with online teacher professional development, both informal and formal, to develop their literacy practice. The purpose of this study, therefore, was to provide insight into elementary teachers' use of the Internet to support their professional learning in the context of literacy education.

SUMMARY

Who Are We?

This research was conducted by the Literacy Education Research Team, led by Dr. Pamela Beach from the Faculty of Education at Queen's University. Three Research Assistants worked on various aspects of this work between 2019-2022: Alexandra Minuk, Elena Favret, and Pamela McDonald.

What Is Our Research About?

There were three parts to the study, all of which involved practicing elementary teachers from Ontario, Canada. All parts of the study that involved the teachers' participation received full ethical clearance from Queen's University.

For the first part of the study, **the survey**, we explored elementary teachers' perceptions of online professional development. Participants were recruited via multiple social media platforms, including the authors' personal Facebook and Twitter accounts, as well as relevant private educational Facebook groups.

For the second part of the study, the **self-directed online learning (SDOL) sessions,** we observed 12 practicing elementary teachers as they completed three open-ended tasks to navigate the Internet for 20 minutes as they normally would when seeking information related to their literacy practice. Participants were recruited via the survey whereby they had the option to indicate their interest in participating in the wider study.

For the third and final part of the study, **the web evaluation and analytics**, the screen recordings captured during the SDOL sessions were used to generate a list of websites participants accessed, analyze the frequency with which they were used, and evaluate their quality. Additionally, Matomo, an open-source web-analytics tool was used to examine user characteristics and the online behavioural patterns for visitors of *The Balanced Literacy Diet*

website, a popular evidence-based literacy-oriented professional learning website.

Each element of the study draws on the Literacy Education Research Team's three major streams of research: 1) examining elementary teachers' professional learning experiences; 2) exploring methodologies for understanding teacher learning; and 3) mobilizing literacy research into the classroom.

Where Can You Read More About Our Work?

Each part of the study has been or will be published in a peer-reviewed academic journal. The findings reported here also build on the findings from our pilot study, which began with a review of the relevant research, published in the *Canadian Journal of Learning and Technology* (Beach et al., 2021a). The overall findings from the pilot study were published in *the International Journal of e-Learning and Distance Education* (Beach et al., 2021b). The survey is currently in press with the *Journal of Educators Online* (Beach et al., 2022). The findings from the self-directed online learning sessions have been accepted for publication with the journal *Online Learning.* The authors presently have two additional papers under review. All journal articles will be made accessible on the research team's website.

PART 1: THE SURVEY

The main objective of the survey study was to examine teachers' perceptions of and experiences with online professional development.

What Did the Survey Ask?

The anonymous online survey was adapted from Parsons et al. (2019), which was originally distributed to teachers in the United States. The survey was adapted for the Canadian context and included a total of 35 items: four demographic items, 27 closed-ended items, and four open-ended items. The complete survey can be found in **Appendix A**.

Examples of the closed ended items included Likert scale items, such as:

- *To what extent was the online professional development beneficial to you?*
- *On a scale of 1-5, how important is it to have the following benefits when you participate in online professional development?*

Examples of multiple choice items included:

- *What is the primary reason you participated in the professional development in an online format rather than face-to-face format?*
- *What, if anything, primarily prevented you from applying what you learned from the online PD to your classroom instruction?*

Examples of ranking items included:

- *How likely would you be to engage in an online video lesson study?*

Lastly, an example of an open-ended item included:

- *Please describe any other ideas you have for conducting or participating in online or technology-enhanced professional learning.*

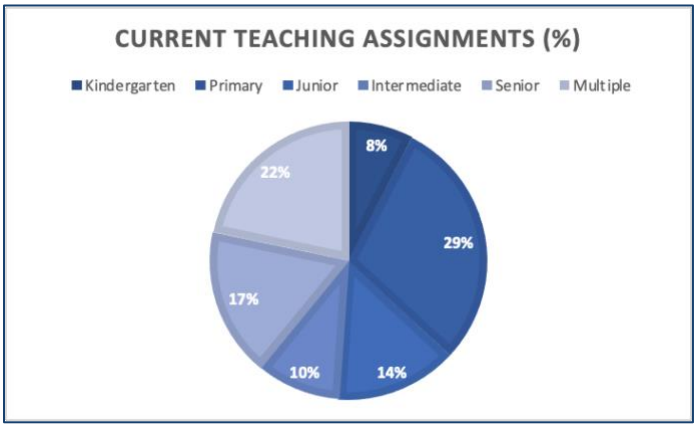
We also asked an additional question pertaining to the COVID-19 pandemic:

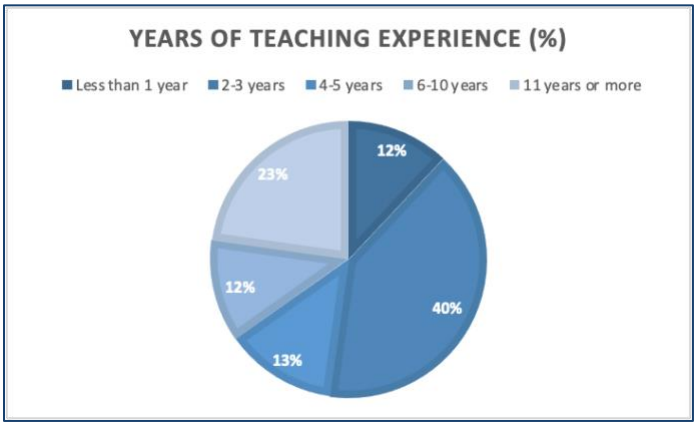
- *Have any of your survey responses been influenced by the current COVID-19 pandemic? If so, please explain.*

How Was the Survey Distributed?

The survey was circulated online via the authors' personal social media pages and through posting in private education-related Facebook groups between July and September 2020. Due to the timing of the COVID-19 pandemic and the additional demands placed on school boards, we were unable to use them as a source of dissemination. Recruitment continued until we reached a sufficient number of responses, resulting in 92 participants. Due to the varied methods of recruitment used, we are unable to provide a response rate for the survey.

Who Participated?



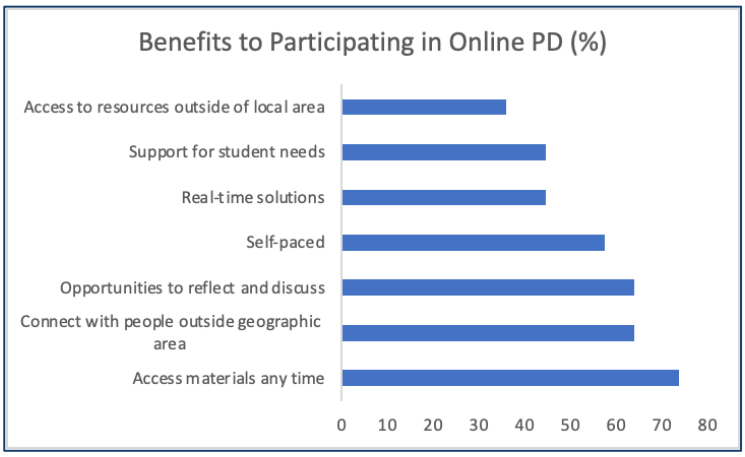


Of the 92 teachers who participated in the survey, over half (51.1%) were qualified elementary teachers, teaching either Kindergarten or grades in the Primary (1-3) or Junior (4-6) divisions. The teachers in the sample also had a wide range of teaching experience, with the majority of participants (40.2%) having worked in the field as a qualified professional for 2-3 years. Almost one quarter (22.8%) of the sample had more than 11 years of experience. While the survey was disseminated across Canada, the vast majority of respondents (83.7%) were based in the province of Ontario.

What Are Teachers' Experiences with Online Professional Development?

Of the survey respondents, over 80% indicated that they had participated in some form of online professional development. Three quarters of participants who had participated in online professional development also indicated that they had engaged in informal online professional development, such as a Facebook group or a Twitter meet-up. The most frequently reported forms of online professional development were accessing course-based learning management systems and self-paced learning, which each represented 22.4% of activities. Topics covered through online professional development were vast and included special education, Indigenous education, and assistive technology.

What Are Teachers' Perceptions of Online Professional Development?



An overwhelming majority (85.4%) of teachers who have participated in online professional development reported that they perceived it to be beneficial. Most participants (65.2%) reported that they were able to apply their learning from online professional development to their classroom practice. A number of specific benefits to online professional development were also identified, such as the ability to access materials at any time.

What Are Teachers' Motivations for Participating in Online Professional Development?

Over a third of participants (32.6%) indicated that the primary reason for participating in online professional development over other forms was convenience. Some participants also indicated that the online professional development they participated in was mandatory (23.9%) and there were no face-to-face options at the time (20.7%). Additionally, 22.8% of respondents reported other reasons for participating in online PD, such as:

- *The local university did not offer all the courses I wanted to take*
- *I was living abroad at the time; go at my own pace*
- *Geographically, it made attending feasible, with a family travel time is an issue*
- *Due to COVID-19*

Of the participants who indicated reasons for not participating in online professional development, some indicated that face-to-face options were preferred (22.8%), followed in frequency by being unaware of online opportunities (19.5%).

Participants indicated that in the future, they would be most interested in participating in online communities of practice, viewing videos of teachers modelling exemplary instruction, as well as accessing videos of teachers working with students who have a wide range of needs. Motivations for participating are summarized according to the themes presented in the table below.

Theme	Example Quote from Survey Respondent
Out of necessity	*Microsoft for education came in response to using the platform for emergency online learning and I was looking to learn how to better integrate the tools provided into my teaching in the classroom, or if need be, online again.*
Requiring new resources for remote teaching	*I did much more PD than I would have without the pandemic. I needed new tools and I needed to ensure I was using all my time during distance learning, so I wasn't at a loss. It gave me a feeling of accomplishment plus helped with new learning.*
Opportunities to create new connections	*This pandemic has made it very evident how flexible we need to be in this profession—always learning and always changing.*

Summary of Survey Findings

While we acknowledge that a limitation of this study is the relatively small sample size as well as the fact that the majority of participants were based in Ontario, the findings offer insight into teachers' perceptions of and motivations to participate in online professional development. These findings have the potential to guide educational organizations and institutions in creating relevant resources conducive to effective online professional development. This may be even more important in the context of COVID-19 and the growing preference for opportunities that can be taken up remotely.

Of the many benefits of online professional development identified, the ability to access materials at any time stood out as a major advantage. While there are many motivations to participate in such activities, three main themes emerged: out of necessity; requiring new resources for remote teaching; and opportunities to create new connections.

PART 2: THE SELF-DIRECTED ONLINE LEARNING SESSIONS

The main objective of the self-directed online learning sessions was to examine elementary teachers' use of the Internet for their professional learning related to their literacy practice.

How Did We Study Teachers' Self-Directed Online Learning?

As noted, survey respondents who expressed interest in participating in the larger study were contacted about engaging in self-directed online learning (SDOL) sessions with a member of the research team. During these sessions, participants (12 practicing elementary teachers in Ontario) were given a 20-minute open-ended task to navigate the Internet as they normally would when seeking information related to their literacy practice. Before each session, participants were emailed the URLs of two literacy-oriented websites: *Reading Rockets: Launching Young Readers* (www.readingrockets.org) and *The Balanced Literacy Diet: Putting Research Into Practice* (www.litdiet.org).

These websites were selected to ensure consistency across the sessions, as well as for their research-informed content and popularity amongst elementary teachers, though participants were welcome to follow hyperlinks to other sites or use those of their choosing. Four sources of data were collected before, during, and after the SDOL sessions.

Demographic Questionnaires

Prior to the first session, participants completed a short demographic questionnaire. Participants were asked to indicate the amount of teaching experience they had (e.g., 1-5 years, 6-10 years, etc.), their age range (e.g., 25-29, 30-35, etc.), their current teaching assignment (e.g., Kindergarten, etc.), and the type of school in which they were presently employed (e.g., public, private, etc.).

Think Aloud Audio Recordings

Participants shared their screen via Zoom and as they navigated the Internet, their actions were captured using Camtasia Studio, a screen recording computer software program developed by TechSmith. Immediately following participants' 20-minute navigation, the recording of their navigation was shared with them via Zoom and the virtual revisit think aloud was conducted; as participants viewed their online choices virtually they verbalized their thoughts aloud.

Screen Capture Recordings

Each 20-minute recording, which were used as the basis of the virtual re-visit think aloud, were also analyzed using a time-sampling analysis to note the frequency of participants' web-based actions and behaviours during their navigations. They were also used to collate a list of websites that the teachers visited during the sessions.

Follow Up Semi-Structured Interviews

Immediately following the third session, a semi-structured interview was conducted with each participant. During the interview, participants were asked to reflect on both the nature of their navigations (e.g., if they had used any of the content they had identified in the sessions in their teaching practice) as well as the think aloud process itself. See **Appendix B** for the complete list of interview questions.

What Types of Goals Do Teachers' Have for Their Self-Directed Online Learning?

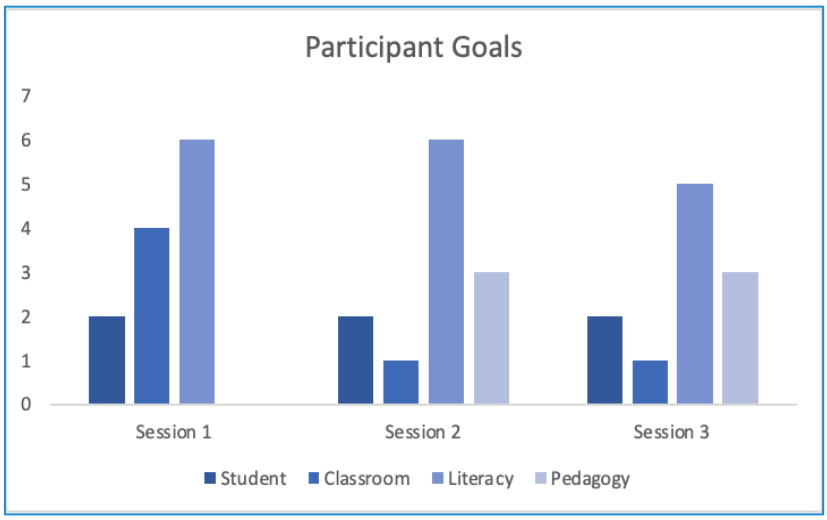
An open-ended analysis of participants' goals, stated at the beginning of each session revealed four categories:

1) *student-focused*;

2) *classroom-focused*;

3) *literacy focused*; and

4) *pedagogy-focused*.



Student-focused goals tended to target individual student needs or home-school communication (e.g., find resources to share with parents during parent/teacher interviews). Though similar, *classroom-focused goals* were more geared to student needs in general by targeting grade level or particular resources (e.g., find more resources for Grade 3). *Literacy-focused goals* tended to focus on reading and writing skills (e.g., looking at the basics of learning to write letters) whereas *pedagogy-focused goals* tended to more broadly entail a focus on teaching structure, filling in knowledge gaps, or seeking educational information (e.g., identify up-to-date information about social/emotional development).

What Type of Cognitive Strategies Did the Teachers' Use During Their Self-Directed Online Learning?

Based on the teachers' navigations and think aloud verbalizations, four main cognitive strategies were identified:

1) *metacognitive awareness*;

2) *monitoring learning*;

3) *evaluating*; and

4) *self-efficacy*.

Metacognitive Awareness

Metacognitive awareness refers to participants' awareness of their own thinking and strategy use, which led them to better understand their choices in relation to their goals. Specifically, participants noted moments when they became distracted or confused, and how such moments influenced their choices during their navigations.

For example, one participant expressed the desire to become more aware of her browsing behaviour relative to her professional goals: "I tend to sometimes divert from what I'm doing and do something else to be distracted and go onto a billion different other things and then eventually come back to my main goal." Participants also commented on how a lack of understanding would lead them to navigate elsewhere. For instance, in reference to an unclear lesson plan one participant acknowledged: "It's also confusing, these names don't say what letter sound, it only says the name so I found that difficult to understand so I think I just left that site."

Participants also recounted their web-based behaviours, commenting on both their decisions and also *why* they made them. For instance, one participant described her decision to click on a specific content tab: "I clicked classroom tips because I was looking for centers and informal assessment to see if there was anything here that was relevant to that." Similarly, a participant provided a rationale for selecting an external link: "I was curious

about the communication milestones so I eventually ended up clicking on that link." In another instance, this same participant explained: "This is me trying to expand this video because I was interested in her evaluation continuum."

Participants also noticed resources that were of professional interest to them. For instance, one participant "saw that they have a character analysis graphic organizer. So [she] thought maybe if it's complex [she] can simplify it a bit."

Additionally, participants were drawn towards information that was familiar to them and that they could immediately relate to their current practice. One participant described how writing activities "caught [her] eye" as she scrolled through a list of lesson plan ideas. Participants were generally attracted to new, yet relatable information. As they navigated, they were "very intrigued" by and described how they "definitely will be going back and taking a look at these [resources] in the future."

They often recollected information by returning to particular websites, as was the case for one participant who decided to return to one of the given sites during her second SDOL session. Another participant described a similar objective: "I decided to go back to the Reading Rockets and to move into the next section after phonemes, moving into some more phonics."

Monitoring Learning

Across the SDOL sessions, participants most often *monitored their own learning,* meaning they were observing, judging, and reacting to new material as it related to their professional goals and teaching practice. Specifically, a common strategy involved searching and filtering for resources. More general searches seemed to occur at the beginning of a participant's navigation. For instance, one participant noted: "I always start my search with something very generic just because I'm curious to see what's out there." Another participant stated that "when it comes to navigating the Literacy Diet site, I tend to go grade-specific." On this website, this

participant found “using the recipe finder and the filter function” helpful to narrow down her search. At various time points throughout their navigation, participants also searched specific topics related to their teaching goals. For instance, one participant described how she used the search engine within a particular website to filter options related to “social emotional development because this is a personal research interest of mine that I’m working on and seeing as an issue that is prominent in the class.”

Searching topics and filtering options often led participants to skim “through what’s there.” By skimming and scanning various webpages, participants were able to observe, judge, and react to topics of potential interest and decide whether the site was worthwhile to continue perusing. For instance, one participant reflected on the recent switch to remote learning. She noted: “As I was quickly skimming through, I realized this is a lot to do with in-person teaching and I really needed to refine my search as I get more creative with how I was going to be teaching word study.” Skimming through information also led participants to make decisions about whether they might return to a specific site. For instance, a participant “did a quick scroll to see if [she] liked the way that the list was done. [She] did, so [she] saved it to come back to later and to have a more detailed look.” As participants skimmed, they “quickly looked through titles”, “browsed and perused to see if anything caught [their] eye”, “flipped through to see if anything captivated [them]”, and “looked for keywords that jumped out and looked relevant.”

The process of skimming sometimes led participants to review information in greater depth. This involved more thoughtful and intentional reading. For instance, after finding an article about reading aloud in the primary grades, one participant noted how she “was reading about the benefits of read aloud and how it helps build knowledge.” Another participant emphasized her careful reading in order to fully understand the content. Similarly, during her third session, a participant described her close reading of a particular topic: “I’m reading this closely just to see what are some traits or ways they consider one to be active or an active citizen, especially for children.”

Participants also saved information through bookmarking, downloading, note-taking, and printing out documents. This was especially the case when participants found direct connections between the information and their classroom contexts. For instance, one participant noted how she would delve deeper into an article at a later time: "So I save this one on my computer. I was looking through it and then there was reading tips for parents for grade three so again, this is really good. I'll come back for this one later." Saving information appeared to directly relate to active planning during the participants' navigations. For instance, one participant remarked on an activity being described by a teacher in a demonstration video: "I like how she numbered it and used different colors to name the groups for them to understand easily in terms of that, so I think I should do that, and save that for later." Another participant began to consider how she might tweak an activity to suit her current students: "It was more so like a grade two activity, but I do love modifying. I love finding [activities that are] easier or harder and changing it up. I can get creative with that."

As participants continued their navigations, they often noted feeling inspired to locate new ideas and resources for their students. For instance, one participant remarked: "I'm looking for some inspiration for some media literacy activities and I started off by referencing the curriculum again." This participant continued sharing her plans related to media literacy and how she was interested in expanding her current teaching unit: "We've looked at print ads, commercials, we've talked about jingles and slogans, we've talked about target audiences, hidden messages, obvious messages and so I was looking for something to expand on that or something different." For all participants, it appeared that the SDOL sessions were beneficial to their own professional learning and instructional planning, particularly in the context of their current classroom: "So again, I was reading through to see what materials were needed for this particular lessons, how applicable or how relevant is it to what's happening in the classroom right now?"

Evaluating

Participants *evaluated* information as they navigated various websites and resources, assessing the source credibility, accessibility, and quality of information. For instance, participants noted whether the source was a credible author, an organization, or field expert whom they could trust to provide them with accurate information. One participant stated: "And then my eye caught this university because I know they're a well-respected university, so I was curious what their teaching guide would say." Similarly, another participant noted that she "really enjoyed that these come up with university-based resources, that are going to be based on academic truth and strong foundational principles that I specifically believe in." Additionally, during her third SDOL a participant remarked: "Going down, checking again references, just want to make sure there's some sort of reliability, academic quota that's being hit, and not just going off someone's gut feeling." Participants found it helpful to "scroll through reading through what the experts have to say."

Along with source credibility, participants noted the accessibility of various websites and resources. They were most interested in material that was free of charge and membership. For instance, one participant "was quite impressed because there were a lot of free books, which is nice." Participants also noted websites' architecture, as in one participant who commented on the "well laid out websites" which she found to be "really helpful for teachers." Participants also made reference to the accessibility of the content:

> *And what I really love about this site particularly, is that it makes a lot of those larger concepts really digestible and then super useful for those that are really versed in it but also really great for those who don't necessarily have a lot of experience within the realm or with the vocabulary or whatever it may be.*

Throughout all three SDOL sessions, participants also evaluated the quality of the websites. One participant, for instance, "just liked how everything was so wonderfully scaffolded and again looking at the list of narratives and just,

you know, always showing them examples, really strong examples." They were intrigued by the possibilities of various online resources, particularly those that were of varying levels where information could be tweaked according to student interest and academic progress. For instance, one participant described how one online resource "was interactive and had a lot of possibilities in it for different activities and different levels." The quality of the literacy content on various websites was also a point of reference in terms of the participants' evaluation. For instance, one participant described:

> *It's so nice that they have so much for literacy so that whenever I seem to be looking for something, I can usually find pretty quickly exactly what I'm looking for which is always nice as a teacher so you're not scrolling the internet looking for something and not being able to find it.*

Self-Efficacy

Finally, participants experienced increases in *self-efficacy*; their confidence in their ability to complete a task or achieve a goal related to their literacy practices appeared to be affected by their SDOL experiences. Although this theme resulted in the least number of thought units across the three sessions, the strategies related to self-efficacy are relevant nonetheless. These included goal setting, drawing on personal experiences, and reflecting on literacy learning. Participants also demonstrated vicarious learning in which increases in confidence for teaching literacy appeared to result from viewing a demonstration video or particular teaching resource.

By setting goals at the beginning of each session and noting goals throughout their navigations, participants were able to stay focused. One participant noted how she would otherwise get distracted by other topics of interest: "I was focusing on writing strategies today because last time I got side-tracked a lot." Goals were obtainable and seemed related to their students' needs and interests. For instance, one participant described her focus on two students: "One of my goals is to think about G's retention of sight words and ability to transfer knowledge." This led her to search and select material that aligned with this goal and student needs. Later in the same session, this participant

stated: “And then I’m thinking about another student, a goal I have for him, he is struggling with recall of sight words.” As participants navigated through the various material they often reflected on their goals: “So when I was starting, I was taking a little bit to think about my goal and trying to have something that was doable.” Similarly, half way through her second SDOL session, a participant reflected: “Then I was back to my original goal, literacy milestones in terms of things that would perhaps come to play in the classroom.”

Participants also drew on personal experiences as well as their own literacy learning during their SDOL sessions. These reflections seemed to create connections to the material. For instance, as one participant viewed a demonstration video she noted: “I spend a lot of time with prekindergarten students so I was thinking, as I watched this, about some of the stuff that I naturally do when I’m just hanging out with kids anyway.” Similarly, another participant reflected on her past experience observing other teachers. This seemed to provide her with a critical lens on how socioemotional development is integrated in the classroom, a topic of personal interest: “I’m thinking about how I’ve seen or observed teachers in my placements or other experiences, how have they effectively taught social emotions or have they taught it at all?”

Although there was only a relatively small number of thought units coded as vicarious learning, it can be suggested that moments of vicarious learning may have contributed to increases in confidence for teaching literacy. For instance, while viewing a demonstration video one participant stated: “It’s also funny because when I did it last year, I hadn’t done it in a long time, so it was nice to watch someone else do one.” Another participant was keen on understanding how a teacher articulated learning goals to her students since this was something the participant found difficult to do: “I’m looking at the learning goal to see how she articulates it because it’s really hard to put down every learning goal, but actually this is a great idea.” By viewing another teacher’s practice, participants may have gained confidence in their own teaching.

What Types of Web-Based Behaviours Do Teachers Engage in During Self-Directed Online Learning?

Participants engaged in a wide range of web-based behaviours and actions during their navigations. Note-taking and video-viewing occurred most often across the three sessions. Participants also explored information by opening webpages; used various web features, including interactive virtual classroom tours; and changed the course of their navigation by opening external links, using the back button, and opening new tabs. A complete list of web-based behaviours can be found in **Appendix C**.

Summary of Findings from the Self-Directed Online Learning Sessions

In general, teachers had four main types of goals (i.e., student, classroom, literacy, or pedagogy-focused) for their self-directed online learning, which varied across the three sessions.

Participants most often monitored their learning (e.g., skimming through resources), but also engaged in metacognitive awareness (e.g., reflecting on the think aloud process itself) throughout. Evaluating source quality, accessibility and credibility was also a prominent theme, as was self-efficacy, or cognition characterized by goal-setting, as an example.

While participants engaged in a wide range of web-based behaviours, video-viewing and note-taking were the most frequent. Unlike the themes, which remained relatively stable across the three sessions, the web-based behaviours noted appeared to increase across the sessions, perhaps indicating participants' increasing comfort level with the process itself.

PART 3: THE WEB EVALUATION AND ANALYTICS

Considering the role of the Internet in this research, the final component of the study was broken down into two parts: 1) the web evaluation; and 2) the web analytics. The web evaluation involved analyzing data collected during the self-directed online learning sessions, whereas the web analytics entailed studying patterns of user behaviour during visits to a literacy-oriented professional development website.

How Were the Websites Used During the Self-Directed Online Learning Sessions Identified?

Using the screen recordings captured during the SDOL sessions, the research team extracted a list of all websites visited by participants. The intention of this part of the study was to identify the types of literacy-oriented professional learning websites available to elementary teachers and evaluate their quality.

To identify the websites, the research team viewed each screen recording, pausing to note the name of each website participants visited during their navigations, as well as the frequency with which they were accessed by participants across the sessions.

How Were the Websites Used During the Self-Directed Online Learning Sessions Classified?

Using existing criteria (Beach, 2020), the research team classified the websites (see **Appendix D** for definitions and URLs to well-known examples). Initially, there were 13 potential classifications, but after carefully reviewing the websites and their content, these were refined to ten categories: *professional learning resources, resource-based websites, social networking/content-sharing websites, blogs, video resources, school board or classroom resources, curriculum resources, online news resources, organization or business-based resources,* and *web portals*.

How Were the Websites Used During the Self-Directed Online Learning Sessions Evaluated?

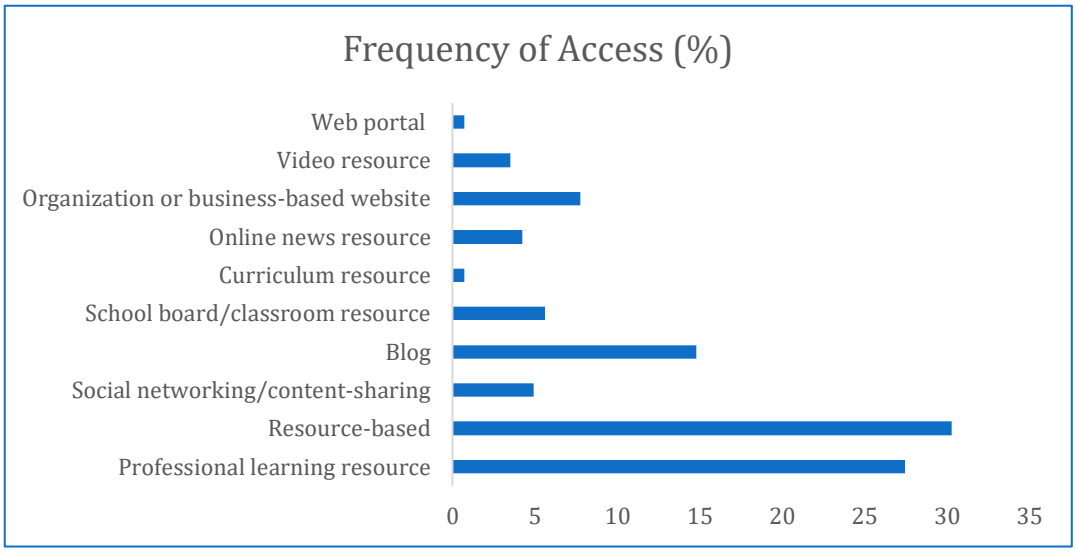
An additional phase of analysis involved selecting a website to represent each category and applying an adapted version of Song and Lee's (2014) website evaluation criteria to assess their quality. Since *The Balanced Literacy Diet: Putting research into practice in the classroom* (www.litdiet.org) and *Reading Rockets: Launching young readers* (www.readingrockets.org) were selected at starting points for the participants' web-based navigations, they were excluded from the list of possible websites to analyze. Additionally, the authors chose not to evaluate websites that were organization or business-based or considered a web portal. Websites that were organization or business-based were excluded for the purpose of focusing the evaluation on freely accessible resources for teachers, whereas web portals were excluded considering the breadth of their scope.

After the exclusions were made, the websites with the highest frequency from each category were selected for evaluation. The chosen websites were rated independently by each member of the research team using a 5-point Likert scale (1 being low, 5 being high) on eight criteria: *content richness, functionality, range of technologies, new technologies, authenticity of the learning environment, potential for learning, potential for change,* and *audience impact* (Song & Lee, 2014).

The researchers followed the same protocol as used previously to complete the assessments, which started by: 1) viewing the website's home and about us pages, if available, and any additional pages linked on the home page; 2) if a search or filter function was available, entering search terms related to language (i.e., phonological awareness, phonemic awareness, and vocabulary comprehension), print skills (i.e., phonics and fluency), and critical literacy (i.e., critical literacy, critical awareness, and critical thinking); and 3) rating each website according to Song and Lee's (2014) criteria along the 5-point Likert scale and recording the scores (Beach, 2020). The research team then met to discuss their ratings for each website, with disagreements being resolved through discussion until consensus was reached.

What Types of Websites Do Elementary Teachers Use for their Literacy-Oriented Professional Learning?

As can be seen in the graph, participants most frequently accessed resource-based websites (*n*=43), representing almost one third (30.28%) of all websites accessed during the SDOL sessions. Following closely in frequency were professional learning resources (*n*=39; 27.46%). Other website categories of note include blogs and social networking/content-sharing sites, of which there were 21(14.79%) and 7(4.93%), respectively. A total of 11(7.75%) organization or business-based websites were also accessed by participants, though these were not included in the overall evaluation.



What Is the Quality of the Identified Resources?

Overall, *Read Write Think,* the professional learning resource evaluated, scored the highest (*M*= 3.46), followed closely by *YouTube* (*M*=3.44). The lowest score (*M*=2.23) was awarded to the resource-based website *Teachers Pay Teachers* as well as to the Ontario curriculum document, with the remaining mean scores ranging between 2.36 and 2.61.

As can be seen in the table below, *Read Write Think* had the highest mean score for content richness (*M*=4.2), followed by the Ontario curriculum document and the Toronto District School Board website, both of which had an average mean score of 3.8. Notably, the resource-based website *Teachers Pay Teachers* scored an average of 1.8 in content richness, largely due to its

low score on the source credibility criterion. As for functionality of technology, scores were comparable across websites, ranging between 3-5 with the exception of the Ontario curriculum resource and *The Measured Mom,* the blog evaluated, both of which had a mean score of 2. The curriculum document scored even lower on its range of technologies (*M*=1), though half of the remaining resources scored an average of 2. Though *YouTube* was the only website to receive a mean score of 5 for its use of new technologies, a majority of websites had a mean score of 1, with the exception of *Teaching Kids News,* the online news source, and *Read Write Think,* the professional learning resource, which scored a 2 and 3, respectively. The same two resources received the highest scores for authenticity of the learning environment (*M*=4), or their relevance for teaching about real world issues. Though almost all (*n*=7) websites evaluated scored an average of 1 in the potential for learning category, *YouTube* stood out with an average mean score of 4. *YouTube* similarly stood out in the potential for change category (*M*=4), though the other websites scored slightly higher than on the previous category ranging between 2-4. Finally, the audience impact scores all fell between 3.5-4, with the exception of the online news source, which had a mean score of 2.

Website Name	URL	Category	Mean Score
Read Write Think	www.readwritethink.org	Professional learning resource	3.46
Teachers Pay Teachers	www.teacherspayteachers.com	Resource-based	2.23
Pinterest	www.pinterest.com	Social networking/content-sharing	2.61
The Measured Mom	www.themeasuredmom.com	Blog	2.36
YouTube	www.YouTube.com	Video resource	3.44

Toronto District School Board	www.tdsb.insigniails.com/library/home	School board/classroom resource	2.54
Government of Ontario	www.edu.gov.on.ca	Curriculum resource	2.23
Online news source	www.teachingkidsnews.com	Online news source	2.48

The extent to which each website addressed print-based, language-based, and critical literacy skills was also evaluated. *Read Write Think* and the Ontario curriculum document received the highest mean scores (M=4) across all three criteria, followed closely by the Toronto District School Board website. The resource-based website *Teachers Pay Teachers* received an average score of 2 across criteria, whereas *Pinterest* and *YouTube* received mean scores of 3. Across the websites, language and print-related skills as well as critical literacy-related skills received a mean score of 2.85, whereas the use of accurate literacy-related language received mean score of 3, suggesting consistency across the categories.

How Were the Web Analytics Conducted?

For this part of the study, both quantitative and qualitative analyses were used to examine how users interacted with *The Balanced Literacy Diet* website. The quantitative component focused on analyzing web analytics of return and non-return users during two time periods to gain insight into patterns of use, while the qualitative component involved an analysis of visitor logs of return users.

Matomo Web Metrics

Matomo, an open source web analytics software program, was used to track online website visits and additional web metrics, including the number of actions, visit duration, and number of pageviews, downloads, and outlinks selected.

Visitor Logs

The visits of return users were also tracked using real-time visitor logs. These logs reported the date, time spent on the website, country, and list of page views and actions individual visitors performed during their visit as well as the number of visits to the website.

What Patterns of Use Were Identified?

Results indicated that return users completed a greater number of actions in visit than non-return users $t(29907) = 22.98$, $p < .001$. Furthermore, return users exhibited a significantly higher visit duration than non-return users $t(29907) = 30.88$, $p < .001$. Results also indicated that return users spent on average a greater amount of time on each action than non-return users $t(29907) = 27.07$, $p < .001$. Finally, return users completed a greater number of page views $t(29633) = 26.41$, $p < .001$ and used more outlinks than non-return users in a given visit $t(2707) = 6.55$, $p < .001$.

Return and non-return users did not differ significantly in the number of downloads completed in a given visit ($p = .225$). These findings suggest that return users interact with the website and its features with greater intention and engagement than non-return users.

How Were Return Visitors' Behaviour Patterns Different to Non-Return Visitors?

Four distinct profiles of behaviour emerged from the qualitative analysis:

1) Image Seeker,

2) Instructional Strategist,

3) Theorist, and

4) Spontaneous User.

These profiles suggest unique categories of users and self-directed online learners.

The Image Seeker

Image seekers are return users that appear to be driven primarily to view and download photographs from the website. Typically, the image seeker does not spend much time on any individual page. Rather, it seems these users collect visual representations from the website and review them more thoroughly at a later date. The majority of image seekers are referred to the website by a social network (e.g., Facebook or Twitter), the most popular of which is Pinterest.

The Instructional Strategist

Instructional strategists appear to return to the website with the key objective of exploring a wide number of lesson plans and strategies to teach a particular literacy topic, spending a great deal of time on each individual page. This suggests that they explore each instructional approach in-depth.

The Theorist

Theorists are those users that appear to be driven to return to the site to explore one or more specific literacy topics in-depth. Specifically, these users focus on conceptualizing the fundamental domains of reading, and developing a deeper understanding of how these concepts are interrelated. Like the instructional strategist, the theorist also spends a great deal of time on each page they view. It is not uncommon for the theorist to be referred from or visit external literacy-oriented educational websites.

The Spontaneous User

Finally, *spontaneous users* are a type of return user that typically only completes one or two actions on any given visit. The pages they explore do not appear to be related and the time they spend on each page varies widely. These users have a wide range of referrer types, and their viewing behavior does not seem to relate to a specific goal.

Summary of the Web Evaluation and Analytics Findings

Of the 13 categories of websites identified, elementary teachers visit resource-based and professional learning websites with the greatest frequency. While the professional learning website evaluated scored the highest in quality overall, the resource-based website had the lowest score, especially as it pertained to literacy education.

When it comes to how elementary teachers interact with a literacy-oriented professional learning website, distinct user profiles emerged, with return visitors being classified as either image seekers, instructional strategists, theorists, or spontaneous users. Each profile can offer insight into the ways in which teachers engage with online learning environments.

KEY TAKEAWAYS

The Survey

Are Teachers Participating in Online Professional Development?

Absolutely. Over 80% of survey respondents indicated that they had participated in online professional development, three quarters of whom had engaged in informal activities, such as an education-specific Facebook group.

What Motivates Teachers to Engage in Online Professional Development?

While there are many motivations for participating in online professional development, the teachers in our study indicated that most often it was out of necessity. This could have been due to the demands on teachers' time that can prevent them from attending in-person events, or it could have been a result of the restrictions in place due to the COVID-19 pandemic. Teachers also identified that engaging in online professional development helped them to find resources to support remote teaching, as well as foster new connections to learning communities and content.

The Self-Directed Online Learning Sessions

What Types of Goals Do Teachers Consider When Engaging in Self-Directed Online Learning?

The teachers in our study had four main types of goals when it came to their self-directed online learning: those that were 1) *student-focused;* 2) *classroom focused;* 3) *literacy-focused*; and 4) *pedagogy-focused*.

What Types of Cognitive Strategies do Teachers Use During Self-Directed Online Learning?

Teachers' used cognitive strategies related to four main themes: 1) *metacognitive awareness*; 2) *monitoring learning*; 3) *evaluating*; and 4) *self-efficacy*. While monitoring learning was the theme that appeared most frequently, metacognitive strategies such as recounting were also prominent.

How Can Their Web-Based Actions and Behaviours Be Characterized When Engaging in Self-Directed Online Learning?

Though the teachers in our study appeared to engage in over 20 web-based behaviours and actions, note-taking and video-viewing had the highest frequency.

The Web Evaluation and Analytics

What Types of Websites Do Elementary Teachers Visit When Seeking Information Related to Their Literacy Practice and What Is Their Quality?

The elementary teachers in our study visited 13 different types of websites when seeking information related to their literacy practice, with resource-based and professional learning websites being visited most frequently. While professional learning websites were evaluated as having the highest quality, resource-based had the lowest, especially as their content pertained to literacy. It should be noted, however, that the 12 teachers in our study visited over 100 websites across the SDOL sessions, speaking to the sheer volume of resources available, and the need for their evaluation.

How Can the Behaviour of Return Users of a Literacy-Oriented Professional Learning Website Be Characterized?

When it comes to visitors of *The Balanced Literacy Diet,* much can be learned from the four user profiles. While image seekers typically do not spend very long on the website, it is clear from their behaviours (e.g., downloads) that they are saving information to return to at a later date. Instructional strategists are those who appear to visit the website with the goal of identifying lesson plans and resources, while theorists tend to do a deeper dive on concepts such as letter sounds or phonics. Spontaneous users tend to engage in a low number of actions per visit, and their goals can be difficult to glean.

CONCLUSIONS

Now more than ever, teachers are turning to the Internet for their professional learning. Given that little is known about how elementary teachers use the Internet to develop their literacy knowledge and practice, and considering the volume of and variability in the quality of resources, this research sought to examine various facets of teacher professional development in online contexts.

Overall, the findings from this study offer both context-specific and broader contributions to the literature. The context-specific contributions relate to understanding teachers' perceptions of and motivations to participate in online professional learning, as well as the cognitive and behavioural strategies they use during self-directed online learning in general. Given that the teachers in our study enacted several strategies related to metacognitive awareness, monitoring learning, evaluating, and self-efficacy, there is evidence to suggest that SDOL can be viewed as a valuable approach to informal PD for practicing elementary teachers. Additionally, SDOL appears to provide a space for elementary teachers to build their confidence for teaching literacy, which can be extended to professional learning as it pertains to other curricular subjects. These findings can be taken into consideration when designing professional development websites so that online platforms are more conducive to teacher learning.

The broader contributions from this research extend beyond teacher professional learning and relate to the multiple methods used in this research. The survey adapted for use in the Canadian context has the potential to reach teachers in other provinces and territories, allowing for insights about professional learning between and within each jurisdiction. Additionally, the virtual revisit think aloud method can be used across domains in education and online learning. Online teaching and learning researchers can use the virtual revisit think aloud to document participants' SDOL, regardless of the context or nature of the learning task. Understanding

the strategies used by online learners, as well as why they access particular resources can contribute new knowledge about informal online learning in general, as well as the platforms used by self-directed online learners. Additionally, the findings from the web analytics and evaluation can offer insight into the markers of high quality online learning websites and resources, to which educational organizations and stakeholders can refer when developing new tools, features, and environments.

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APPENDICES

Appendix A

Survey Items

Q1 In which province/territory do you currently teach?

_____

Q2 What grade level do you currently teach? (select all that apply)

- o Kindergarten
- o Primary (Grades 1-3)
- o Junior (Grades 4-6)
- o Intermediate (Grades 7-10)
- o Senior (Grades 11-12)

Q3 How many years have you been a practicing teacher?

- o Less than 1 year
- o 2-3
- o 4-5
- o 6-10
- o 11 or more

Q4 What subject do you currently teach?

1. All subjects
2. English Language Arts
3. Mathematics
4. Science
5. Social Studies
6. Other _____

Q5 Have you ever participated in any formal professional development that was delivered online (completely online, hybrid format, etc.)?

- o Yes
- o No

Q6 What was the topic of the professional development? (List as many topics as apply)

_____

_____

_____

_____

_____

Q7 How was the professional development delivered? (check all that apply)

7. Course management system
8. Video conferencing
9. Self-paced learning online
10. Other _____

Q8 What is the primary reason you participated in the professional development in an online format rather than face-to-face format? (select all that apply)

- o It was mandatory that I participate online
- o It was more convenient to participate online
- o There was no option to participate face-to-face
- o It was less expensive to participate online
- o Other, please explain _____

Q9 To what extent was the online professional development beneficial to you?

- o Not at all beneficial
- o Slightly beneficial
- o Moderately beneficial
- o Largely beneficial
- o Extremely beneficial

Q10 For those who mark "not at all beneficial" ask what about it wasn't beneficial? (open ended)

_____

_____

_____

_____

_____

Q11 Please indicate if the online professional development in which you participated provided the following benefits:

	Yes	No	I don't know
I could go at my own pace	o	o	o
I could access the materials anytime	o	o	o
I was able to connect with people outside of my immediate geographic area	o	o	o
It provided real-time solutions to problems in my classroom	o	o	o
It gave me access to resources not available in my local area	o	o	o
It provided ongoing support for needs in my classroom	o	o	o
	o	o	o

It gave me the opportunity to reflect on my teaching and discuss it with other educators			

Q12 To what extent were you able to apply what you learned from your most recent online PD to your teaching?

- o Not at all
- o Small extent
- o Moderate extent
- o Large extent
- o Not sure/not applicable

Q13 What, if anything, primarily prevented you from applying what you learned from the online PD to your classroom instruction?

11. Nothing. I was able to apply what I learned
12. It wasn't relevant to my teaching
13. I didn't have the tools/materials I needed
14. It was not allowed by my school's policies/curriculum
15. I didn't have time to plan instruction based on what I learned
16. I meant to implement what I learned, but never got around to it
17. Other-please explain _____

Q14 Which response best describes your reason for not participating in professional development in an online setting?

- o I am not aware of any online professional development offerings
- o I prefer to participate in face-to-face professional development
- o I don’t think I have the technical skills needed to participate in online professional development
- o It is too expensive
- o I do not have the equipment I need to participate online
- o I do not receive credit from my school or district for online professional development

- o I do not think it would be useful

Q15 Have you ever participated in any **informal** online professional development (ex.- Twitter Meetup, Facebook group, anything online that is not part of an official PD offering)?

- o Yes
- o No

Q16 To what extent do you think you the **informal** online professional development was beneficial?

- o Not at all beneficial
- o Slightly beneficial
- o Moderately beneficial
- o Largely beneficial
- o Extremely beneficial

Q17 To what extent were you able to apply what you learned from the **informal** online PD to your teaching?

- o Not at all
- o Small extent
- o Moderate extent
- o Large extent
- o Not sure/not applicable

Q18 What, if anything, primarily prevented you from applying what you learned from the **informal** online PD to your classroom instruction?

- o Nothing. I was able to apply what I learned
- o It wasn't relevant to my teaching
- o I didn't have the tools/materials I needed
- o It was not allowed by my school's policies/curriculum
- o I didn't have time to plan instruction based on what I learned
- o I meant to implement what I learned, but never got around to it
- o Other _____

Appendix B

Semi-Structured Follow Up Interview Questions

1. What were your general feelings during your navigations?
2. What did you find challenging while over the three sessions?
3. Were there any websites/resources that stood out to you?
4. What was it about these websites/resources that made them stand out?
5. Was there anything missing that you would like to have seen/viewed?
6. Do you feel that you gained information about your literacy program during these sessions?
7. Have you incorporated or do you plan to incorporate any of the information that you found?
8. What other forms of professional learning do you regularly engage in? Would like to engage in?
9. Is there anything else you would like to share about the sessions or the think aloud exercise?

Appendix C

Web-Based Actions

Enters a search term
Selects an interactive feature
Uses interactive feature
Opens content page
Opens page about background
Opens homepage
Opens a video
Starts a video
Views a video
Stops video before the end
Opens external link
Opens lesson plan
Selects filter option
Takes a note
Highlights text
Views a photograph
Saves information
Opens new tab
Switches tab
Closes tab
Scrolling
Opens a pop-up window

Appendix D

Definitions and Examples of Website Categories

Category	Description	Example	URL
Professional learning resource	A freely accessible multimedia professional development website for elementary teachers with both informational content and available resources.	The Balanced Literacy Diet	www.LitDiet.org
Resource-based	A website designed for teachers to share or download resources that can be used to support their teaching, including those with digital books or that are student-interactive.	Epic Books	www.getepic.com
Social networking/content-sharing	A social networking site or content-sharing network that provides opportunities for users to share information and resources using media tools (e.g., photos, videos, etc.) through a community platform.	Facebook	www.facebook.com
Blog	A website that provides educational information, both pedagogical and content-based, for educators through regular postings and updates.	Thought co	https://www.thoughtco.com/
School board/classroom resource	Websites including a range of resources for members of specific school communities or classrooms. Resources are approved and deemed credible for the school or	Saskatchewan School Library Association	https://www.ssla.ca/

	school board context, and are often designed by either teachers or school board staff.		
Curriculum resource	Government website that provides curriculum resources, such as specific expectations for the subject.	Ontario Ministry of Education	www.Edu.gov.ca
Online news resource	Website providing national or international updates on current events.	BBC	www.bbc.org
Organization or business-based website	Website for a service-oriented organization, or where items or services could be purchased, related or unrelated to teaching.	ATL Speech Therapy	www.atlspeechtherapy.com
Video resource	A free online platform for sharing videos.	YouTube	www.YouTube.com
Web portal	A search engine for finding information using key words	Google	www.Google.com