Knowledge of Late-Emerging Reading Disabilities Amongst Current and Future Ontario Educators

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Abstract

Children with Late Emerging Reading Disabilities (LERD) are believed to represent a significant proportion of children with reading disabilities (Badian, 1999; Leach et al., 2003; Shaywitz et al., 1992). Yet, these disorders have gone unnoticed or are minimally discussed in educational settings (Chugh, 2011; Catts et al., 2012). Little is known about the extent of teachers’ LERD knowledge, which is problematic given their role in supporting students with reading difficulties. In the first study of this dissertation, in-service teachers’ knowledge, and perceptions of LERD was investigated. Results showed that teachers had little knowledge of LERD and limited confidence in their abilities to identify and provide interventions for these students in the classroom. Based on these findings, a web-based, self-paced workshop was developed with the purpose of increasing educators’ conceptual and practical knowledge of LERD. Participants in Study 2 were pre-service teachers at the University of Western Ontario. Participants watched three module videos, completed associated quizzes, and completed pre- and post-workshop questionnaires. The findings of this study supported the utility of the short web-based workshop for significantly improving pre-service teachers’ conceptual knowledge of LERD. There was some support for its impact on practical knowledge acquisition. Implications for current and future educators’ professional development as well as limitations and next steps for this area of research are discussed.
Summary for Lay Audience

Children can struggle in different areas of their reading and can begin to struggle at different stages in their learning. For example, students might struggle with word reading, reading comprehension (i.e., understanding texts they read), or both. They can also start to struggle in the early elementary grades (grades 1-3) or middle elementary grades (grade 4-6). These are referred to as Early Emerging Reading Disabilities (EERD) and Late Emerging Reading Disabilities (LERD), respectively. Students with an EERD require different supports from those with LERD.

As with many other places in the world, in Ontario, teachers are often the ones to initiate supports for struggling learners. In fact, there is an expectation that teachers have appropriate knowledge of assessment practices, progress monitoring, and intervention strategies to help students with learning needs. In order to appropriately support struggling readers, teachers must have sufficient knowledge of both the assessment and intervention practices but also the reading disabilities impacting the child’s learning. In this dissertation, an initial study was conducted to determine what Ontario school teachers know about LERD given that this type of reading disability has been less well-studied and is believed to be less well-known amongst educators. Results showed that teachers had little knowledge of LERD and limited confidence in their abilities to identify and provide interventions for these students in the classroom. Based on these findings, a web-based, self-paced workshop was developed with the purpose of increasing future educators’ conceptual and practical knowledge of LERD. In this second study, pre-service teachers completed three modules to help facilitate their learning of LERD. The findings of this study supported the utility of the short web-based workshop for improving pre-service teachers’ knowledge of LERD. Implications for current and future educators’ professional development as well as limitations and next steps for this area of research are discussed.
Co-Authorship Statement

I, Chastine Lamoureux, acknowledge that the two integrated manuscripts included within this thesis all resulted from collaboration with my coauthor. In both manuscripts, the first author designed the methodologies, conducted literature reviews, sought appropriate ethical approvals, recruited all participants, collected and coded all data, led the analysis of all data, and led the construction and writing of all manuscripts. Research assistants within the lab assisted with the coding of data as well.

The contribution of coauthor Dr. Deanna Friesen was primarily through her research supervision of the primary author, methodology development, theoretical guidance, analysis of the data, and support in the intellectual and editorial process of creating the work and preparing it for publication.
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Chapter One: Introduction to Late Emerging Reading Disabilities

Learning disabilities have become the most diagnosed disorders of childhood and have received significant attention in the literature (Learning Disabilities Association of Ontario, 2018). This literature has resulted in the development of assessment and intervention practices for professionals and educators to help remediate learning difficulties. In 2005, Education for All was developed by the Ontario Ministry of Education who called for teachers to receive “adequate development in teacher-based assessment practices, progress monitoring, and intervention strategies for students with special needs” (OME, 2005, p.60). They also recommended a three-tiered approach to facilitate the proactive identification and support of struggling learners based on a response-to-intervention (RTI) model (Ontario ministry of Education 2005; Ontario ministry of Education 2013).

As with many Canadian provinces and other countries, the RTI approach provides evidence-based instruction to meet students’ needs more quickly than a model that relies on identification, thus promoting the assessment of risk and facilitating early identification of students with learning disabilities, reducing identification bias, and fostering a positive learning environment (Vaugh & Fuchs, 2003). The three-tiered system (figure 1) used in Ontario should be applied to address reading needs. The first tier requires evidence-based classroom instruction for all students. When students do not sufficiently learn a particular reading skill or set of skills, they are moved up to the second tier where they may receive more intense and focused small group instruction (Mastroppieri et al., 2012). If difficulties persist, students are moved to the final tier (i.e., Tier 3) typically comprised of individual instruction which is often facilitated through special education instruction (Mastroppieri et al., 2012).
While the RTI model can be successful in supporting struggling readers, its effectiveness relies on teachers’ competencies in evidence-based classroom assessment practices and intervention strategies. This begs the question, what happens to this system if teachers do not have sufficient knowledge or the confidence to implement or advocate for greater support for the student?

The following dissertation will introduce two research projects aimed at 1) better understanding current educators’ knowledge of Late Emerging Reading Disabilities (LERD) and their perceived sense of confidence in implementing assessment and intervention practices for these students, and 2) determine the effectiveness of a brief workshop in improving teacher candidates’ knowledge of and confidence in supporting students with LERD. In this first chapter, information about reading development, theories explaining the processes related to reading disabilities, and information specific to LERD and teachers’ knowledge of LERD will be
discussed in order to situate studies one and two, and to inform future directions described in the final chapter.

**Reading Development**

There are multiple theories of reading that each serve different functions. One popular theory is that provided by Hoover and Gough (1990) titled the “Simple View of Reading”. This theory posits that reading is comprised of decoding and linguistic comprehension. Decoding refers to the ability to translate print into word and linguistic comprehension (i.e., listening comprehension) refers to the ability to interpret words, sentences or conversations (Hoover & Gough, 1990). According to this theory, challenges with reading may result from difficulties with decoding, difficulties with linguistic comprehension, or difficulties with both decoding and linguistic comprehension. They posit that reading comprehension is acquired through both adequate decoding and linguistic comprehension skills (Hoover & Gough, 1990).

Alternatively, there are models that suggest reading comprehension is a highly complex interaction of knowledge, processes, and general cognitive resources (e.g., Cain, 2009; Kendeou & Trevors, 2012; Perfetti & Stafura, 2014; van den Broek & Espin, 2012). Cognitive models of reading such as the “Reading Systems Framework” (Perfetti & Stafura, 2014), the “Reading Model” (Gough, 1972), and the “Theory of Automatic Information Processing” (LaBerge & Samuels, 1974) informed our understanding of the processes involved in reading rather than the individual skills. These theories describe the implications of bottom-up processing and/or top-down processes in reading. Bottom-up processes refer to taking information from the outside world (e.g., letters and words) and putting these together to help understand a text (Chugh, 2011). Therefore, a student moves from a part to a whole in order to determine meaning from text. In their theory, Gough (1972) describes a process in which readers begin by identifying sounds in words, then string the sounds together to identify a word, and then infer the meaning of the text by putting the words together. Laberge and Samuels (1974) expanded this theory by introducing the concept of automaticity (i.e., recognize and decode words without hesitation), now commonly referred to as reading fluency, which helps reduce stress on decoding and thus improved comprehension as a result. Bottom-up processes rely primarily on lower-level skills such as vocabulary knowledge, phonological awareness, decoding ability, and reading fluency.

Other researchers highlight the important role of top-down processes in reading (e.g., Goodman, 1976; Gosta et al., 2013; Kolers, 1972; Levin & Kaplan, 1970; Paran, 1996; Rouet et
al. 2017). Top-down processes refer to the use of prior knowledge and expectations in understanding a text. Therefore, meaning is derived by the student moving from the whole to a part and focuses on higher-level processes. Higher-level skills include activating background knowledge, generating inferences, verbal and nonverbal reasoning, working memory, inhibition, cognitive flexibility, and planning/organization (e.g., Cain & Oakhill, 1999; Cain et al., 2001; Castle et al., 2018; D’Angelo, 2016; Locascio et al., 2011; Sesma et al., 2009). However, the degree to which top-down or bottom-up processes are engaged during reading is dependent on the stage of reading development (Steinman et al., 2006).

Stages of Reading Development.

Chall (1983, 1996) was among the first to identify stages in which reading skills are learned. She identified six stages of reading development and described the processes involved at each stage. In stages 0-3, the role of bottom-up processes and the development of lower-level skills become increasingly important. In stage zero, the pre-reading stage (up to kindergarten) children start to learn about sound structures of words and have some knowledge of print. However, children in this stage predominantly engage in “pretend reading” because they have not yet had any formal teaching. As children transition to the first stage of reading development, they begin their formal skills training in reading and begin to engage bottom-up processing as they acquire lower-level skills such as decoding. This stage is characterized by children’s ability to decode and blend unfamiliar words (Breech & Pedley, 1994). By the end of this stage (grade 1), children should have a general understanding of the spelling-sound system. In stage 2, (grades 2-3) children continue to develop their understanding of letter-sound associations and begin to read words and stories. The use of sight-word reading in addition to phonetic cues are used in reading. Importantly, children build fluency in their reading during this stage and master automatic decoding. By the end of this stage, it is presumed that children are ready to transition from “learning to read” to “reading to learn”.

In stages 3 to 5, top-down processes become more useful for decoding more advanced texts with increasingly complex words, integrating knowledge, and inferring meaning from texts (Steinman et al., 2006). In stage 3, (grades 4-8), readers begin to use reading as a tool to add to their knowledge. Readers grow their vocabulary and background knowledge through accessing a broader range of reading materials (e.g., textbooks, novels) and topics during this stage. Reading
comprehension becomes the primary focus of instruction. The final stage of reading (age 18 and above) entails being able to select reading materials that are helpful to the reader (i.e., reading only what they need to read and not reading what is unnecessary). They are also able to analyze, synthesize, and make judgments about what they read to a high degree.

Broadly speaking these stages of reading development are useful in informing educational practices. The objectives for formal training become progressively more complex as children progress through the stages of reading development. For example, teachers in grades 1 and 2 teach foundational skills for reading (i.e., lower-level skills) starting with phonological awareness (i.e., letter-sound associations) which sets the stage for decoding, blending, and eventually word reading. With practice and strategies implemented in the third grade, these lower-level skills become more automatic which subsequently leads to more fluent reading. As children transition to the middle elementary grades (i.e., grades 4-6) training becomes primarily focused on reading comprehension.

Reading comprehension involves an interaction of both bottom-up and top-down processing (e.g., Angosta et al., 2013, Rouet et al. 2017). When a child struggles with reading comprehension, the difficulties could be linked to one or both of these processes. For example, a child may struggle with reading comprehension because of poor decoding or reading fluency which impacts the degree to which they can take-in the information from the text. Conversely, another child may struggle with reading comprehension because of poor comprehension abilities (i.e., listening comprehension). Research has shown that while lower-level skills (i.e., decoding, reading fluency) are highly correlated to reading comprehension prior to the fourth grade, but that their role diminishes by the fourth grade (e.g., Garcia & Cain, 2014; Jared et al., 2011; Lee & Chen, 2018; Veerhoeven & Van Leuwe, 2008; Yovanoff et al., 2005).

Conversely, the role of higher-order skills such as listening comprehension (i.e., the ability to understand spoken language), cognitive skills (i.e., working memory, executive functions), and top-down processes (i.e., inferencing, reasoning) become increasingly more correlated with reading comprehension in the middle elementary grades (e.g., Cain & Oakhill, 1999; Cartwright et a., 2016; Cole et al., 2014; Eason et al., 2012; Gernsbacher et al., 1990; Johnston et al., 2008; Nadig, 2013; Tighe et al., 2015; Yeari, 2017). This distinction between the skills most highly correlated to reading comprehension across stages of reading development is important for distinguishing between different types of reading disabilities.
Reading Disabilities

A child with a diagnosed reading disability (RD) may struggle with word reading accuracy, reading rate or fluency, and/or reading comprehension (American Psychiatric Association, 2013). Reading disabilities emerge from difficulties with lower-level skills (e.g., decoding, phonological awareness, word reading) and/or higher-level skills (e.g., cognitive processes, executive functions) (Vellutino et al., 2007). As previously stated, while lower-level skills are believed to be more relevant to early stages of reading development, the role of higher-level skills increases as children mature in their reading and build towards comprehending more advanced texts (e.g., Badian, 1999; Cain et al., 2004; Catts et al., 2012; Leach et al., 2003).

There are three common profiles of struggling readers. These profiles include students with a specific word-reading disability, a specific reading comprehension disability, or a mixed reading disability (e.g., Catts et al., 2012; Leach et al., 2003; Lesaux & Kieffer, 2010; Pimperton & Nation, 2010; Spear-Swerling, 2015). A specific word-reading disability is characterized by difficulties with lower-level skills such as phonological awareness, and accurately & fluently recognizing and decoding words (e.g., Catts, 1991; Hoskyn & Swanson, 2019; Vaughn et al., 2007). For example, dyslexia is a specific-word reading disability and represents between 5 and 17 percent of the population (Cutting et al., 2013). Most of these students are identified early as there is a greater focus on decoding in the beginning of reading development and this disability is primarily characterized by difficulties with lower-level skills which subsequently impact reading comprehension (Cain & Oakhill, 2007; Oakhill et al., 2003). However, because the difficulties lie in lower-level skills such as decoding or reading fluency, students tend to better comprehend texts that are read to them aloud.

For another 3 to 10 percent of school-age children, difficulties with reading comprehension are present despite having at least average abilities in lower-level skills (e.g., Cain & Oakhill, 2006, 2011; Leach et al., 2003). For those children with a specific reading comprehension disability, difficulties with higher-level processes (e.g., activating background knowledge, generating inferences, verbal and nonverbal reasoning etc.) are associated with struggles with both reading and listening comprehension (e.g., Cain & Oakhill, 1999; Cain et al., 2001; Castle et al., 2018; D’Angelo, 2016; Locascio et al., 2011; Sesma et al., 2009). For these students, difficulties can become especially debilitating when the focus of school shifts from learning to read to learning from reading which typically occurs in the fourth grade (Chall, 1983;
Cutting et al., 2013). The reason being the demands of higher-level skills in reading processes increases as children age (Vellutino et al., 2007). Finally, students with mixed reading difficulties struggle with a combination of reading skills including decoding and phonological awareness as well as core comprehension areas (Spear-Swerling, 2015). For these students, difficulties with both lower and higher-level skills are observed.

**Identifying Early- and Late-Emerging Reading Disabilities**

While most individuals with reading disabilities have symptoms that are readily apparent in the early school years (i.e., by grade 3) others may not manifest symptoms fully until after the third grade at which point in time learning demands have increased and now exceed the individual’s capacities (American Psychiatric Association, 2013). Children with reading disabilities can be categorized as having either an early (EERD; i.e., emerges prior to the 3rd grade) or Late Emerging Reading Disabilities (LERD; emerges after the 3rd grade). It was Chall (1983, 1996) who identified a “second wave” of students who appeared to undergo a “fourth-grade slump” in reading achievement. She suggested that these students were unable to make the transition from the third to the fourth stages of reading. It must be acknowledged that EERD are at times “missed” and can be misidentified as a LERD or alternatively, LERD can be misidentified as a Late-Identified Reading Disability (LIRD). That said, children with LERD have “literacy difficulties that truly develop at a later age” (de Bree et al., 2021) while those with LIRD are characterized by “persistent literacy difficulties that are present much earlier than the actual age of diagnosis” but for whom difficulties were not identified for a variety of reasons (de Bree et al., 2021, pp. 278). For teachers in the middle elementary grades (grades 4-8), identifying an individual with a reading disability could be especially challenging. While many students with EERD have been diagnosed by the third grade, others go undetected until after the third grade. Teachers must be able to differentiate reading comprehension difficulties a student with LERD from one who is late identified.

Given time of onset of reading difficulties and what is known of reading development, the following assumptions may help inform assessment practices as per the RTI model to help differentiate students with LERD from those with LIRD. First, reading involves the integration of lower-level and higher-level skills. As children grow older, the role of lower-level skills in reading decreases and the role of higher-level skills increases (Vellutino et al., 2007). For those
with EERD and LIRD, difficulties emerge in grades 1 through 3 and represent challenges with acquiring skills in stages 1 and 2 of Chall’s model. Therefore, struggles with reading are believed to reflect difficulties with lower-level skills such as the ability to recognize words as whole units, to determine the meaning of a word through accessing sight vocabulary, and to recognize features such as grammar (Srisang & Everatt, 2021). Lower-level skills can include reading fluency, decoding, phonological awareness, and vocabulary amongst others. As children transition to “reading to learn” in grades 4 through 8, reading comprehension is likely to be impacted by gaps in lower-level skills.

Contrastingly, those with LERD begin to experience difficulties in reading only after the second stage of reading development (grades 4-8) where top-down processing is believed to be primarily involved in reading. Thus, students with LERD are hypothesized to struggle with higher-level skills and might have difficulty with making inferences, monitoring comprehension, avoiding incorrect interpretations, or acquiring structure knowledge (Hogan et al., 2011). Higher-level skills involved in reading comprehension include activating background knowledge, generating inferences, verbal and nonverbal reasoning, working memory, inhibition, cognitive flexibility, and planning/organization among others (e.g., Castle et al., 2018; Cain & Oakhill, 1999; Cain et al., 2001; D’Angelo, 2016; Locascio et al., 2011; Sesma et al., 2009).

Given what is known of Late and Early Emerging reading disabilities, the following criteria are likely to differentiate these different reading profiles in the middle elementary grades. First, assessment procedures should include: 1) identifying the time of onset of reading difficulties, and 2) assessing both higher and lower-level skills. Assessment processes could include the use of standardized tools of word-level skills and reading comprehension, though caution should be taken as these have not been developed specifically for LERD. Another way to assess whether difficulties with reading comprehension are related to word-reading skills and/or comprehension is to assess for comprehension when the text is read aloud to the child and when the child must read the text themselves. If students struggle with higher-level skills such that they struggle with comprehending a text both when they read it themselves and when it is read aloud, and the onset of difficulties occurred after the third grade, this may represent a LERD, and appropriate interventions should be provided to remediate difficulties as this is required of the RTI model.

**Interventions for supporting students with Early-and Late-Emerging disabilities**
There are two primary methods of supporting students with reading disabilities: accommodations and interventions. Each is designed to help in a different way. Whereas accommodations remove barriers and provide equal access to learning, interventions target instruction to improve a specific skill and are based on a student’s particular needs (OME, 2017.). Accommodations allow a child to get around a specific barrier by altering the format of presentation (e.g., oral, visual, tactile; small group vs one-to-one support; topic of interest). Conversely, interventions allow a child to get through a specific barrier by receiving explicit and regular instruction that targets a specific area of difficulty identified as part of a previous assessment (OME, 2017.).

Previous research suggests that individuals with EERD and LERD benefit from different interventions. Whereas those interventions with EERD are likely to benefit from phonics and phonological-based interventions such as the currently named EMPOWER program originally developed in by Dr. Maureen Lovett and colleagues in 1979, those with LERD are most likely to benefit from interventions that explicitly teach and model text comprehension strategies that promote higher-level processing, and vocabulary and encourage oral language development (Aaron et al., 2008; Clarke et al., 2010; Snowling & Hulme, 2012; Spear-Swerling, 2015). Examples of interventions for reading comprehension include modeling and scaffolding of reading comprehension strategies (summarizing, predicting, connecting, inferring, visualizing, and questioning), learning to active background knowledge, and previewing texts. Positively, the EMPOWER program does have a module dedicated to reading comprehension that may be helpful to those with LERD. To effectively implement interventions for students with reading disabilities teachers are required to have two things: 1) knowledge of the interventions as discussed above, and 2) sufficient knowledge of all reading disabilities including EERD and LERD to select appropriate interventions.

**Teachers’ Knowledge of Reading Disabilities**

Few studies, to date, have been published on teachers and pre-service teachers’ knowledge of reading disabilities. Of those published, most examine knowledge of dyslexia (Ness & Southall, 2010; Ryder & Norwich, 2019; Wadlington & Wadlington, 2005; Washburn et al., 2014), some explore general reading disabilities (e.g., Harrold, 2019; Washburn et al., 2017), and only one has sought to understand teachers’ knowledge of LERD (Chugh, 2011). Generally,
findings suggest that educators have some conceptual knowledge of reading disabilities but also hold misconceptions and uncertainties with respect to the skills impacted by the reading disabilities and the supports necessary to improve reading (e.g., Ness & Southall, 2010; Ryder & Norwich, 2019; Wadlington & Wadlington, 2005; Washburn et al., 2014). For example, studies of teacher and pre-service teachers’ knowledge of dyslexia highlight that while many correctly associate difficulties with decoding and spelling, there are misconceptions that dyslexia is caused by an impairment in visual perception and that the use of tinted lenses or colored overlays are adequate ways of supporting students with dyslexia (e.g., Wadlington & Wadlington, 2005; Washburn et al., 2014).

There is limited research about teachers’ knowledge and perceptions of students with LERD and their response to students who begin to display reading difficulties in grades 4 and up. To my knowledge, there has only been one study published that has specifically examined teachers’ perceptions of students with LERD. Chugh (2011) explored elementary and intermediate teachers’ perceptions of reading difficulties and the interventions being used to help students with early and late emerging reading difficulties. Of the 78 teachers surveyed, Chugh found that only 12.8% (10 people) of the teachers had heard of LERD. However, a large proportion of teachers did endorse the belief that students could begin to have difficulties in reading in the intermediate elementary grades (i.e., grades 4 through 6). Chugh further found that most teachers reported a significantly lower likelihood of a child being identified with a RD in the intermediate elementary grades compared to a child showing difficulties in the early elementary grades.

When noting the possible causes for later onset of reading difficulties, Chugh (2011) found that teachers most often reported problems with comprehension as the primary culprit. Specifically, most teachers believed difficulties with reading comprehension first identified in grades 4 and up were likely due to increasing reading demands and diminished contextual support of intermediate elementary texts. Additionally, they attributed difficulties with reading in grades 4 and up to limited background knowledge, problems with reading between the lines, and limited vocabulary. As such, teachers in their study tended to recommend accommodations such as increased reading time and exposure to different genres of texts as strategies to help these students rather than to recommend appropriate interventions.
Teachers’ Self-efficacy for Assessment and Intervention of Reading Disabilities

For the RTI model to be effectively implemented with struggling readers, teachers must have a good understanding of reading disabilities including knowledge of EERD and LERD, but they must also have sufficient confidence in their abilities to apply this knowledge to assessment and intervention practices (Bandura, 1977; Monteiro, 2021; Nichols et al., 2020). Findings from multiple studies in the United-States suggest that teachers consistently believe themselves to be capable of assessing and identifying students in need, but report having significantly less confidence in their knowledge about providing intensive interventions for such students (e.g., Means et al., 2009; Spear-Swerling & Cheesman, 2012; Wilcox et al., 2013). For example, in their study of teachers in Texas and Michigan, Wilcox et al. (2013) found that while teachers felt they had received sufficient training in measurement and identification of struggling readers, they felt only “fairly confident” in their ability to adapt instruction and implement intervention techniques for these students. Similarly, in their study, Spear-Swerling and Cheesman (2012) identified that while 85% of teachers surveyed had knowledge of assessment practices for a RTI model, fewer than one third felt they could adjust instruction to include tier 2 and tier 3 reading programs for struggling readers.

Coined as teacher self-efficacy (Bandura, 1977), this perceived sense of capabilities (or lack thereof) is linked to teachers’ willingness to implement new methods when responding to students with diverse needs and to the effectiveness of interventions (e.g., Berman et al., 1977; Nichols et al., 2020). Adding to the complexity of the RTI model for use with reading disabilities is the implication of having to adjust existing assessment and intervention practices for different types of reading disability profiles. To this author’s knowledge, there have been no studies to date which have sought to understand teachers’ perceived confidence in assessment and intervention for students with LERD. Given their role in implementing assessment and intervention as part of the RTI model (Otaiba et al., 2019), it may be assumed that information about teachers’ existing knowledge of these practices is necessary.

Organization of Present Work

This dissertation addresses two related research questions. Chapter two investigates teachers’ existing knowledge of LERD and their perceived confidence in being able to identify
and respond to the needs of students with LERD. Chapter three explores whether a 40-minutes web-based workshop increases pre-service teachers’ theoretical and practical knowledge of LERD as well as their perceived confidence in identifying and intervening with LERD. Whereas Study 1 could identify potential gaps in teachers’ knowledge and abilities as they relate to supporting those with LERD, study two could help inform the effectiveness of a brief workshop in addressing these gaps at an earlier stage in teachers’ professional development.

Using an online questionnaire, study two gathered information about teachers’ existing knowledge of LERD as well as their perceived sense of confidence in their ability to identify these students and select appropriate interventions. Using both quantitative methods (i.e., Likert scales) and qualitative methods (i.e., open-ended questions), gaps in teachers’ knowledge and abilities were identified. The findings from Chapter two informed the design of the web-based workshop implemented in Chapter three. Chapter three reports whether a brief, web-based, self-paced workshop would improve pre-service teachers’ conceptual and practical knowledge of LERD. Pre-service teachers were selected to participate to help address the identified gaps from current educators’ professional development. A teacher education program was perceived to be an ideal time for future educators to receive this information. The purpose of this study was to determine whether a brief workshop could sufficiently increase pre-service teachers’ conceptual and practical knowledge of LERD as well as their confidence in supporting students.

Finally, Chapter four summarizes the work completed within this dissertation and highlights the shared conclusions from both studies. Further, this chapter explains how the work may contribute to future research within the field of educational psychology and inform the implementation of the RTI model for reading disabilities. Implications for professional development and training opportunities for in-service and pre-service teachers are also discussed within this section. Finally, next steps for expanding on this body of research with the hopes of increasing teachers’ awareness of evidence-based assessment and intervention approaches for reading disabilities are identified.
References


Harrold, B.L. (2019). Primary teachers’ knowledge and beliefs as predictors of intention to provide evidence-based reading instruction. ProQuest Dissertations Publishing.


Some recent Canadian sources for statistics on learning disabilities. Ldao.ca
https://www.ldao.ca/introduction-to-ladsadhd/articles/about-lads/learning-disabilities-statistics/


Monteiro, E. M. (2021). *Using a Brief Web-Based, on Demand Training to Improve Pre-Service Teacher Knowledge of Attention Impairment Hyperactivity Disorder (ADHD)*. University of California, Riverside ProQuest Dissertations Publishing.


processes in children who are blind and sighted. *Journal of Impairment & Blindness, 100*(1).


http://dx.doi.org/10.1111/1540-5826.00070


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Chapter Two: Teachers’ Knowledge and Perceptions of Late-Emerging Reading Disabilities

Teachers play a critical role in the identification of students with learning challenges as well as the implementation of interventions to support these students. For example, teachers’ responsibilities include initiating and directing referrals for special education services, performing educational assessments, and implementing interventions (Chu, 2011; Egyed & Short, 2006; Gottlieb et al., 1991; Stiffman et al., 2010). In recent years, the teacher’s role has evolved so much so that they have been referred to as “gateway providers” (Stiffman et al., 2004). A gateway provider is an individual that has a strong influence and involvement in students’ successful access to appropriate supports, such as a referral for learning support services. While having teachers at the forefront can help quickly identify struggling students and implement interventions sooner, the decision to request special education support or to initiate interventions is subjective and relies heavily on teachers’ knowledge and subsequent decision-making. Given teachers’ importance in initiating identification and intervention for students with learning disabilities, the main objective of this current study was to investigate teachers’ knowledge of a less discussed but still pervasive learning disorder: Late-Emerging Reading Disabilities.

Late-Emerging Reading Disabilities

Late-emerging reading disabilities (LERD) are among disorders that have gone unnoticed or are minimally discussed in educational settings (Chugh, 2011; Hugh et al., 2012). This is problematic given estimates that indicate roughly 41 to 46% of students with reading disabilities have a late-emerging reading disability (Badian, 1999; Leach et al., 2003; Shaywitz et al., 1992). Late emerging poor readers present with average or good reading skills in the early grades but fall behind their peers in the later grades; they are students for whom reading difficulties do not begin until the fourth or fifth grade (Catts et al., 2012; Garcia, 2015; Hugh et al., 2012).

Although some researchers have suggested that children with LERD have simply gone undetected in the early grades, findings suggest that these students are not merely late identified but are late emerging (Badian, 1999; Catts et al., 2012; Compton et al., 2008; Kieffer, 2010; Leach et al., 2003). For example, Leach et al. (2003) demonstrated that late-emerging poor readers were not “missed” early poor readers by showing that those students who met the criteria for a LERD had not been overlooked because of high intelligence, good behaviour, or
compensatory strategies. Furthermore, Badian (1999) was able to identify three distinct groups of children with reading disabilities associated with poor reading comprehension in their longitudinal study: Early poor readers, late poor readers, and consistent poor readers (i.e., difficulties observed in both primary and junior grades). Additionally, Catts et al., (2012) used latent transition modelling from grades 1 through 4 to demonstrate that while students with early reading disabilities and typical reading had stable scores across grades, five of their participants showed normal range reading performance in first and second grades and below normal range performance in the fourth grade. Given these findings, there is evidence that LERD is a distinct reading disability.

There are three profiles of LERD that have been identified in the literature: specific comprehension difficulties, specific word reading difficulties, and both comprehension and word reading difficulties (Catts et al., 2012; Leach, et al., 2003; Ritchey et al., 2015; Speece et al., 2010). Children with specific reading comprehension difficulties are particularly interesting given their sizable proportion to the total number of children with LERD (Catts et al., 2012; Etmanskie et al., 2014). While Leach and colleagues (2003) found only 6% of students with early emerging reading disabilities had difficulties with comprehension alone, 35% of late emerging poor readers had comprehension difficulties alone. Comparatively, in a study by Catts et al., (2012), nearly 52% of their sample were identified as have specific comprehension difficulties. In Etmanskie et al., (2014), a larger proportion of children with LERD had profiles of reading comprehension difficulties than word recognition difficulties. Therefore, comprehension difficulties that do not result from decoding difficulties appear to be much more common in LERD than in early emerging reading disabilities.

Children with specific comprehension difficulties tend to demonstrate good fluency and accuracy in reading and spelling words and pseudowords (i.e., made-up words), good phonemic awareness and average to above average phonological awareness. However, they exhibit poor reading comprehension and listening comprehension (Badian, 1999; Cain et al., 2004; Catts et al., 2012; Leach et al., 2003). Moreso, those individuals with these difficulties have been noted to have a history of nonverbal cognitive impairments and specific language impairments, poor oral language proficiency, decreased breadth of vocabulary, poor organizational skills, below average reasoning abilities, and difficulties with semantics and morphology (Cain et al., 2004; Catts et al., 2012; Leach et al., 2003). In contrast, children with word reading difficulties might
struggle with bottom-up processing impairments in word and pseudoword reading as well as spelling, phonological awareness, and naming speed, as well as verbal short-term memory tasks but have unimpaired listening comprehension, vocabulary, and nonverbal reasoning (Adams, 1990; Leach et al., 2003; Stanovich & Siegel, 1994). For these children, reading fluency decreases and the effort needed to make connections in the text increases. Consequently, there are fewer cognitive resources allocated to higher level processes such as reading comprehension and thus these children have poor reading comprehension. (e.g., Perfetti, 1985; Leach et al., 2003).

Importantly, between the third and fourth grade, there appears to be a pedagogical shift whereby the focus of teaching changes from teaching students to read to using reading to learn (Chall, 1983; Etmanskie et al., 2014). Consequently, students encounter lengthier and more complex texts that require greater utility of higher-level skills such as planning and organizing, inferencing, the use of contextual cues, and reasoning. Thus, these greater demands engage cognitive abilities that, prior to the fourth grade, were underutilized or unknowingly weak (e.g., Etmanskie et al., 2014; Leach et al., 2003; Snow et al., 1998). Therefore, students who were previously successful in their reading, have tasks that exceed their abilities and begin to struggle in reading (i.e., LERD).

Chall (1983) was amongst the first to identify a “second wave” of students who appeared to undergo a “fourth-grade slump” in reading achievement. For these students, readily observable reading challenges do not emerge until the fourth to sixth grades. While examining their subgroups, Catts and colleagues (2012) noted that all three profiles of LERD had a higher proportion of children with nonverbal cognitive impairments (NLI) and Developmental Language Disorder (DLD; formerly Specific Language Impairment) than those without LERD. Moreover, those with a history of both DLD and NLI were particularly prevalent among those with late emerging reading comprehension difficulties. It appears general cognitive and language processes may be especially important in understanding students with LERD, particularly those with comprehension difficulties.

Reading involves both bottom-up and top-down processing (e.g., Angosta et al., 2013, Rouet et al. 2017). Bottom-up processing can be understood as a process in which comprehension starts with the letter and sounds, then to words, to the sentence, the text, and finally to meaning (e.g., Angosta et al., 2013; Gough, 1972; Vandergrift & Goh, 2012). Top-
down processing, also referred to as a concept-driven model, involves going from the whole to its parts (Paran, 1996). This perspective emphasizes that information is first generated by the activation of readers’ knowledge which then guides the reader into testing assumptions throughout the processing of the input (e.g., Paran, 1996; Tapiero, 2007; Van Den Broek & Lorch, 1993). It is generally believed that successful reading comprehension relies on the complex integration of both bottom-up and top-down processing (e.g., Angosta et al., 2013, Rouet et al. 2017).

There is evidence to suggest that struggles associated with LERD are driven primarily by difficulties with top-down or higher-level processing (e.g., Lee & Chen, 2018; Muter et al., 2004; Ouellette, 2006; Tong et al., 2011; Yovanoff et al., 2005). Consistent with this hypothesis, students with early RD rarely have difficulties with reading comprehension alone, whereas many students with LERD only have comprehension difficulties (Catts et al., 2012; Leach et al., 2003; Shankweiler et al., 1999; Yuill & Oakhill, 1991). A brief description of bottom-up and top-down processes may help explain this discrepancy. When students have trouble with reading comprehension because they struggle with bottom-up processing, difficulties are primarily observed with word level skills or “lower-level skills”. These skills can include vocabulary knowledge, phonological awareness, decoding ability, and reading fluency. Difficulties with lower-level skills is common in those with dyslexia (e.g., Derawi et al., 2022). Difficulties may include the ability to recognize words as whole units, to determine the meaning of a word through accessing sight vocabulary, and to recognize features such as grammar (Srisang & Everatt, 2021).

When students have trouble with reading comprehension because they struggle with top-down processing, difficulties may be observed with meaning processing skills or “higher-level skills”. For example, students might have difficulty with making inferences, monitoring comprehension, rejecting incorrect interpretations, or integrating knowledge (Hogan et al., 2011). Higher-level skills involved in reading comprehension include activating background knowledge, generating inferences, verbal and nonverbal reasoning, working memory, inhibition, cognitive flexibility, and planning/organization (e.g., Cain & Oakhill, 1999; Cain et al., 2001; Castle et al., 2018; D’Angelo, 2016; Locascio et al., 2011; Sesma et al., 2009). This distinction between whether difficulties are driven by bottom-up or top-down processing has significant implications for the identification of intervention goals (Charles, 2014).
Implications of LERD in the Classroom

In Ontario, as with many Canadian provinces and other countries, the Ministry of Education documents indicate that schools should follow a model of instruction called the “Tiered Approach to Early Identification and Intervention” (Ontario ministry of Education 2005; Ontario ministry of Education 2013). This three-tier system is often referred to as Response-to-Intervention (RTI) outside of Ontario and requires that schools provide evidence-based instruction to students in the classroom (Tier 1). Students who do not show sufficient growth in Tier 1 instruction are moved up through a series of increasingly intensive interventions (Mastroppieri et al., 2012). Teachers are required to gather information (e.g., diagnostic tests, direct observation, work samples) and demonstrate teaching adaptations at Tier 1 before referring a student to the in-school support team (SST) (TDSB, 2014). This approach relies heavily on teachers’ ability to recognize and assess learning difficulties, to screen for early indicators of reading struggles, as well as to appropriately select the skills on which to intervene.

The RTI model presents challenges for children with late-emerging reading disabilities because of its focus on early identification and prevention. By definition, children with LERD are not identified as at-risk during early screening and could present as false negatives thus depriving students of any early interventions that they may require (Compton et al., 2008; Torppa et al., 2015). When screeners are unable to flag a student, in theory, teachers would have to use alternative methods to identify and support their needs. When teachers have limited knowledge about a particular learning disorder, it becomes increasingly challenging to identify where the difficulty emerges and then to appropriately select the skills on which to intervene.

Unfortunately, there is limited research about teachers’ knowledge and perceptions of students with LERD. To our knowledge, only Chugh (2011) explored elementary and intermediate teachers’ perceptions of early and Late Emerging Reading Disabilities. Of the 78 teachers surveyed in Central Iowa, Chugh found that only 12.8% had previously heard of LERD. However, a large proportion of teachers endorsed the statement that students could begin to have difficulties in reading in the upper elementary grades (grade 4 and up). Chugh further found that most teachers reported a significantly lower likelihood of a child being identified with a RD in the intermediate elementary grades relative to the early elementary grades. Most respondents believed that for LERD, comprehension is the primary difficulty. Specifically, most teachers believed reading comprehension difficulties identified after grade 3 were likely due to increasing
reading demands and diminished contextual support of intermediate elementary texts. Additionally, they attributed these difficulties to limited background knowledge, problems with reading between the lines, and limited vocabulary.

Teachers in Chugh’s (2011) study tended to recommend increased reading time and exposure to different genres of texts as strategies to help these students. Given what is known of LERD, specifically the emphasis on difficulties originating from top-down processing, strategies such as increasing reading time and exposure to different genres of texts are unlikely to be optimal interventions for developing the necessary skills to be a successful comprehender. The reason being, these strategies, on their own, are unlikely to develop fluency with higher-level skills. While most students in the middle elementary grades want to improve, interventions are often targeted at younger grades with programs dedicated to improving decoding and vocabulary skills; interventions for the middle elementary grades are lacking in both quality and quantity (Calhoon et al., 2010; Scammaca et al., 2007; Phillips et al., 2011). A study by Oakley (2011) showed that teachers often feel inadequate and ill prepared for teaching strategies such as summarizing and making inferences which would be especially important for students with LERD.

The reviewed research suggests the following: 1) LERD are a unique reading disability that has been understudied relative to early emerging RDs, 2) difficulties associated with LERD can encompass challenges with word-processing, comprehension, or both word-processing and comprehension, 3) while early emerging RDs are most often associated with bottom-up processing, difficulties in LERD are likely to originate from top-down processing, 4) a response-to-intervention model is likely to put students with LERD at increased risk for false negatives, especially if teachers are unfamiliar with alternative strategies to assess for student needs, and 5) teachers appear to lack awareness and understanding of LERD and the optimal interventions needed for remediation. What remains unknown is whether teachers outside of the study by Chugh (2011) have accurate knowledge of LERD, can appropriately identify higher and lower order skills as important in the remediation of late emerging poor reading comprehension, and whether their perceptions of LERD are influenced by the context in which the student is struggling.
The Current Study

This study investigated Ontario teachers’ knowledge and perceptions of students with reading comprehension difficulties in the middle/intermediate grades. Specifically, the study examined teachers’ beliefs both about the underlying causes of LERD and effective teaching approaches. In Ontario, students are typically registered in either a monolingual (e.g., English) or a bilingual (e.g., French Immersion) education program. To assess whether the context in which the student is experiencing difficulties influences teachers’ perceptions of those difficulties, teachers were given three similar case students in which the school context was changed (i.e., English monolingual context, French Immersion context, no context provided).

The present study used both Likert scales and open-ended questions to address the following: To what extent are Ontario teachers aware of LERD? Do Ontario teachers endorse the belief that children can begin to have difficulties with reading comprehension in grades 4 to 6? What skills do Ontario teachers believe are most related to late emerging poor reading comprehension? Does the educational context influence teachers’ perceptions of students with LERD and their selection of which skills are most related to late emerging poor reading comprehension? What factors do Ontario teachers most associate with reading comprehension challenges that emerge in the middle elementary grades? How would Ontario teachers support students with late emerging poor reading comprehension?

It was hypothesized that most teachers in Ontario would have limited knowledge of LERD but would endorse the belief that children can begin to have difficulties with reading comprehension in grades 4 to 6. Additionally, it was hypothesized that the context in which the difficulty was described may influence teachers’ perceptions of the impact of each skill though no predictions were made about how these responses might differ across contexts. If teachers are not familiar with LERD and the educational context impacts their responses, this finding has important implications for the identification and intervention of students with LERD. Specifically, teachers are unable to appropriately implement a response-to-intervention model and select the necessary intervention strategies as they are unlikely to have sufficient knowledge of the skills being impacted. It was also hypothesized that teachers would have some misconceptions about LERD, specifically with confusing features of Early Reading Disabilities with Late Emerging Reading Disabilities.
Method

Participants

Respondents were required to have at least 1 year of teaching experience and qualifications to teach in the primary/junior or junior/intermediate grades (kindergarten through grade 8) in Ontario, Canada. The participants included 63 elementary teachers (Male: n = 4, Female: n = 59). Of these participants, 30 participants indicated that they had taught only in an English School and 33 indicated that they had experience teaching in either a French Immersion or French First Language School. Respondents ranged in teaching experience from 1.5 years to 39 years (mean=15.16, SD = 9.4) and had ages ranging from 24 to 63 years old (mean = 40.6, SD = 9.1).

Measures

Teacher Demographics Questionnaire. This questionnaire included items on age, gender, educational achievement, years of teaching experience in the general education classroom (including grade levels), years of special education experience, and school language context.

LERD Questionnaire. A Five-point Likert scale was developed to evaluate teachers’ perceptions and knowledge of LERD. Teachers rated five statements from Strongly Disagree to Strongly Agree. The questions assessed a) their perceived confidence in assessing and supporting students with an Early RD or a Late RD, b) their beliefs about whether or not a student can begin to have trouble reading in the middle elementary grades and c) their knowledge of LERD (Appendix A).

Case Scenarios. Teachers read three scenarios and subsequently answered multiple statements about each case using a Five-point Likert Scale from Not at all Related to Very Likely Related. In both language context scenarios, the student’s grades in word reading and comprehension up to the third grade are noted to be mostly As and Bs whereas grades are primarily Cs and Ds in the fourth grade. Additionally, the student is noted to have had no changes in environment or behaviour. The only difference between language contexts is the first scenario described a student who studied in an English school (English context) and the second scenario described a student who studied in a French immersion school (Dual-language context). The third scenario described a struggling student with no information noted about language context or environmental factors. Only information regarding changes in reading abilities in the
fourth grade is provided. The three scenarios are provided in Appendix A. After reading each scenario, teachers rated the likelihood that the student’s reading difficulty was caused by the following 14 component skills: phonological awareness, reading fluency, decoding, vocabulary, background knowledge, grammatical knowledge, identifying main ideas, inferencing, verbal reasoning, nonverbal reasoning, working memory, inhibitory control, cognitive flexibility, and planning/organization. They were also asked to rate the likelihood that each of the following factors contributed to the difficulty: increases in academic demands, lack of parental support, previous coping strategies no longer successful, lack of appropriate instruction, lack of motivation, and late onset reading disability. Once teachers had completed the three case scenarios, they were asked “What strategies would you try if one of your students whose reading development has been similar to peers through third grade begins to demonstrate significant and unexpected reading comprehension difficulties in grade 4?”

Procedure

Ontario teachers were recruited via Facebook and professional teacher organizations’ websites. Consented teachers were sent a link to all study materials (i.e., letter of information and questionnaires). First, teachers completed the demographic questionnaire. In the second section, teachers completed questionnaires on their sense of self efficacy, beliefs about teaching and learning, and burnout. Results from these questionnaires were not included in the present work but can be accessed through publication in the Journal for Social Sciences & Humanities (Friesen et al., 2023). Finally, teachers completed the LERD questionnaire and three case studies in the following order: English context, French Immersion context, and no language context. Teachers were compensated $20 (as an amazon gift card or a donation to a local Learning Disabilities Association) for their time and were sent a debriefing form which included information about the Office of Human Research Ethics.

Results

Knowledge of LERD

Thirty-three percent of respondents (n = 21) indicated that they had heard about LERD. However, 3 participants provided incorrect definitions, indicating that a more accurate estimate of 29% (n = 18) had previous knowledge of LERD. Of the 42 remaining participants, 39 indicated that they were unfamiliar with the condition, and 3 did not provide an answer. When asked whether they believed a student could have reading abilities similar to peers in the primary
grades and then experience reading difficulty in the intermediate grades (4 through 6), 4.8% somewhat disagreed, 12.7% somewhat agreed, 44.4% agreed, and 33.3% strongly agreed. No participants strongly disagreed.

**Confidence in Assessment and Intervention**

Teachers reported their confidence in identifying Early- and Late-emerging reading disabilities on a 6-point Likert scale (from Strongly Disagree (1) to Strongly Agree (6)). Teachers reported significantly greater confidence in identifying early (mean = 4.47, SD = 1.16) versus late (mean = 3.72, SD = 1.20) emerging disabilities, t(59) = 4.44, p < .001. Notably, 86.7% of respondents gave a response at or above “somewhat agree” about their confidence in identifying a student with an early emerging reading disability; this percentage was only 55% for late-emerging reading disabilities. Teachers were also asked to report the extent to which they felt confident appropriately selecting interventions for students with a late-emerging reading disability. Responses indicated that only 55% endorsed a statement that they felt confident, to some extent, in their ability to appropriately select interventions for students with LERD. Within this group of teachers, 25% somewhat agreed, 19% agreed, and 8% strongly agreed.

**Perception of Component Skills’ Impact on Reading Difficulty**

Teachers rated fourteen variables on whether they were likely causes of the reading difficulty described in the scenarios on a 5-point scale from Not at All Related (1) to Very Likely Related (5). Table 2.1 presents the means and standard deviations of ratings of skill relatedness as a function of skill (14 components) and context (monolingual context, dual-language context, no language context). Rankings from most (1) to least (14) related to reading comprehension within the contexts are also provided.

A within-subject repeated measures ANOVA was conducted to investigate the perceived relatedness of the fourteen skills with skill and context as independent variables and Relatedness Rating as the dependent variable. Greenhouse-Geisser corrections were used to correct for Sphericity. There were significant main effects of context, $F(2, 88) = 8.45$, $p = .002$, $\eta^2_p = .161$ and of skill, $F(13, 572) = 7.70$, $p < .001$, $\eta^2_p = .149$ There was also a significant interaction of skill by context, $F(26, 1144) = 2.23$, $p = .009$, $\eta^2_p = .048$. All follow-up comparisons were corrected using the Bonferonni adjustment for multiple comparisons. Overall, Relatedness was rated significantly lower in the No context scenario relative to both the English context, $p = .014$, 

and the Dual-language context, \( p = .003 \). No overall differences emerged between the English context and Dual-language context \( (p > .05) \).

The significant interaction between skill and context was analyzed by examining the simple main effects for each skill across context in order to see if context impacted the perceived importance of each skill. Participants rated the importance of phonological awareness, reading fluency, and decoding as being significantly lower in the no context condition than in both other contexts, \( ps < .05 \). Participants rated the importance of identifying main ideas (\( p = .008 \)) and inferencing (\( p = .012 \)) as being significantly more important in the English context than in the no context condition. Working memory was rated as significantly more important in the English condition than both the No context \( (p = .024) \) and dual-language conditions \( (p = .05) \). Participants rated the importance of grammatical knowledge as being significantly higher in the dual-language context than in the English condition \( (p = .032) \) and in the no context condition \( (p = .014) \). Context had no impact on perceived importance of Verbal Reasoning, Nonverbal Reasoning, Vocabulary, and Background Knowledge, \( (all ps > .05) \).

To examine the perceived overall importance of each skill within each context, a follow-up analysis of the skill simple main effect on relatedness was undertaken. In the English monolingual context, there was a significant main effect, \( F(13, 663) = 8.07, \ p < .001, \eta^2 = 0.75 \) with two variable groupings emerging. In the top grouping, inferencing, vocabulary, identifying main ideas, and working memory were identified as the most important and did not differ significantly from each other \( (p > .05) \) but differed from all other skills. The second grouping included all other variables which did not show a clear distinction from one another.

In the dual-language context, there was a significant main effect in perceived relatedness, \( F(13, 715) = 6.30, \ p < .001, \eta^2 = 0.62 \) with three variable groupings emerging. In the top grouping, inferencing, vocabulary, and identifying main ideas were identified as most important and did not differ significantly from each other \( (p > .05) \) and significantly differed from all other variables \( (p < .05) \). The second grouping included working memory, verbal reasoning, reading fluency, decoding, background knowledge, cognitive flexibility, phonological awareness, and grammatical knowledge which differed significantly from the top and bottom groupings \( (p < .05) \). The final grouping included inhibitory control, nonverbal reasoning, and planning/organization which were rated least important and did not differ significantly from each other \( (p > .05) \) and significantly differed from all other variables \( (p < .05) \).
In the No-context scenario, there was a significant main effect of skill on relatedness, \( F(13, 702) = 6.43, p < .001, \eta^2_p = 0.77 \). The top two rated skills included vocabulary and inferencing which differed significantly \((p < .05)\) from the bottom two skills: phonemic awareness and planning/organization. However, the top and bottom skills did not significantly differ from many of the middle-rated skills suggesting there was no clear delineation of skills.

**Perception of Additional Factors’ Impact on Reading Difficulty**

Teachers rated the likelihood that the observed reading comprehension difficulties were caused by six factors in three different contexts on a 5-point from *Not at all Likely* to *Very Likely*. Table 2.2 reports the means and standard errors of these ratings. Rankings from most (1) to least (6) likely to impact reading comprehension within the contexts are also provided. A within-subjects repeated measures ANOVA was conducted. It included cause (6 causes) and context (3 contexts) as independent variables with importance rating as the dependent variable. Since Mauchly’s Test of Sphericity was significant for context, cause and context by cause \((p s < .05)\), Greenhouse-Geisser correction was used. There was a significant main effect of cause, \( F(5, 265) = 28.70, p < .001, \eta^2_p = .351 \), but no main effect of context, \( F(2, 106) = 1.24, p = .29, \eta^2_p = .023 \), and a near significant interaction of context and cause, \( F(10, 530) = 1.96, p = .052, \eta^2_p = .036 \).

Follow-up comparisons of the significant main effect of cause revealed three groupings. *Increase in academic demands* and *Previous coping strategies no longer effective* were rated as most related to the difficulty and did not differ from each other \((p > .05)\). They were both identified as significantly more likely causes of reading difficulty than all other causes \((p < .05)\). The only exception was *Late Onset Reading Disability* which did not differ significantly from *Increased in Academic Demands* \((p = .079)\). Lack of parental support was scored as least likely to cause the difficulty and differed significantly from all other variables \((ps < .001)\). Lack of appropriate instruction, lack of motivation, and late onset of reading disability did not significantly differ from one another \((p > .05)\). Results indicate that teachers in this sample perceive emerging challenges with reading comprehension to be likely impacted by increased academic demands and previous coping strategies no longer successful across all three contexts and unlikely to be related to a lack of parental support.

**Teachers’ Strategies for Supporting Students with Late Emerging Poor Comprehension**
One open-ended question was analyzed using a flexible Thematic Analysis approach (Braun et al., 2019). Teachers were asked the following question: “What strategies would you try if one of your students whose reading development has been similar to peers through third grade begins to demonstrate significant and unexpected reading comprehension difficulties in grade 4?” Fifty-seven statements underwent multiple phases of thematic analysis by two researchers. In the first phase, the researchers familiarized themselves with the data. In the second phase, the researchers selected preliminary codes based on the data and the literature. Following a review of the coding, the two researchers redefined the constructs twice more to better capture all the data. Data were coded for the presence or absence of statements about 1) lower-order or higher-order skills, 2) Assessment of these skills, 3) Teaching approaches, 4) Consultation. Teaching Approaches coded included Going Through the Barrier (i.e., interventions that target skill building such as modeling or guided reading) and/or Going Over or Around the Barrier (i.e., providing supports and accommodations to reduce the impact of the difficulty).

To quantify the number of quality responses, the statements were rated for comprehensiveness by determining whether they mentioned assessment, intervention, and/or consultation. A Level 1 was assigned to responses that included all three components, whereas a Level 2 included two components, and a Level 3 included only one component. The statements’ quality was further assessed to determine whether they aligned with evidence-based approaches. Statements were scored as Level A, B, C, or D. A Level A response mentioned all three of the following: higher-level skills should be assessed and intervened on, interventions should include a component of direct instruction (i.e., going through the barrier), and consultation with student, parents, and/or colleagues should occur. A Level B included two of these essential components, whereas a Level C only mentioned one and a Level D did not include any of the components required for a high-quality approach.

Table 2.3 shows the distribution of responses for the open-ended question on strategies to use with a student who has late-emerging poor reading comprehension. 61% of respondents mentioned higher-order skills. However, only 5% indicated they would specifically assess for performance on higher-order skills and only 30% stated they would target higher-order skills in interventions. Contrastingly, 77% of respondents mentioned lower-order skills; 16% indicated they would assess for lower-order skills and 45% stated they would target lower-order skills in
interventions. Surprisingly, given the low confidence rates and self-disclosed lack of knowledge around LERD, only 33% indicated they would engage in consultation.

Although ~53% of respondents gave responses that included assessment, intervention, and consultation (Level 1 response) only 31% of individuals gave quality responses in the A or B level. For example, a top-rated response was “Figure out what components are causing them problems (is it decoding, inferences, etc.), work with LST to access resources, structure additional work/independent work opportunities for them to practice”. The reason being, this individual identified assessment of higher-level and lower-level skills and consultation with the LST. They also identified intervention opportunities though this was not specific, thus making it an A level response. Another well-rated response was “Identify where the weaknesses are and construct instruction in a way to support individual needs. Talk to LST for ways to best support needs (i.e., interventions or technology to support the child)” This individual indicated that they would consult with the LST and specified using interventions and accommodations to support the child. While they also identified assessment practices as something to do, they did not specify the skills they would assess thus making it a B level response. Comparatively, a low-rated response was “I would want to know if the difficulty was decoding related or vocabulary related. I would use a phonological awareness screener (ie. PAST) and a phonics screener that includes pseudowords and multisyllabic words to find out what the areas of weakness are. I would compare reading comprehension when the students reads independently to comprehension when a text is read to them to see if comprehension improves when decoding is removed from the equation.” While this response is comprehensive, the focus of assessment and intervention is on lower-level skills which is most appropriate for an early-emerging reading disability rather than a late-emerging reading disability. They also did not include consultation as part of their process. Another example of a low-rated response was “Assessment of phonemic awareness. I use a PAST [the Phonological Awareness Screening Test].” Once again, this individual did not prioritize assessment or intervention of higher-level skills. They also did not include consultation as part of their process.

Discussion

The goal of this study was to investigate teachers’ knowledge and perceptions of late-emerging reading disabilities. As hypothesized, most teachers surveyed (~71%) had no knowledge of late-emerging reading disabilities but most (~90%) endorsed, to varying degrees,
the belief that a student could begin to manifest difficulties with reading comprehension in grades 4 through 6. These results are in line with those of Chugh (2011) in which 87% of teachers had no knowledge of late-emerging reading disabilities and roughly 96% endorsed their existence. As expected, most teachers felt confident to an extent in identifying a student with early emerging reading disabilities (~87%), yet just over half of teachers felt some degree of confidence in identifying a student with Late Emerging Reading Disabilities (~55%). These results suggest that while teachers may have knowledge of early reading disabilities and confidence in their abilities to support students with this learning profile, very few teachers have knowledge of LERD and this is reflected by their perceived confidence, or lack thereof, in identifying such students in the classroom.

While most teachers were unfamiliar with LERD terminology, their endorsement of late emerging struggles may suggest they have witnessed a similar presentation in their classrooms. The question becomes: What are teachers identifying as the cause of the newly emerging reading challenges since the majority are unaware of Late-Emerging Reading Disabilities? Insight can be gleamed from incorrect descriptions of LERD. Two respondents described a compensatory reader rather than a LERD. A compensatory reader has an early emerging reading disability in which the student experiences challenges with decoding. However, these challenges only begin to significantly impact reading comprehension in the middle elementary grades because the student can no longer effectively use alternative strategies (Peck et al., 2018). The compensatory reader often has a very large vocabulary and relies heavily on sight words to read. They typically have average to strong intellectual skills and teach themselves an alternative strategy to decoding to read, often convincing themselves and others that they are decoding (Peck et al., 2018). This profile is markedly different from a LERD in which difficulties with reading comprehension are likely primarily due to higher-order processing, impact comprehension directly and do not emerge until the middle elementary grades.

Evidence from the respondents’ statements about causality from the case studies also supports the idea that many respondents may have equated late emerging poor reading comprehension with either the compensatory reader profile or to another “late identified” early emerging reading disability. Respondents generally perceived emerging challenges with reading comprehension to be more likely impacted by increased academic demands and by previous successful coping strategies becoming ineffective than to a late-emerging reading disability.
Since most teachers had minimal knowledge of LERD, they likely attributed late emerging comprehension difficulties to an unidentified early reading disability. Given the different impact of lower- and higher-level skills on reading difficulties in early versus late emerging profiles, it can be assumed that intervention approaches would also differ considerably based on teachers’ attributions of reading difficulty causes.

When teachers are required to make decisions in the absence of complete or accurate information, there is greater risk of bias (Soodak & Podell, 1993). The reason being, they are likely to use preconceptions to “fill in” missing information (Taylor & Crocker, 1981). This process relies a great deal on teachers’ intuition, their assumptions, and motivations to make decisions in education (Helsing, 2007). The disadvantage of using intuitive expertise is that it can lead to confirmation bias. Teachers may focus their attention on what they expect to see and may misinterpret or completely miss important information that questions their assumptions (Vanlommel et al., 2018).

Teachers’ ratings of each skill’s importance provide insight into their knowledge about LERD. Across the three contexts, teachers identified inferencing and vocabulary as top-rated skills and planning/organization as the bottom-rated skill. Other skills rated highly in all three contexts included identifying main ideas and working memory. Inhibitory control, grammatical knowledge, and nonverbal reasoning were frequently rated as less related to comprehension challenges in all scenarios. The identified top-rated skills align quite well with the research which indicates that difficulties with linguistic and cognitive abilities are associated with late emerging poor reading comprehension (e.g., Jared et al., 2011; Leach et al., 2003; Muter et al., 2004; Ouellette, 2006; Yovanoff et al., 2005; Lee & Chen, 2018; Yovanoff et al., 2005)
However, most low-rated skills (e.g., planning/organization, nonverbal reasoning, inhibitory control, and grammatical knowledge) are incorrectly identified as having less impact on late emerging poor reading comprehension relative to some higher ranked word-level skills. For example, given the information provided, respondents should have rated word reading skills (e.g., phonological awareness, decoding, and reading fluency) as lower than the bottom skills. This is consistent with the supposition above in which teachers may have overly focused on features more consistent with an early emerging reading difficulty.

Further, when looking across contexts, teachers appeared to have less clearly delineated ratings in the no-context condition relative to the language-based conditions. Specifically,
whereas both language-based conditions had clear groupings, there were no clear groupings emerging from the no-context condition. Teachers tended to rate the importance of skills as significantly lower when no context was provided relative to the other contexts. They also differentiated less between skills, indicating no strong opinions. This finding may indicate that teachers’ impressions are likely impacted by the context in which the student is learning and not solely based on a description of their primary difficulty. More specifically, teachers are less likely to hold strong positive or negative beliefs when there is limited contextual information on which to base their decision. When teachers are making decisions with incomplete or missing information and knowledge, they are more likely to rely on their intuition, assumptions, and motivations (Helsing, 2007; Taylor & Crocker, 1981). The added contextual information in the monolingual and dual-language scenarios could have allowed teachers to make “educated guesses” such that language-based skills were perceived as more related to difficulties for dual-language learners and cognitive abilities to monolingual learners. Contrastingly, the no context scenario might not have provided sufficient information for them to make assumptions.

The school language context was an important exploratory variable, since presumably language context would impact teachers’ perceptions of the relative importance of the different skills. Surprisingly, there were very few differences in responses for the English and Dual-Language contexts. The only observed differences were on grammatical knowledge which was rated higher in the Dual-Language context and working memory which was rated higher in the English context. This finding may indicate that teachers perceive difficulties with linguistic knowledge as having a greater impact on reading comprehension success for dual-language learners (though the impact is still rated as relatively low compared to the other skills) while a cognitive ability such as working memory may be more important for reading comprehension success in monolingual learners where the presumption is oral language is developing typically.

In order to select appropriate supports, teachers must have a good understanding of the underlying skills associated with LERD that may need an intervention and/or an accommodation. The effectiveness of the intervention is highly impacted by teachers’ self-efficacy as well as their attributions for the students’ successes and failures (Nichols et al., 2020). In the current study, roughly half of teachers felt confident, to some extent, in their ability to appropriately select interventions for students with LERD. Of note, only 8% felt strongly confident in their ability. Given their confidence levels, it is not surprising that there was substantial variability in
respondents’ assessment and intervention plans. Although many respondents identified having little to no knowledge of LERD, only a third highlighted the importance of consulting with others. Furthermore, despite the inclusion of assessment, intervention, and consultation practices in their responses, just over half of respondents did not identify higher-order skills as part of their strategy. There appears to be a disconnect between what teachers identify as likely causes to the reading comprehension difficulties and what they suggest as appropriate approaches to supporting these students. Many teachers focused on targeting lower-orders skills in their assessment practices (e.g., the use of a phonological awareness screener such as The Phonological Awareness Screening Test (PAST)) and intervention strategies (e.g., selecting texts that are easier to decode, personal phonics/decoding programs, fluency training). This finding is interesting given that as a group, they identified inferencing, vocabulary, and identifying main ideas as the skills most related to the difficulties being described, yet they are not proposing targeting these skills.

**Limitations and Future Directions**

The results of this study must be considered in light of its limitations. The main limitation of this study is its generalizability to other populations. The study was conducted predominantly with primary and junior teachers in Ontario, Canada. While it is the authors’ belief that findings are likely applicable to provinces in Canada given the similarities in the educational systems, different provinces may offer additional professional development opportunities. Additionally, given the overlapping findings between this study and those of Chugh (2011) conducted with teachers from the United States, findings from this study may also be applicable to US populations. It will be important to conduct similar studies in different Canadian provinces and in countries outside of Canada as well as with intermediate and secondary education teachers in order to have a sound understanding of teachers’ knowledge and perceptions of LERD.

Given the limited knowledge teachers are likely to have about learning disabilities, specifically LERD, it becomes important to recognize the limitations of the RTI approach. When teachers have limited knowledge about a particular learning disorder, it becomes increasingly challenging to identify where the difficulty emerges and then to appropriately select the skills on which to intervene. When teachers are unable to identify an area of need or select interventions that target the wrong skills, it may be assumed that the likelihood of seeing improvements is low. The results from this study support the need for greater teacher education
around LERD, more specifically greater access to resources and professional development on how best to identify and support students with late emerging poor reading comprehension. It should also be noted that research in this area remains scarce relative to other learning disorders. It will also be important for research to establish more evidence for best practices in identifying and supporting students with LERD and for this information to be shared with teachers in a timely manner. To our knowledge, this is the second study to ever look at teachers’ knowledge and awareness of LERD. Unfortunately, teachers in Ontario appear to lack the necessary knowledge to identify and support students with LERD.
References


https://doi.org/10.1080/09297040802220029

https://doi.org/10.1007/s11145-009-9180-z


https://doi.org/10.1080/00220671.1993.9941836


https://doi.org/10.1037/0022-0663.86.1.24


Table 2.1

Means, Standard Deviations, and Ranks of Skills within Each Context

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<thead>
<tr>
<th></th>
<th>English</th>
<th>Dual-Language</th>
<th>No Context</th>
<th>Mean Across Context</th>
<th>Rank Across Context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Rank</td>
<td>Mean</td>
<td>SD</td>
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<td>Inferencing</td>
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<td>.91</td>
<td>1</td>
<td>3.85</td>
<td>.91</td>
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<td>.81</td>
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<td>4.02</td>
<td>.80</td>
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<td>Identifying Main Ideas</td>
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<td>.84</td>
<td>2</td>
<td>3.81</td>
<td>.83</td>
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<tr>
<td>Working Memory</td>
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<td>.89</td>
<td>3</td>
<td>3.61</td>
<td>.93</td>
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<td>3.74</td>
<td>.74</td>
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<td>5</td>
<td>3.76</td>
<td>.97</td>
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<td>.89</td>
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<td>.92</td>
</tr>
<tr>
<td>Cognitive Flexibility</td>
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<td>.91</td>
</tr>
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<td>1.2</td>
<td>9</td>
<td>3.56</td>
<td>1.09</td>
</tr>
<tr>
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<td>13</td>
<td>3.52</td>
<td>.96</td>
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<tr>
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<td>1.0</td>
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<td>3.24</td>
<td>1.01</td>
</tr>
<tr>
<td>Planning/Organization</td>
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<td>1.0</td>
<td>14</td>
<td>3.22</td>
<td>1.04</td>
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<td>Total Mean</td>
<td>3.64</td>
<td>3.61</td>
<td>3.42</td>
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Table 2.2
Perceived Impact of Five External Variables on Emerging Challenges with Reading Comprehension in Grade 4

<table>
<thead>
<tr>
<th>Variable</th>
<th>English Context (Mean=3.23)</th>
<th>Dual-Language Context (Mean=3.24)</th>
<th>No Context (Mean=3.28)</th>
<th>Mean Across Context</th>
<th>Rank Across Context</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Mean</td>
<td>SE</td>
<td>Rank</td>
<td>Mean</td>
<td>SE</td>
</tr>
<tr>
<td>Previous coping strategies no longer effective</td>
<td>3.91</td>
<td>.10</td>
<td>1</td>
<td>3.76</td>
<td>.11</td>
</tr>
<tr>
<td>Increase in academic demands</td>
<td>3.59</td>
<td>.11</td>
<td>2</td>
<td>3.82</td>
<td>.12</td>
</tr>
<tr>
<td>Late onset of Reading Disability</td>
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<td>.12</td>
<td>3</td>
<td>3.32</td>
<td>.14</td>
</tr>
<tr>
<td>Lack of appropriate instruction</td>
<td>3.11</td>
<td>.11</td>
<td>4/5</td>
<td>3.09</td>
<td>.12</td>
</tr>
<tr>
<td>Lack of motivation</td>
<td>3.11</td>
<td>.14</td>
<td>4/5</td>
<td>3.02</td>
<td>.14</td>
</tr>
<tr>
<td>Lack of parental support</td>
<td>2.44</td>
<td>.11</td>
<td>6</td>
<td>2.43</td>
<td>.11</td>
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Table 2.3  
Percentage of Qualitative Responses Aligned with Evidence-Based Practices for Identifying and Supporting Students with LERD

<table>
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<tr>
<th>Identification</th>
<th>Assessment</th>
<th>Teaching Strategies</th>
<th>Consultation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower</td>
<td>Lower</td>
<td>GTI*</td>
<td>Yes</td>
</tr>
<tr>
<td>22 (38.6)</td>
<td>9 (15.8)</td>
<td>15 (26.3)</td>
<td>19 (33.3)</td>
</tr>
<tr>
<td>Higher</td>
<td>Higher</td>
<td>GOI**</td>
<td>No</td>
</tr>
<tr>
<td>5 (8.8)</td>
<td>0</td>
<td>8 (14.0)</td>
<td>38 (66.7)</td>
</tr>
<tr>
<td>Both</td>
<td>Both</td>
<td>Both</td>
<td></td>
</tr>
<tr>
<td>22 (38.6)</td>
<td>3 (5.3)</td>
<td>18 (31.6)</td>
<td></td>
</tr>
<tr>
<td>Higher</td>
<td>Higher</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>27 (47.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comprehensiveness of Approach</th>
<th>Quality of Evidence-based Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Level A 1 (1.75)</td>
</tr>
<tr>
<td>30 (52.6)</td>
<td>Level B 17 (29.8)</td>
</tr>
<tr>
<td>Level 2</td>
<td>Level C 26 (45.6)</td>
</tr>
<tr>
<td>20 (35.1)</td>
<td>Level D 13 (22.8)</td>
</tr>
<tr>
<td>Level 3</td>
<td></td>
</tr>
<tr>
<td>7 (12.3)</td>
<td></td>
</tr>
</tbody>
</table>

*Going Through the Barrier Interventions  ** Going Over the Barrier Interventions  ***Not Specified

Note: Levels A and 1 represent higher rated response
Appendix A: Study 1: Teacher Questionnaire

SECTION I: This section focuses on demographic information.

1. What is your age? __

2. What is your gender?
   I consider myself male
   I consider myself female
   I consider myself gender variant/non-conforming

3. Approximately how many years have you taught in these grades or positions? (Include long-term substitute positions of 6 months or more; 6 months= 0.5).

   Preschool ________  Grade 6 ________
   Grade 1 ________  Grade 7 ________
   Grade 2 ________  Grade 8 ________
   Grade 3 ________  Special Ed. ________
   Grade 4 ________  Other ________
   Grade 5 ________

4. What teaching qualifications do you have? (Mark all that apply)
   Primary (Kindergarten-Grade 3)  Teaching English Language Learners
   Junior (Grades 4-6)  Teaching students who are blind/low vision
   Intermediate (Grades 7-10)  Teaching students with
   Senior (Grades 11-12)  Communication Needs
   Second Language Education (FLS)  Reading Specialist
   Special Education
Early Childhood Education  Other:

5. What is your current teaching position? Mark all that apply.
   General Education  Administration
   Reading Specialist  Other
   Special Education

6. What grade(s) are you teaching this academic year (2020-2021)? _____________

7. What is your highest level of education completed? Select the one that applies
   Bachelors (B.Ed)  PhD
   Bachelors with some graduate credits  EdD
   Masters (M.A., M. Sc., M. Ed)  Other
   Masters with some graduate credits

8. In which type of educational settings have you worked? Please select all that apply.
   English
   French First Language
   French Immersion

9. In what region do you currently work?
   Northeastern Ontario (Algoma – County – Ottawa – Peterborough
   District – Cochrane – Manitoulin  County – Prescott & Russell – Prince
   – Nipissing District – Parry Sound  Edward County – Renfrew –
   District – Sudbury – Timiskaming  Stormont, Dundas & Glengarry

   Eastern Ontario (Frontenac County
   – Haliburton County –
   Hastings- Kawartha Lakes – Lanark
   – Leeds & Grenville – Lennox &
   Addington – Northumberland  Central Ontario (Durham – Halton
   Region – Muskoka District – Peel
Region – Simcoe County – Toronto – York)
Northwestern Ontario (Kenora – Rainy River – Thunder Bay)
Southwestern Ontario (Brant County – Bruce County – Chatham– Kent – Dufferin County – Elgin

SECTION II: Case Studies

(Please read the case study below and answer questions 1, 2, and 3)

Student A is a 10-year-old student in Grade 4. Lately student A’s teacher has noticed that Student A’s performance in reading comprehension is declining. She has spoken about this concern with Student A’s parents and they are equally concerned. According to Student A’s parents there have been no changes in the home environment. Their parents also reported that they were doing well in grade 3 and were meeting grade level expectations. Student A’s teacher has noticed that Student A is losing interest in academics and is also struggling to comprehend material in their textbooks and refuses to read aloud. This year, Student A has received mostly Bs and Cs in oral language and writing and mostly Ds in Reading with particular difficulties in "reading for meaning" expectations.

1. What additional information do you want to know about Student A and how would you obtain that information?

2. Imagine a world where you cannot access additional information. To what extent do you believe difficulties with the following skills are likely causes of the reading difficulty?

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Unlikely</th>
<th>Somewhat Likely</th>
<th>Likely</th>
<th>Very Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phonemic awareness</td>
<td>Reading fluency</td>
<td>Decoding</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-------------------</td>
<td>----------------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>Background Knowledge</td>
<td>Grammatical Knowledge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identifying main ideas</td>
<td>Inferencing (i.e., the ability to go beyond the literal meaning of texts as well as to integrate information between sentences, text, and prior knowledge to fill in the gaps about what is not explicitly stated)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verbal Reasoning (i.e., the ability to use language to solve and analyze problems)</td>
<td>Nonverbal Reasoning (i.e., the ability to use visual information rather than linguistic information to solve and analyze problems)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Working memory (i.e., the ability to store,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Inhibitory Control (i.e., the ability to control automatic responding and to discard irrelevant information)

Cognitive Flexibility (i.e., the ability to manage multiple tasks or to switch between two or more mental sets of information)

Planning/Organization

Other:

3. To what extent do you believe the following factors are impacting Student A’s performance?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Not at all</th>
<th>Unlikely</th>
<th>Somewhat Likely</th>
<th>Likely</th>
<th>Very Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in academic demands</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Lack of parental support</td>
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<tr>
<td>Previous coping strategies no longer successful</td>
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<tr>
<td>Lack of appropriate instruction</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of motivation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Late onset of reading disability

(Please read the case study below and answer questions 1, 2, and 3)

Student B is a 10-year-old student in Grade 4 in a French immersion program. They have been enrolled in French immersion since kindergarten. Lately student B’s teacher has noticed that Student B’s performance in reading comprehension is declining in French and that Student B’s performance in reading comprehension in English is below those of their peers. Of note, Student B has only begun taking English classes this year. The teacher has spoken about this concern with Student B’s parents and they are equally concerned. According to Student B’s parents there have been no changes in the home environment. Their parents also reported that Student B was doing well in grade 3 and was meeting grade level expectations. Student B’s teacher has noticed that Student B is losing interest in academics and is also struggling to comprehend material in their textbooks and refuses to read aloud. This year, Student B has received mostly Bs and Cs in oral language and writing and mostly Ds in reading with particular difficulties in "reading for meaning" expectations.

1. What additional information do you want to know about Student B and how would you obtain that information?

2. Imagine a world where you cannot access additional information, to what extent do you believe difficulties with the following skills are likely causes of the reading difficulty?

<table>
<thead>
<tr>
<th>Skill</th>
<th>Not at all</th>
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<th>Somewhat Likely</th>
<th>Likely</th>
<th>Very Likely</th>
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<tr>
<td>Phonemic awareness</td>
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<td>Reading fluency</td>
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<td>Vocabulary</td>
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<td>Background Knowledge</td>
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<td>--</td>
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<tr>
<td>Grammatical Knowledge</td>
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<tr>
<td>Identifying main ideas</td>
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<td>Inferencing (i.e., the ability to go beyond the literal meaning of texts as well as to integrate information between sentences, text, and prior knowledge to fill in the gaps about what is not explicitly stated)</td>
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<td>Verbal Reasoning (i.e., the ability to use language to solve and analyze problems)</td>
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<td></td>
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<tr>
<td>Nonverbal Reasoning (i.e., the ability to use visual information rather than linguistic information to solve and analyze problems)</td>
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<td>Working memory (i.e., the ability to store, manipulate, and process actively held information)</td>
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<tr>
<td>Inhibitory Control (i.e., the ability to control automatic responding and to discard irrelevant information)</td>
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<td></td>
</tr>
</tbody>
</table>
Cognitive Flexibility (i.e., the ability to manage multiple tasks or to switch between two or more mental sets of information)

Planning/Organization

Other:

3. To what extent do you believe the following factors are impacting Student B’s performance?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Not at all</th>
<th>Unlikely</th>
<th>Somewhat Likely</th>
<th>Likely</th>
<th>Very Likely</th>
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<tr>
<td>Increase in academic demands</td>
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<tr>
<td>Lack of parental support</td>
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<td>Previous coping strategies no longer successful</td>
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<td>Lack of appropriate instruction</td>
<td></td>
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<tr>
<td>Lack of motivation</td>
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<tr>
<td>Late onset of reading disability</td>
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</table>

If a child has difficulties in reading, what is the likelihood that these difficulties will FIRST be identified in the primary grades 1 through 3? (Select one)

- Always
- Rarely
- Often
- Never
- Sometimes
- I am unsure
If a child has difficulties in reading, what is the likelihood that these difficulties will FIRST be identified in grades 4 through 6? (Select one)

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>Always</td>
<td>Rarely</td>
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<tr>
<td>Often</td>
<td>Never</td>
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<tr>
<td>Sometimes</td>
<td>I am unsure</td>
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</tbody>
</table>
Consider a child whose reading development has been similar to peers through third grade. This child begins demonstrating significant and unexpected reading comprehension difficulties in grade 4. To what extent do you believe difficulties with the following skills are likely causes of the child’s reading difficulty? Mark one response for each category.

<table>
<thead>
<tr>
<th>Skill</th>
<th>Not at all</th>
<th>Unlikely</th>
<th>Somewhat Likely</th>
<th>Likely</th>
<th>Very Likely</th>
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</thead>
<tbody>
<tr>
<td>Phonemic awareness</td>
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<tr>
<td>Reading fluency</td>
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<tr>
<td>Decoding</td>
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<tr>
<td>Vocabulary</td>
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<tr>
<td>Background Knowledge</td>
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<tr>
<td>Grammatical Knowledge</td>
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<tr>
<td>Identifying main ideas</td>
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<tr>
<td>Inferencing (i.e., the ability to go beyond the literal meaning of texts as well as to integrate information between sentences, text, and prior knowledge to fill in the gaps about what is not explicitly stated)</td>
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<tr>
<td>Verbal Reasoning (i.e., the ability to use language to solve and analyze problems)</td>
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<tr>
<td>Nonverbal Reasoning (i.e., the ability to use visual information rather than</td>
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</tbody>
</table>
linguistic information to solve and analyze problems

Working memory (i.e., the ability to store, manipulate, and process actively held information)

Inhibitory Control (i.e., the ability to control automatic responding and to discard irrelevant information)

Cognitive Flexibility (i.e., the ability to manage multiple tasks or to switch between two or more mental sets of information)

Planning Organization

Other:

Consider a child whose reading development has been similar to peers through third grade. This child begins demonstrating significant and unexpected reading difficulties in grade 4. To what extent do you believe the following factors are associated with the child’s reading difficulty? Mark one response for each category

<table>
<thead>
<tr>
<th>Factor</th>
<th>Not at all</th>
<th>Very little</th>
<th>Somewhat</th>
<th>To a great extent</th>
<th>I am unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in academic demands</td>
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<tr>
<td>Lack of parental support</td>
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</table>
What strategies would you try if one of your students whose reading development has been similar to peers through third grade begins to demonstrate significant and unexpected reading comprehension difficulties in grade 4?

Have you ever heard about, read about, or learned about a Late Emerging Reading Disability (i.e., students do not exhibit difficulties in reading prior to Grade 4)? (Yes, No) If so, please describe the source of this information
Please rate the following responses.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Disagree somewhat</th>
<th>Agree somewhat</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am confident in my ability to identify a student who may have a <strong>late</strong> emerging reading disability (emerging difficulties in grades 4-6)</td>
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<tr>
<td>I am confident in my ability to identify a student who may have an <strong>early</strong> emerging reading disability (emerging difficulties in grades 1-3)</td>
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<tr>
<td>I am confident in my ability to appropriately select classroom interventions for students with <strong>late</strong> emerging reading difficulties</td>
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<tr>
<td>I have experience working with students with Late Emerging Reading Disabilities</td>
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</table>
A child who demonstrates reading abilities similar to peers in the primary grades can experience reading difficulty in the intermediate grades (4 through 6)
Chapter Three: Using A Brief Web-based Training to Improve Pre-service Teachers’ Knowledge of Late Emerging Reading Disabilities

Learning Disabilities (LDs) have both become the most diagnosed set of childhood disorders and have received significant attention in the literature (American Psychiatric Association, 2013). Specific Learning Disorders include impairment in reading, written expression, and/or mathematics (American Psychiatric Association, 2013). A child with a diagnosed reading disability (RD) may struggle with word reading accuracy, reading rate or fluency, and/or reading comprehension. While many individuals with an RD have symptoms that are readily apparent in the early school years, others may not manifest symptoms until after the third grade. Yet, teachers are often less familiar with reading disabilities that emerge later in elementary school and as a result are less prepared to support these students (Chugh, 2011). The goal of the current study was to determine the effectiveness of a brief, web-based training for teacher candidates to increase their knowledge of Late-Emerging Reading Disabilities and to improve their skills in both assessing and appropriately selecting strategies to teach these students.

Given current focus on early intervention, much of the research on reading disabilities has prioritized identifying early emerging reading disabilities such as dyslexia (e.g., Hoskyn & Swanson, 2019; Vaughn et al., 2007). Consequently, many children who struggle with word-level processing skills are typically identified by the second or third grade (Leach et al., 2003). However, between the third and fourth grade (ages 9 to 10 years), there is a pedagogical shift wherein the focus shifts from decoding instruction to learning through printed text (i.e., “reading to learn”; Chall, 1983; Etmanskie et al., 2014). Consequently, students encounter lengthier and more complex texts that require greater use of higher-level skills such as planning and organizing, inferencing, the use of contextual cues, and reasoning. These greater demands engage cognitive abilities that, prior to the fourth grade, were underutilized or unknowingly weak (e.g., Etmanskie et al., 2014; Leach et al., 2003; Snow, Burn, & Griffin, 1998). For these children, previous successes on measures of reading achievement are met with newly appearing struggles in the fourth grade (de Bree et al., 2021). Late-emerging reading disabilities (LERD) are among disorders that have most frequently gone unnoticed or are minimally discussed in educational settings (Chugh, 2011; Catts et al., 2012). This is problematic given estimates that indicate roughly 41 to 46% of students with reading disabilities have a late-emerging reading
disability (Badian, 1999; Leach et al., 2003; Shaywitz et al., 1992). As such, a significant proportion of children with RDs are characterized by emerging challenges in reading comprehension in Grades 4-6.

Given the substantial uncertainty with respect to the development, presentation, and interventions for LERD in the literature, it is not surprising to find teachers do not have substantial knowledge of LERD (Chugh, 2011; Chapter 2). Since teachers have a role in identifying concerns, referring students for assessment, and supporting students with learning challenges, the gap in teachers’ knowledge of LERD is worrisome. If teachers are unaware of LERD, they are unlikely to properly identify a student’s learning needs and subsequently unlikely to select appropriate interventions. As such, greater education on LERD is necessary for educators and pre-service teachers. In the following sections, we describe what is currently known about LERD, the roles that teachers play in supporting students with LERD and methods for increasing knowledge in these educators through professional development.

**Late-Emerging Reading Disabilities**

Late emerging poor readers present with average to good reading skills in the early elementary grades but fall behind their peers in the fourth and fifth grades (Catts et al., 2012; Garcia, 2015). However, LERD can have heterogeneous presentations with three distinct profiles: specific reading comprehension difficulties, specific word-reading difficulties, and mixed reading difficulties (Catts et al., 2012; Leach, et al., 2003; Ritchey et al., 2015; Speece et al., 2010). Children with specific reading comprehension difficulties tend to demonstrate at least average fluency and accuracy in reading and spelling words and pseudowords (i.e., made-up words), phonemic awareness and phonological awareness. However, they exhibit difficulties with top-down processing evidenced by poor reading comprehension and poor listening comprehension (Badian, 1999; Cain et al., 2004; Catts et al., 2012; Leach et al., 2003). Those individuals with specific reading comprehension difficulties tend to have a history of difficulties with nonverbal cognition, oral language proficiency, vocabulary, organizational skills, reasoning abilities, and semantics and morphology (Cain et al., 2004; Catts et al., 2012; Leach et al., 2003). Such difficulties with these foundational abilities may negatively impact text comprehension.

In contrast, children with specific word reading difficulties might struggle with bottom-up processing in word and pseudoword reading as well as spelling, phonological awareness, and naming speed, as well as verbal short-term memory tasks but have unimpaired listening
comprehension, vocabulary, and nonverbal reasoning (Adams, 1990; Leach et al., 2003; Stanovich & Siegel, 1994). For these children, reading fluency decreases and the effort needed to make connections in the text increases. Consequently, there are fewer cognitive resources allocated to higher level processes such as reading comprehension and thus these children have poor reading comprehension. (e.g., Perfetti, 1985; Leach et al., 2003). Leach et al. noted that children with both challenges in comprehension and word-level processing struggle equally with bottom-up processing skills as well as vocabulary, listening comprehension, and nonverbal reasoning, but also tend to lack background knowledge and have difficulties with inferencing.

The ability to distinguish an Early Emerging Reading Disability (EERD) from a LERD can be challenging. EERDs are at times “missed” and can be misidentified as a LERD or vice versa. That said, these two conditions are distinct. Children with LERD have “persistent literacy difficulties that truly develop at a later age” (de Bree et al., 2021) while those with a Late identified early emerging reading disability are characterized by “persistent literacy difficulties that are present much earlier than the actual age of diagnosis” but for whom difficulties were not identified for a variety of reasons (de Bree et al., 2021). It has been argued that LERD are not in fact distinct from EERDs; however, evidence has been able to refute this argument (Catts et al., 2012; Compton et al., 2008; Kieffer, 2010; Leach et al., 2003). For example, in their study, Leach and colleagues (2003) reported that while good readers and early identified poor readers have scores that are consistent across grades three, four, and five, students with LERD exhibit a noticeable drop in their performance after the third grade from at least average grades prior to the third grade. Given these distinctions, it becomes important for teachers to recognize how approaches for supporting a student with LERD may be different than those with EERD.

**Identifying and Supporting students with LERD**

Teachers play a critical role in the identification of students with learning challenges as well as the implementation of interventions to support these students. For example, teachers’ responsibilities include initiating and directing referrals for special education services, performing educational assessments, and implementing interventions (Charles, 2014; Chugh, 2011; Egyed & Short, 2006; Gottlieb et al., 1991; Ontario, 2011; Stiffman et al., 2010). While having teachers at the forefront can help quickly identify struggling students and implement interventions sooner, the decision to request special education support or to initiate interventions
is subjective and relies heavily on teachers’ knowledge of exceptionalities and of appropriate interventions.

With respect to reading disabilities, the challenge for middle elementary teachers is to be able to differentiate those who have emerging difficulties with comprehending written texts (LERD) from those who have previously been able to mask their challenges (LIRD). A lack of understanding of the reading disability profiles can lead to misconstruction of students’ needs and subsequently misguided intervention efforts (Hulme, 2014). To appropriately identify and select interventions for students with reading challenges in later elementary school, teachers must be able to differentiate LERD from late identified EERD. This process will require adequate knowledge of both LERD and EERD as well as perceived confidence in being able to identify and support students with each condition.

Few studies to date have examined teachers’ knowledge of LERD. However, findings from Chugh (2011) and Chapter 2 estimate between 12 and 30% of in-service teachers have little to no knowledge of LERD. Furthermore, Chapter 2 noted 45% of the teachers in their sample had limited confidence in their abilities to identify students with LERD and appropriately select interventions for these students. In both studies, teachers struggled with correctly identifying the causes of the emerging difficulty as well as selecting appropriate interventions. Additionally, most teachers in the Chugh study (2011) believed difficulties with reading comprehension first identified in grades 4 and up were likely due to contextual factors such as increasing reading demands and diminished contextual support of intermediate elementary texts. They attributed difficulties with skills such as background knowledge, reading between the lines, and vocabulary knowledge. In their study, Chapter 2 also found that most teachers attributed difficulties to contextual factors such as increased reading demands and to previous coping strategies no longer being successful.

More troubling, these studies reported that teachers did not select teaching approaches that would best target the needs of students with LERD. In Chugh (2011), teachers tended to recommend increased reading time and exposure to different genres of texts as strategies to help these students. In Chapter 2, although teachers attributed difficulties to both higher-order skills (e.g., inferencing, identifying main ideas, background knowledge) and lower-order skills (e.g., decoding, reading fluency), they tended to recommend approaches to target lower order skills. These recommendations included accommodations for word-level difficulties (e.g., reducing the
complexity of the text) and interventions that targeted building reading fluency by using web-programs that target phonemic awareness and decoding (e.g., Lexia). Taken together, the findings from these studies highlight teachers’ lack of knowledge and their uncertainty in how best to support students with LERD.

**LERD Focused Training**

For effective teaching, educators must feel confident in their abilities to organize and implement strategies to help students achieve their desired learning goals (Bandura, 1977; Monteiro, 2021). Coined as teacher self-efficacy (Bandura, 1977), this perceived sense of capabilities appears to be more malleable during teacher education programs (Gordon & Debus, 2002; Woolfolk Hoy & Burke Sperio, 2005), specifically early on in their learning (Bandura, 1977). High self-efficacy beliefs are linked both to an increased willingness to implement new methods when responding to students with diverse needs and to the effectiveness of interventions (e.g., Berman et al., 1977; Nichols et al., 2020). While pre-service teachers often have knowledge about specific subject areas, they can lack adequate knowledge, skills, and attitudes necessary to teach diverse student populations (Mills, 2011; Sharma & Nuttal, 2016; Sogunro, 2001). Rising concerns have been noted over pre-service teachers’ preparedness for the classroom, especially with respect to supporting students with diverse learning needs (e.g., Stavroulia & Lanitis, 2017) and the need for greater opportunities for practice and feedback in such things as teaching students with varying learning needs and challenges (Kaufman & Ireland, 2016). As such, it appears pre-service teachers may be ideal candidates for training on LERD.

There are several important considerations when developing a training program for educators. First, training should emphasize integrating a range of skills and knowledge that can be flexibility recombined in a variety of contexts (Gabriel, 2018). Knowledge acquisition should thus include both *conceptual knowledge* (i.e., having sufficient knowledge of content to be able to understand it in useful ways) and *practical knowledge* (i.e., having sufficient knowledge to propose solutions that are specific). Secondly, the training format should be considered carefully. There are several components to consider when developing a professional development opportunity. These include the length of the program, the labour needed to conduct the training (i.e., self-paced vs multiple facilitators), and the location of the training (i.e., in person or virtually).
As digital technologies have advanced, the use of more interactive web-based education programs for pre-service teachers has grown (Jonassen et al., 2003). These web-based programs can range from interactive, self-paced webinars (e.g., Monteiro, 2021) to virtual simulations (Arvola et al., 2018) and the use of virtual reality (e.g., Ragnemalm & Samuelsson, 2016). To our knowledge, there has been no research done on the effectiveness of professional development on improving pre-service or in-service teachers’ knowledge of LERD or their ability to identify and support these students. However, evidence from attention deficit hyperactivity disorder (ADHD) training research indicates moderate knowledge acquisition for both brief, web-based, self-paced training (e.g., Monterio, 2021) and for more time intensive, labour intensive, in-person trainings for pre-service and current teachers (e.g., Aguiar et al., 2014; Syed & Hyssein, 2009). For example, in their study, Monterio (2021) provided pre-service teachers with a 2-hour single-session training delivered via webinar and assessed the efficacy of the training in increasing knowledge and self-efficacy of pre-service teachers working with students with ADHD. The training included a pre-training survey, three pre-recorded lectures between 20 and 30 minutes in length, and a post-training survey that participants were able to access on their own and at their pace. Three topics were covered as part of the training: diagnostic criteria, assessments, and evidence-based interventions. Results supported the efficacy of the training on increasing pre-service teachers’ knowledge and self-efficacy in working with students with ADHD.

In addition to providing high-quality, feasible training to pre-service teachers, the success of knowledge acquisition through web-based training is reliant on student motivation for learning (Kaya, 2002). That said, findings by Cakir and Horzum (2014) demonstrated that future teachers in Turkey were motivated to engage in web-based professional development. To this end, the present study aimed to evaluate the impact of a brief, web-based training program focused on increasing pre-service teachers’ knowledge and skills pertaining to identifying and supporting students with LERD. Evidence of an effective web-based training program would entail increased confidence in their capabilities in both identifying and selecting appropriate interventions for students with LERD as well as applying these newly acquired skills.

**The Current Study**

This study investigated the effectiveness of a brief, web-based workshop on pre-service teachers’ knowledge of students with reading comprehension difficulties in the
middle/intermediate grades. Specifically, the study examined teachers’ abilities to appropriately identify and support students with comprehension-LERD following a self-paced workshop which included three 10-minute videos, quizzes, and pre- and post-questionnaires. In its entirety, the session took approximately 60 minutes to complete. Pre-service teachers completed three modules on the following topics: 1) What is a LERD 2) Assessment practices, and 3) Intervention and Accommodation practices.

The present study used both Likert scales and open-ended questions to address the following research questions: Does a brief, web-based workshop increase pre-service teachers’ knowledge of LERD? Will pre-service teachers report confidence gains in their abilities to identify and select interventions for students with LERD following the workshop? Will pre-service teachers be able to differentiate between poor comprehension resulting from a LERD or a Late identified EERD? Will pre-service teachers be able to provide evidence-based approaches to supporting students with LERD? Finally, will pre-service teachers select appropriate approaches for students with LERD and students with an early emerging RD? If there are positive outcomes for each question, then this would be seen as evidence that the workshop was effective.

Method

Participants

Participants were pre-service teachers from the University of Western Ontario in Canada in their first year of the Bachelor of Education program. The total number of participants who consented was 145 pre-service teachers. After removing individuals with substantial missing data (i.e., completed no more than 1 quiz and/or responded to less than 50% of questions on the questionnaires) and those respondents who completed the questionnaires in less time than would be realistically possible given the length of the workshop videos, 109 pre-service teachers remained (Male: n=22, Female: n=86, Gender non-conforming 1). Pre-service teachers ranged in age from 22 years old to 50 years old (mean = 25.66, SD = 5.47).

Study Materials

The workshop was created using a secure OWL website. OWL is an online learning management website frequently used by universities. All workshop materials including module videos, module quizzes, and pre and post-workshop questionnaires may be accessed in a repository located at: https://osf.io/gn4s6/?view_only=b15ad48990784f4e8bf4e65f3b08b158
Pre-workshop Questionnaire. (see Appendix B) Demographic information included items on age, gender, educational achievement, and teaching experience. In addition, Five-point Likert scales were used to capture pre-service teachers’ perceptions and knowledge of LERD prior to the workshop. Pre-service teachers rated five statements from *Strongly Disagree to Strongly Agree*. The questions assessed a) their perceived confidence in assessing and teaching students with an Early RD and a Late RD, b) their beliefs about whether a student can begin to have trouble reading in the middle elementary grades and c) their knowledge of LERD. Finally, respondents were asked to define a Late-emerging reading disability.

Post-workshop Questionnaire. (see Appendix D) A Five-point Likert scale was developed to evaluate pre-service teachers’ knowledge of LERD after the workshop. It comprised of three parts, the first of which was identical to that in the pre-workshop questionnaire. Pre-service teachers were asked to rate the same five statements from the pre-workshop questionnaire from *Strongly Disagree to Strongly Agree*. Part 2 of the post-workshop questionnaire asked participants to rate the effectiveness and enjoyment of the workshop. They were also invited to identify any challenges or barriers to implementing the presented assessment and intervention strategies and to provide comments or suggestions for future workshops. The analysis of Part 2 is not included in this study.

The third part of the questionnaire examined participants’ ability to implement material from the workshop by responding to two scenarios. The first scenario described student B who was experiencing challenges with reading comprehension that resembled an early emerging reading disability. The second scenario described student A who was experiencing challenges with reading comprehension that resembled a late-emerging reading disability. The key distinction between the scenarios was the time at which difficulties emerged. Whereas student A only began to struggle in the fourth grade, student B was achieving below grade-level in grades 1 to 3. Additionally, whereas student A struggled with reading for meaning, Student B also struggled with reading fluency and unfamiliar word reading. However, both scenarios included the following identical elements: no change in environmental factors and parents are concerned. After reading each scenario, using a Five-point Likert Scale from *Not at all Related to Very Likely Related*, teachers rated the likelihood that the student’s reading difficulty was caused by the following 14 component skills: phonological awareness, reading fluency, decoding, vocabulary, background knowledge, grammatical knowledge, identifying main ideas,
inferencing, verbal reasoning, nonverbal reasoning, working memory, inhibitory control, cognitive flexibility, and planning/organization. The question read as follows: “To what extent do you believe difficulties with the following skills are likely causes of the reading difficulty?” The second question asked: “To what extent do you believe the following factors are impacting Student A’s performance.” Factors included: increases in academic demands, lack of parental support, previous coping strategies no longer successful, lack of appropriate instruction, lack of motivation, late onset reading disability, missed early reading disability. Finally, they were asked an open-ended question: “Given what you know of Student (A or B), what strategies or practices would you try in order to help them?”

Workshop Materials

Modules. Power point presentations for all three Modules were pre-recorded using MAC iOS recording software. Each module consisted of approximately 10 minutes of content presented in a voice-over PowerPoint presentation. Module 1 introduced participants to Late Emerging Reading Disabilities and the three sub-types. It also provided an overview on how LERD differ from other reading disabilities, more specifically emphasizing the differences between LERD and late identified EERDs. Module 2 included content on best practices to assess for comprehension-specific Late Emerging Reading Disabilities. This included the importance of differentiate difficulties with lower vs. higher-order skills, of consulting with peers, parents, the student, and the Ontario Student Record, and using different modalities to assess comprehension (i.e., reading and listening). Finally, Module 3 included details pertaining to best practices for selecting and utilizing interventions for comprehension-specific Late Emerging Reading Disabilities. For example, differentiating going over the barrier (i.e., providing accommodations) from going through the barrier (i.e., teaching skills) strategies. Each module was followed by a quiz composed of three multiple-choice questions (see Appendix B). The quizzes were designed to assess engagement throughout the training series and identify participants who may not have actively engaged in the training series (i.e., those who completed one or none of the quizzes).

Procedure

First year pre-service teachers from the University of Western Ontario in Canada were recruited via the Faculty of Education’s Teacher Education Conference Week. Once on the OWL site, teacher candidates completed the pre-workshop questionnaire which included demographic information and assessed prior knowledge of LERD and EERDs (~ 10 mins). Then, teacher
candidates watched three video modules (~10 mins each). Following each module, they completed a brief quiz to assess their knowledge of the content. Finally, teachers completed the post-workshop questionnaire (i.e., workshop evaluation, knowledge and confidence of EERD and LERD) and two case studies in the following order: LERD and EERD. All pre-service teachers who completed the workshop received professional development credits required by their program regardless of whether their data was used for the purpose of the study.

Results

Prior Knowledge of LERD

Pre-service teachers defined a Late-emerging reading disability as part of the pre-workshop questionnaire. Definitions of LERD were scored as correct if they indicated that the challenges with reading are *newly emerging, appearing or beginning* in the middle elementary grades. Responses coded as incorrect are coded as such because they mis-define LERD as being *newly discovered* challenges, having *missed* the difficulties or hinting at *compensatory strategies* no longer being effective. Forty-three percent (n=47) of respondents correctly defined a LERD while 56% mis-defined LERD. One respondent did not answer.

Confidence

Pre-service teachers reported their confidence in identifying and appropriately selecting interventions for Early- and Late-emerging reading disabilities on a 5-point Likert scale (from Strongly Disagree (1) to Strongly Agree (5). First, a within-subject repeated measures ANOVA was conducted to investigate whether confidence in identifying a RD varied based on the type of reading disability and the time at which confidence was assessed (pre vs. post workshop). There were significant main effects of time $F(1, 108) = 237.65, p <.001, \eta^2_p =.688$ and of type of LD, $F(1, 108) = 12.072, p < .001, \eta^2_p =.101$. There was also a significant interaction of time by type of LD, $F(1, 108)= 15.95, p<.001, \eta^2_p =.129$. See Figure 3.1 for the time by type of LD interaction. Pairwise comparisons demonstrate a significant difference in perceived confidence in identifying an individual with Early RD ($M = 2.12, SD=1.11$) than one with a Late RD ($M =1.73, SD=1.10$) prior to the workshop ($p <.001$) with students feeling more confident in their ability to identify a student with an early RD. However, after the workshop, students had no significant differences in their abilities to identify a student with early ($M= 3.14, \text{SD} =.76$) or late emerging RDs ($\text{mean} = 3.15, \text{SD} = .76$), $p >.05$. This interaction also revealed that for both early and late RDs, students’ perceived confidence is significantly greater post-workshop, but the
magnitude of this difference is greatest for those with late RDs. While 27% of respondents gave a response at or above “somewhat agree” about their confidence in identifying a student with a late emerging reading disability prior to the workshop; this percentage increased to 88% post workshop. Gains were also observed for early emerging reading disabilities with 43% of respondents having given a response at or above “somewhat agree” about their confidence in identifying a student with an early emerging reading disability prior to the workshop and 85% post workshop.

Secondly, a within-subject repeated measures ANOVA was conducted to identify whether confidence in selecting appropriate interventions varied based on the type of reading disability and the time at which confidence was assessed (see Figure 3.2). There were significant main effects of time $F(1, 106) = 174.08, p = .001, \eta^2_p = .622$ and of type of LD, $F(1, 106) = 12.07, p < .001, \eta^2_p = .102$. There was also a significant interaction of time by type of LD, $F(1, 106) = 6.81, p < .001, \eta^2_p = .262$. Pairwise comparisons demonstrate significantly greater confidence in appropriately selecting interventions for an individual with Early RD (mean = 2.20, SD = 1.14) than one with LERD (mean = 1.78, SD = 1.06) prior to the workshop ($p < .001$). However, after the workshop, there were no significant differences in students’ confidence to appropriately select interventions for an early (mean = 3.18, SD = .88) vs. a late RD (mean = 3.24, SD = .83). Results also demonstrate that for both early and late RDs, students’ perceived confidence was significantly greater post-workshop ($p < .001$). While 28% of respondents gave a response at or above “somewhat agree” about their confidence to appropriately select interventions for a student with a late emerging reading disability prior to the workshop; this percentage increased to 87% post workshop. There was also a significant gain for early emerging reading disabilities, but the magnitude was not as large as for the LERD with 45% of respondents gave a response at or above “somewhat agree” prior to the workshop and this percentage was 79% post workshop.

**Reading Disability Identification Accuracy**

Pre-service teachers read two case scenarios in which one detailed a student with LERD and the other a late identified EERD. Pre-service teachers rated whether the case study described an EERD or a LERD using a 6-point Likert scale (from Strongly Disagree (1) to Strongly Agree (6)). Participants who selected Agree/Strongly Agree or Disagree/Strongly Disagree were coded
as having strong opinions. Those who provided Somewhat Agree or Somewhat Disagree responses were coded as having ambiguous opinions. Pre-service teachers who correctly identified the RD (by providing Agree/Strongly Agree responses) and correctly negated the alternative RD (Disagree/Strongly Disagree) were coded as having correctly distinguished the two profiles. 32% of respondents correctly identified the EERD while 76% correctly identified the LERD. Furthermore, 29% correctly identified both the EERD and the LERD.

**Perception of Component Skills’ Impact on Reading Difficulty**

Pre-service teachers rated fourteen variables on whether they were likely causes of the reading difficulty described in each scenario on a 5-point scale from Not at All Related (1) to Very Likely Related (5). Table 3.1 presents the means and standard deviations of ratings of skill relatedness as a function of skill (14 components) and type of RD (late versus early). Rankings from most (1) to least (14) related to reading comprehension difficulty are also provided.

A within-subject repeated measures ANOVA was conducted to investigate the perceived relatedness of the fourteen skills with skill and type of LD as independent variables and relatedness rating as the dependent variable. Greenhouse-Geisser corrections were used to correct for Sphericity. There were significant main effects of type of LD, $F(1, 86) = 9.037, p = .003, \eta^2_p = .095$ and of skill, $F(13, 1118) = 17.31, p < .001, \eta^2_p = .573$. There was also a significant interaction of skill by type of LD, $F(13, 1118) = 32.44, p < .001, \eta^2_p = .566$. All follow-up comparisons were corrected using the Bonferroni adjustment for multiple comparisons.

To examine the perceived overall importance of each skill in the Late emerging RD scenario, a follow-up analysis revealed a significant main effect, $F(13, 1274) = 33.22, p < .001$, wherein three variable groupings emerged. The bottom grouping included phonological awareness, reading fluency, decoding, vocabulary, and grammatical knowledge which were identified as the least important variables; these variables’ ratings did not differ significantly from each other ($p > .05$) but differed significantly from all other skills ($p < .001$). The top grouping included inferencing, identifying main ideas, nonverbal reasoning and cognitive flexibility which did not differ significantly from each other ($p > .05$) and were rated as most important. A middle grouping consisted of background knowledge, verbal reasoning, working memory, inhibition, and planning/organization and did not differ significantly from one another ($p > .05$). Notably, apart from inferencing, the other skills in the top grouping had nonsignificant
relationships with some of the skills in the middle grouping which may highlight some uncertainty as to the perceived importance of the skills rated as top and middle. In contrast, to examine the perceived overall importance of each skill in the Early emerging RD scenario, a follow-up analysis of the skill main effect was undertaken and was significant, $F(13, 1209)=10.122, p < .001$. Reading fluency was the top rated skill and was significantly different from other skills. A middle grouping comprised of inferencing, identifying main ideas, and grammatical knowledge. There were no other distinctions between the remaining skills.

The significant interaction between skill and learning disability was also analyzed by examining the main effects for each skill across learning disability in order to see if learning disability impacted the perceived importance of each skill. Participants rated the importance of phonological awareness ($p < .001$), reading fluency ($p < .001$), decoding ($p < .001$), vocabulary knowledge ($p < .001$), and grammatical knowledge ($p = .032$) as significantly more related to the challenges described in the Early emerging RD scenario. Participants rated the importance of nonverbal reasoning ($p < .001$), working memory ($p < .001$), inhibition ($p < .01$), and cognitive flexibility ($p < .01$) as significantly more related to the challenges described in the Late emerging RD scenario. The context had no impact on the perceived importance of background knowledge, identifying main ideas, inferencing, verbal reasoning, and planning/organization ($p > .05$).

**Perception of Factors Causing the Reading Difficulty**

Pre-service teachers rated seven factors on whether they were likely causes of the reading difficulty described in the scenarios on a 5-point scale from Not at All Related (1) to Very Likely Related (5). Table 3.2 presents the means and standard deviations of ratings of relatedness as a function of causal factor (7 components) and type of LD (late versus early RD). Rankings from most (1) to least (7) related to reading comprehension difficulty for each LD are also provided.

A within-subject repeated measures ANOVA was conducted with causal factor and type of LD as independent variables and relatedness rating as the dependent variable. Greenhouse-Geisser corrections were used to correct for Sphericity. There were significant main effects of type of LD, $F(1, 104) = 8.91, p = .004, \eta^2_p = .079$ and of causal factor, $F(6, 624) = 59.76, p < .001, \eta^2_p = .365$. There was also a significant interaction of causal factor by type of LD, $F(6, 624) = 61.19, p < .001, \eta^2_p = .370$. All follow-up comparisons were corrected using the Bonferonni adjustment for multiple comparisons.
Based on the follow-up comparisons for the Late emerging RD scenario, the component skills created 4 groupings. In the first grouping, Late emerging reading disability was rated as most related to the difficulty and differed significantly from all other factors ($p < .001$). In the second grouping, Previous coping strategies no longer useful and Increase in academic demands did not significantly differ from one another ($p > .05$). The third grouping consisted of Lack of motivation and Lack of appropriate instruction which did not differ significantly from each other ($p > .05$). In the fourth grouping, Missed early emerging reading disability and Lack of parental support were scored as least likely to cause the difficulty and differed significantly from all other variables ($p < .001$). Results indicate that pre-service teachers in this sample perceived emerging challenges with reading comprehension to be most likely impacted by Late onset of reading disability and least likely to be related to a missed early emerging reading disability or lack of parental support.

Based on the follow-up comparisons for the Early emerging RD scenario, the component skills created 3 groupings. In the first grouping, Early emerging reading disability was rated as most related to the difficulty. In the second grouping, Lack of Appropriate Instruction, Increase in Academic Demands, Late Emerging Reading Disability, Lack of Motivation or Previous Coping Strategies no Longer Useful did not differ significantly from one another ($p > .05$). The third grouping consisted of Lack of parental support which scored as least likely to cause the difficulty and differed significantly from all other variables ($p < .001$). Results indicate that pre-service teachers in this sample have perceived emerging challenges with reading comprehension to be most likely impacted by Early onset of reading disability and least likely to be related to lack of parental support. However, the additional factors were perceived to be as equally likely to contribute to the emerging challenges.

**Teachers’ Strategies for Supporting Students with Poor Reading Comprehension**

Pre-service teachers answered the following question about each scenario: “*Given what you know of Student (A or B), what strategies or practices would you try in order to help them?*” Responses were scored by two researchers for accuracy on whether the responses aligned with best practices for the respective learning disability. A response that emphasized interventions for lower-order skills in scenario A (missed early RD) were coded as correct while a response emphasizing higher-order skills in scenario B (LERD) were coded as correct. Answers that were extremely generic (e.g., small group instruction) or focused on the wrong skills were scored as
incorrect. Cohen’s Kappa coefficient (k) was used to measure inter-rater reliability and was determined to be .67, indicating substantial agreement. Agreement was subsequently reached by both raters on discrepant scoring. Table 3.3 shows the distribution of responses. Most participants could identify strategies specific for a student with Late-Emerging poor reading comprehension (68%). Many of the answers provided included targeting higher level processing, providing background knowledge, or previewing the text to activate background knowledge, modelling reading comprehension strategies (e.g., making inferences, predicting, summarizing, visualizing), working on organization and/or providing accommodations to assist with barriers such as graphic organizers, parsing out the texts etc. Conversely, 40% of participants were able to provide responses that explicitly target lower-order skills for the student described in the Early RD scenario. These strategies included but were not limited to, working on phonological awareness, decoding, reading fluency, modifying the difficulty of the text, providing the text orally, and/or using text-to-speech technology.

Participant responses were coded for successfully differentiating the two learning profiles by correctly selecting appropriate strategies for each of the students. Table 3 indicates the percentage of participants who were able to distinguish between the two learning profiles. That is, they provided different responses across scenarios and correctly identified strategies that emphasized lower-level skills in scenario A (EERD) and higher-order skills in scenario B (LERD). For example, one student noted in scenario A “I would have them practicing decoding and easier-reading texts more frequently so that they are able to practice” while they responded to scenario B with “I would connect him with the school’s learning support teacher and have them help him with find meaning in his reading”. Another participant noted for scenario A “use short but regular sessions to carry out interventions regarding phonological processing, especially for multisyllabic words and morphology while monitoring if reading comprehension improves” while they share for scenario B “model and teach explicitly about comprehension strategies such as think-aloud, text features, identifying main ideas and supporting details. Scaffold use of graphic organizers to help connect ideas in the text”. Finally, a third participant shared that for scenario A they would “work on comprehension, fluency, and decoding strategies the student can use themselves to help read independently, providing alternative modes of information delivery” while for scenario B they noted “practicing comprehension strategies with
the student for them to use while reading independently, providing alternative methods of information delivery, removing barriers associated with comprehension issues”.

Of note, 36% (n=38) of participants effectively described strategies for the Late RD scenario but not for the Early RD scenario while 7% (n=8) effectively described strategies for the Early RD scenario but not the Late RD scenario. An analysis of responses suggests that many participants listed strategies provided in the workshop for both scenarios. Thus suggesting, they were unable to critically apply the knowledge to the case studies. Finally, 24% (n=26) of participants did not provide answers that were congruent with best practices for either of the two scenarios, demonstrating little knowledge acquisition of specific intervention approaches for reading disabilities. For example, one participant provided only one example of a general approach to accommodating reading disabilities by writing “breaking down the text” for both scenarios. Another participant provided a thorough and thoughtful answer to both scenarios but lacked specificity with respect to targeted interventions for either reading disability. For the Early RD scenario, they wrote “I would do anything I could to help the student. I would ask to meet with the student and parents to work out some strategies that the student thinks will help them. I would use anchor charts, fill in the blank questions. Further, I would see if technology helps the students. I would also try to work one-on one with the student whenever possible”. For the Late RD scenario, they wrote “I would support them in any way possible. I would reach out to the resource teacher and see if they were able to work one on one with the student. I would provide anchor charts, fill in the blank questions, ask questions throughout the process, use technology, chunk instructions, use graphic organizers etc.”

Discussion

The goal of this study was to investigate the effectiveness of a brief web-based training program on increasing pre-service teachers’ knowledge of Late Emerging Reading Disabilities. To this end, teachers’ conceptual and practical knowledge of LERD as well as their reported confidence was assessed using a pre- and post- workshop questionnaire. Information obtained after the workshop indicated that 85% of participants found the training to be helpful, 91% learned something new, 69% enjoyed the training, 88% indicated that they would use the information they learned in practice, and 78% would recommend the workshop to others. Findings from the questionnaires suggest a substantial proportion of participants gained
conceptual knowledge (and confidence) from the training. Conversely, the training may not have been as effective in increasing teachers’ ability to apply the information to real-world scenarios.

Prior to the training, only 30% of students reported feeling confident in their ability to identify and select appropriate interventions for a student with a LERD and 43% of participants correctly defined LERD. These results suggest that while some pre-service teachers may have had previous knowledge of LERD, most lacked the confidence to identify and support these students in a classroom. This finding aligns with existing research which reports that pre-service teachers may lack the necessary knowledge, skills, and attitudes to be able to properly support students with learning challenges in the classroom (Mills, 2011; Sharma & Nuttal, 2016; Sogunro, 2001).

Since a key component of effective practice in teaching students with learning disabilities is high self-efficacy, a primary goal of the training was to increase pre-service teachers’ sense of self-efficacy, or confidence in their abilities to identify and support a student with LERD. Results demonstrated that the brief, web-based training was effective in significantly increasing pre-service teachers’ confidence in both their abilities to identify and support a student with LERD with nearly 80% of participants indicating they agreed or strongly agreed with the statement indicating confidence in these abilities following the training. Similarly, participants made significant gains in their confidence of their knowledge of EERD. Notably, despite significant differences prior to the workshop, there was no difference in reported confidence between reading disabilities post-workshop. These gains are in-line with a similar study of a web-based training for ADHD which also demonstrated an increase in pre-service teachers’ sense of self-efficacy after a brief training (Monterio, 2021).

While self-efficacy beliefs are a necessary component for supporting students with reading disabilities, self-efficacy, in and of itself is not sufficient in helping increase students’ abilities. To properly teach a student with a learning disability, teachers must have adequate knowledge of the learning disability and be able to apply this knowledge in the classroom. In this study, gains in conceptual knowledge (i.e., being able to define and describe components of a LERD as well as know how it is different from EERD) and practical knowledge (i.e., being able to propose solutions that are specific to addressing the unique needs of students with LERD) were deemed to be equally important and investigated independently.
With respect to conceptual knowledge acquisition, there were two primary objectives. The first objective was to increase teachers’ understanding of how language and cognitive variables are related to late and early emerging poor reading comprehension. Results indicated that candidates ranked higher-order skills as being more likely causes of the reading challenges in the Late RD scenario whereas there was greater uncertainty as to the likely causes of the reading challenges in the Early RD scenario. This difference may reflect the greater emphasis on LERD in the web-based training series. The second objective was to increase their awareness of likely causes of LERD. Results demonstrate that within the LERD scenario, most participants successfully identified the reading disability. Subsequently, they highlighted the primary impact of increased academic demands on reading ability in the fourth grade on the emergence of the difficulties. However, they equally noted the impact of previous coping strategies no longer being useful which is more closely aligned with a missed early emerging reading disability. Thus, while many made substantial gains in conceptual knowledge, results suggest that additional gains could be made.

With respect to practical knowledge acquisition, the primary objective of the study was for pre-service teachers to develop the capacity to critically apply their conceptual knowledge to two case scenarios. A comparison of responses from the two scenarios demonstrated that approximately one third of participants could successfully identify both the EERD and the LERD and apply the information garnered to practical situations. They were able to provide individualized and targeted approaches to support both students in the case scenarios with reading comprehension interventions that accounted for the differences in their profiles. Unfortunately, the other two thirds of pre-service teachers were unable to successfully identify both reading disabilities and to communicate specific, targeted strategies for both reading challenges described. Rather, a large proportion of participants provided responses that were congruent with interventions for LERD to both scenarios and seven percent provided responses congruent with interventions for EERDs to both scenarios. Thus, many participants remembered the strategies identified in the workshop; however, they simply were unable to critically apply this information. Moreso, just under a third of pre-service teachers either provided examples of general strategies for reading (e.g., one-to-one support, material of interest to the student) or selected strategies that were incongruent with the skills impacted by the reading profile and as such were unsuccessful in providing appropriate strategies for either of the scenarios. Thus, this
evidence, in sharp contrast to conceptual knowledge acquisition, does not support substantial gains in practical knowledge for most participants.

Taken together, the results of this study suggest that the workshop was effective in increasing pre-service teachers’ confidence in their ability to identify and support students with LERD and their conceptual knowledge of LERD. However, the workshop had limited impact on many pre-service teachers’ practical knowledge of LERD. The gap between conceptual and practical knowledge has been described in research as the theory-practice gap (e.g., Allen, 2009; Blomberg et al., 2013; Siebert, 2005). It is common for pre-service teachers to struggle with applying scientific theories and knowledge to a classroom setting. Moreso, training designs that help facilitate this translation are often challenging to implement (Blomberg et al., 2013). As such, pre-service teachers’ knowledge often remains inert (Gruber et al., 2000). Importantly, for one third of our sample, this workshop was effective in increasing both theoretical and practical knowledge of LERD.

Concerns with respect to pre-service teachers’ preparedness for the classroom highlight a need for greater opportunities for practice and feedback (Kaufman & Ireland, 2016). In the current study, pre-service teachers were provided theoretical knowledge about LERD and were provided an opportunity for feedback to learn the content through module quizzes. However, despite the use of case studies to help foster problem-solving and practical skills, participants did not receive additional opportunities for practice and feedback about the case scenarios. In their study, Debrelli (2016) followed the changes of pre-service teachers’ theoretical and practical knowledge during the course of practicum. What they found was that, initially, many pre-service teachers had strong theoretical knowledge rather than practical knowledge. However, as they were continuously confronted with difficulties that emerged in practical settings, they were able to develop their practical knowledge. Given this information, it is likely that pre-service teachers were unable to sufficiently develop their practical knowledge because of the lack of opportunity for feedback and ongoing practice. Future studies should incorporate additional opportunities for feedback to help foster the development of practical knowledge.

Furthermore, a likely contributor to the limited gains in practical knowledge observed during the training may be attributable to the imbalance in information provided. This training provided substantial information with respect to LERD, but only minimal information emphasized EERD. As previously noted, many participants gained abilities in both identifying
skills related to LERD and describing strategies to support individuals with LERD. Where they struggled most was when they needed to differentiate the two disabilities and modify the approach to supporting the unique needs of each reading disability. Perhaps an oversight was the assumption that these teacher candidates would have previously established a sufficiently strong understanding of EERD to be able to differentiate effectively. For some, responses suggest that participants were simply providing answers that aligned with the information that was provided in the training without acknowledging the differences in the case scenarios.

The main limitation of this study is its generalizability to teacher populations. The study was conducted with pre-service teachers in London, Ontario Canada. While it is the authors’ belief that findings are likely applicable to other pre-service programs in Canada given the similarities in the Bachelor of Education Course requirements for professional education programs, different programs may offer additional professional development opportunities. Secondly, given that pre-service teachers have limited practical experience, it is unknown whether results are applicable to in-service teachers. Teachers likely have additional student experiences and training that could help increase their pre-existing knowledge of LERD. Conversely, teachers who have experience with reading disabilities are more likely to have cognitive frameworks for RDs and their respective interventions. Thus, when given new information they must revise what they already know (or thought they knew) to accommodate a new idea. They may be more likely to overemphasize information that supports the current theory and discount information that would contrast the existing theory (Longfield, 2009). As such, teachers’ responses to the workshop may vary from those of pre-service teachers.

Another limitation of this study is the removal of participants due to incomplete data. Given that the workshop was virtual and self-paced, participants were not monitored during the completion of the workshop. As such multiple people were removed from analyses due to incomplete data or questionable engagement (i.e., completed the workshop is less time than is possible). In this study, students registered for the workshop as part of mandatory training for their program, however they were not evaluated for their contributions. In future studies, to maximize completion of the workshop in its entirety, the selection of participants should be considered at length and attrition should be minimized by engaging individuals who want to learn more about LERD. The reason being that the success of professional training is impacted
by the motivation of the learner. Conversely, should individuals require training in this area when motivation is low, a different training format would likely to be more efficacious.

**Conclusion**

Pre-service teachers were provided with the opportunity to learn about Late-Emerging Reading Disabilities using a brief, self-paced, web-based training series. Students gained confidence in their abilities to both identify LERD and propose appropriate interventions. In addition, most participants were able to correctly identify the skills that are most likely to be impacted by LERD and to select specific strategies to assess and provide intervention for these skills. While the emphasis of the training series was on LERD, many pre-service teachers were also able to correctly identify the skills most likely to be impacting reading comprehension difficulties associated with Early Emerging Reading Disabilities, and one third were able to identify specific strategies to support students with this learning profile. Despite positive gains in theoretical knowledge of LERD, the training series does not appear to have been sufficient in fostering the practical abilities necessary to differentiate LERD from EERD for most participants. Opportunities for both learning and practical experiences will be necessary for pre-service teachers to develop their ability to differentiate and create diagnostic formulations for a student who exhibits poor reading comprehension in grades 4 through 6. Particularly, additional training will be necessary to increase the accuracy with which they can attribute the difficulty to a Late-Emerging Reading Disability or a “missed” Early-Emerging Reading Disability and to subsequently select strategies to support the unique needs of the student. With appropriate support and opportunity for continued professional learning, teachers and future educators will be better equipped to support students with various learning needs.
References


https://doi.org/10.1037/0022-0663.96.4.671

https://doi.org/10.1016/j.sbspro.2014.04.094

https://doi.org/10.1097/00011363-199112010-00003

https://doi.org/10.1037/a0025323


https://doi.org/10.1016/j.lindif.2008.04.003


https://doi-org.proxy1.lib.uwo.ca/10.1002/dys.1712


Monteiro, E. M. (2021). *Using a Brief Web-Based, on Demand Training to Improve Pre-Service Teacher Knowledge of Attention Impairment Hyperactivity Disorder (ADHD)*. University of California, Riverside ProQuest Dissertations Publishing.


https://doi.org/10.1207/S15327892MCP0303_5


https://doi.org/10.1037/0022-0663.86.1.24


http://dx.doi.org/10.1016/j.tate.2005.01.007
Table 3.1: Means, Standard Deviations, and Ranks of Component Skills within Each Scenario Context

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<td>SD</td>
<td>Rank</td>
<td>Mean</td>
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Table 3.2: Means, Standard Deviations, and Ranks of Causal Factors within Each Scenario Context

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<td></td>
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<td>Mean</td>
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<td>1.44</td>
<td>2</td>
<td>3.24</td>
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<td>Increase in academic demands</td>
<td>3.36</td>
<td>1.44</td>
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<td>3.03</td>
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<td>Scenario B (LERD)</td>
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<td>Inaccurate</td>
<td>Total</td>
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<td>------------------</td>
<td>------------------</td>
<td>----------</td>
<td>------------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>Accurate</td>
<td>35 (33%)</td>
<td>8 (7 %)</td>
<td>43 (40%)</td>
</tr>
<tr>
<td></td>
<td>Inaccurate</td>
<td>38 (36%)</td>
<td>26 (24%)</td>
<td>64 (60%)</td>
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<td>Total</td>
<td></td>
<td>73 (69%)</td>
<td>34 (31%)</td>
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Table 3.3: Respondent Intervention Selection Accuracy on the Case Scenarios as a Function of Learning Disability Type
Figure 3.1
Mean confidence ratings in identifying reading disabilities as a function of reading disability type and time
Figure 3.2

Mean confidence ratings in selecting appropriate interventions as a function of reading disability type and time.
Appendix B: Study 2: Pre-workshop Questionnaire

Pre-Workshop Questionnaire

Part 1

What is your age?

What is your gender?

☐ A. I consider myself male
☐ B. I consider myself female
☐ C. I consider myself gender variant/non-conforming

Approximately how many years have you taught in Grades 7-8? (Include long-term substitute positions of 6 months or more; 6 months= 0.5)

Approximately how many years have you taught in Grade 4-6? (Include long-term substitute positions of 6 months or more; 6 months= 0.5)

Approximately how many years have you taught in Grades 1-3? (Include long-term substitute positions of 6 months or more; 6 months= 0.5)

Approximately how many years have you taught in Kindergarten? (Include long-term substitute positions of 6 months or more; 6 months= 0.5)

Approximately how many years have you taught in Special Education? (Include long-term substitute positions of 6 months or more; 6 months= 0.5)

What is your current teaching position? Mark all that apply.
What is your current teaching position? Mark all that apply.

- A. General Education
- B. Pre-service Teacher
- C. Reading Specialist
- D. Special Education
- E. Administration

Please rate the following responses.

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Disagree somewhat</th>
<th>Agree somewhat</th>
<th>Agree</th>
<th>Strongly agree</th>
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</thead>
<tbody>
<tr>
<td>I am confident in my ability to identify a student who may have</td>
<td>⃝</td>
<td>⃝</td>
<td>⃝</td>
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<td>grades 4-6)</td>
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<tr>
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<tr>
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<td>grades 1-3)</td>
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<td>interventions for students with LATE emerging reading</td>
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<tr>
<td>difficulties</td>
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<tr>
<td>interventions for students with EARLY emerging reading</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>difficulties</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I have experience working with students with late emerging</td>
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<td>⃝</td>
<td>⃝</td>
<td></td>
<td>⃝</td>
<td>⃝</td>
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<tr>
<td>reading disabilities</td>
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<tr>
<td>A child who demonstrates reading abilities similar to peers in</td>
<td>⃝</td>
<td>⃝</td>
<td>⃝</td>
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<td>⃝</td>
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<tr>
<td>the primary grades can experience reading difficulty in the</td>
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</tr>
<tr>
<td>intermediate grades (4 through 6)</td>
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</tbody>
</table>

Feedback:

What is a Late-emerging reading disability?
Appendix C: Study 2 Module Quizzes

Module 1 Quiz

Part 1

Students with late-emerging reading disabilities can have difficulties with:
- A. Word-level processing only
- B. Comprehension only
- C. Word-level processing & Comprehension
- D. All three profiles are possible

Although 3 profiles of late Emerging Reading Disabilities exist, the most prevent difficulties are observed in:
- A. Phonemic awareness
- B. Comprehension
- C. Reading Fluency
- D. Decoding

In what ways are students with late-emerging reading disabilities different from those with other reading disabilities?
- A. Students struggle with expressing ideas in a meaningful sequence
- B. Students may avoid reading about
- C. Students comprehend better when the text is read to them aloud rather than when they must read for themselves
- D. Students struggle mostly with top-down processing

Module 2 Quiz

Part 1

What skill is least likely to be associated with late-emerging poor reading comprehension?
- A. Inference
- B. Decoding
- C. Nonverbal Reasoning
- D. Memory/organization

Which of the following statements is FALSE about a compensatory reader?
- A. They struggle with reading comprehension in grades 4 through 6.
- B. The late Compensatory reader is synonymous to Late Emerging Poor Comprehenders.
- C. Their difficulties with RC are due to lower level processes.
- D. All of the above are true

All of the below statements are TRUE of the assessment process EXCEPT:
- A. It is important to consult with colleagues, parents, and the student.
- B. It is important to distinguish difficulties due to lower level processing from those resulting from higher-level processing.
- C. It is more important to assess reading comprehension than listening comprehension.
- D. The Ontario Student Record (OSR) should be consulted

Module 3 Quiz

Part 1

Which of the following strategies is an example of going over the barrier:
- A. Providing access to Speech to Text technology
- B. Providing background knowledge
- C. Queruing throughout the text.
- D. Previewing the text

Which of the following is NOT a stage in the Self-Regulated Strategy Development approach to Reading Comprehension:
- A. Discourse
- B. Model
- C. Memorize
- D. Evaluate

Which of the statements regarding the use of technology to support students with Late Emerging Reading Disabilities is FALSE:
- A. Technology should be used sparingly and in combination with interventions
- B. Computer programs can help parse texts into phrase size units
- C. Technology is sufficient in helping students with Late Emerging Reading Disabilities overcome their difficulties.
- D. Graphic organizers can be used to teach reading comprehension strategies
Appendix D: Study 2 Post-Workshop Questionnaire

Post-Workshop Questionnaire

Part 1: Post-Workshop Questionnaire

Please rate the following responses.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Disagree Somewhat</th>
<th>Agree Somewhat</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am confident in my ability to identify a student who may have a LATE emerging reading disability (emerging difficulties in grades 4-6)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I am confident in my ability to identify a student who may have an EARLY emerging reading disability (emerging difficulties in grades 1-3)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I am confident in my ability to appropriately select classroom interventions for students with LATE emerging reading difficulties</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I am confident in my ability to appropriately select classroom interventions for students with EARLY emerging reading difficulties</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I have experience working with students with late emerging reading disabilities</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>A child who demonstrates reading abilities similar to peers in the primary grades can experience reading difficulty in the intermediate grades (4 through 6)</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
</tbody>
</table>

Part 2: Scenario B

Student B is a 10-year-old student in Grade 4. Student B’s teacher has noticed that Student B’s performance in reading comprehension is below grade-level expectations. She has spoken about this concern with Student B’s parents, and they are equally concerned. According to Student B’s parents there have been no changes in the home environment. Their report cards show that they received mostly Cs and Ds in Reading in grades 1-3. Student B’s teacher has noticed that Student B is losing interest in academics and is also struggling to comprehend material in their textbooks and refuses to read aloud. This year, Student B has received mostly Cs in oral language and writing and mostly Ds in Reading with particular difficulties in “reading for meaning” expectations, fluency, and reading unfamiliar words.

To what extent do you believe difficulties with the following skills are likely causes of the reading difficulty?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Unlikely</th>
<th>Somewhat likely</th>
<th>Likely</th>
<th>Very likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonemic Awareness</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Reading Fluency</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Decoding</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Background Knowledge</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Grammatical Knowledge</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Identifying Main Ideas</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Inferencing</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Verbal Reasoning</td>
<td>☐</td>
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<tr>
<td>Nonverbal Reasoning</td>
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<td>Working Memory</td>
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<td>Inhibitory Control</td>
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<td>☐</td>
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<td>Cognitive Flexibility</td>
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<tr>
<td>Planning/Organization</td>
<td>☐</td>
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</table>
To what extent do you believe the following factors could be impacting Student B's performance?

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<th>Not at all</th>
<th>Unlikely</th>
<th>Somewhat likely</th>
<th>Likely</th>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Lack of parental support</td>
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<tr>
<td>Previous coping strategies no longer successful</td>
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<tr>
<td>Lack of appropriate instruction</td>
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<tr>
<td>Lack of motivation</td>
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</tr>
<tr>
<td>Late onset of reading disability</td>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Missed early reading disability</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Given what you know of Student B, what strategies or practices would you try in order to help them?

Part 3: Scenario A

This is a new scenario for you to read.

Student A is a 10-year-old student in Grade 4. Student A's teacher has noticed that Student A's performance in reading comprehension is below grade-expectations. She has spoken about this concern with Student A's parents, and they are equally concerned. According to Student A's parents there have been no changes in the home environment. Their report cards show that they were doing well in grade 3 and were meeting grade level expectations. Student A's teacher has noticed that Student A is losing interest in academics and is also struggling to comprehend material in their textbooks and refuses to read aloud. This year, Student A has received mostly Bs and Cs in oral language and writing and mostly Ds in Reading with particular difficulties in "reading for meaning" expectations.

To what extent do you believe difficulties with the following skills are likely causes of the reading difficulty?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Unlikely</th>
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<th>Very Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonemic awareness</td>
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<td>Reading Fluency</td>
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<td>Background Knowledge</td>
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<td>Planning/Organization</td>
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<td>✓</td>
<td>✓</td>
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</table>

To what extent do you believe the following factors could be impacting Student A's performance?

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<th>Somewhat likely</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Increase in academic demands</td>
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<td>Lack of parental support</td>
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<td>Previous coping strategies no longer successful</td>
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<tr>
<td>Lack of motivation</td>
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</tr>
<tr>
<td>Late onset of reading disability</td>
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<tr>
<td>Missed early reading disability</td>
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Chapter Four: Final Considerations

The purpose of this dissertation was to understand teachers’ knowledge of the less known Late Emerging Reading Disability and to create a brief workshop to help increase pre-service teachers’ knowledge of LERD. Results of this dissertation indicate that current educators have minimal knowledge of Late Emerging Reading Disabilities, have difficulty differentiating late from early emerging reading disabilities, and have little confidence in their abilities to assess and address these issues in the classroom (Chapter Two). Knowing this, the latter study focused on implementing a brief, web-based, self-based workshop to increase knowledge, abilities, and confidence amongst future educators (Chapter Three). While previous professional development studies showed support for using a brief, web-based training model for pre-service teachers, no studies had used this approach to encourage conceptual and practical knowledge acquisition of LERD amongst educators. The following discussion will incorporate findings from both studies, provide overall conclusions, discuss limitations, propose future directions, and introduce implications for practices in education.

Overall Findings

The initial goal of the dissertation was to determine how much (or how little) Ontario teachers know of Late Emerging Reading Disabilities. Chapter two revealed three important findings. The first result was that most teachers had never heard or learned about Late Emerging Reading Disabilities. The second take-home message was that a majority of teachers lacked the confidence to sufficiently assess and subsequently provide intervention to students with this unique learning profile despite their role in doing so as part of a RTI model implemented by the Ontario ministry of education. Finally, for a portion of teachers surveyed, there was confusion around the distinction between Late Emerging Reading Disabilities and their early emerging counterpart. Many teachers identified a need for additional professional development about reading disabilities and more specifically about LERD.

The knowledge obtained from the teachers in Chapter two informed the methodology of the study in Chapter three. A workshop for future educators was developed to help address the gaps in knowledge of LERD and limited confidence in assessment and intervention practices. Three components associated with a response-to-intervention model frequently implemented in Ontario school systems were embedded in the workshop. Information included: (1) defining and
conceptualizing LERD as distinct from EERD, (2) evidence-informed assessment practices, and (3) evidence-informed intervention strategies. The goal was to determine if a brief, web-based, self-paced workshop would result in gains in both conceptual and practical knowledge amongst pre-service teachers. After the workshop, participants had significantly more conceptual knowledge of LERD including how it is distinct from EERD, what skills to assess to inform intervention, and what general intervention strategies could be used in supporting a struggling reader. The results also support gains in perceived confidence in assessing and addressing LERD (as well as EERD) in the classroom. Unfortunately, the workshop was less successful in increasing practical knowledge of intervention strategies amongst future educators as only one third of participants were able to critically apply the information to case scenarios.

In both studies, questions about participants’ pre-existing knowledge of LERD and confidence in assessing and providing intervention to these students was assessed. Notably, current educators were less accurate in their definition of LERD but more confident in their abilities to assess and intervene than pre-service teachers. Twenty-nine percent of current teachers provided an accurate definition of LERD compared to forty-three percent of pre-service teachers. However, 55% of teachers felt confidence in assessment and intervention of students with LERD whereas only 27.5% of pre-service teachers felt confident prior to the workshop. This discrepancy could suggest that in-service teachers are more likely to overestimate their abilities to support and identify students with LERD. Unfortunately, unwarranted confidence could have significant implications for implementing the RTI model. Specifically, if teachers are overestimating their knowledge of LERD, there is a greater likelihood of selecting inappropriate assessment tools and interventions. Comparatively, pre-service teachers lack the necessary confidence to select appropriate assessment tools and interventions. Based on the findings of this dissertation, both pre-service and in-service teachers would benefit from additional professional development to help augment their knowledge of LERD, increase appropriate selection of assessment and intervention approaches, and foster a greater sense of confidence.

Case scenarios were used in both studies to help assess knowledge of LERD amongst educators and future educators. Whereas teachers in the first study were asked to respond to three case scenarios describing a student with LERD in varying language-based contexts (i.e., English, French Immersion, No context), pre-service teachers were required to respond to two case scenarios intended to delineate students with varying learning profiles (i.e., EERD vs. LERD)
within a single-language context. In the original study, a primary objective of the case scenarios was to understand whether language context would impact teachers’ perceptions of late emerging poor reading comprehension. However, there were minimal differences in teachers’ responses across the monolingual and dual-language scenarios. Rather, an intriguing finding from Study 1 was the unexpected difficulty with which teachers understood LERD as distinct from EERD. Therefore, in designing the workshop for pre-service teachers, a primary objective of the case scenarios was to understand how well pre-service teachers were able to delineate LERD from EERD rather than to assess whether the language context impacted their perception of late emerging poor reading comprehension. Positively, the change in scenarios allowed for researchers to identify, specifically, the differences in pre-service teachers’ perceptions of LERD and EERD. This information is helpful in thinking about future training opportunities and implications for the RTI model highlighted by the Ontario Ministry of Education.

Taken together, the two studies demonstrate that both current and future teachers require greater opportunity to learn about Late Emerging Reading Disabilities and how it is distinct from early emerging reading disabilities if they are to appropriately assess and provide intervention in the classroom as per the RTI model. Although a brief workshop may be an effective way of providing this education and facilitating gains in confidence, it may not be sufficient for improving educators’ practical skills. Reasons for this will be discussed in the limitations section of this chapter. Overall, the workshop was effective in enhancing pre-service teachers’ understanding of LERD and highlighting assessment and intervention approaches that could be used in the classroom. Generally, participants reported having enjoyed the workshop and felt more confident in their abilities to support a student with LERD when they enter their own classrooms. The fact that some participants were able to apply the knowledge to case scenarios by modifying their intervention approaches to address the unique needs of students with reading challenges is promising. With more exposure, more practice, and more opportunities for feedback, professional development for educators could potentially result in observable improvements in the implementation of an RTI model for reading disabilities and better outcomes for students with LERD.

Limitations and Next Steps

The findings from this dissertation should be considered alongside its limitations. It is important to acknowledge the limitations associated with the workshop (i.e., content). The
workshop was informed by existing literature; however, studies on Late Emerging Reading Disabilities is minimal relative to other reading disabilities. Specifically, content related to assessment and intervention practices was evidence-informed rather than evidence-based as would be best practice. The reason being that our understanding of Late Emerging Reading Disabilities is in its infancy and there remains some disagreement about the source of the difficulties and trajectories. Therefore, although there are tools to assess risk factors for early emerging reading disabilities and multiple interventions for struggling early readers, these tools do not appear to exist for LERD. As such, assessment and intervention practices within this dissertation are an amalgamation of studies looking to identify and differentiate the profiles of LERD and those looking to understand poor comprehenders in grades 4 through 6. A next step would be to conduct additional research to seek clarity about higher and lower-level kills impacted in late emerging poor readers and to compare these factors to the existing literature. Subsequently, this information could be used to inform modifications to existing interventions or the development of new interventions for reading challenges. Finally, any new information obtained should be implemented in any future professional development opportunities for educators as training should be ongoing.

Another limitation of this dissertation is the difference in sample populations across studies. For multiple reasons, the web-based study was provided to pre-service teachers rather than current educators despite the latter being involved in the first study. Study 1 informed the development of the training and as such several assumptions about the similarities between both groups were made. For example, it was presumed that pre-service teachers, like current teachers, had some knowledge of reading development and component skills. Therefore, content about Chall’s stages of reading development and the impact of top-down and bottom-up processing and relevant skills was not included. It was also assumed that they had sufficient knowledge of general assessment practices and some reading intervention strategies and as such the information provided was specific to LERD. Additionally, it was the assumption of researchers that future educators already had adequate understanding of early emerging reading disabilities. Given the emphasis on Dyslexia in the literature, it was presumed that teachers and pre-service teachers would have sufficient knowledge of EERD and confidence in their abilities to assess and provide intervention to these students. Therefore, minimal conceptual information about EERD was included in the training which could have proven to be beneficial. Taken together, the
impact of not including this information could have decreased the accessibility of the workshop and thus some of the results may have reflected this lack of information about all reading disabilities rather than the effectiveness of the training.

**Implications for Education**

In November of 2012, the Supreme Court of Canada recognized that learning to read is a basic and essential human right. Almost 10 years later, the Ontario Human Rights Commission (OHRC) released a report entitled “The Right to Read” which identified gaps in instruction of reading in the Ontario school system and sets out recommendations for those connected to the education sector on how to meet the right of all students to read (OHRC, 2022). Specifically, data showed that more students are experiencing reading difficulties than should be. To help ensure high-quality education in areas such as reading, this report highlights the importance of preparing teachers to teach students early reading skills and provide ongoing professional development in reading and special education. While the Right to Read report provides 157 recommendations around curriculum and instruction, early screening, reading interventions, accommodations, and modifications, as well as professional assessments, the primary focus of the report was on early reading skills (OHRC, 2022). As a result, this report appears to endorse a response-to-intervention model approach for students with early reading difficulties. Notably, these recommendations are most helpful for students with early emerging reading disabilities who are likely to have difficulties with word-level processing. Unfortunately, there are minimal recommendations for those with other reading-based challenges. Specifically, there are few examples for ensuring high quality education and special education services to those with comprehension specific reading disabilities most common in those with LERD.

In consideration of the findings from this dissertation, recommendations highlighted in the Right to Read report could help inform next steps for providing high quality reading instruction to those with other reading-based challenges such as students with LERD. To allow for consistency in evidence-based approaches in education, gaps across systems must be addressed. Specifically, the role of individual teachers, schools, school boards, and the larger society in ensuring the right to read of students must be identified. While the Right to Read report and the Ministry of Education in Ontario identify the importance of many parties in supporting students’ right to read, there are significant demands placed on teachers to provide
immediate instruction, assessment, and intervention for reading challenges. Specifically, the RTI approach for supporting struggling readers requires that teachers play a primary role. Consequently, as the demands placed on teachers continue to grow, they are more likely to experience burnout (e.g., McCarthy et al., 2016) and are less likely to stay in their job (e.g., Billingsley & Bettini, 2019; Brouwers & Tomic, 2000). Subsequently, the quality of instruction and implementation of assessment and intervention approaches may be reduced. However, as evidenced by their meta-analysis of over 30 articles, Park and Shin (2020) found that teachers who feel more confident in their abilities (i.e., self-efficacy is high) and feel more supported by school personnel have lower levels of burnout. Therefore, for the RTI approach to be effective and for teachers to provide quality reading instruction and special education services to students with reading disabilities, they would benefit from having sufficient confidence in their abilities and appropriate support from the school.

It is evident from this dissertation that teachers and pre-service teachers do not have sufficient knowledge or confidence to provide quality instruction and special education services to students with LERD nor did they frequently list consultation as a common strategy to supporting students with reading disabilities. To address the rights of students with reading disabilities, pre-service teachers and current teachers must first receive sufficient training in reading and reading disabilities. This training needs to reflect all reading disabilities, not only those with early reading difficulties. It is the responsibility of teacher education programs for future teachers and the education system to provide that training and to promote accountability and continuous improvement of teachers’ practice (OHRC, 2022). It is also the right of teachers to feel sufficiently confident in their abilities and to seek external support or consultation when they are not sufficiently confident or prepared to support a struggling student. In considering the responsibility of the school in supporting teachers’ implementation of evidence-based reading instruction and assessment and intervention practices for struggling readers, it will be important for schools to have a specialized team available for consultation or more specialized treatment and assessment. This team may include a learning support teacher and/or a school psychologist who should have specialized training in reading disabilities.

The right to read report also highlights the role of school boards to implement provincial standards for instruction, assessment, and intervention. However, provincial standards should be evidence-based (OHRC, 2022). Whereas much research has been initiated in the area of early
reading disabilities such as Dyslexia, there have been relatively few studies that have sought to identify the skills impacted by LERD and intervention approaches specifically for these students. Positively, there has been some research on evidence-based interventions for reading comprehension difficulties which could prove helpful for those with comprehension-related difficulties related to LERD. Furthermore, while there are standardized assessment tools to identify students with EERD given the Right to Read report’s recommendation for early screening of early reading difficulties, to my knowledge, there are no existing assessment batteries for LERD. Without sufficient research in this area of reading disabilities, school boards will struggle to identify procedures for assessment and intervention of LERD. To help address this barrier, funders and researchers in education and educational psychology will need to develop a more comprehensive understanding of Late Emerging Reading Disabilities.

The education system has a responsibility to ensure that all students have opportunities to receive high quality reading instruction and access to special education services. There are many barriers to promoting consistent quality supports to those with reading disabilities across school boards in Ontario while using an RTI model. These include gaps in pre-service teacher and current teacher knowledge of reading instruction and reading disabilities, difficulties with accessing specialized consultation and supports in schools, limited standardized procedures for classroom-based assessment and intervention of reading disabilities, and limited research in the area of reading disabilities, especially with respect to less known reading disabilities (e.g., Pyle et al., 2011; Washburn et al., 2017; Werts et al., 2014). Positively, the implementation of recommendations in the Right to Read report is a good example of how our education system is making strides towards being more equitable in providing quality education to all students. Continued collaboration between educators, school psychologists, school boards, and ministry will be critical for moving towards a comprehensive approach to both early and late reading disabilities.
References


Appendix E: Ethics Approval Forms

Ethics Approval for Chapter Two (Lamoureux & Friesen, 2021)

Western Research

Date: 5 March 2021

To Dr. Deanna Friesen

Project ID: 116239

Study Title: Teachers’ Perceptions of Late-Emerging Reading Disabilities

Short Title: Teachers’ Perceptions of Late-Emerging Reading Disabilities

Application Type: NMREB Initial Application

Review Type: Delegated

Full Board Reporting Date: April 9, 2021

Date Approval Issued: 05/Mar/2021 12:02

REB Approval Expiry Date: 05/Mar/2022

Dear Dr. Deanna Friesen,

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. All other required institutional approvals and mandated training must also be obtained prior to the conduct of the study.

Documents Approved:

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<td>Recruitment Materials</td>
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<td>Translated Documents</td>
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No deviations from, or changes to the protocol should be initiated without prior written approval from the NMREB, except when necessary to eliminate immediate human(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Kelly Patterson, Research Ethics Officer on behalf of Dr. Randall Graham, NMREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Ethics Approval for Chapter Three (Lamoureux & Friesen, 2022)
Dear Dr. Deanna Friesen

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. All other required institutional approvals and mandated training must also be obtained prior to the conduct of the study.

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Please do not hesitate to contact us if you have any questions.

Sincerely,

Kelly Patterson, Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair

*Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).*
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**Conference Presentations:**


Conference of Society for the Scientific Study of Reading, Newport Beach, California.
