Dyslexic Design: Designing Instructional Materials for Dyslexia in the Workplace

by

Andrew Vela

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Supervisor: Melissa White, PhD, Faculty of Education

Examining Board: Ellen Rose, PhD, Faculty of Education, Chair
                 Amanda Benjamin, PhD, Faculty of Education
                 Peter Sawchuk, PhD, University of Toronto

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ABSTRACT

The purpose of this study was to investigate how to develop workplace training materials to meet the needs of adults with dyslexia. The study attempted to connect the fields of instructional design and adult dyslexia to find a method for creating workplace training materials that are accessible to adults with dyslexia. Document analysis was used to assess instructional design standards in workplace training. Following the document analysis, the design-based research portion of the study resulted in the creation of a new instructional design standards document that incorporated best practices of dyslexia support, and an eLearning course built in adherence to the new standards document. The eLearning course was tested with dyslexic participants, which included a survey and interview. The study found that gaps exist between the fields of instructional design and adult dyslexia, but that incorporating strategies to support dyslexia into workplace training standards has the potential to make workplace training more accessible.

DEDICATION

For Jeff and Mom.

If you have the guts to be yourself, other people'll pay your price.

-John Updike

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Chapter 1: Introduction

1.0 Background

In response to the proliferation of technology and information since the turn of the century, employers across industries have increased their focus on training and developing their workforce to meet ever-changing demands. In 2015, training and development expenditures across six primary industries in the United States totalled $70.6 billion USD — an increase of 14.2% from the previous year (Training Industry Report, 2015). Sharma (2016) suggests that with this growth comes the need for employers to also adapt their training practices for a changing and diverse workforce.

The growth of training needs produces the need for people to design, develop, implement, and evaluate training programs. This process is referred to as instructional design. Instructional design is a discipline that has historical roots in educational psychology and behaviourism, and as Brown and Green (2016) describe, "is the linking science that applies logic and scientific methods to the problems involved in designing and developing instruction" (p. 19). Most instructional designers in a workplace training environment adhere to some kind of framework or model to design and develop training programs. Though there are numerous varieties of instructional design models, "almost all are based on the generic analysis, design, develop, implement, evaluate (ADDIE) model" (Allen, 2006, p. 430).

During an instructional design process, a practitioner should take time to assess the abilities of the learners who will be taking the training program. Most learner

analyses focus on demographic information such as gender, age, education level, and entry-level competencies or behaviours (Handshaw, 2014). The information gathered through learner analyses helps to identify similarities within a group of learners through observable and measurable data, such as age and work experience. However, conventional learner analyses are less effective at identifying differences within a group of learners since many differences, such as learning disorders, are invisible and/or unknown to instructional designers. As such, information that is overlooked in conventional instructional design models is adult dyslexia.

Dyslexia is a disorder that has become part of the common vernacular, despite remaining largely misunderstood. According to the International Dyslexia Association (2016), 15-20% of the population as a whole demonstrates symptoms of dyslexia, and would benefit from dyslexia-focused instruction. *The Diagnostic and Statistical Manual of Mental Disorders* (5th ed.) now categorizes dyslexia as a *Specific Learning Disorder*, and characterizes the disorder as demonstrating predominant impairment with word reading accuracy, reading rate or fluency, and reading comprehension (American Psychiatric Association, 2013).

Dyslexia is typically diagnosed during childhood and recognized as an academic impairment. However, dyslexia is not a condition that can be outgrown, and the impairments persist into the contexts of adulthood. Most interventions and research are focused on childhood dyslexia. This is problematic for adults with dyslexia due to the fact that "the effects of dyslexia change considerably as [an] individual gets older. The needs of adults with dyslexia are significantly different from the needs of child dyslexics" (Fitzgibbon and O'Connor, 2002, p.18). Just as dyslexia has the potential to inhibit

academic performance and engagement in children, dyslexia also may impact job performance and engagement in adults. As the statistics from the International Dyslexia Association (2016) indicate, there are many individuals who are likely struggling to engage meaningfully with their workplace training due to impairments of dyslexia. The necessity for adults to be able to learn in their places of work is a must for every worker, as it opens doors to other learning and professional growth, and facilitates the acquisition of other skills (Blackmoore 1996). Workplace training designed with the specific needs of adults with dyslexia in mind could help remedy this issue, however, there is a lack of research on how to design instruction for adults with dyslexia. Though there is significant research on dyslexia, instructional design, and workplace training as separate topics, there is currently a dearth of study focused on combining those fields of understanding.

1.1 Research Question

How can instructional materials for workplace training be developed to meet the needs of adults with dyslexia?

This research question is rooted in the literary evidence that traditional instructional design practices in corporate training contexts do not provide guidance for designing instruction for adults with dyslexia. The focus on workplace training was made due to the fact that the majority of instructional design research regarding dyslexia is applied to primary, secondary, and postsecondary education contexts. By addressing the gap found in the research regarding instructional design for dyslexia in the workplace, the intention was to provide a basis for improvement of practices. The rationale for focusing on dyslexia was due to the likelihood of the research having the greatest potential for impact

— the literature demonstrates that the disorder is a reality for a statistically significant percentage of the adult working population.

1.2 Key Terms

Workplace Training

Workplace training is a broad term that can describe many types of training events that occur in a workplace setting. Workplace training can refer to orientation for new-hires, industrial safety training and certification, professional development workshops, training on new software or procedures, required training for promoted employees, and many other learning experiences that are unique to an industry or workplace. Workplace training is typically designed and intended to train employees to demonstrate skills, knowledge, and attitudes required to succeed in the position they are hired for, or the position they want to be promoted to. This intention of instructional design is highlighted by Lieberman and Valencius (2016), who describe utilizing "a suite of instructional design methods founded in cognitive science, [which enables] employees to respond more swiftly, flexibly, and creatively to the changing technical and business landscape" (p. 45). Workplace training is delivered through several methods including eLearning, mLearning (mobile learning), and instructor-led training.

Dyslexia

The Diagnostic and Statistical Manual of Mental Disorders (5th ed.; *DSM–5*; American Psychiatric Association, 2013) now refers to dyslexia as a sub-form of *Specific Learning Disorder;* however, the term dyslexia will be used in lieu of specific learning disorder for the sake of clarity, and consistency with the literature. Furthermore, for the purposes of this research, the term *dyslexia* refers to *developmental dyslexia*, that is, dyslexia that is

rooted in a neurological basis, as opposed to *acquired dyslexia*, which is the result of a significant brain trauma (Shaywitz, 2003).

Adult Dyslexia

Dyslexia is a pervasive and often misunderstood learning disorder. Research on the nature of and interventions for dyslexia has often been focused on school-aged children. A common definition that was popularized by the World Federation of Neurology (1968) is that dyslexia is "a disorder in children who, despite conventional classroom experience, fail to attain the language skills of reading, writing and spelling commensurate with their intellectual abilities" (as cited in Nicolson & Fawcett, 2008, p.1). Renowned dyslexia expert, Dr. Sally Shaywitz, focuses on dyslexia as being primarily a reading deficit, wherein individuals with dyslexia are unable to engage in a complete reading process. Shaywitz (2003) explains that the process of reading "consists of two major components: decoding, which results in word identification, and comprehension, which, of course, is related to meaning" (p.53). This means that an individual with dyslexia may have impairment with decoding or identifying single words, may have an impairment with comprehending the word, or both. Lastly, throughout this study the term 'adult(s) with dyslexia' will be used in lieu of terms such as 'dyslexic adults', or 'adult dyslexics.' This phrasing aligns with the concept of *person-first language*, which is focused on the person, not the disability, and is used to speak appropriately and respectfully about individuals with disabilities (National Center on Birth Defects and Developmental Disabilities).

1.3 Organization of Thesis

      Chapter 1 of this thesis is an overview of the purpose of the study and why it is relevant. It provides background information, states the research question, and defines key terminology that is relevant to the study.

      Chapter 2 is a comprehensive review of the literature that pertains to the fields of instructional design, adult dyslexia, and workplace training, provides a baseline for current theories and practices, and identifies opportunities or gaps between the fields to be bridged.

      Chapter 3 outlines the methodology of this study. It describes components of the document analysis, design-based research, and participant phases of this study, and provides rationales for decisions made within these phases. Chapter 3 also articulates ethical considerations made during the study, and identifies the goals of the study.

      Chapter 4 focuses on the document analysis phase of the study. It uses the insights gained from the literature review to define the scope of the document analysis phase. The chapter describes the analysis of three workplace training instructional design standards from three separate organizations. The chapter concludes with a discussion of the findings and applications of the document analysis.

      Chapter 5 outlines the design-based research phase of the study. It describes the design and development of a new instructional design standards document, and two eLearning courses to be used in the participant study.

      Chapter 6 discusses the participant study phase of the study. This discussion includes an overview of the participants and a description of the survey and interviews

used in the study. The survey and interview results are described at length, and general findings and themes from the results are discussed.

 Chapter 7 provides a summary and conclusion of the study. The chapter discusses limitations of the study, and opportunities for using the study for future research.

Chapter 2: Literature Review

In this chapter I review and discuss the literature pertinent to answering my research question: how can instructional materials for workplace training be developed to meet the needs of adults with dyslexia? There is significant literature and discourse focused on instructional design, and adults with dyslexia. However, these bodies of research exist on separate planes. Due to this separation of research, it was necessary to synthesize research from several fields, and connect the findings from those fields to apply to my research. To accomplish this, the literature review focused on the fields of dyslexia, adult dyslexia, instructional design, and workplace training.

In order to establish a foundation of understanding, the review and discussion of dyslexia and adult dyslexia literature included an overview of the characteristics of the disorder, theories of impairment, and the implications of the adult dyslexia in the workplace. The review of instructional design literature was focused on examining the major instructional design models and theories in order to establish a baseline, and identify opportunities to integrate theories related to adult dyslexia within the existing models. Within the instructional design realm, literature specific to instructional design strategies also received significant review and discussion. Literature specific to workplace training was reviewed to assess the common workplace training strategies and methods that are being used in industries today, and to identify how these strategies and methods could be updated to better meet the needs of adults with dyslexia.

2.1 Criteria

Due to the changing landscape of instructional design in response to the acceleration of technology development, this literature review placed an emphasis on research conducted in the last fifteen years. Older literature was reviewed only to establish context. The review attempted to focus on literature specific to adult dyslexia, however, due to the disproportionate amount of research focused on childhood dyslexia, in some instances general theories and discussion regarding childhood are applied to adult contexts.

2.2 Adult Dyslexia

Much of the research and discourse surrounding dyslexia in the last half century has been focused on school-aged children. This may be due to common conceptions and attitudes that dyslexia is a childhood disorder that can be outgrown. Medical and educational practitioners have since emphatically refuted this assumption. For example, Shaywitz (2003) describes that based on a longitudinal study she conducted, it was "determined quite decisively that dyslexia is a chronic condition and …it does not represent a temporary lag in reading development" (p.33). With these types of conclusions made, and since many individuals who were identified as dyslexic as children have now reached adulthood, researchers are beginning to assess the nature of dyslexia in adults.

Everatt and Fidler (2012) explain that as individuals with dyslexia grow, "some of the basic features of childhood dyslexia can characterize dyslexia in adulthood, though the specific manifestation of literacy problems presented in adulthood may be different

from, or more variable than, that found in children" (p.93). This variability that Everatt and Fidler (2012) refer to is associated with the context in which adults with dyslexia participate in reading; for example, a dyslexic child may be required to read aloud in school, which is an activity that requires intensive word-decoding accuracy, but adults with dyslexia are very rarely required to read aloud, as much of their reading is focused on comprehension and retention. With the contextual nature of dyslexia, Everatt and Fidler identify that primarily, "literacy problems associated with dyslexia in adults would be more likely to be identified via measures of:

- reading rate rather than accuracy
- continued poor spelling
- inefficient decoding (i.e., in non-word or pseudo-word reading tests, as in pronouncing an unfamiliar letter string, such as 'sploog'), and
- comprehension problems under time pressure or when ease of reading is reduced" (2012, p. 94).

2.3 Theories of Impairment

Dyslexia remains a largely misunderstood and perplexing disorder. There are numerous theories and studies that focus on the underlying conditions that perpetuate dyslexia. The melding of these theories is commonplace in the study of dyslexia, and according to Berninger et al. (2006), very necessary, as "full understanding of dyslexia is likely to require many different small theories and a systems approach that considers multiple, interacting variables within individual brains and the external environment not described well by simple, linear, unidimensional causal mechanisms" (p. 190).

2.3.1 Phonological Deficit

When identifying the primary impairment that enables dyslexia, the most common and agreed upon theory is the phonological deficit theory. Phonological deficit theory asserts that individuals with dyslexia have impairment with phonological awareness, that is, impairment with "the ability to translate letters into sounds or phonemes. A phoneme is any of the units of sound that distinguish one word from another, for example, *m* and *c* in *mat* and *cat*" (Das 2009, p.14). When a reader is unable to distinguish between the sounds that make up a word, they are unable to properly decode or comprehend the word.

To characterize a phonological deficit, Lundberg & Hoien identified that the deficit manifests in the following ways:

- Problems in segmenting words into phonemes
- Problems in keeping linguistic material (string of sounds or letters) in short-term memory
- Problems in repeating back long no words
- Problems in reading and writing short no words
- Slow naming of colors, numbers, letters, and objects in pictures
- A slower rate of speech, sometimes with indistinct pronunciation
- Problems in playing word games where the point is to manipulate phonemes (games like Pig Latin) (2001, as cited in Nicolson & Fawcett, 2008, p. 24)

The phonological deficit theory provides a neurological and developmental basis for dyslexia, and dispels common misconceptions of dyslexia that are related to visual impairments, i.e.; letters being mixed-up on the page, as this type of impairment occurs very rarely (Szenkovits et al., 2016). Szenkovits et al. (2016) describe phonological deficit theory's popularity and acceptance as due to the fact that regardless of the focus of

alternative theories, "all views assume that the most proximal cause of the reading disability in dyslexia is the phonological deficit" (p. 317).

2.3.2 Double-Deficit Hypothesis

While there is fundamental agreement on the relationship between phonological processing impairment and dyslexia, there is significant evidence to suggest that there can be two processing impairments that enable dyslexia. This evidence of two impairments led to Wolf and Bowers (1999) developing the *double-deficit hypothesis* (DDH). DDH proposes that while phonological processing is a deficit present in individuals with dyslexia, Rapid Automatized Naming (RAN) poses another major deficit. RAN refers to the ability to quickly and accurately retrieve phonetic information based on visual prompts, such as identifying objects, colours, letters, or numbers from a chart (Cronin, 2013). According to DDH, "the phonological deficits and the processes underlying naming speed are separable sources of reading dysfunction, and their combined presence leads to profound reading impairment" (Wolf & Bowers, 1999, p. 416).

In the years since the development of the double-deficit hypothesis, it has become an increasingly studied and adopted conceptualization of dyslexia. Torppa et al. (2012) support the value of the DDH over phonological deficit: "although the phonological deficit hypothesis has been able to account for the large proportion of reading impairments, it has not been able to explain the heterogeneity of deficits observed in children and adults with dyslexia" (p. 288). Torppa et al. (2012) also describe the value of the DDH in terms of classifying individuals with dyslexia into subtype groups. When

adhering to the DDH, "the majority of poor readers can be classified into three groups: two with a single deficit in either phonological awareness or RAN and one with a double deficit in both phonological awareness and RAN" (Torppa et al., 2012, p. 289). This classification is important for understanding dyslexia due to the fact that both phonological awareness and RAN deficits are assumed to have independent negative effects on reading, meaning individuals in the double-deficit group generally experience the most severe reading problems (Torppa et al., 2012).

Though the double-deficit hypothesis has gained ground in the field of dyslexia, there are still contentions to the theory. Nelson (2015) applied the three subtype group classifications of the DDH to 149 university-aged participants with diagnosed dyslexia. The participants then were assessed based on phonological awareness, RAN, intellectual ability, reading skills, and spelling skills. Upon assessment of the sub-groups, Nelson (2015) concluded "DDH subtypes did not support the core assumption of the DDH that the double-deficit subtype would have more impaired reading skills than both of the single-deficit subtypes" (p.159). Nelson (2015) suggests that the double-deficit dyslexics were not more impaired than single-deficit dyslexics due to the finding that "[RAN] predicted unique variance in real word reading, reading fluency, and spelling but, inconsistent with the DDH, was not a significant unique predictor of timed or untimed reading comprehension" (p. 175). While Nelson's (2015) study did find support for the DDH, he concluded that the "results provided mixed support for the DDH and pointed to the need for the inclusion of additional abilities within theories of the underlying mechanisms disrupted in dyslexia" (p. 159).

2.3.3 Implicit Learning

In recent decades, the concept of implicit learning and its relationship to dyslexia has become more common. Implicit learning refers to the unconscious processes of learning. Implicit learning occurs when an individual is not aware they are learning. Common examples of implicit learning relate to young children and include native-language acquisition, and learning to walk. Both of these examples occur without the child being consciously aware they are learning. Implicit learning is in contrast to explicit learning, which refers to conscious learning, that is, learning that occurs with the individual's awareness.

The literature recognizes that reading involves both explicit and implicit learning capabilities, but there is disagreement about whether implicit learning is a primary deficit in individuals with dyslexia. Folia et al. (2008) contend that since both implicit and explicit learning are needed for reading, "a deficit in implicit acquisition mechanisms might therefore have a negative impact on the acquisition of reading and writing skills and therefore affect literacy acquisition" (p. 133). However, Russler, Gerty, and Munte (2006) discerned that the capacity for implicit learning was intact in adults with dyslexia.

Lassonen et al. (2013) expanded on Russler et al.'s (2006) research by conducting a study that examined the relationship between implicit learning and adults with dyslexia, and also adults with ADHD. The study focused on the assessment of implicit learning in three groups of adults (18-55), those with dyslexia (n=36), those with ADHD (n=22), and a control group (n=35). The study employed the use of two tasks to assess the participants, a serial reaction time (SRT) task, and an artificial grammar-learning (AGL) task. The SRT task was focused on implicit learning and required participants to review

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material that was sequenced based on a set of rules or patterns. More specifically, "participants [were] presented with a choice reaction time task while being unaware that the presentation sequence (e.g., location, color, or type of visual stimulus) [was] defined by a pattern or a set of rules" (Lassonen et al., 2013, p. 3). The AGL was focused on explicit learning, and assessed participant ability to memorize series of letters or symbols. After being exposed to the series of letters or symbols, participants were informed that sequences conformed to a set of rules. Participants were then required to "classify a new set of strings into grammatical and ungrammatical ones" (Lassonen et al., 2013, p. 6). For the SRT task, participants were assessed by their reaction time, whereas the AGL task was assessed based on accuracy.

There were several insightful findings that arose from this study. In relation to the SRT task, Lassonen et al. (2013) found that "the groups with dyslexia or ADHD did not differ from the controls" (p.22). This finding demonstrates that implicit learning does not pose a barrier to adults with dyslexia or ADHD, and more importantly, is an area where they are on par with other adults who do not struggle with learning disorders. Regarding the AGL task, Lassonen et al. (2013) asserted "those [participants] with dyslexia, and perhaps also ADHD, do not learn the underlying rule structure of the grammar" (p. 25). This finding solidifies the notion that adults with dyslexia and/or ADHD have significant deficiencies with explicit learning, compared to other adults who do not struggle with learning disorders. Lassonen et al. (2013) suggest that future research regarding their findings could be conducted in the form of a longitudinal study that could be used to identify potential causations of implicit or explicit learning difficulties.

Though Lassonen et al.'s (2013) study demonstrated intact implicit learning mechanisms in adults with dyslexia, recent studies have suggested otherwise. Kahta and Schiff (2016) conducted a study wherein 14 dyslexic and 15 non-adults with dyslexia were provided an AGL task similar to Lassonen et al.'s (2013). Unlike in Lassonen et al.'s (2013) study, Kahta and Schiff (2016) did not provide participants with instruction about the grammatical rules of the AGL task, as this type of instruction supports explicit learning. Based on this AGL task, Kahta and Schiff (2016) found a significant difference between the groups in their learning measures, as non-dyslexic readers performed significantly better than individuals with dyslexia, supporting the assumption of a deficit in implicit sequential learning processes among individuals with dyslexia.

In order to discern whether their experiment was specifically measuring implicit learning deficiencies, Kahta and Schiff (2016) conducted a second experiment, during which the participants did receive instruction about the grammatical rules. Kahta and Schiff (2016) concluded that the results of the seconded experiment strengthened "the assumption that the deficit is indeed specific to implicit sequential processes, as no difference between the groups was found when participants were aware of the existence of the grammar underlying the strings" (p. 236).

As is evident through the literature, there is no clear agreement upon the relationship between dyslexia and implicit learning. However, the most recent studies suggest that implicit learning is in fact a primary impairment for individuals with dyslexia.

2.3.4 Memory

Recent studies have examined the relationship between dyslexia and memory impairments. This interest in memory impairments is related to "an increasing number of studies [which] suggest that both short- and long-term memory processes underlie various aspects of language development such as vocabulary acquisition and reading" (Bogaerts et al., 2016, p. 151). Typically, memory impairments that foster dyslexia are described in terms of serial-order and working memory, and the consolidation of those memories into long-term memory. Bogaerts et al. (2016) explain, "natural language can be regarded as a well-structured environmental input with an inherently sequential nature. A limited number of phonemes and letters form different words, depending on the order of their arrangement, and these words in turn are sequentially arranged to form sentences" (p. 140). With this conceptualization of language, it is obvious that impairments with serial-order, working, and/or long-term memory could be a factor that impairs individuals with dyslexia in terms of phonemic awareness, RAN, and comprehension.

The current literature reflects significant evidence to support the theory that there is a link between memory impairment and dyslexia. Hachmann et al. (2014) conducted a study with 52 adult participants, 26 with diagnosed dyslexia, and 26 with average reading ability for their IQ. The participants then were required to complete tasks focused on serial-order and short-term memory: a *nonverbal item task*, a *verbal item task*, a *nonverbal order task,* and a *verbal order task.* Based on these exercises, Hachmann et al. (2014) concluded, "dyslexia is related to a specific impairment in short-term memory for sequential order, but not item information… We propose that this specific impairment

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may lead to the language problems that are characteristic for dyslexia" (p. 133). In a study that built on the findings of Hachmann et al. (2014), Bogaerts et al. (2015) focused on the serial-order long-term acquisition abilities of individuals with dyslexia. Through the study, Bogaerts et al. (2015) made the conclusion that "adults with dyslexia are fundamentally impaired in the long-term acquisition of serial-order information" (p. 106).

An emerging area of study regarding memory impairment and dyslexia is prospective memory. Prospective memory is defined as the memory for delayed intentions, or 'remembering to remember' (Smith-Spark, Ziecik, & Sterling, 2016). Smith-Spark et al. (2016) identified that reports of deficits in prospective memory in individuals with dyslexia had not been objectively tested in a lab environment. In response, Smith-Spark et al. (2016) conducted a study focused on having two groups of adults, one dyslexic, the other not, complete time-based tasks that required working memory and reflected the strength of prospective memory. The task required participants to review series of labeled images of either living or dead celebrities, then after the images disappeared, they would make responses about the order of the images, or identify whether the celebrity was living or dead (Smith-Spark et al., 2016). Following the study, Smith-Spark et al. (2016) concluded "time-based PM [prospective memory] was found to be poorer in the group with dyslexia compared with the group without dyslexia" (p. 43). In addition to these findings, Smith-Spark et al. (2016) describe the value of this study as being "the first study to find evidence of PM problems in dyslexia using objective measures of performance" (p. 43). Further research and studies would improve the merits and adoption of the conclusion that adults with dyslexia demonstrate impairments in prospective memory.

2.4 Implications of Adult Dyslexia in the Workplace

As earlier described, just as dyslexia poses a significant barrier to learning for children in school, the impacts of the disorder persist into adulthood and may inhibit the ability of adults to perform their jobs in the workplace. The impairments faced by adults with dyslexia therefore have the potential to become a significant disadvantage in the workplace environment. As Bartlett, Moody, and Kindersley (2010) explain, this disadvantage for adults with dyslexia can occur even prior to securing employment, as "their writing difficulties will make the production of a CV daunting. If they also have poor speaking and listening skills — and the lack of confidence associated with these — they will find it hard to perform successfully in interviews" (p. 213). Though the impairments of dyslexia can have a direct impact on an individual's performance in securing employment, the most observable impact on performance occurs on the job.

It can be challenging to identify the impact of dyslexia in a work setting, especially when considering factors such as motivation, skill, and age. To better understand the experienced impairment of adults with dyslexia in the workplace, Logan (2009) conducted a study that included 39 participants with dyslexia who were either entrepreneurs or corporate managers. During this study, participants completed a questionnaire based on experienced difficulties in the workplace. Out of the 39 dyslexic participants, "39 experienced difficulty with spelling and pronunciation of long words and sequencing. 36 had difficulty taking down and passing on messages. The other most common problems included learning tables and mixing up appointments" (Logan, 2009, p. 332).

The challenges described by the participants of Logan's (2009) study are consistent with the predicted challenges outlined in the current literature. According to McLoughlin and Leather, "the most common challenges facing a dyslexic person at work are in areas such as:

- Organization
- Time management and work prioritization
- Demands on written language abilities
- Memory for procedures
- Training situations
- Carrying out instructions
- Unsympathetic colleagues
- Dealing with distractions of noise, people and place" (2013, pp. 228-9).

Bartlett et al. (2010) more succinctly categorize the primary barriers to performance adults with dyslexia face in the workplace as impairments with short-term memory, working at speed and with accuracy, and organization skill. To compound the disadvantages, these three areas of impairment also happen to be the areas in which employers demand strength and efficiency (Barlett et al., 2010). The challenges identified through the literature on dyslexia in the workplace correlate with the common theories of impairment such as memory impairments, implicit learning, and DDH.

2.5 Instructional Design

The origins of instructional design (originally referred to as *instructional systems design*) can be traced back to the 1960s. During that time, applying tenets of psychology to an instructional setting was intended to improve the performance of those training for the military and aerospace pursuits (Gustafson & Branch, 2007). However, during the 1970s, instructional design became commonplace in training across industries. Though

the field of instructional design has existed for over fifty years, there remains a significant amount of confusion surrounding what instructional design is, and what it is not. This confusion is likely the result of a nuanced and ambiguous discipline.

Major instructional design authorities, Smith and Ragan (2005), attempt to clarify the ambiguity of instructional design by defining it as "the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation" (p. 4). This definition encapsulates the concept of instructional design well, and is compatible with the definitions provided from many other major authorities. However, not all agree upon one, or any definition of instructional design, such as Piskurich (2015), who concedes that "how you see instructional design is up to you… we will not champion one view over another, or even one definition as the most correct. What we will do is try to convince you that creating a training program without using instructional design principles is inviting failure" (p. 2). While Piskurich's (2015) expression of instructional design's value is admirable, the unwillingness to describe or recommend an even general definition reflects the challenges faced by those researching and practicing instructional design, as unlike other disciplines, there remains a vast unknown regarding the function and responsibility of the discipline.

2.6 Instructional Design Models

2.6.1 ADDIE

ADDIE is an acronym for analysis, design, development, implementation, and evaluation, which describes the phases of the instructional design process. ADDIE is the

most common model used in the training industry, and as Notess (2004) describes, "is sometimes even described as *the* instructional systems design model" (p. 75).

The analysis phase of ADDIE is typically divided into three sections: needs analysis, task analysis, and learner analysis. Needs analysis refers to understanding the current context of the learning environment (such as a workplace), and assessing the learning needs that exist, and the changes that are desired. After understanding the needs, an instructional designer will then analyze the tasks that are to be completed, which involves understanding the content of learning and how it will be applied in the real world. Lastly, the instructional designer will analyze the learner. Learner analysis involves understanding the unique characteristics of the instructional target audience such as gender, motivations, general abilities, and cultural differences (Brown & Green, 2016; Dick, Carey, & Carey, 2009).

The design phase of ADDIE involves the activities most associated with the discipline of instructional design. During the design phase, the instructional designer will develop "a detailed plan of instruction that includes selecting the instructional methods and media and determining the instructional strategies" (Allen, 2009, p. 436). The information collected during the analysis phase is applied to the design and methodology of an instructional event. In most instances, the development phase will happen shortly after the design phase. During the development phase, the training plan created during the design phase is brought to life through the development of materials, media, etc. (Allen, 2009). The subsequent phases of ADDIE, implementation and evaluation, often happen simultaneously. As Gustafson and Branch (2007) describe, "implementation includes delivering the instruction in the settings for which it was designed. Evaluation includes

both formative and summative evaluation, as well as revision" (p. 11). While implementation involves the delivery of the instruction, evaluation analyzes the success of that delivery and can often involve user feedback, or statistical information based on whether the intended change the training was designed for has occurred.

Though ADDIE is widely used as a prescriptive model for instructional design, many believe it is merely a means of describing the essential components of any instructional design model (Molenda, 2003; as cited in Brown & Green, 2016). Some, such as Molenda (2003), assert that the ADDIE model should not be understood as a linear guideline to designing instruction. Despite these assertions, ADDIE continues to be used in the instructional design field as a literal step-by-step framework. The conception of ADDIE as a functional process is captured by Armstrong's (2004) explanation that "there already exists a mechanism which can be used to ensure that cognitive strategies are incorporated into electronic learning, and that mechanism is the instructional design process, commonly known in its simplest form as ADDIE" (p. 105).

Allen (2012) acknowledges the prevalence of ADDIE, but suggests that acceptance, like that of Armstrong (2004) is misguided, explaining that "faith in ADDIE has been strong, perhaps from tradition as much as any other reason, but ADDIE is far from the most up to date, effective, reliable, and proven process for building learning" (p. 13). Among other reasons, Allen (2012) suggests that ADDIE is not ideal due to being too systematic, linear, rigid, and time consuming. Bichelmeyer (2005) echoes the sentiments of Allen (2012), explaining that the ADDIE model is inconsistent with "the way instructional designers do their work" (p. 4).

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Though there is contention in academic circles regarding the nature and function of the ADDIE model, its prevalence and adoption in the industry demonstrates the importance of evaluating and improving the model.

2.6.2 Successive Approximation Model

Several opponents of the traditional ADDIE model of instructional design have opted to develop instructional design models and frameworks that attempt to meet the perceived shortcomings of ADDIE. Allen (2012), a vocal opponent of ADDIE, developed an instructional design model referred to as the *Successive Approximation Model*, or SAM. Allen's SAM is consistent with many of the basic tenets of the ADDIE model, however sequences the process as evaluate → design → develop (Brown & Green, 2016). Brown & Green (2012) differentiate SAM from ADDIE by explaining that SAM "places greater stress on the iterative nature of each step in the process" (p. 12). This focus on iterations of design is at the core of SAM. As the name may imply, the goal of SAM is to become successively closer to the end instructional design target through a series of iterations focused on developments, assessments, and redevelopments.

During the implementation of SAM, at least three iterations occur, each iteration beginning and ending with evaluation. During the first iteration, the instructional designer(s) "begin with a quick evaluation (analysis) of the situation, need, and goals" (Allen, 2012, p. 34). Though called evaluation, this step is essentially the analysis stage of ADDIE, as Allen (2012) suggests that the instructional designer(s) should assess learner needs, competencies, and the overall learning goals during this phase. The first iteration of SAM then continues to the design phase, wherein the instructional designer(s)

"quickly, but with thought, prepare a rough design for discussion," which may include listing ways to assess performance, selecting delivery media, and sketching sample designs (Allen, 2012). Iteration one then concludes with the development phase, during which the instructional designer(s) "prepare prototypes using whatever tools can quickly provide a sense of the design idea in application" (Allen, 2012, p. 34). Allen (2012) describes this phase as being the time when the sketches are fleshed out in more depth, and developing a rudimentary prototype to be built upon in iteration two.

SAM iteration two begins with an evaluation of iteration one. The goal of this evaluation is to "determine the success of the first iteration" (Allen, 2012, p. 35), and to evaluate whether enough was known about the situation, needs, and goal, assess what would work and what would not work, and to identify areas that require an alternative approach. Prior to moving to the design phase of iteration two, Allen (2012) asserts that it is necessary to determine whether the first iteration needs to be repeated again, explaining that "a cycle that clarifies needs or discards initial ideas is a success and an important step forward, but only if taken advantage of" (p. 35). If the evaluation determines the first iteration was sufficient, the instructional designer(s) proceed to the design phase of iteration two, which focuses on sketching new alternatives, refining ideas. However, Allen (2012) also suggests that a new design be created that does not incorporate the design from iteration one, arguing that "people nearly always find that by imposing the restriction of doing something different, they actually create something better" (p. 35). The design phase also requires the fleshing out of the initial ideas from previous iterations and creating representative content. The development phase of iteration two is the stage where prototypes become more thoroughly representative of a final product.

The instructional designer(s) will prepare learner materials, and test delivery for the intended method, such as developing a facilitator guide for an instructor-led course, or preparing interface designs if developing for eLearning (Allen, 2012).

Once iteration two is completed, a third, and potentially final iteration is conducted. Allen explains that the third iteration is very similar to the second iterations, however due to the work completed in the first two iterations, the subsequent iterations "become much more focused on development than design" (Allen, 2012, p. 36).

While Allen (2012) believes that "the successive approximation model (SAM) provides a clear pathway to success, measurable and obtainable milestones for marking completion, and targeted moments to reach agreement and consensus" (p. 33), there remains a lack of empirical evidence to support this claim. While some literature describes the application of SAM, such as Nieveen and Folmer (2013), there has yet to be a study that assesses the efficacy of SAM. Though the literature on SAM is limited, its tenets reflect best practices from other design models, such as ADDIE, which have been more thoroughly studied.

2.6.3 Dick & Carey Instructional Systems Design Model

One of the most popular and influential workplace instructional design models is the Instructional Systems Design Model developed by Dick and Carey, more commonly referred to as the Dick & Carey Model (Gustafson & Branch, 2007). The Dick & Carey model was first developed in the 1970s, and has remained relevant and adopted well into the twenty first century due to modifications that respond to the changing technology and landscape of instructional design (Dick, 1996).

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The Dick & Carey Model is a primary example of a systematic approach to instructional design, wherein a series of steps are followed sequentially to achieve the instructional goal. The Dick & Carey model begins with the identification of instructional goals, which are then used to perform a simultaneous instructional analysis and learner analysis. These initial steps are intended to shift the burden from learners being required to absorb the information, to the instructional designer(s), who is required to make the information accessible (Brown & Green, 2016). The subsequent steps of the Dick & Carey model, in order, require the instructional designer(s) to create performance objectives, develop assessment instruments, develop instructional strategies, create and select instructional materials, and then design and conduct formative evaluation of the instruction (Dick, Carey, & Carey, 2009). At each step, the instructional designer is required to revisit their instructional analysis and make revisions as needed. The Dick & Carey model concludes with a final reference to the learner analysis to ensure consistency with the end product, and lastly, the design and implementation of a summative assessment to measure the effect of the instructional design (Dick, Carey, & Carey, 2009).

While the Dick & Carey model provides a pragmatic and systematic approach to instructional design, it is essentially the ADDIE model with an explicit emphasis on revision and analysis. In fact, the Dick & Carey model has been described as being synonymous with ADDIE (Hanlis, 2004). With this similarity, the Dick & Carey model faces many of the same limitations of ADDIE previously described, such as rigidity, time consumption, and linearity.

2.7 Instructional Design and Workplace Training

Much of the instructional design field is targeted towards adult learning, and in particular, workplace training. Two of the most common forms of workplace training today are eLearning, which has given way to the emergence of mobile learning, or mLearning, and the traditional instructor-led training. Instructional design strategies tend to stay relatively consistent between the different delivery formats, however, since eLearning/mLearning and instructor-led training are inherently different, differing theories and practices exist between the delivery formats.

2.7.1 Workplace eLearning and the Emergence of mLearning

Many workplaces have moved towards asynchronous, computer-based learning to train their employees, commonly referred to as eLearning. eLearning has become a desirable option for workplace training due to its cost effectiveness and its efficiency, as employees can often complete the training at their own pace. Dobrovolny (2006) conducted a phenomenological study to assess how employees learn through self-paced workplace eLearning events. This study was concerned with understanding what type of mental processes and strategies enable success in employees who engage in this type of workplace training.

Dobrovolny's (2006) study followed seven participants as they completed self-paced eLearning courses in their respective workplaces. The primary focus of the study was to assess "in what ways do adults, in a corporate setting, construct their own knowledge during and after using a self-paced, technology-based course that is relevant to their current employment responsibilities." (Dobrovolny, 2006, p. 158). The

techniques assessed by Dobrovolny (2006) were conversations, reflection, metacognition, prior experiences, authentic experiences, and generative learning strategies. As this study was phenomenological in nature, participants' experiences with the eLearning were measured by participating in interviews with researchers before, during, and after the participant's completion of the training. Participants also kept journals to track their progress and record difficulties and strategies used to overcome those difficulties. Researchers would record participant responses to questions regarding strategies, and would categorize the responses based on which skills were used to enable learning. Through the research, Dobrovolny (2006) found that metacognition was the most critical strategy to learning in a computer-based, self-paced course. Metacognition is a "higher-order, executive process that monitors and coordinates other cognitive processes engaged during learning" (Tobias & Everson, 2009, p. 108), and is commonly referred to as "thinking about thinking." Dobrovolny (2006) suggests that metacognition is crucial throughout the learning process, stating that the results imply that "learning starts with, and is sustained by metacognition" (p. 167).

The study conducted by Dobrovolny (2006) provides exceptional insight for instructional designers who construct self-paced, workplace eLearning. There are, however, limitations of this study, such as the sample size. As there were only seven participants in the study, it is challenging to assess the applicability of the findings to wider populations. Furthermore, there is contention about the nature of metacognition in eLearning. As Meyer (2014) explains, "metacognition is thought to be socially situated, requiring the presence of a community so that metacognition can develop and manifest within the individual" (p. 25). Since the social aspect of learning is typically lost in

workplace eLearning, Meyer's (2014) assertion recognizes that while metacognition may indeed be important for performance in eLearning, the ability to foster metacognition may be an inherent limitation of eLearning in the workplace.

The future research of eLearning will likely be muted due to an increasing focus on mobile-learning, or mLearning. Mobile technologies, such as tablets, laptops, and smartphones, have revolutionized the workplace, and in response, employers are "abandoning fixed, personalised workstations, instead offering a variety of flexible workspaces and task-appropriate environments. These changes mean that providing mobile-friendly learning content is no longer a 'nice-to have', in fact, we now need to consider development for a mobile audience first, desktop second" (Benvin, 2016, p. 18). Though mLearning is very likely the wave of the future when it comes to workplace training, eLearning remains the industry standard.

2.7.2 Instructor-Led Workplace Training

While eLearning and mLearning are the new faces in the corporate training and development world, the traditional instructor-led training programs are still commonplace and desired. The function of instructor-led training is often the same as eLearning, such as onboarding, safety training, software training, etc., however, the method and medium are inherently different. A caveat of instructor-led training is the time and cost associated with it, but as Laff (2007), explains, instructor-led training is unlikely to fizzle out as "instructional designers believe that classroom training is likely to remain a staple of training delivery, especially for complex tasks such as network engineering. Training for

Cisco engineering, for example, will still require sending staff members to a three- or five-day training boot camp" (p. 72).

Typically, designing instructor-led workplace training involves creating instructional materials. These materials usually include a facilitator guide, a learner workbook, media such PowerPoint slides, and descriptions of instructional activities such as role-playing and group discussions (Handshaw, 2014). The instructor-led training environment is often more easily aligned with major tenets of adult learning such as communicating the value, participation, and hands-on practice, such as during a First Aid course (Price & Shaw, 2000). To meet those adult-learning principles, Pike (2016) advocates designers and facilitators of instructor-led workplace training should focus on CPR: content, participation, and revisiting. Pike (2016) recommends that content should be clearly relevant to the learner and their job, participation should occur every eight minutes, and complex concepts should be revisited upwards of six times to improve retention.

Though there are benefits to instructor-led workplace training, many researchers find limitations to the approach. Murphy (2007) conveys that "traditional classroom training does not work because it is not interactive, it is not applicable and it simply does not address the issues and problems" (p. 36). The lack of applicability, according to Murphy (2007), is at the crux of why instructor-led training is problematic, as learners are unable to apply the content to the area in which it will be used. Furthermore, since learners do not have control over the way they receive information in an instructor-led training experience, learners with reading, visual, or auditory impairments may be disadvantaged. Draffan (2012) explains that well designed eLearning courses provide

clear presentation of materials, intuitive navigation, multimedia options such as video and audio, the ability for learners to change text colour, opportunities for collaboration, and software such as spell-checker or text-to-speech. This functionality of eLearning that is designed to improve accessibility is something that is lost in most instructor-led workplace training events.

2.8 Instructional Design Strategies for Adult Dyslexia

2.8.1 Typography

When designing instructional materials to meet the needs of adults with dyslexia, a fundamental decision to make is the use of typography. Typography refers to the stylistic choices made when presenting text, such as font/typeface, colour, italicization, etc. Rose (2011) conceptualizes the importance of typography by explaining that "the relationship between content and typography [is] analogous to the relationship between what people say and their body language" (p. 59). That is to say, how text is written is as important as what is being written. Brown and Green (2016) explain that in instructional design, "the typefaces that we use to present text are considered to be in one of three categories: serif, sans serif, and decorative" (p. 204). While serif and sans serif typefaces are generally considered to be the most legible, Brown and Green (2016) caution against the use of decorative typefaces, as these typefaces tend to muddle the message, and instructional designers should recognize that "less is more" (p. 204). This recommendation is echoed by Rose (2011) who advises that "research shows that, in the case of typography, as with many elements of message design, more is often less" (p. 60).

There is clear consensus that the use of typography when designing instructional materials is a critical consideration with direct implications for learning. However, the contentions made by Rose (2011) and Brown and Green (2016) do not provide insight into how typography may impact dyslexic readers. Insight into this matter has been developed through the work of Robert Hillier. Hillier (2012) conducted research into the legibility of different typefaces for dyslexic readers to understand if certain typefaces were easier to read and preferred by adults with dyslexia. Hillier (2012) focused on two theories of word legibility; the *word shape model*, which suggests that "words are recognized as whole units according to the outlines made by their shape" (p. 186), and *parallel letter recognition*, which "states that the reader identifies all the letters within a word simultaneously" (p. 187). After testing the strengths and limitations of these two concepts, Hillier (2012) designed a new series of typefaces for adults with dyslexia called Sylexiad.

Using two groups of adult readers, one dyslexic and the other non-dyslexic, Hillier (2012) conducted a study to compare his two Sylexiad fonts (serif and sans-serif) to the very common Arial, Sassoon Primary, and Times New Roman. Participants compared and rated fonts based on their legibility and readability. The study found that "for the majority of non-dyslexic readers, their typographic preferences were for serif-style fonts, lowercase forms, large x-heights, medium letter weights, variable strokes, normal inter-word spacing and familiarity of form" (p. 191). These findings appear to be consistent with Brown and Green's (2016) description regarding use of typefaces. In contrast, Hillier (2012) found that "the majority of dyslexic readers, however, preferred handwritten-style fonts, uppercase (Sylexiad) forms rather than lowercase forms, long

ascenders and descenders, light letter weights, uniform strokes, perpendicular design, generous inter-word spacing and, as with the non-dyslexic readers, familiarity of form" (p. 191). As Hillier (2012) acknowledges, these findings suggest that many of the dominant principles of typographic legibility are not consistent with the preferences of individuals with dyslexia. Hillier (2012) suggests that this inconsistency is likely due to the fact that the principles of legibility "were established by non-dyslexic typographers for a non-dyslexic audience" (p. 191).

The findings regarding the use of Sylexiad fonts for adults with dyslexia raise intriguing considerations for the design of instructional materials. If an instructional designer can utilize a typeface like Sylexiad when constructing an instructional material, perhaps the accessibility and readability of the document could be improved to meet the needs of adults with dyslexia. It is worth noting that while Hillier's (2012) findings demonstrate a typographic preference, the study does not reflect whether the use of Sylexiad improved reading accuracy, speed, or comprehension.

Many of Hillier's findings seem to ring true when put into practice. Ismail and Jaafar (2015) conducted a study that identified the practices teachers of dyslexic students found effective to improve readability of materials, in particular, digital media. Overall, Ismail and Jaafar's (2015) study found that when creating materials for dyslexic students, "the right choice of font type, appropriate size for text, proper spacing between line of text, highlighting text and suitable colours for the text and the background improve the readability" (p. 5). These findings are consistent with Hillier's (2012) findings, but Ismail and Jaafar also describe that bold typeface, extra-large letter spacing, and the ability for learners to change font type on their devices all improve readability.

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Rello and Baeza-Yates (2015) conducted a similar, though more robust version of Ismail and Jaafar's (2015) study that focused on eye-tracking and reading speed of dyslexic and non-dyslexic readers who interacted with digital media. Though this study employed more sophisticated technology, it resulted in many of the same conclusions other studies found. Rello and Baeza-Yates summarize their findings by presenting a series of suggestions for text presentation:

- Font size: 18, 22 and 26 points (17-Inch screen).
- Character spacing: +7 or +14 %.
- Font/background colors: black font on white background, or white font on black background.
- Typeface: Arial, Courier, CMU, Helvetica or Verdana.
- Font style: Roman and sans-serif. (2017, p. 45).

These suggestions are consistent with other studies. However, Rello and Baeza-Yates (2017) raise an important caution of relying on text presentation alone to meet the needs of individuals with dyslexia, reiterating that because "dyslexia is a learning disability that affects language, it can be assumed that accessibility can be approached not only in terms of text presentation, but also in terms of text content" (p. 45). This suggests that in addition to instructional design considerations of typography, attention needs to be paid to writing style and form in order to meet the needs of individuals with dyslexia.

2.8.2 Instructional Design for Reading Comprehension

As earlier described, reading comprehension is a primary impairment in adults with dyslexia. The aim then becomes to address how instructional materials can be designed in such a way that they support the reading comprehension deficiencies common in adults with dyslexia.

In addition to assessing the context of reading for adults with dyslexia, Everatt and Fidler (2012) identify strategies to enable success in reading comprehension. According to Everatt and Fidler (2012), "many people learn to comprehend incidentally, probably through appropriate practice, and it may be that a consideration of self-acquired strategies can inform support methods" (p. 94). However, this description tends to be untrue for individuals with dyslexia. To better understand how reading comprehension could be improved for those who did not learn it incidentally, Everatt and Fidler (2012) conducted a study with five groups of dyslexic university students. In this study, each group utilized a different strategy to read a passage of text. Two of these strategies focused on decoding: text-to-speech software, and having someone teach keywords to the students in advance; and the other three strategies focused on comprehension skills: producing a mind map about the text, reading the text and highlighting/making notes simultaneously, and a pre-reading task where the headings and first sentences in the first paragraph of the text were read aloud in advance (Everatt & Fidler, 2012).

The results of Everatt and Fidler's (2012) study found that the most effective strategies were those that facilitated metacognition while reading: the three strategies that focused on comprehension. Everatt and Fidler (2012) explain this, stating that "the key [to comprehension] is to engage actively with the text via metacognitive strategies. Writing summaries whilst reading, the use of highlighter pens to identify relevant information, and using mind maps to structure and organize information all seem to aid comprehension" (p. 98).

While the findings from Everatt and Fidler (2012) are clearly relevant for an intervention or skill development instruction, they are also applicable for the design of

instructional materials in a workplace setting. For example, when creating an instructional material, an instructional designer could incorporate opportunities and direction for the learner to engage in metacognitive practices, such as writing a summary or putting the information into some kind of graphic organizer. The literature suggests that focusing on facilitating metacognition in instructional materials would make them more accessible and palatable for adults with dyslexia.

2.8.3 eLearning Course Design and Dyslexia

Instructional design of a course is often focused on delivering content effectively, while maintaining levels of learner engagement. This focus is arguably more important when designing eLearning courses, since learners engage with content on a self-directed basis. As earlier described, well designed eLearning courses combine many elements, including user navigation, multimedia, learner control, and integrated software functionality (Draffan, 2012). Though these elements tend to be standard in eLearning courses, consideration of them can have an influence on how dyslexic learners interact with the course material.

Dziorny's (2012) doctoral research included a study of the relationship between eLearning course design and dyslexic university students' experiences with the eLearning. Dziorny (2012) made several conclusions regarding eLearning course design, including providing multiple formats for delivering course materials (audio, video, etc.), having open course navigation that allowed learners to move through the course in any order, and incorporation of interactive and clickable elements on screen. The multiple formats for delivering course materials was perhaps Dziorny's most significant

conclusion, as the dyslexic participants "confirmed that the use of multiple modalities to deliver course materials enhanced their understanding of the materials more than simply reading text on the topic" (p. 195).

2.8.4 Universal Design for Learning

Universal Design for Learning (UDL) is a model for instruction that has become popular in primary and secondary education, and focuses on improving accessibility and inclusion. The roots of UDL started with the design of physical environments, such as ramps in public spaces, which allow people of all abilities to enter and exit spaces without impediment (Nelson, 2014). Seeing the benefit of designing physical spaces to be accessible by all, researchers applied the concept to education. The spirit of UDL is to ensure all learners, regardless of ability, have the opportunity to learn and develop their skills (Gordon et al., 2010). To meet this goal, UDL prescribes that learning accommodations and considerations be made for the learners who need them, and in turn, all other learners will benefit from the accommodations and considerations, much in the same way that closed captioning on television is designed for people who are hard of hearing, but is also beneficial to English language learners or people watching television in a waiting room (Gordon, David, et al., 2010). Gordon et al. describe this concept as "essential for some, good for all" (2010, p. 85).

The fundamental driving principles of UDL are to provide learners with multiple means of engagement, multiple means of representation, and multiple means of action and expression (Nelson, 2014). Multiple means of engagement refers to providing learners with options for self-regulation, sustaining effort, and recruiting interest.

Multiple means of engagement can be accomplished by providing learners the

opportunity to choose about what they learn about, providing options to vary difficulty

level of a task, and providing opportunities for self-assessment (Nelson, 2014). Multiple

means of representation refers to the delivery method of instructional content, and is

focused on providing learners with "different experiences to receive the information"

(Nelson, 2014, p. 61). Providing multiple means of representation may include

incorporating various types of media, such as text, audio, or video that learners can

receive information from. Multiple means of action and expression is associated with the

ways in which learners are assessed. According to UDL, learners should have choice

regarding the ways in which they can demonstrate their knowledge and have their

learning assessed. This may involve providing learners the option to present ideas

verbally, textually, or through a creative media source, such as a graph or diagram

(Nelson, 2014).

Though UDL is primarily focused on primary and secondary education, it is

conceivable that the tenets of the model may be applied to adult learning and workplace

training settings. Instructional designers could likely incorporate UDL principles into

their repertoire by including multiple means of engagement, representation, and

expression and action into a workplace training event. The implications of doing this

could potentially make training more accessible for all individuals engaging in workplace

training, including adults with dyslexia. However, literature that overtly relates to

incorporating principles of UDL to a workplace training setting could not be found.

2.9 Conclusion

The literature reflects that there is significant research and consideration paid to the fields of adult dyslexia, and instructional design for workplace training. However, the literature demonstrates that these fields are studied independently, without overt consideration of the other. There are various theories and contentions within these fields, however, there are also core concepts that are agreed upon.

In general, dyslexia is defined as a reading disorder that prevents individuals from engaging in a complete reading process (Shaywitz 2003). However, most literature has historically been focused on dyslexia in children and adolescents. The impact of adult dyslexia is primarily felt in the workplace, wherein reading rate, poor spelling, inefficient decoding, comprehension impairments, time management, organization, and many other executive functions may impede work performance (Everatt & Fidler, 2012; McLoughlin & Leather, 2013). The primary theories of dyslexia impairment include phonological processing impairment (Das, 2009; Nicoloson & Fawcett, 2008; Szenkovits et al., 2016), the Double Deficit Hypothesis (Wolf & Bowers, 1999; Torppa et al., 2012), implicit learning impairment (Kahta and Schiff, 2016), and memory impairment (Smith-Spark, Ziecik, & Sterling, 2016).

Instructional design is the discipline of applying tenets of education psychology and behaviour to develop training programs across industries. Instructional designers typically adhere to a model to design training. The most popular instructional design models, especially for workplace training, include the ADDIE model (Brown & Green, 2016), the Successive Approximation Model (Allen, 2012), and the Dick & Carey Instructional Systems Design Model (Dick & Carey, 2009). Instructional design is often

applied to workplace training contexts, and may be used to develop eLearning (Dobrovolny, 2006), mLearning (Benvin, 2016), or instructor-led training (Handshaw, 2014, Price & Shaw, 2000; Pike, 2016).

Research on instructional design for adults with dyslexia exists, but is limited and primarily focuses on the designing of instructional materials. When the focus is on developing instructional materials for adults with dyslexia, there are several practices that may improve the accessibility of the material. Incorporating Sylexiad typefaces (Hillier, 2012), and other typographical strategies (Ismail & Jaafar, 2015; Rello & Baeza-Yates, 2017) into an instructional material may improve the readability for adults with dyslexia. In eLearning environments, focusing on aspects such as presentation of information, navigation, and text colour (Draffan, 2012; Dziorny, 2012) may improve the learning experience for adults with dyslexia. Integrating opportunities for metacognition into instructional materials may improve a dyslexic adult's comprehension of an instructional material (Everatt & Fidler, 2012). Lastly, Universal Design for Learning (UDL) (Gordon et al 2010, Nelson 2014) is a model that promotes learner accessibility, and has the potential to be applied to a workplace training context, but currently there is a lack of research that focuses on doing so.

There is extensive research in the areas of adult dyslexia and instructional design for workplace training. However, the literature indicates that while there are evidenced-based approaches to designing instruction for adults with dyslexia, these practices are not integrated into the major instructional design models, and tend to only be applied to the public education realm, not workplace training. Furthermore, while all of the major instructional design models advocate for a learner analysis phase, none make

considerations for dyslexia. Problematically, the learner analysis phase often includes gathering demographic information such as education level as an indicator of reading proficiency, which may in fact disparage adults with dyslexia in the workplace, as they have often been able to cope with their disorder and achieve higher levels of education (Logan, 2009).

The lack of explicit discussion regarding dyslexia in instructional design models is not a fault of the models. It is unrealistic to expect a model to capture the myriad of adult learning differences. It is also unrealistic and impractical to attempt to integrate tenets of dyslexia research into popular instructional design models, as these models are intentionally descriptive, not prescriptive. However, a realistic and practical approach to meeting the needs of adults with dyslexia would be to develop a supplement to an instructional design model. This supplement may be a set of guidelines or standards that address the instructional design considerations for dyslexia, which can be used in conjunction with any instructional design model. A supplement such as this would bridge the described gaps between instructional design and adult dyslexia.

Chapter 3: Methodology

In this chapter, I describe the methodology I used to answer my research question: how can instructional materials for workplace training be developed to meet the needs of adults with dyslexia? This chapter includes a rationale for taking a qualitative approach to the research, as well as descriptions and rationales for the three methods used in this research: document analysis, design-based research, and participant study. Ethical considerations of the study are also discussed.

3.1. Qualitative Research

The research design for this study was qualitative in nature, and employed the methodologies of document analysis, design-based research, and participant study. Qualitative research tends to focus on the study of social life and human experience, which may include documentation of cultural observations, new insights and understandings about individual and social complexity, evaluation of the effectiveness of programs or policies, and/or the critique of existing social orders (Saldaña, 2011). Qualitative research differs from quantitative research as qualitative research is much more interpretive and subjective, whereas quantitative research is more positivist and objective (Cranton & Merriam, 2015). Quantitative research typically involves experimental designs to understand cause-and-effect relationships, and in general, is a much more prescriptive approach to research. In contrast, qualitative research is a more eclectic and holistic method of understanding, and places a higher emphasis on the nuances of human interaction and experience (Saldaña, 2011).

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Qualitative research was the appropriate method to answer the research question: how can instructional materials for workplace training be developed to meet the needs of adults with dyslexia? This decision was made based on the need for me to interpret the relationship between common instructional design standards and practices, and how those standards and practices can impact adults with dyslexia in the workplace. To fully understand this relationship, I needed to interpret written artifacts (documentation), act as a "human instrument" (Saldaña, 2011, p. 30) in the study by creating a potential solution to a perceived problem through design-based research, and gain an understanding of the lived experiences, perspectives, and preferences of adults with dyslexia through a participant study. Each of these activities aligned with qualitative research principles, and would be difficult to achieve through a quantitative approach. Though there are limitations of qualitative research in terms of generalizability and objectivity, due to the interpretive and social nature of the research question, qualitative research was the appropriate approach.

3.2 Document Analysis

Document analysis, sometimes referred to more broadly as content analysis, is a qualitative research method that is focused on scrutinizing and synthesizing written records. These written records can take many forms such as newsletters, newspaper clippings, financial records, or corporate training standards documentation. Patton (2004) describes the essence of document analysis as a "sense making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings" (p. 453). The identification of consistencies and meanings may be accomplished by searching

documents for recurring themes and words, or through the comparison of documents (Cranton & Merriam 2015). At the crux of document analysis is the desire to recognize patterns within and between documents, and interpret those patterns.

The value of focusing on document analysis is due to the meaning documents carry. Scott (1990) posits that meaning is derived from document analysis as "the literal and the interpretative" (p. 28). The literal meaning of a document refers to the surface-level comprehension of the language and content of the document. The interpretive meaning is the reader's interpretation and understanding of the context and implications of the literal meaning. For this research design, the literal meaning of the instructional design documentation was analyzed, but more importantly, the literal meaning was interpreted based on their implications in regards to adults with dyslexia. The goal of interpreting the literal meaning was to gain "information about some reality external to [the documentation]" (Ten 2004, p. 90). But perhaps more importantly, the analysis of the literal meaning of the documentation shed light on knowledge gaps within the documentation, in particular, gaps regarding instructional design for adults with dyslexia.

Document analysis was an appropriate method due to corporate practices of standardization. Standardization has significant influence in corporate settings, as de Vries (2006) describes: "company standardization can be regarded as a form of knowledge management, where tacit knowledge is transformed into explicit knowledge" (p. 76). This suggests that standardization of instructional design documentation leads to instructional design practices being adopted, practiced, and normalized as explicit knowledge. Due to the prevalence and impact of standardization, document analysis was relevant and necessary for this research design.

The document analysis phase of this research focused on examining three separate instructional design guidelines created by three separate organizations' training departments. The term *organization* is used broadly so as to apply to both public and private entities. Some documents focused specifically on eLearning development, while others focused on training development as a whole, including eLearning and instructor-led training. Though the focus of the standards differs, the underlying instructional design philosophies described in the documents were applicable to any training delivery format; thus, there is no apparent limitation from analyzing documents with different focuses. For this research design, documents were selected based on the greatest number of employees represented by the document, that is, the overall size of the organization. The rationale for this selection criterion was that larger organizations have larger training and development teams that implement the practices, and a greater number of employees receiving training in accordance with those practices. Thus, the greatest impact would be made by adjusting documents of larger organizations.

The documents analyzed are publicly available; however, the organizations represented by these documents were not identified. Instead, the pseudonyms Organization X, Organization Y, and Organization Z were used. The use of pseudonyms was intended to maintain the anonymity of the organizations whose standards were analyzed. However, a brief and generic description of the organizations — the work they do, their location, and number of employees represented — was provided.

The documents were analyzed based on their prescription of instructional design practices, and how these do, or do not meet the unique needs of adults with dyslexia. The term *prescription* refers to an adoption or incorporation of the tenets of major

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instructional design models identified in the literature review, such as the ADDIE model, the Successive Approximation Model (Allen 2012), or the Dick & Carey Model (Dick & Carey 2009). The determination of the ways in which the documents meet the needs of adults with dyslexia was made by comparing the standards described to the best practices identified in the literature (Everatt & Fidler, 2012; Dziorny, 2012; Ismail & Jaafar, 2015; Rello & Baeza-Yates, 2017; etc.) Though the analysis was of a critical nature, it was not intended to condemn or disparage the corporation that created the document, but instead to highlight gaps between bodies of knowledge — instructional design and dyslexia. Though the documents covered guidelines regarding technical elements of training development such as integration with learning management systems, eLearning output standards, SCORM compliance, etc., the analysis only focused on elements relevant to accessibility of the training to adults with dyslexia, such as text presentation standards, multimedia elements, reading comprehension strategies, etc. The rationale for focusing on certain areas of the documents and disregarding others was that the literature did not identify that technical factors such as learning management systems, eLearning output standards, or SCORM compliance have an appreciable impact on meeting the needs of adults with dyslexia. However, the literature did identify in many instances that factors such as text presentation standards, multimedia elements, and reading comprehension strategies have an impact on adults with dyslexia.

3.3 Design-Based Research

This study attempted to answer the question of how to design workplace training materials to meet the needs of adults with dyslexia. As the design of materials is at the

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crux of the research, the study utilized design-based research methodology. Design-based research is an iterative process that is concerned with the "messiness of real-word practice" (Barab & Squire, 2004, p. 3) and attempts to gain understanding and insight into an issue through the practical design of a solution to a perceived issue (Van den Akker, et al., 2006). The intent of the design-based research component of this study was to make a practical assessment of the applicability of melding the fields of adult dyslexia and instructional design. The design-based research component of the study focused on designing a total of three materials: one instructional design standards document, one eLearning course built using the new standards document, and one eLearning course built using the standards of Organization X, which is used for comparative and participant testing purposes.

The initial phase of design-based research focused on using the findings from the document analysis to create a new instructional design best practices and guidelines for workplace training document that integrates knowledge of designing instructional materials to meet the needs of adults with dyslexia. The value in the creation of new documentation was rooted in the pragmatic value of design-based research itself, wherein the research refines practice (Wang & Hannafin, 2005). The new document attempted to bridge the gaps between what is known about dyslexia, what is known about instructional design, and what is practiced in workplace training.

The second phase of design-based research focused on the training material design, which consisted of the creation of two short eLearning courses built in the Articulate Storyline 360 (latest version) platform. This platform was chosen as it is one of the most popular eLearning programs used in training and development, with over 78,000

organizations in 151 countries using the software (Articulate, 2017). The eLearning courses focused on identical content—office ergonomics—and were developed from the resources created by the Worker's Compensation Board of Alberta (2007). The rationale for using office ergonomics as a topic was that ergonomics applies to more industries and work settings than a more industry and work-specific topic such as confined space awareness, or fall protection.

Though the content of the courses was identical, they were designed and developed differently. The design and development of Course 1 aligned with the standards set out by Organization X. Organization X's standard was used as it was the standard that focused specifically on eLearning, and had the most robust details, such as media, text layout, and text presentation standards, unlike Organization Y and Organization Z. The intention of Course 1 was to provide a tangible representation of the end product that arises from the application of an existing corporate training instructional design standards document.

Course 2 was designed and developed in accordance with the standards outlined in the new instructional design standards document created for this study. Course 2 represents the culmination of the design-based research that guided the study. The intention of Course 2 was to reflect the impact that small changes to standards can have on the creation of a training material. In turn, these impacts reflected in Course 2 were intended to better meet the needs of adults with dyslexia in the workplace. The two phases of design-based research were grounded in the understanding that design-research is not simply an approach, but "a series of approaches, with the intent of producing new

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theories, artifacts, and practices that account for and potentially impact learning" (Barab & Squire 2004, p. 2).

3.4 Participant Study

Due to this study's focus on identifying how to design workplace training materials to meet the needs of adults with dyslexia, participants were required to be adults with dyslexia who were of working age — only three participants were identified to have met the criteria and agreed to participate in the study. The participants were identified through postings made on adult dyslexia support groups, as well as a posting on an internal corporate classifieds site. The limited scope and sample size of the study did not allow for the analysis of gender, age, or cultural variations, and as such, participants remained anonymous, and are identified as Participant A, Participant B, and Participant C, with gender-neutral pronouns. The small number of participants is a noted limitation of this study. It was not the expectation of this study that the data collected from the participants be extrapolated to apply to a larger population. However, when combining the participant data with the design-based research components of the study, valuable insights and considerations can be made.

The participant study consisted of three phases — the eLearning review, the survey, and the interview. For the eLearning review, participants were provided access to a website in which eLearning Course 1 and eLearning Course 2 were embedded. Once participants completed the eLearning review, participants were directed to an online survey that was created to gather feedback about their perceptions, experiences, and opinions of the eLearning. Following the survey, participants engaged in an interview

with myself. The interview focused on collecting background information, perceptions of workplace training, and insights into dyslexia supports and coping strategies, and opinions of the eLearning courses. The benefit of combining a survey with an interview is to use triangulation in order to have a more robust representation of the participant experience with the material, and to provide an opportunity for more depth of discussion that cannot be captured in a survey alone.

The function of the eLearning review was to have participants interact with the materials developed during the design-based research phase in as authentic a manner as possible. The eLearning review was designed to have participants review two eLearning modules with identical content, but formatted and presented differently. The intent of this review was to gain insight into preferences and experiences of adults with dyslexia in order to better understand how to design workplace training materials to meet the needs of adults with dyslexia. The decision to have participants review the eLearning prior to engaging in a survey or interview was made in an attempt to prevent participants from reviewing the eLearning with any kind of expectation or bias that may result from discussing dyslexia, training preferences, and reading strategies in advance of the review.

The survey portion of the study occurred immediately following the eLearning review and was designed to gather broad information about participants' experiences with and opinions of the eLearning. The decision to have the survey directly follow the eLearning review was made so that the content, layout, and features of the eLearning courses would be fresh in participants' minds. Responses from the survey were used in conjunction with interview responses to have a more comprehensive understanding of

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participant experiences and preferences by comparing structured and semi-structured questions and responses.

The interview was used to gain insight into participants' experiences and preferences, both of the eLearning courses, and of workplace training and reading in general. The interview was valuable as it allowed participants to express their opinions in greater detail than they could, or perhaps felt they could in a survey or survey comments. In addition to biographical information such as employment status, participants provided details about their own experiences with dyslexia, reading, education, and workplace training, and also explained their opinions of the eLearning courses. The decision to conclude the participant study with the interview was made so that participants had the opportunity to reflect and discuss after having already reviewed the eLearning, and after already beginning to make considerations of their preferences during the survey.

3.5 Ethical Considerations

Due to the sensitive nature of identifying and testing participants with a learning disability, several ethical considerations informed my research. In addition to the overriding principle of 'do no harm', I emphasized the importance of treating my research participants with dignity and respect and ensured that their anonymity and confidentiality were maintained. I made significant consideration of the use of language within the surveys and interviews to ensure participants felt respected. This consideration included using person-first language when discussing disabilities, and phrasing questions in an open-ended manner so participants could exercise control over the data they wished to report (Stalker, 1998).

Informed written consent was obtained from participants prior to the study. Due to the inherent reading burden of the informed consent document, I had an in-depth discussion about the document with each participant prior to engaging in the study to provide explanations, time to process information, and time to inspect the document further. This comprehensive discussion was done to ensure that any reading impairments did not inhibit participants' ability to provide informed consent, while also establishing rapport and a "respectful relationship" (Nind, 2008, p. 8) with participants from the onset of the study. Participants' anonymity was maintained through use of gender-neutral pseudonyms to identify them in the thesis. Throughout the entirety of the study, transparency and honesty was upheld, which included me offering participants a copy of transcripts, notes, and a final copy of the thesis once approved by the University of New Brunswick. Lastly, it is my assertion that in no way was bias or desired outcomes of the research communicated or implied to participants.

Chapter 4: Document Analysis

In this chapter, I describe the document analysis process, including in depth analysis of the three organizations' documents, and a discussion of patterns and themes that emerged. The intent of this research was to identify ways in which instructional materials for workplace training can be developed to meet the needs of adults with dyslexia. The document analysis attempted to aid in answering the research question by interpreting the literal meaning of the documents to gain information about a "reality external to [the documents]" (Ten, 2004, p. 90), that is, information about how training materials are developed in the workplace. That information was invaluable to answering the research question, as it provided insight into current standards and practices of designing instructional materials in the workplace, which was necessary to establish a baseline for the research. Furthermore, the document analysis ensured that changes to standards and practices that arose from the research were novel and applicable to what is currently being standardized and practiced.

4.1 Organization X

Organization X is an American, state-level government department of transportation. Though this research study is being conducted in Canada, the examination of an American company is appropriate as the major instructional design models (ADDIE, SAM, Dick & Carey) were created in the United States, and are adopted throughout industries in Canada and the United States. In fact, the *Institute for Performance and Learning* (the Canadian authority for training and development)

provides training and resources based on these instructional design models. Thus, there is

no discernible difference between the training development and instructional design

contexts in the United States and Canada, as both countries recognize the same theories

and practices. Organization X employees roughly 6000 individuals in the state, and has a

robust training and development operation to meet their training needs.

Organization X's training and development department created and published a

handbook that prescribes their standards for the instructional design of eLearning within

their organization. The handbook is comprehensive and effectively provides

unambiguous standards for all phases of instructional design and eLearning development.

The guideline sections in Organization X's handbook relevant to this study are

Instructional Design Standards, which include elements such as learner interactivity,

content presentation, and screen design, and Media Standards, which covers elements

such as typography, graphics, and audio-visuals.

Instructional Design Standards

Organization X adheres to the traditional ADDIE model of instructional design,

and emphatically advocates for the application of adult learning principles. For

Organization X, the Analysis phase of ADDIE is comprised of a series of questions:

- What is the performance gap?
- What are the Human Performance & Training factors behind this gap?
- Why is eLearning the right approach?
- What are the learning objectives?
- What is a suitable design strategy to achieve those objectives?
- What technical and schedule risks do the objectives and design strategy present?
- How will we and the sponsor be assured the objectives are achieved, both at the individual level and organizational level?

- What follow-on support should be provided in order for the training to 'stick?'

Organization X's Analysis phase does not make explicit reference to considerations of learner abilities or competencies, but is instead focused on needs analysis at an organizational level.

Organization X uses its handbook to provide an in-depth description of instructional design strategies to employ during the design phase. The strategies described include a significant emphasis on interactivity, opportunities for self-assessment and feedback, and intuitive sequencing of content. All of the strategies described are grounded in the philosophy of increasing learner engagement, applying adult learning principles, and fundamentally reflect sound, evidence-based best practices in eLearning and instructional design that are aligned with many recommendations identified in the literature regarding instructional design, including Price and Shaw (2000), Handshaw (2014), and Pike (2016). However, the strategies do not reflect an emphasis on improving reading comprehension, or meeting the needs of learners with diverse abilities or competencies.

The instructional design guidelines articulated by Organization X are valid; however, incorporating considerations and practices to meet the needs of dyslexic learners could bolster them. To begin, it is my assertion that the analysis phase of the design should focus on a learner analysis that describes the importance of considering the reading abilities of learners taking the training. The rationale for this assertion is grounded in the principles of the Universal Design for Learning model (Gordon, Meyer, & Rose, 2010), or UDL. To this end, including a focus on a learner analysis that makes

considerations for reading abilities will enable instructional designers to make decisions in the design and development phases that focus on improving readability. These types of considerations and decisions have the potential to improve the learning experience for employees who struggle with reading, and may either improve or leave the experience unchanged for those with more advanced reading skills. Furthermore, details in Organization X's document regarding the structuring of content presentation to improve reading comprehension, for example, incorporating previews or summaries of text passages, would improve the standard. Standardization of reading comprehension aids would align with the principles of UDL as previews or summaries of text are an accommodation that is intended to improve comprehension (Everatt & Fidler ,2012), and would be potentially beneficial to both dyslexic and non-dyslexic readers.

Media Standards

Media development is a component of the development phase of the ADDIE model. The media developed during this phase is used to enhance and deliver training, and may include video, audio, graphics, or PowerPoint presentations. Organization X succinctly outlines guidelines for the development of media to be used in their training. The standards for media development are focused on the elements of screen design (for eLearning), text, graphics, animation, audio, and video. The handbook articulates standards from both a technical, programming perspective, as well as a functional, user-experience perspective.

For screen design of an eLearning course, Organization X lays out several specific standards. Organization X suggests that screen size/resolution should be 780x440

pixels in order to prevent users needing to scroll to view a full screen display. The guidelines also make recommendations regarding consistency and use of screen space, such as using specific locations for the presentation of instructions or prompts, and providing recurring information in consistent locations. While none of the standards for screen design explicitly reference readability, Organization X does suggest that generous white space be used to separate blocks of text, which it can be assumed is related to legibility of text.

Organization X's standards for text are categorized into text layout, and text appearance. For text layout, Organization X suggests that instructional designers should:

- Present instructional information in a top down, left to right format.
- Limit the amount of text on each page; use a PDF format or link to an external document to display long text segments.
- Use short lines of 40 – 60 characters; maximum of 60 characters per line.
- Design text layout in short segments or phrases.
- Use bullets, numbered lists, tables and charts to break up lengthy sentences.
- If bulleted text wraps to a second line, left-align both lines on the text (not the bullet). Do not indent paragraphs.
- Left justify text. Do not right justify.

These standards for text layout are not qualified with any connection to instructional impact. Instead, these text layout standards reflect standardization and consistency for corporate branding purposes. This is, however, a limitation of the handbook's focus, since text layout can have a significant impact on a dyslexic person's ability to identify and decode words (Rello & Baeza-Yates, 2017). While many of the text layout standards would apply to designing instruction for dyslexic readers, there is an absence of a focus on accessibility.

Organization X's text appearance standards primarily focus on consistency of

style and formatting. However, unlike with text layout, there is reference to the impact on learner readability in the text appearance standards. Organization X suggests that instructional designers should:

- Use consistent color for text and graphics throughout a course.
- Use Arial and Verdana sans serif fonts
- Use consistent font style and size throughout the course.
- Break up blocks of text to make it easier for the learner to scan the content.
- Underline hyperlinks only; glossary words should be hyperlinks.
- Use bold font to emphasize a word or phrase.
- AVOID USING ALL CAPITAL LETTERS [sic] or underlining to emphasize words or phrases
- Use standard Web conventions for hyperlinks
- Do not use blinking text or repetitive animation.

Organization X does quite well in capturing many of the text appearance conventions that the literature suggests can support dyslexic readers, such incorporating Arial and Verdana sans serif fonts, and breaking blocks of text into smaller sections. However, there is room for more specificity, such as standardization of font size, and font colour on background colour. Furthermore, specificity regarding character spacing could also be incorporated into Organization X's guidelines, as Rello & Baeza-Yates (2017) described that increasing character spacing up to 14% had positive impacts on readability for individuals with dyslexia.

Organization X's *Media Standards* are rounded out by graphics, animations, audio, and video. These sections focus on standards related to functionality, appearance, such as avoiding graphics that may become out-dated in a short time, using an MP3 audio file format, and including replay buttons on videos. Interestingly, there is a reference to accessibility through the graphics standards, which suggests that graphics use colours that accommodate colour-blind learners, however, the specific colours that meet this end are

not described. An opportunity for improvement in these sections could include language that expresses the effectiveness of employing multiple means of content delivery (Dziorny, 2012). Furthermore, descriptions in the handbook regarding how media and graphical elements, such as flow charts or infographics, can increase text accessibility for individuals with dyslexia (British Dyslexia Association, 2016) would benefit Organization X's standardization guidelines.

Organization X has developed a comprehensive handbook of guidelines that outlines instructional design standards for eLearning development. The handbook is robust and incorporates standards that align with industry best practices and are backed by research. For example, Organization X identifies specific standards for conducting a needs analysis, developing media for training, and how to format and present text. These standards are written coherently, and could likely be easily adhered to by an instructional designer. However, the underlying deficiency of Organization X's handbook appears to be a lack of emphasis on accessibility. For example, the analysis phase does not include a learner analysis component, which would be an essential analysis to ensure the training is accessible to all learners. In addition, an emphasis on formatting and presenting text in a way that improved readability and comprehension is lacking in Organization X's document. An emphasis on accessibility would bridge some of the described gaps found in the handbook, and would guide instructional designers employed by Organization X to make decisions that can have a positive impact on dyslexic employees' ability to engage with the training in a meaningful way.

4.2 Organization Y

Organization Y is an American, state-level Department of Human Services. The Organization Y workforce is comprised of approximately 9800 employees. In order to meet the training needs of this robust workforce, Organization Y has developed standards for the full cycle of training development initiatives, including classroom-based training and eLearning. The standards are intended for Organization Y's training staff, who are identified as 20–25 training and development specialists, and roughly 200 staff members who deliver training as part of their jobs.

Organization Y's training development standards document adheres to, and is structured according to the ADDIE model, however, Organization Y opts to use the term *Assessment* in lieu of Analysis. For the purposes of this study, the Assessment (Analysis), Design, and Development phases described by Organization Y will be the primary focus, as these sections describe specific standards that have implications on the design of instructional materials.

In addition to the ADDIE model, Organization Y divides general training standards into three categories: Pre-Design (Assessment/Analysis), Design, and Development/Presentation, which is simply a compact version of ADDIE. At the Pre-Design (Assessment/Analysis) stage, Organization Y articulates that it is standard to assess whether training is appropriate, and if so, identify which training method is best suited to meet the training need, and to involve customers, managers, subject matter experts and partners in planning the instructional design. Organization Y's Design standards are to incorporate adult learning principles, corporate values, and concepts of

diversity and cultural competence into objectives, lesson plans, training approaches and

evaluations. The Development/Presentation standards outlined by Organization Y are

described in terms of what their corporate trainers will do. Organization Y trainers will

create materials that are relevant, legible, at an appropriate reading level, conform to

corporate branding guidelines. Furthermore, training materials will include concepts of

diversity and cultural competence.

The high-level instructional design standards prescribed by Organization Y

provide a clear framework for training developers and instructional designers to operate

within, and in many ways, a highly valuable resource. The handbook goes on to describe

each stage of the ADDIE model and provide templates and considerations for each stage.

For example, a comprehensive flowchart is provided that focuses on decision making

regarding identifying a need for training. Furthermore, checklists for the delivery of

training are provided to ensure the standards are understood and implemented by trainers.

In its totality, the standards document developed by Organization Y is highly effective,

relevant, and functional for the training and development staff. However, when

examining the document through the lens of creating training materials for dyslexic

professionals, there are gaps in the standards developed by Organization Y.

During the Assessment (Analysis) phase of instructional design, Organization Y

outlines the standard that instructional designers assess learner characteristics. To assess

learner characteristics, Organization Y has instructional designers ask themselves a series

of questions:

- How many people are taking the training?
- What is their educational level?
- What cultural characteristics will be present?

- What attitudes and biases towards work and training could be present?
- What current knowledge, skills, and abilities in the subject will they bring?
- How will I have them demonstrate their learning — so I will know the gap is closed?

While the answers to these questions provide valuable information for the design, development, and implementation of a training program, the questions lack a focus on reading ability. Granted, there is a question focused on knowledge, skills, and abilities, however, it is qualified as being related to the training content, as opposed to learning ability in general. A question regarding the reading abilities of learners taking the training would be an effective improvement to this section, as it would help structure decision making in the Design, Development, and Implementation phases, especially during the creation of instructional materials, such as limiting reliance on text, supplementing text-heavy areas with mind maps or summaries, and making typographical considerations.

The Design phase of Organization Y's document provides exceptional examples of training plans and important considerations. However, the Design phase is organized as a checklist and series of tasks, with little discussion of instructional design approaches or the implication of elements such as course navigation or content sequencing. It could very well be the case that considerations such as navigation and sequencing are not mentioned due to the focus of the document being leaned towards instructor-led training, which limits opportunities for navigation or content sequencing options. However, the document does claim to be applicable to eLearning as well, so it could be improved to meet the needs of dyslexic employees by providing considerations regarding training design that could be used, if possible. For example, an update could include discussion of having open course navigation that allows learners to move through the course in any

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order, and incorporation of interactive and clickable elements on screen, as these have proven to be effective for adults with dyslexia.

Organization Y's Development phase describes standards regarding the development of instructional materials. One standard that, on the surface, appears very promising to meet the needs of adults with dyslexia is to produce materials that are relevant, legible, and of a reading level appropriate to the intended audience. However, moving further into the resource to gather information about appropriate reading level leads to a single sentence that simply reiterates the sentiment: *the reading level should be appropriate to the audience.* No other mention of reading ability is made throughout the 57-page document. It is unrealistic to expect instructional designers to have any kind of authentic assessment of a learner's reading ability, so this standard is likely the child of the learner characteristics assessment, wherein the education level of learners is assessed. However, as previously noted, equating education level to reading ability is problematic, as adults with dyslexia have often been able to cope with their disorder and achieve higher levels of education (Logan, 2009), meaning that relying on education level alone as an indicator of reading ability may lead to misguided assumptions being made, and in turn, dyslexic learners' needs being unmet in training environments. To improve this standard, measures, such as a grade level, should be identified and standardized as means to make text accessible to the greatest number of learners, which would ensure both dyslexic and non-dyslexic readers have an increased chance of grasping the content, and also aligns with principles of the Universal Design for Learning (Gordon, Meyer, & Rose, 2010). To elevate this standard, examples that demonstrate how the same message

can be delivered in different ways to meet various levels of reading ability would bolster Organization Y's resource.

Another limitation of Organization Y's standards document lies again within the standard that instructional materials need to be relevant, legible, and at a reading level appropriate to the intended audience. The term "legible" is assumed to relate to text presentation and readability. However, Organization Y does not go any further than this statement. In fact, the terms *font, typeface*, and *typography* are not present in the document. Since there is no definitive standard for what legibility means, this leaves the standard open to the interpretation of individual instructional designers. Corporate style and consistency issues aside, this lack of standardization raises issues of readability, especially for dyslexic employees. Though text readability alone cannot circumvent the barriers faced by individuals with dyslexia, it can limit the number of barriers and make the text more visually accessible. To remedy Organization Y's lack of typography standards, an evidence-based set of standards, such as those developed by Rello and Baeza-Yates (2017) could be implemented.

Organization Y's instructional design standards provide a comprehensive overview of the plethora of considerations and decisions that go into the full cycle of instructional design. It is a very useful resource, and it is easy to see how it would be very useful to the training and development team at Organization Y. There are, however, limitations within the document that require additional consideration. There is space to improve the learner analysis standards described my Organization Y, which could include a more direct consideration of learning abilities, in particular, reading abilities. This

consideration, if nothing else, would prompt instructional designers to make decisions about the breadth and depth of text usage. This consideration segues into the potential improvement in the design and development phases, which includes discussion on the implications of course navigation and interactivity, clearly articulating how to adjust text for a reading level, and standardized typographical usage. These small adjustments could improve the design of instructional materials that could meet the needs of dyslexic employees at Organization Y.

4.3 Organization Z

Organization Z is a branch of a European ministry of defence. Organization Z is relatively young, having been established in 2009, but employs approximately 850 employees. To meet their training needs, Organization Z has developed an instructional design standards guide that is intended to document the processes of developing training materials through the entire instructional design lifecycle. The guide includes information on the main steps and stages in sequence of designing a training solution. It is worth noting that document is published in English, however, as English is not the official language of the country, there is the potential for translation ambiguity. That being said, no overt instances of this were found.

Organization Z utilizes a slightly modified version of ADDIE that is sequenced as *Needs Assessment, Design, Development, Delivery,* and *Evaluation.* This modification is only to the phase names; the underlying processes of the traditional ADDIE model remain intact. For the purposes of this study, the Needs Assessment, Design, and Development phases will be the primary focus.

Organization Z's standards for the Needs Assessment phase is a succinct

representation of common industry best-practices (see Brown & Green, 2016; Allen,

2012; Dick & Carey, 2009; etc.) Organization Z uses four question-categories to frame its

needs assessment standards:

- **Audience**: Who is the target audience for a proposed training?
- **Current roles**: What do members of this target audience presently do in their roles?
- **Knowledge gaps**: What gaps exist between what these providers know how to do, and what they need to know to carry out their roles successfully?
- **Outcome:** Will training help fill this gap?

The audience and knowledge gaps categories have potential for addressing the needs of

employees with different learning abilities, but that potential is not realized. Instead, the

audience section is simply focused on identifying what type of professionals will be

taking the training. Furthermore, the knowledge gaps category is also focused on

operational gaps, related specifically to job roles. While there is some consideration about

learner characteristics, these characteristics focus on demographic and operational

characteristics, such as experience, cultural background, education, location, motivation,

and logistical constraints (location, job demands, etc.) While this type of assessment is

undeniably valuable and necessary for a business to ensure there is growth, and a return

on its investment, there is room within these standards to make considerations for diverse

learning needs. Information or considerations that focus on assessing learning

differences, such as impairments in reading ability, would improve Organization Z's

needs assessment standards as it would limit assumptive reasoning about learner abilities.

The Design phase of Organization Z's standards provides a systematic approach

to planning the design of training. Organization Z describes its Design phase as

answering the questions *what, where, who, when,* and *how*, as they apply to a training

solution. While the design phase does provide a systematic approach to design, such as

identifying learning goals, considering the scope of the training, and creating a plan for

what content will be delivered, there is no discussion of how the instructional design

standards impact learning. Following an update to the Needs Analysis phase, which

identifies learning ability differences, the Design phase should include steps to remedy

potential barriers. For example, when discussing the identification of what content will be

created and delivered, consideration could be paid to how to differentiate or supplement

that content, such as by using reading comprehension aids (Everatt & Fidler, 2012), or

providing multiple formats for delivering the content (Dziorny, 2012). Updates such as

this would round-out Organization Z's Design standards, by identifying solutions to

potential barriers, specifically, for dyslexic employees.

      As with the Design phase, Organization Z's standards for the Development phase

are very systematic and comprehensive. However, since the Development phase involves

the creation of the training materials learners will use, systematicity can place emphasis

on the development of the final product, and deemphasize the thought that goes into how

it is being developed. For example, Organization Z outlines the steps in the process for

developing a training solution: developing background information, developing

directions on using the training, creating the training material, etc., but they do not

standardize *how* it should be developed. There is no mention of any typography, no

discussion of text usage, and no consideration of how to create any content formats

(paper, computer-based, video, etc.). The most straightforward approach to improve the

Development phase for Organization Z would be to integrate standards within their

comprehensive overview of the process. These standards could include typography, language levels, organization of text, and use of graphical elements, among other standards. Incorporating these additional standards would improve the likelihood that the training developed would be accessible by dyslexic employees.

Organization Z's instructional design standards document is thorough, organized, and well informed. It provides an in-depth look at the multiple processes, and sub-processes that make up a training solution. However, the major limitation of the document is a lack of specificity. Providing specific considerations in the areas of learner characteristic assessment, instructional design implications, and development standards would improve the document, which in turn, could improve learning experiences for dyslexic employees, and improve Organization Z's consistency across training solutions.

4.4 Conclusion

Standardization is a common practice across many industries, and has significant implications for the actions and knowledge of employees adhering to the standards (de Vries, 2006). Organizations X, Y, and Z all developed documentation in an attempt to standardize elements of the instructional design processes and products used in their workplace training. Though these companies differ in terms of industry and geography, there are several commonalities among their standards. These commonalities are grounded in the ways in which the instructional design standards do, or do not meet the needs of adults with dyslexia.

A common theme found in the three companies' standards documents was a lack of emphasis on diverse learning abilities and accessibility. Though all of the companies

included consideration of the learner in their documentation, none mentioned learning ability as a necessary consideration, and only one mentioned reading levels, albeit, vaguely. With approximately 16,650 employees between the three companies, and considering that approximately 15-20% of the population demonstrate dyslexia symptoms, (International Dyslexia Association, 2016), that equates to roughly 2,500 - 3, 300 employees being unrepresented by these three documents. An emphasis and discussion on differing learning, and specifically, reading abilities would improve the three documents.

Another commonality of the documents was a need to develop a full, comprehensive standard for typography. While Organization X did include typography standards, there was room for specificity, and Organizations Y and Z had no standards for typography. An update that incorporates evidence-based typography standards could meet the needs of dyslexic learners.

Other themes that emerged from the document analysis were context specific, but worth articulating in a standards document. These updates include discussions of learner course navigation in eLearning, the use of multiple formats to present content, incorporation of reading comprehension aids, and clear guidance on adjusting reading levels. These considerations within an instructional design standards document would help instructional designers understand how the training they develop can meet the needs of learners with unique needs, but specifically, dyslexia.

The document analysis identified that there is a gap in understanding between what is known and practiced in instructional design, and what is known about adult dyslexia. All of the documents demonstrated a rigorous understanding of instructional

design principles and industry best-practices. However, they demonstrated a lack of understanding about diverse learning abilities in a corporate setting, and in particular, dyslexia. There exists enough knowledge and evidence in both fields to meld the understanding of instructional design and adult dyslexia. By completing this document analysis, it is clear that there is a need for change, and the dyslexia literature suggests that by making changes to corporate training instructional design standards, there is the likelihood of improved learning experiences and outcomes for dyslexic professionals.

Chapter 5: Design-Based Research

In this chapter I describe the design-based research phase of the study. This phase was instrumental in answering the research question: how can instructional materials for workplace training be developed to meet the needs of adults with dyslexia? The design and development of the new instructional design standards document, and the two eLearning courses are discussed at length.

5.1 Document Design

The new instructional design standards document created for this research study (see Appendix I) was designed to be used by those involved in creating materials for corporate training events, including instructional designers, course developers, trainers, or technical writers. The document adheres to the ADDIE model of instructional design (Analysis, Design, Development, Implementation, and Evaluation). However, since the document is focused on the creation of training materials, standards for the Analysis, Design, and Development phases were discussed. The inclusion of standards for the Implementation and Evaluation phases would not impact the creation of training materials, as these phases occur after the creation of the material.

The analysis phase of the document is comprised of two sections: learner analysis and needs analysis. This format is consistent with the practices prescribed by the ADDIE model (Brown & Green, 2016), as well as the Dick & Carey model (Dick, Carey, & Carey, 2009). The learner analysis section is focused on assessing the audience the training material will be created for, and is grounded in two questions: who are the learners, and what are the learners' abilities? The intention of the analysis phase is to

build upon common instructional design standards and to provide insights into how training materials can be made more accessible as a result of considerations made during this phase. For example, one new standard created by myself for this study reads: *Consider the diverse learning abilities of learners taking the training.* This standard is then supplemented by the information that:

- o Education level is **not** an indication of learning ability, as many people with learning disabilities are able to attain credentials.
- o Diverse learning abilities can include reading difficulties, such as dyslexia, and cognitive impairments, such as ADHD.
  - ▪ Research suggests that 15-20% of the population has dyslexia symptoms, and around 4% of adults have ADHD.
- o Since employee disclosure of learning disabilities is rare, assume participants with learning disabilities will be taking the training.

This supplementary information is intended to contextualize what is meant by considering learning abilities. Furthermore, the information serves to initiate considerations regarding accessibility and learning abilities from the onset of the process. The needs assessment section focuses less on accessibility, and aligns with standard instructional design considerations, such as identifying the business need for the training and logistical requirements to deliver the training material.

The design phase of the document builds on the analysis phase to begin the mapping out of the creation of the training material. This section employs evidence-based practices for designing training materials to meet the needs of adults with dyslexia, while also maintaining traditional instructional design principles. In addition to information

regarding the selection of a delivery method of the training material, the document

suggests that when possible, learners should be able to freely navigate the training

material, such as being able to move through an eLearning course at their own pace. This

standard is consistent with the Dziorny's (2012) findings, which suggested that open

navigation was beneficial to adults with dyslexia. Dziorny's (2012) findings are also the

basis of the standard that outlines the need to develop multiple formats of presentation,

such as audio, video, graphics, and text, which Dziorny asserted was the most beneficial

instructional design practice to meet the needs of adults with dyslexia. In addition to open

navigation and multiple formats of presentation, the document also recommends that

lengthy passages of text be supplemented with reading comprehension aids, such as text

summaries, and definitions of key terms prior to passages. This standard aligns with the

contentions of Everatt & Fidler (2012), and is intended to ensure that when training

materials are developed, considerations are made that enable adults with dyslexia to fully

comprehend the content of the material.

The development phase provides an in-depth outline of how training materials are

to be created, while also emphasizing accessibility. The document indicates that

accessible training materials are those that improve learning for all learners, regardless of

diverse learning abilities. This emphasis alone is a departure from common instructional

design standards documentation. The document standardizes the formatting studied by

Rello and Baeza-Yates (2017) regarding font size, character spacing, line spacing, font

colour, background colour, typeface, and font style. Within the typeface standard, it is

recommended that if possible, learners should be able to adjust typeface on screen,

especially for text heavy sections, which is a standard that aligns with the research of

Ismail and Jaafar (2015). The document also suggests that graphical elements, such as flow charts or infographics, should be used to supplement or substitute text, which is consistent with the guidelines proposed by the British Dyslexia Association (2016). Additional details regarding writing style, such as concise language, and use of lists are also described, and are common within most corporate style-guides and documentation.

The instructional design standards document is a collection of best practices in both the fields of instructional design and dyslexia support. The document attempts to bridge gaps that were found, during the document review phase of this research, in corporate instructional design standards documentation, such as a lack of emphasis on accessibility, and lack of clarity on how content, and in particular, text should be presented in training materials in order to meet the needs of adults with dyslexia. The intention of the document is that it is specific enough to make meaningful changes in how training materials are created, but broad enough to be easily incorporated into existing documentation.

5.2 Training Material Design

5.2.1 Course 1

The creation of Course 1 began with a review of Organization X's analysis phase standards. Due to this course being developed outside of an organization, analysis of performance gaps, technical or scheduling considerations, follow-ups, and organizational goals were not applicable. However, learning objectives for the course were created by myself, stating:

After this course, learners will be able to:

1. *Define ergonomics.*

2. *Summarize the steps in adjusting an office chair.*

3. *Describe the importance of rest breaks and posture.*

Based on these learning objectives, I determined that eLearning was an appropriate training method, as the objectives are awareness-based, and not performance-based.

The design phase standards prescribed by Organization X are limited; however, Course 1 aligns with these standards. Course 1 was designed to have a logical sequence of content, and segmentation of content. Course 1 begins by defining ergonomics, then moves into highlighting the importance of chairs in office work, which segues into summarizing how to adjust a chair, and culminates by combining the concepts of rest and posture, as these concepts overlap. Furthermore, Course 1 incorporates interactivity by way of clickable elements to reveal text. This type of interactivity is suggested by Organization X to increase learner engagement. Furthermore, Course 1 makes use of a chart to organize and communicate the procedure of adjusting a chair, which Organization X advises as it limits text on screen.

The development phase of Course 1 incorporates the Organization X standards, which are referred to as Media Standards and Text Standards. Course 1 uses a black Arial typeface, sans serif, as standardized by Organization X. However, since Organization X does not standardize font size, 12-point font was used, as this is default size for the built-in theme used in Articulate Storyline 360. Line spacing remained at the default 1 value. The background colour is also not standardized by Organization X, resulting in Course 1 having a light grey background that is part of the same built-in theme as the font. Organization X provides in depth formatting standards, such as text alignment, character

maximums, lists, bold font, capital letters, and many other. In addition, Course 1 adheres to the media standards of Organization X regarding screen size and resolution. Due to the depth and specificity of standardization, Course 1 successfully meets the development phase standards outlined by Organization X.

5.2.2 Course 2

As the new instructional design standards document created for this study adheres to the ADDIE model, the creation of Course 2 began with the analysis phase. Using the new instructional design standards document, assumptions were made that learners taking the training would have reading difficulties, or other learning or cognitive difficulties. As was the case with Course 1, the organizational considerations were not applicable to this course. Since the content and desired training outcomes between Course 1 and Course 2 were consistent, the same learning objectives from Course 1 were used in Course 2:

After this course, learners will be able to:

1. *Define ergonomics.*

2. *Summarize the steps in adjusting an office chair.*

3. *Describe the importance of rest breaks and posture.*

The design phase of Course 2 served as the planning stage for the creation of the course. However, as proponents of the ADDIE model will attest, the phases are not perfectly linear and tend to overlap, which was the case with Course 2, as once certain design decisions were made, they were immediately developed. The design decisions that were made regarded the structure and layout of the course. To better aid reading comprehension, it was decided that the course would be structured to begin with

definitions of key terms. Furthermore, it was decided that a section with longer passage of text would be supplemented by the option for learners to review a summary that highlights the key points of the text. This decision was made based on the research conducted by Everatt and Fidler (2012), which found that introducing key terms at the start of a reading task, and providing summaries of key points improved the reading comprehension of adults with dyslexia. Course 2 also used the standards outlined in the new document to decide on using graphics to replace text and provide context, which aligns with suggestions by the British Dyslexia Association (2016). In addition, the navigation of the course is consistent with the new instructional design standards document, as learners are able to freely move forward and backward within the course, a feature that Dziorny's (2012) found was preferred by adults with dyslexia.

Development of Course 2 incorporated the considerations decisions made in the analysis and design phases, and upheld the standards prescribed by the new document. Consistent with the findings of Rello and Baeza-Yates (2017), Course 2 uses 18-point body text, 26-point headings text, and black font on a white background. A limitation of Articulate Storyline 360 is the inability to adjust character spacing, so no customization was implemented. Line spacing was set at 1.5. The default text on screen is Arial. However, functionality was incorporated to allow learners to switch between Arial, Helvetica, Courier, and Verdana typeface, based on their preferences, as is recommended in the new standards document. Bullet points and lists were used to break up long passages, and as previously described, where a long passage exists, it is supplemented by the option to review a quick summary. To address the chair adjustment section, an interactive graphic was used that eliminates text on screen, allows learners to review

sections of the text at their own pace, and uses graphical elements to contextualize concepts. Course 2 is a representation of a training material that is created with the intention to meet the needs of adults with dyslexia.

5.3 Conclusion

The design-based research component of this study focused on the creation of one instructional design standards document and two eLearning courses. Design-based research was a necessary methodology for understanding how to design workplace training materials to meet the needs of adults with dyslexia. By engaging in the active design and development of training materials and documentation, I was able to refine practice (Wang & Hannafin 2005) by combining theories of instructional design (see; Brown & Green, 2016; Allen, 2012; Dick & Carey, 2009; etc.) with theories of dyslexia support (Everatt & Fidler, 2012; Dziorny, 2012; Ismail & Jaafar, 2015; Rello & Baeza-Yates, 2017; etc.) into the design and development of materials with practical applications.

The new standards document created for this study assembles the best practices of two fields of study, instructional design and dyslexia support. This new document is designed for simple integration into existing training and instructional design documentation, or used as a supplemental resource. As described in the Methodology section, the two eLearning courses are a basis for measuring the effectiveness of the new standards document by testing them with participant in a controlled study. The results of the study will provide insight into the applicability of the new standards document, and

whether adjustments can be made to better meet the needs of adults with dyslexia in the workplace.

Chapter 6: Participant Study

In this chapter, I describe the participant study phase of the study. This chapter is an instrumental phase of the study, as it consolidates the feedback from adults with dyslexia regarding preferences of how training materials can be designed to meet the needs of adults with dyslexia. I provide a brief overview of the participants, including biographical information, and then describe the outline for the survey and interview. The survey results and interview results are discussed separately. A brief summary of findings from the participant study concludes the chapter.

6.1 Participants

Participant A is a retired Occupational Therapist who was diagnosed with dyslexia as an adult. Participant A described having struggled with dyslexia throughout their schooling and into their career, and only received dyslexia support during graduate school. Despite their struggles with dyslexia, Participant A expressed that they were able to achieve academic and professional success by developing reading strategies, such as utilizing text-to-speech software or reading text from coloured paper. Furthermore, they asserted that as confidence in their ability to read improved, many of their symptoms of dyslexia were dulled.

Participant B is a practicing Chiropractor who was not diagnosed with dyslexia until middle age. Like Participant A, Participant B described the struggles they faced during their education, especially in text-heavy courses during chiropractic college. In their practice, Participant B explained that much of the professional development required for licensure relies significantly on text, and can prove challenging without

reading supplements. To cope with challenging text, Participant B uses text-to-speech software, coloured paper for lengthy passages, and interestingly, uses a font specifically designed for dyslexic readers. It was not discerned during the interview whether the font referred to by Participant B was the Sylexiad typeface (Hillier, 2012), or another variation.

Participant C is a Water Plant Operator who was diagnosed with dyslexia during adolescence. Unlike Participants A and B, Participant C received intensive reading support during their education. During Junior High school, Participant C spent eighteen months attending a provincially funded boarding school, where students would be on a cycle of two weeks at their regular school, and two weeks at the boarding school. At this school, Participant C explained that they received intensive reading support and learned reading strategies (Participant C could not remember the specific strategies taught.) After the eighteen months, Participant C progressed from a Grade 3 reading level to a Grade 10 level, and eventually moved to a College reading level later in their education. Participant C credits this reading intervention as the reason they are not engaged in menial employment. Some of the coping strategies Participant C uses to read lengthy passage of text include re-reading, making notes, and eliminating environmental distractions.

6.2 Survey

The survey consisted of nine closed questions and used a Likert scale to range responses from *Strongly Disagree* to *Strongly Agree* (see Appendix II). The survey was administered electronically and completed by participants immediately following the eLearning review. The intention of the survey was to gain feedback that was specific to

the elements of both eLearning courses. The data collected from this survey was instrumental in evaluating the applicability of the updated instructional design standards document that was used to create eLearning Course 2. Having participants indicate whether certain elements of the eLearning, such as the ability to change font, improved their reading experience, provided insight into the effectiveness of the instructional design guidelines prescribed in the new standards document. Furthermore, the survey also provided feedback on elements of the Organization X standards document, as this document was used to create eLearning Course 1.

6.3 Survey Results

All three participants completed the survey in its entirety. No comments were provided by the participants on the questions within the survey, however, their personal opinions and insights were collected and documented through the Interview. The questions and their corresponding results are indicated below.
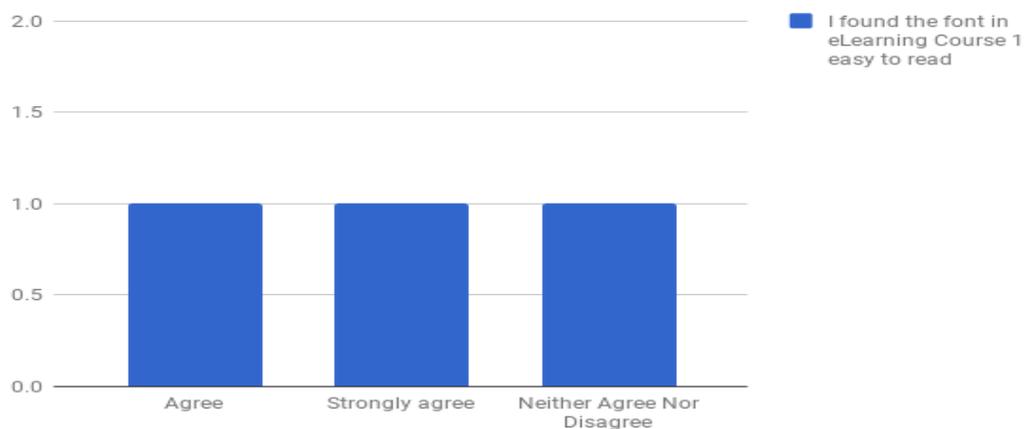

Figure 1. Survey question 1 responses.

The participants split their responses on question 1 with one participant strongly agreeing, one agreeing, and one neither agreeing nor disagreeing that the font in eLearning Course 1 was easy to read.
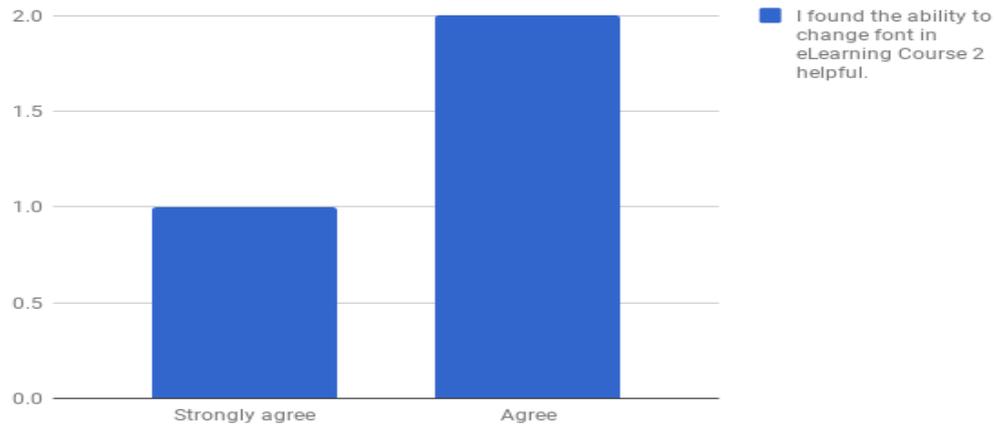

Figure 2. Survey question 2 responses.

Responses to question 2 indicated that two participants agreed that the ability to change font in eLearning Course 2 was helpful, and one strongly agreed that the functionality was helpful.
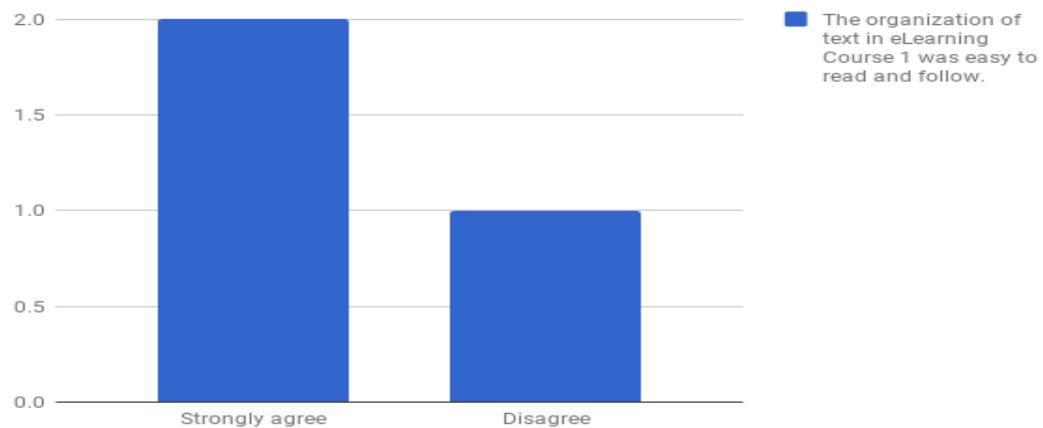

Figure 3. Survey question 3 responses.

Responses to question 3 indicated that two participants strongly agreed that the

organization of text in eLearning Course 1 was easy to read and follow, while one
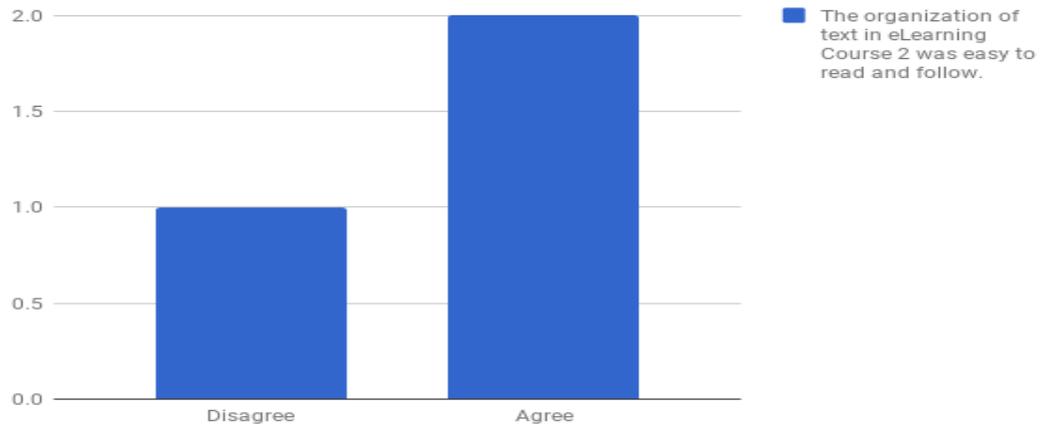
disagreed.

Figure 4. Survey question 4 responses.

Responses to question 4 indicated that two participants agreed the organization of

text in eLearning Course 2 was easy to read and follow, while one disagreed,
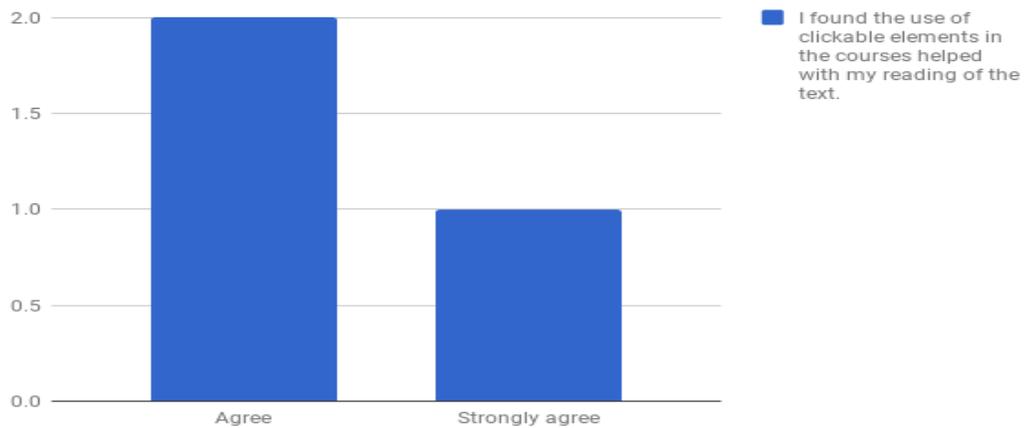

Figure 5. Survey question 5 responses.

Responses to question 5 indicated that two participants agreed that the use of clickable elements in the courses helped with their reading of the text, while one strongly agreed.
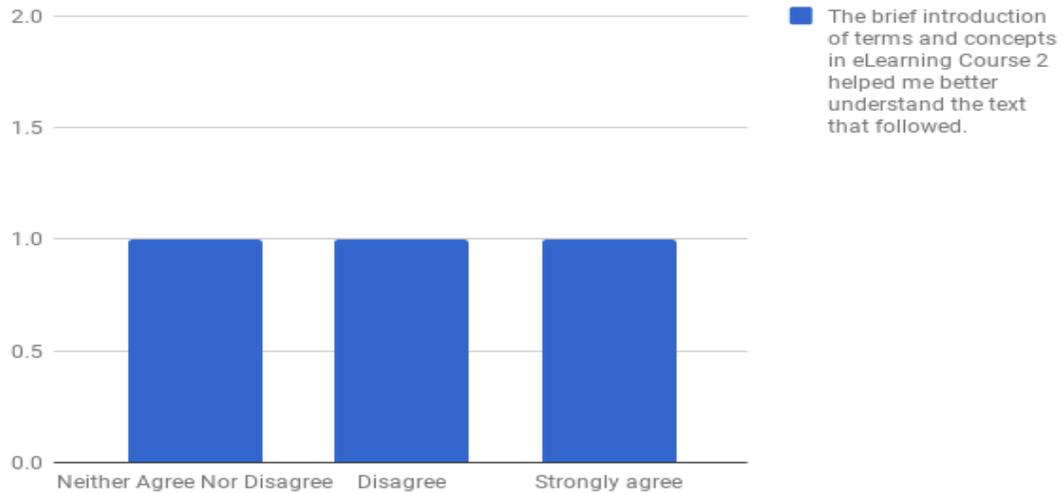

Figure 6. Survey question 6 responses.

Participants split their responses to question 6, with one strongly agreeing, one disagreeing, and one neither agreeing nor disagreeing that the brief introduction of terms and concepts in eLearning Course 2 helped them better understand the subsequent text.
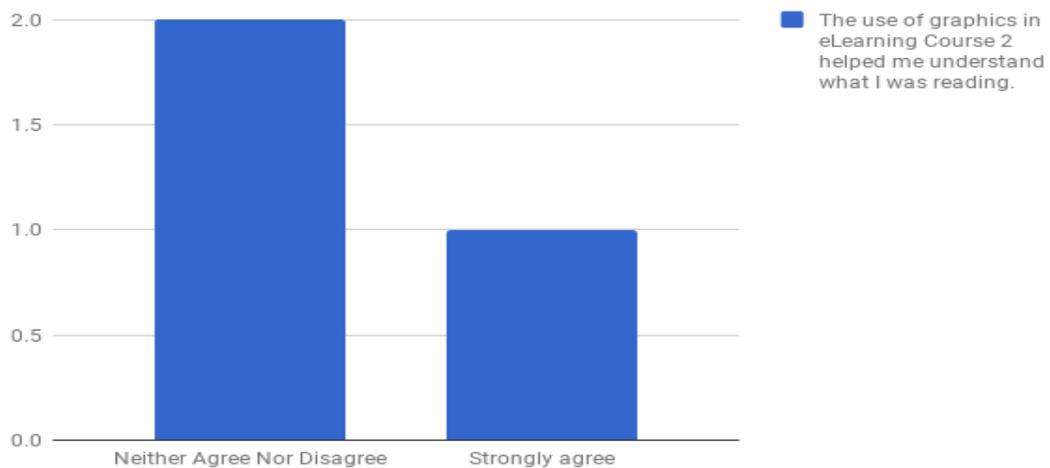

Figure 7. Survey question 7 responses.

Responses to question 7 indicated that one participant strongly agreed that the use of graphics in eLearning Course 2 were helpful in understanding the text, while two participants neither agreed nor disagreed.
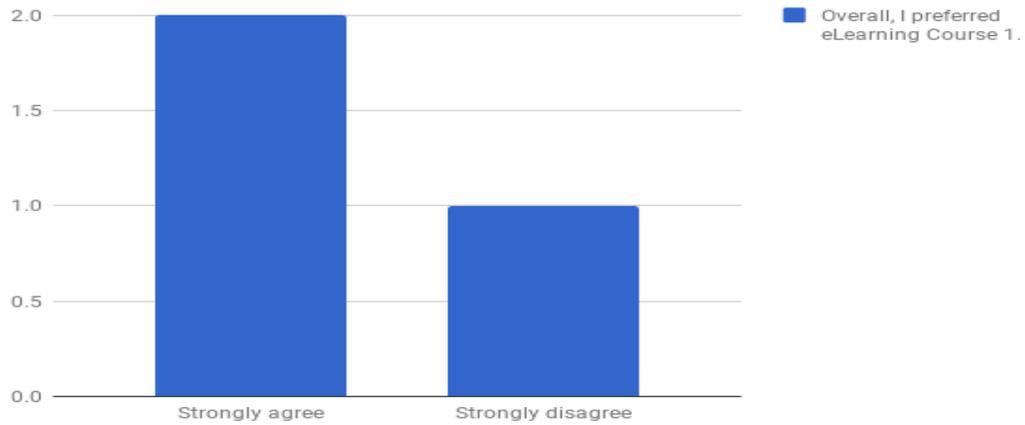

Figure 8. Survey question 8 responses.

Responses to question 8 indicated that two participants strongly agreed that they preferred eLearning Course 1, while one strongly disagreed.
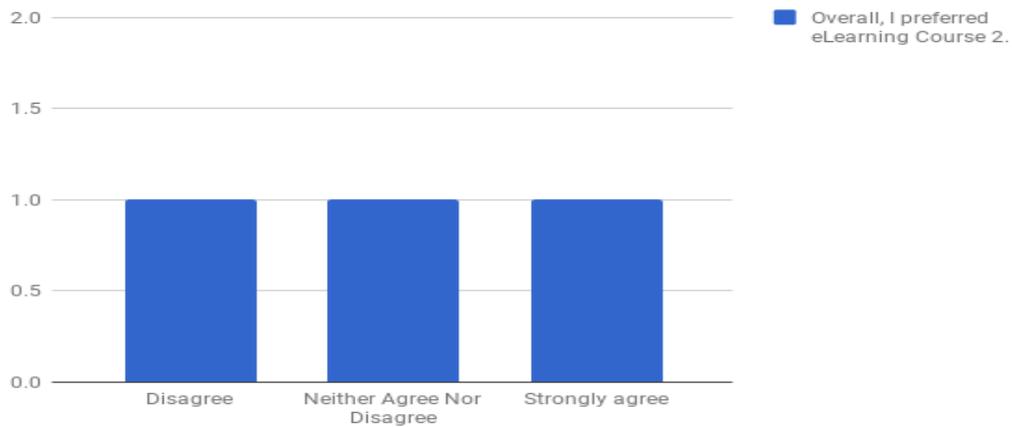

Figure 9. Survey question 9 responses.

Participants split their responses on question 9, indicating that one strongly agreed that they preferred eLearning Course 2, one disagreed, and one neither agreed nor disagreed.

6.4 Interview

The interview portion of the study (see Appendix III) was semi-structured, wherein the questions were consistent and structured, but allowed for natural conversation and discussion to occur. The interview consisted of eight questions, three of which contained sub-questions, such as conditional questions, i.e. *'if yes...'* The interview was used to collect biographical information about participants, as well as to gain insight into the experiences and opinions of adults with dyslexia in regards to workplace training, dyslexia support, and the impact of dyslexia in the workplace. Portions of the interview also addressed the eLearning courses, and had participants discuss if they would be effective in a workplace training environment. The interview was a valuable component of the study as it allowed for authentic discussion about the lived experiences of adults with dyslexia, and provided invaluable insights into the kinds of supports and changes they believe would improve workplace training. In addition, participants were able to articulate their opinions and experiences with the eLearning courses in a way that was less limited than survey responses and written comments alone.

6.5 Interview Results

Individual participant responses to the interview questions varied in terms of

amount of detail provided. However, the interview results fall into three thematic

categories: dyslexia background, workplace training insights, and study-specific

feedback. These thematic categories were determined during the analysis of interview

transcripts. Participant responses were coded according to the content and context of their

responses. Responses that referenced education, coping strategies, or dyslexia diagnosis

information were assigned to the 'dyslexia background' category. Responses that

referenced work experience, workplace training, reading at work, opinions of workplace

training, and interpersonal relationships in the workplace were assigned to the 'workplace

training insights' category. Lastly, responses that made specific reference to either of the

eLearning courses were assigned to the 'study-specific feedback' category.

Dyslexia Background

The responses focused on dyslexia background related to details about dyslexia

supports during participants' education and coping strategies used to manage lengthy

passages of text, both in the workplace and in their personal lives. When asked if they

had ever received reading support during their education, and if so, what kinds of

support, Participant A and Participant B described similar experiences in their education,

and a lack of formalized support. Participant B did concede that they may have

participated in small group reading in junior high, but did not recollect any formalized

reading interventions. Participant A said that they did eventually receive reading support

during graduate school in the form of one-on-one reading with their supervisor. As earlier

described, Participant C did receive intensive reading support for dyslexia during their education, which they credit as "the only reason [they are] not working at Walmart right now."

Participants were asked what strategies they use to help them in reading long passages of text, either at home or at work. Participant A explained that text-to-speech software was the most common strategy they used to supplement their reading of long passages. Furthermore, Participant A said they find text on a white background to be glaring, and when reading off of white paper, they place a coloured overlay on top of the paper to remedy the issue. When possible, Participant A also increases the font size of text. Participant B utilizes similar strategies to Participant A, including using text-to-speech software and printing text on coloured paper, but also uses a font designed for dyslexic readers. Participant B said that prior to the popularization and availability of text-to-speech software, they found reading much more challenging. Participant C said they often rely on re-reading passages of text to ensure they comprehend the meaning. To further aid this, Participant C said they try to make notes in the margins while reading, and eliminate environmental distractions, such as background noise, by reading in a quiet, private setting.

Workplace Training Insights

The responses focused on workplace training insights provided information related to participants' experience with workplace training, the amount of reading they do in their places of work, comfort level with discussing reading challenges with an employer, the potential benefits of dyslexia support in the workplace, participants'

perceptions of whether dyslexia poses a barrier to job performance, and changes they would like to see in workplace training. When asked how much reading they do on a daily basis at their place of work, Participant A, a retired Occupational Therapist, said during their career they had to read a high volume of text, usually in the form of records, to gather information about patients. Participant B said they do not read a significant amount of text during the workday, but that some reading is involved during data entry tasks. Participant C said that in their current role they do not read a significant amount, as they usually only need to read log sheets. However, Participant C did explain that some of the supervisory roles they held in the past required significant written communication through email, which they explained, "…was sometimes tough to keep on top of because you've got to read what [the email sender] sent, and then write and read your reply to them."

Participants were asked if they had ever participated in workplace training, to which all participants responded they had. The follow up to that question was whether they had difficulties with reading the materials during workplace training. Participant A said that "… early on [in their career], absolutely I struggled" with reading in workplace training, but as their coping skills, confidence, and experience grew, training became less daunting. Participant B also found workplace training more challenging earlier in their career, but said, "…once I could start using the computer to read [passages of text] to me, it got easier." Participant C echoed the experiences of Participants A and B, and said that they found the reading challenging in workplace training events, but said if there was some kind of auditory engagement, either through narration in an eLearning course even "someone at the front of the room reading from the slides" it was less challenging.

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When asked if it would be beneficial to have supports for dyslexia and reading in the workplace, similar to those from educational experiences, Participant A emphatically expressed that it would be beneficial. Participant A said that "both employers and employees should have an understanding of dyslexia" and that employees need to be able to communicate their needs to the employer. Participant B did not have any formal support for their dyslexia during their education, so did not have context for the kind of supports that could be provided, but expressed that supports would likely be beneficial to employees with dyslexia. Participant C also believed dyslexia supports in workplace training would have a positive effect on employees with dyslexia.

To gauge attitudes and perceptions of dyslexia in the workplace, participants were asked if they would be comfortable discussing their reading challenges with their employer. Participant A said that today they would be comfortable, but early in their career they would not be comfortable having these discussions with their employer as legislation had yet to be developed to adequately protect workers, and explained that they knew of an individual who lost their employment after disclosing their dyslexia to their employee. Participant B expressed that they felt it was important to have these kinds of discussions with employers, and that people with dyslexia can be advocates for the disorder. Participant C had experiences with disclosing their dyslexia to employers, and found that nothing valuable came from the disclosure, but Participant C found that disclosing to coworkers had a more positive impact, stating that "… they can understand that things like email or writing might take longer, and are usually willing to help you out."

To further assess attitudes and perceptions, participants were asked if they believe dyslexia poses a barrier to job performance. Participant A said that they do not believe that performance itself is impaired by dyslexia, but said the time it takes to get up to speed and understand information is impaired. This statement was qualified by stating that "once [people with dyslexia] are given enough time to process and understand [information given to them] they can actually really excel at their job." Participant B and Participant C had the same opinion, that is, that it depends on the job. They both acknowledged that dyslexia can absolutely pose a barrier to job performance, but many jobs can be done without significant reading.

To round-out the workplace training insights theme, participants were asked about the changes they would like to see in how the needs of people with dyslexia are met in workplace training. Participant A said they would like to see employers provide ample time to employees to read and process information, suggesting that training materials be provided in advance, if possible. Participant A also discussed environmental factors that could improve workplace training, such as providing a quiet area to take self-paced training, and consideration of the negative connotations and anxiety dyslexic employees may have towards a typical classroom setting due to adverse experiences in education. Like Participant A, Participant B said they would like to see employers provide more time to complete training. Participant B also explained that they believe whenever possible, "training on a procedure or how to do something should be done hands-on, not just reading about it." Participant B said that for individuals with dyslexia, it is much easier to show them how to complete a task than it is to have them read about how to complete a task. Participant C also felt that training should avoid relying solely on text,

saying that the use of audio, or the option to use audio should be available in all courses, both eLearning and classroom based. Furthermore, Participant C said they would like to see more use of interactivity and videos in eLearning courses, as their company uses eLearning frequently, and they find that it is easier to retain information from the courses with interactivity and videos.

Study-Specific Feedback

The remaining interview responses provided feedback specific to this research study as they were directly focused on the opinions and perceptions of the eLearning courses. Participants were asked hypothetically if they were to be trained about a new procedure at their place of work, would they want the training to be more like eLearning Course 1 or eLearning Course 2, and why. Participant A said they "definitely" would want the training to be more like eLearning Course 1. The primary reason for this preference was that eLearning Course 1 used a light grey background with black text on top, which Participant A explained "is much easier to read than a white background", such as in eLearning Course 2. Participant A also liked the use of blocks and tables to organize text in eLearning Course 1. Despite the preference for eLearning Course 1, Participant A said they found the ability to change font in eLearning Course 2 helpful, and said it would be beneficial to combine that functionality with the overall layout of eLearning Course 1. In addition, referring to text-to-speech functionality, Participant A mentioned "I didn't see an option for 'read this to me.' That would have helped a lot."

Participant B's response was a near carbon copy of Participant A's, as they too preferred eLearning Course 1, and did so for many of the same reasons. Participant B

said they preferred eLearning Course 1 because of the background colour, the use of pictures, and also found that the sequencing of text was more straightforward. Also like Participant A, Participant B said the ability to change font in eLearning Course 2 was helpful. Furthermore, Participant B said it would be beneficial to not only be able to change font within the course, but also be able to change background colour.

Participant C differed in their opinion by saying they preferred eLearning Course 2. According to Participant C, eLearning Course 2 was easier to move through and less overwhelming as the clickable elements revealed chunks of text and allowed them to read at their own pace, stating that "it was nice to be able to click on something and have a little bit of text come up at a time, instead of all at once." In addition to the layout, Participant C said that the ability to change font was helpful and improved their ability to read the text. Unlike Participants A and B, Participant C did not find the white background in eLearning Course 2 problematic. However, Participant C did mention that audio within the course would have improved their experience.

6.6 Conclusion

The participant study provided important insights into the applicability of the study by both affirming and disputing the literature and components of the design-based research. While the application of certain elements of the instructional design standards document appear to have resulted in the desired effect, other elements are less conclusive, and may in fact be inaccurate. Though the sample size of the study poses inherent

limitations, there remain conclusions to be drawn that may have a positive impact on the instructional design of workplace training to meet the needs of adults with dyslexia.

The participant study resulted in several findings. Participants identified that the ability to change font was beneficial, but some found the use of black text on a white background difficult to read. It was suggested that the functionality to change font be applied to changing text colour, size, or background colour. Another unanimous response from participants was that the incorporation of audio, or text-to-speech software would have improved their experience with both eLearning courses. Additional findings included preferences for charts, tables, and graphics, and segmentation of long passages of text by using clickable elements within the course.

Though there were some unanimous responses from participants, the survey results reflect that preferences may differ quite drastically from person-to-person. The absence of conclusive preferences may be due to the limitations of the small participant pool, however, it may also be due to the highly individualized and nuanced nature of dyslexia, wherein symptoms and experiences can vary greatly between individuals (Berninger et al., 2006). Though a lack of conclusive preferences may seem problematic, it is my conjecture that this is simply evidence of why a multitude of instructional design strategies to meet the needs of adults with dyslexia should be incorporated into workplace training materials and instructional design standards. It is unrealistic to assume a workplace training material can be created that appeals to all variations of adults with dyslexia, but by incorporating multiple strategies to meet their needs, the likelihood of the training material being accessible to a greater number of people increases (Gordon et al., 2010).

Chapter 7: Conclusion

In this chapter I provide a discussion of the overall findings and implications for the research study. This discussion includes how the findings from the study could be applied to a real-world setting. I also discuss further research that could build upon this study. A general conclusion of the thesis closes out the chapter.

7.1 Discussion

This research study was comprised of multiple phases, and each provided unique insights that have the potential to impact the ways in which workplace training can be designed and developed to meet the needs of adults with dyslexia. The document analysis phase examined the instructional design standards documents for three large organizations. The documents were analyzed based on the ways in which they did or did not prescribe instructional design practices that meet the needs of adults with dyslexia. The analysis resulted in the conjecture that a lack of overt consideration of learning disabilities, in particular, dyslexia, exists in the standardization of instructional design processes and products for workplace training.

The identified limitations of the documents as they relate to meeting the needs of adults with dyslexia were used as the basis for the first phase of the design-based research. The first phase of design-based research resulted in the creation of a new instructional design standards document. This new document attempted to bridge gaps identified during the document analysis phase, and prescribed standards that the literature suggested would improve accessibility for adults with dyslexia, while also maintaining fundamental instructional design tenets. Using the ADDIE model, the new document

describes standards for conducting a learner analysis that is focused on reading abilities. The new document also makes evidence-based suggestions for the design phase, such as having learners be able to freely navigate the training material (Dziorny, 2012), and incorporating reading aids to supplement long passages of text (Everatt & Fidler, 2012). The new document places significant emphasis on standardization in the development phase as it relates to typography (Rello & Baeza-Yates, 2017; Ismail & Jaafar, 2015), as well as the use of graphics and images (British Dyslexia Association, 2016). The new instructional design standards document segued into the second phase of design-based research, which consisted of the development of two eLearning courses. eLearning Course 1 was designed and developed using the standards document of Organization X, which was a standard assessed during the document analysis phase. eLearning Course 2 was designed and developed using the new instructional design standards document.

This research study culminated with the participant study, which asked participants to interact with the eLearning courses, complete a survey, and participate in an interview. Feedback from the survey and interviews suggested that black text on a white background (as found in eLearning Course 2) was problematic for some dyslexic readers. This finding was contrary to the findings of Rello and Baeza-Yates (2017) who suggested a black font on a white background would be more easily read by individuals with dyslexia. Rello and Baeza-Yates (2017) also suggested white text on a black background would be more easily read, however, this design was not tested in this study. Though one of the participants did not take issue with the black text on a white background, the fact that two others did is cause for further consideration. These

discrepancies in preference may be indicative of the individualized and nuanced symptoms of dyslexia.

A potential solution to the background colour issue lies in an aspect of eLearning Course 2's design. All participants, even those who preferred eLearning Course 1, expressed that they found the ability to change font on screen in eLearning Course 2 to be helpful. This functionality allows learners to adjust the font to meet their preferences, but could also easily allow learners to adjust background colour, text colour, or even font size. Currently, the instructional design standards document created for this study prescribes that instructional designers should incorporate functionality that allows learners to adjust the font in eLearning, as per findings of Ismail and Jaafar (2015). This standard could be amended to include the functionality to change background colour, font colour, and font size in eLearning. This amendment is not limited to eLearning, as the standard could describe the printing of training materials on different coloured paper, with different font size, and/or different font colour.

Another common theme that arose from the participant study was the lack of audio within the eLearning courses. All participants discussed their preference for audio, and two participants directly referenced their use of text-to-speech software when they need to read a significant amount of text. The use of audio is described in the new standards document, and is in line with the findings of Dziorny (2012), who found that multiple presentation formats, such as audio, text, and video better met the needs of adults with dyslexia. Though the use of audio is described in the new standards document, it is described as a recommendation that *should* be incorporated in the design and development of training materials. To better meet the needs of adults with dyslexia in

workplace training, this standard can be updated to prescribe that audio, or the option to turn audio on or off needs to be available within training materials. This is a relatively easy solution to implement within eLearning, as many eLearning platforms have built-in text-to-speech functionality, and would be an effective way to provide multiple means of representation (Nelson, 2014). More planning and consideration is required when the training involves hard-copy reading materials, such as booklets or manuals, but meaningful solutions are still possible. One potential option to incorporate audio into hard-copy materials is to provide training participants with the digital copies of the files prior to the training, and ensuring text-to-speech software is enabled on their work computers. This potential solution would allow adults with dyslexia to participate in the training while it is occurring, and also process the textual information at their own pace without the immediate pressure of the training environment by reading/listening to the text before and/or after the training. This solution may also improve performance of adults with dyslexia in workplace training, as it provides a preview of the information that is to come, which can improve comprehension (Everatt & Fidler, 2012).

While background colour and use of audio appeared to need further consideration, several aspects of the new instructional design standards document appeared to be effective in making the training material more accessible for adults with dyslexia. The use of graphics, charts, and tables to break up longer passages of text and convey meaning was something all participants identified as being beneficial, though the preference for specific graphics, charts, or tables used within the courses seemed to be an individual opinion, as one participant liked the chart in eLearning Course 1, and another liked the chair graphic in eLearning Course 2. It is unrealistic for an instructional

designer to create a graphic, chart, or table that is universally appealing, however, consideration should be made regarding the incorporation of such visual elements, as they appear to meet the needs of adults with dyslexia. An emphasis was made on keeping the language level in eLearning Course 2 accessible and concise, however, no feedback was provided on the writing style or language level of either of the courses. While a lack of feedback is not sufficient enough to suggest any conclusions, it is reasonable to assume that the writing style and language level did not pose a barrier to the adults with dyslexia who participated in this study.

The purpose of the study was to answer the research question: how can instructional materials for workplace training be developed to meet the needs of adults with dyslexia? Overall, I believe a preliminary answer to that question was found. The study found that by combining tenets and theories of the fields of adult dyslexia, instructional design, and workplace training, certain needs of adults with dyslexia can be met by focusing on the use of font, background and text colour, multimedia elements, and overall text presentation. Though a preliminary answer was found, there is considerable opportunity for further research into how to best meet the needs of adults with dyslexia.

7.2 Opportunities for Further Research

This research study provided important insights into the ways in which workplace training materials can be designed to meet the needs of adults with dyslexia. However, despite inherent limitations related to the number of research participants, the study provides a basis for further research. A primary opportunity for further research would be to conduct a similar study with more participants. An increased number of participants

could allow for the correlation of survey and interview responses with variables such as age, gender, education level, or professional attainment. Furthermore, an increased number of participants could generate more conclusive findings.

A limitation of the study was that it was based entirely on participants' expressed preferences rather than an empirical measure of how the two eLearning course designs impact reading comprehension. To remedy this limitation, there is the opportunity to move from a qualitative research design to a quantitative design. To accomplish this, a research study may identify whether participant performance is improved when incorporating the findings from this study. This performance-based study may include having participants complete a series of reading comprehension assessments, or some type of standardized test. The study could use the two eLearning courses in a quasi-experimental design, wherein some participants interact with one eLearning course and some interact with the other. This type of study would provide important insights into whether dyslexic adult reading preferences translate into improved reading performance.

As this study focused on the design of eLearning courses, there is opportunity to conduct a similar study that focuses on paper-based training materials. By using paper-based training materials in lieu of, or in addition to eLearning, a researcher could assess whether the instructional design principles intended to improve accessibility for adults with dyslexia apply equally to eLearning and paper. This type of study may have broader implications beyond workplace training, and could be applied to other paper-based text mediums, such as marketing materials or journalism.

7.3 Conclusion

Adult dyslexia is a complex disorder that can have a profound impact on individuals' daily lives, particularly in the workplace. Despite the fact that many instructional design strategies to support adults with dyslexia have been identified, these strategies are not part of the common instructional design standards for workplace training. Incorporating strategies to support dyslexia into workplace training standards has the potential to make positive impacts on dyslexic employees by increasing the likelihood they are able to interact with training in a meaningful way. The implications for improved comprehension and retention of workplace training are plentiful and may include improved work performance, promotions, pay raises, and further training opportunities. By focusing on making workplace training accessible for adults with dyslexia, organizations will be able to deliver training that is more impactful, and thus, will foster a more competent workforce, and a culture that values inclusion.

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Appendix I

New Instructional Design Standards Document

Introduction

This document is intended for those involved in creating materials for corporate training events, including instructional designers, course developers, trainers, or technical writers. Corporate training events may include instructor-led training, a training manual, an eLearning course, or any other material or product that is intended to train staff. This document adheres to the ADDIE model of instructional design (Analysis, Design, Development, Implementation, and Evaluation). As this documentation is focused on the creation of training materials, standards for the Analysis, Design, and Development phases are discussed. The document is designed to meet the needs of the greatest number of participants, including individuals with reading or learning disorders.

Analysis

The analysis phase is comprised of two parts: *Learner Analysis*, and *Needs Analysis*. These parts require considerations of the learners taking the training, and what outcomes, or needs will be met by the training. These considerations are made by asking yourself a series of questions. These questions, and the actions required to answer the questions are listed below. Please note; many of the actions recommended are context specific, and may not apply to all training events.

Learner Analysis	
Who are the learners?	- Identify how many learners are expected to take the training. - Identify the job roles that are participating in the training. - Identify the range in learner age and/or years of experience - Identify education levels of learners - Identify past training experience of learners
What are the learners' abilities?	- Determine the skill and experience level learners will enter training with in regards to: - Technology (using a computer for eLearning, accessing the LMS, etc.) - Training event concepts and content - The demands of a training event (attention, assessment, participation, etc.) - Consider the diverse learning abilities of learners taking the training - Education level is **not** an indication of learning ability, as many people with learning disabilities are able to attain

	credentials ○ Diverse learning abilities can include reading difficulties, such as dyslexia, and cognitive impairments, such as ADHD. 　▪ Research suggests that 15-20% of the population has dyslexia symptoms, and around 4% of adults have ADHD ○ Since employee disclosure of learning disabilities is rare, assume participants with learning disabilities will be taking the training • Identify language levels of participants, and whether English Language Learners (ELL) will be taking the training • Determine if learners with physical disabilities, including visual, auditory, and mobility difficulties will be taking the training

Needs Analysis	
Why is the training needed?	• Identify the business need that is requiring training to occur 　○ Assess if there is a gap between what the business needs, and what is currently going on in the business • Determine the goals and intended outcomes of the training 　○ This can include behavioural changes in training participants, and quantitative measures, such as increased profits or decreased incidents • Determine learning objectives for the training
What do the learners need?	• Determine what learners will need in order to be successful 　○ Logistical needs, such as time off, or access to a computer 　○ Accessibility needs, such as text-to-speech software or a translator • Recognize constraints that might impact the training, such as timelines, access to resources, and staff availability
How will we know the training need has been met?	• Use the goals and intended outcomes of the course to identify assessment tools 　○ Includes learner assessment within the training, as well as evaluation after the training to ensure the intended outcome has occurred • Identify a timeline for the full training cycle to occur, including the evaluation of training success

Design

The design phase uses the information gathered during the analysis phase to begin the creation of the training materials. The decisions made during the design phase can be made by asking yourself a series of questions. These questions, and the actions required to answer the questions are listed below.

How will the training be delivered?	• Identify the delivery format that is appropriate, effective, and/or required for the training. Delivery formats include:
	    o Instructor-led training
	    o eLearning, web based, online, etc.
	    o Training manual
	    o Blended (combination of formats)

What content will be covered?	• Refer to your analysis to determine the content that is required to meet the goals and intended outcomes of the training • Use the identified content and the training goals to create learning objectives for the training (if you haven't already done so)

How will the content be structured?	*Structure is largely dependent on the delivery format being used, but general considerations can be applied to any format.
	
	• Decide the layout and sequencing of the training, ensuring content is broken up into logical sections
	    o Content should be as concise and accessible as possible
	        ▪ Content that does not support the training goals is distracting, and places unnecessary strain on learners
	    o May involve modularizing a course
	• Whenever possible, learners should be able to fully navigate the training
	    o In eLearning, this means being able to move through a course or modules freely, without restricted navigation

What training materials need to be developed?	• Determine how the content will be presented, based on the delivery format being used
	• Multiple presentation formats should be developed and used, including:
	    o Audio
	    o Video
	    o Graphics
	    o Text
	    o Charts, Graphs, Tables
	• Text-heavy training materials should be accompanied by supplements to remedy potential reading difficulties

	o Supplements may include:
	    ▪ Short summaries of long passages
	    ▪ Infographics
	    ▪ Definitions of key words, acronyms, and jargon
	    ▪ Space to record notes or create a mind map

Development

The development is where the planning that has occurred in the previous phases is put into the creation of the training material. The primary focus of the development phase must be to create training materials that are relevant, learning-focused, and most importantly, accessible. Accessible training materials are materials that improve learning for all learners, regardless of diverse learning abilities. The development phase standards outline the specific requirements of all training materials.

Font Size	18, 22 or 26 points
Character Spacing	+7 or +14 %.
Line Spacing	1.5
Font/Background Colour	Black font on white background, or white font on black background.
Typeface	Arial, Courier, CMU, Helvetica, Verdana or a custom font made for dyslexic readers, such as Sylexiad. If possible, learners should be able to adjust typeface on screen, especially for text heavy sections.
Font Style	Roman or Sans-Serif
Alignment	Left-justified
Headings	Bold, 26 point, title case.
Text Layout	• Use bullet points and numbering in lieu of long passages • Break up long paragraphs into multiple short paragraphs • In eLearning, use clickable elements to reveal text to allow learners to review text at their own pace
Writing Style	• Use short, concise, and clear language. For example, the word 'use' is more short, concise, and clear than the word 'utilize.' • Write for a Grade 8 reading level

	• Avoid unnecessary jargon, abbreviations, cultural references, or colloquialisms • Provide clarification and definitions of specific terms and concepts at the beginning of the training material • Use lists or charts to communicate complex ideas. For example, a 'Do's and Don'ts' list is easier to read than a passage about best practices.
Graphics	When possible, use graphics to supplement or substitute text. For example, a flowchart can be used to describe a procedure, or an infographic to articulate the location of something.

Appendix II

Participant Survey

<u>**Post Study Survey**</u>

I found the font in eLearning Course 1 easy to read.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
Comments:	

I found the ability to change font in eLearning Course 2 helpful.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
Comments:	

The organization of text in eLearning Course 1 was easy to read and follow.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
Comments:	

The organization of text in eLearning Course 2 was easy to read and follow.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
Comments:	

I found the use of clickable elements in eLearning Course 2 helped with my reading of the text.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
Comments:	

The brief introduction of terms and concepts in eLearning Course 2 helped me better understand the text that followed.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
Comments:	

The use of graphics in eLearning Course 2 helped me understand what I was reading.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
Comments:	

Overall, I preferred eLearning Course 1.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
Comments:	

Overall, I preferred eLearning Course 2.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree

Comments:

Appendix III

Interview Questions

1. Have you ever participated in workplace training programs?
   a.   If yes, did you find any difficulties with reading the materials?

2. What strategies do you use to help you read long passages of text, either at home or at work?

3. How much reading do you do on a daily basis at your place of work?

4. Would you be comfortable discussing reading challenges with your employer?

5. Did you ever receive reading support during your education?
   .   If yes, what kind of supports? Do you feel these kinds of supports would be beneficial in the workplace?

6. In your opinion, does dyslexia pose a barrier to job performance? Why or why not?

7. If you had to be trained about a new procedure at your job, would you want the training to be more like eLearning Course 1 or eLearning Course 2?
   .   Why?

8. If any, what changes would you like to see in how the needs of people with dyslexia are met in workplace training?

Curriculum Vitae

Candidates Full Name: Andrew Jordan Vela

Universities Attended: University of Alberta, Bachelor of Education, 2014

Publications: None

Conference Presentations: None