

The Effect of Assistive Technology on the Writing Proficiency of Junior High Students with
Significant Learning Needs

by

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Abstract

The purpose of the present study was twofold: to examine the impact of assistive technology (AT) on the writing proficiency of junior high students and to explore the utility of a writing assessment for students with significant learning needs. Writing skills included productivity, sentence complexity, word complexity, spelling, overall quality, and genre-specific skills (e.g., engage and orient reader, state an opinion). Participants were 10 students with a range of learning needs (Mild Cognitive Disability, Learning Disability, Communication Disability, Physical/Medical Disability) enrolled in Grades 5 to 7 within a segregated classroom. Four writing samples were collected from each participant: (1) unassisted narrative, (2) assisted narrative, (3) unassisted persuasive and (4) assisted persuasive, and coded using a writing assessment developed for this study. Results indicated that the use of AT lead to statistically significant improvements in spelling in persuasive and narrative genres, in narrative overall writing quality, and providing reasons in the persuasive genre. In general, students achieved higher proficiency in the narrative genre than in the persuasive genre. However, there was great variation in writing among the students, and only 50% demonstrated higher quality narrative writing with the use of AT. Two case analyses of student writing explored the extremes of writing variability and the utility of the writing assessment. Analyses revealed that, despite the modest gains realized with AT, the writing assessment allowed for a clear understanding of writing skill and demonstrated promising utility as a teacher friendly measure for targeting writing goals for students with significant learning needs. Discussion explores the importance of

providing students with significant learning needs with AT that meets their writing needs and the provision of quality writing instruction across writing genres.

Keywords: assistive technology, writing, assessment, junior high students, significant learning needs

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Chapter 1: Introduction

Writing is one of the most challenging skills that children are expected to master during their school years. As such, skilled writing is a complex communication activity that includes the acquisition, coordination, and integration of many processes and strategies (De La Paz & Graham, 2002). The skills associated with writing must be mastered while in school, since successful participation in educational, work, and social settings beyond school require strong writing competence and overall literacy (Rutenberg, 2009). Unfortunately, writing is a challenging task for typically developing students, confirmed by 72% of employers who rate high school graduates as deficient in writing skills (National Endowment for the Arts, 2007). Writing is even more challenging for those with significant learning needs (e.g., Learning Disability, Intellectual Disability, Autism Spectrum Disorder, Attention-Deficit/Hyperactivity Disorder). Writing produced by these individuals frequently contain more mechanical errors (e.g., hand-writing, spelling), are generally shorter, less coherent, less well organized, and overall, are lower in quality than the writing of typically developing students (MacArthur, 2000).

Assistive technology (AT) has been proposed as a strategy to support the continued development of struggling writers, with emphasis placed on the processes of transcription and revision (MacArthur, 2009). Alberta Education (2006) defines Assistive technology (AT) for learning as:

The devices, media and services used by students with physical, sensory, cognitive, speech, learning or behavioural disabilities to actively engage in learning and to achieve their individual learning goals. AT is a subset of a broad range of technologies that

enhance students' learning. AT assists students in performing functions that would otherwise be difficult or impossible to accomplish independently. (p. 1)

AT has been applied widely across many classroom situations, such as for positioning and mobility (i.e., physical disability supports), environmental interaction (i.e., performing activities of daily living), and communication (Simpson et al., 2009) but has not been closely examined in regard to how it can support writing. The focus of the present study is to examine whether the use of AT can improve student writing proficiency.

The Current State of Writing

Alarming, data from the United States indicates that less than one quarter of students are able to produce writing that fully meets grade level expectations (National Centre for Education Statistics, 2012). Unfortunately, much less is known about the writing proficiency of Canadian students, as the focus of standardized, large-scale assessments has not been placed on writing. For example, the Pan-Canadian Assessment Program (PCAP), developed by the Council of Ministers of Education, Canada (CMEC), informs Canadians on how well their education systems are meeting societal and student needs in core disciplines (CMEC, 2007). However, like the Programme for International Student Assessment (PISA; OECD, 2014) the identified “core disciplines” to assess were reading, mathematics, and science; thus, largely ignoring writing. Even though one aspect of the reading assessment, response to text, has a small written component (CMEC, 2007), it is hardly a satisfactory measure of true writing proficiency since it only requires a short (e.g., one or two sentences) response to a question. This type of written task would provide extremely limited information, which would not be nearly as effective as more in depth writing assessment across different writing genres.

In Alberta, the Provincial Achievement Test (PAT) is used to assess student achievement in the following areas: Language Arts, Mathematics, Science, and Social Studies (Alberta Education, 2015). Within the Language Arts component, there are two writing assignments: narrative/essay and functional writing (Alberta Education, 2015). The narrative/essay writing assignment requires students to respond to a topic presented, and is scored according to content, organization, sentence structure, vocabulary, and conventions (Alberta Education, 2015). The functional writing assignment involves responding to a situation in the format of a business letter, and is scored on content and content management (Alberta Education, 2015). In 2014, 78% of Grade 6 students met the “acceptable standard” on the writing component, while 11% met the “standard of excellence” (Alberta Education, 2014). Although a large proportion of students seem to be meeting this minimum acceptable standard, it must also be considered that these results also suggest that 11% of students are not performing at this level. A proportion of students, which likely includes those with significant learning needs, must be achieving well below this acceptable standard. However, the reporting of the PAT results focuses on how well most students are doing, as opposed to the variability and range in performance. This suggests that there may be cause for concern in regard to student writing proficiency in the province.

Additionally, there is much controversy surrounding the PAT. The Alberta Teachers’ Association (ATA) believes that the primary role of testing is to improve student learning by obtaining information required to plan for further learning (Alberta Teachers’ Association, 2010). However, there is a belief among the ATA that the PAT does not improve teaching and learning, and instead, might actually have a negative impact on students and school (Alberta Teachers’ Association, 2010). The PAT measures only a small portion of what students are

expected to learn, and therefore, is not a fair or even accurate measure of achievement (Alberta Teachers' Association, 2010). Additionally, there is a lack of evidence that the PAT actually improves student learning, and instead, this high stakes test serves to sort and rank students (Alberta Teachers' Association, 2010). Further, the shared assessment results do not go beyond a simple statement of acceptable or not acceptable. Thus, it appears as though this assessment provides no insight to teachers or parents regarding how to facilitate the development of student writing.

It is clear that, in the realm of high-stakes testing, writing proficiency has been largely ignored, not only at a national level, but also internationally. Thus, there is a lack of knowledge about the current state of writing. Although Alberta has assessed writing in their Provincial Achievement Tests (PAT), there is a high level of controversy surrounding this test. Given the importance of written language competence beyond school, it is crucial that writing is accepted as an important aspect of student achievement, and that assessments gather information to inform development of these skills.

Writing in the 21st Century

The digital revolution has transformed education (Alnahdi, 2014). Attempts are being made within school systems to bridge the gap between how students learn and how they live (Tucker, 2014). Thus, there has been a strong push to identify and integrate 21st Century skills into instruction in order to equip students to live in the technology-driven world of today. As teachers prepare students for the 21st Century, effective writing becomes an important skill in a context where collaboration and communication take greater precedence within contexts that are digitally mediated (Ministerial Order, 2013). In the information-driven world of the 21st Century,

effective communication is a standard that is expected for all citizens across social, academic, and vocational settings (Nippold, 2014); therefore, individuals with written language difficulties are at a clear disadvantage.

One way that teachers are transforming the learning environment to support the acquisition of 21st Century skills is through one-to-one initiatives, which strive to have a technological device in the hands of every student for use within the classroom (Tucker, 2014). What was once thought a “far-fetched” idea has now emerged as a central context for educational innovation in today’s digital age. This type of technologically enriched environment supports the development of the 21st Century learner, as all students can take control of their own learning through the use of individual or ‘personalized’ devices (Tucker, 2014). Additionally, students with significant learning needs can use AT to access and support learning. The use of AT within the classroom is considered an effective teaching practice to a diverse student population, but may also be a crucial support for students with significant learning needs (Tucker, 2014).

AT for Writing

MacArthur (1996, 2000, 2009) describes AT for students with writing difficulties, and reflects on various types of AT commonly used to support student writing. Although MacArthur recognizes that word processing has become the way most individuals write, additional supportive tools can be used in conjunction with a word processor, such as spell checkers, speech-to-text software, and word prediction. A brief overview of these ATs will be given, as these were all features of the AT used in the present study.

Spell checkers. It is widely recognized that spell checkers help students correct their spelling errors by identifying incorrectly spelled words. However, MacArthur outlined some of their key limitations. Spell checkers fail to detect certain types of spelling errors, such as those that form other words (e.g., homonyms), and those words that are severely misspelled. Additionally, it is also possible that the correct spelling might not be suggested, and finally, the student may not even be able to recognize the correct spelling in the list of suggestions.

Speech recognition. Speech recognition software (“speech-to-text”) is a dictation tool that translates spoken language into text for individuals who struggle with transcription. Although this software alleviates problems with the mechanics of writing, the writer must be able to articulate accurately, which increases the cognitive demand of the writing task.

Word prediction. Word prediction software “predicts” what word the writer is intending to type based on the initial letters typed. Then, the software offers writers a continually updated list of word suggestions as the writer types, which is based on spelling and syntax. For example, if the writer has already typed, “I went to the s”, the software might offer a list of suggestions including the words *store*, or *show*. If the writer continued and typed the letter *t*, the program would update the list to include only words that begin with the letters *st*. The writer can then select the desired word from the list of predicted words, and it will be inserted into their text. This type of AT was originally designed for individuals with physical disabilities to make the act of typing easier (reducing the number of keystrokes), but has also been applied with individuals who have severe spelling problems.

Research Supporting the Use of AT to Enhance Writing Proficiency

AT has been widely implemented across clinical and educational settings (MacArthur, 2009). There is a sizable body of literature on the widespread use of AT, which includes the use of AT to improve the quality of life for individuals with disability (e.g., Alper & Raharinirina, 2006; Brodwin, Star & Cardoso, 2004), as well as to support reading (e.g., Chan, Foss & Poisner, 2009; Miranda, 2003). However, despite a thorough search of the educational and related databases, research on AT for writing is limited to two published peer reviewed articles (Cullen, Richards & Frank, 2008; Handley-More, Deitz, Billingsley & Coggins, 2003) and two doctoral dissertations (Cunningham, 2013; Silió, 2008). Thus, an important gap in the literature was identified, as further research needs to be conducted to support the use of AT for writing.

The study by Handley-More and colleagues (2003) investigated whether teaching students to use word processing alone or with word prediction, was more effective in improving the written communication skills of children with learning disabilities and handwriting problems. Researchers replicated a single-subject alternating treatments design across three children in Grades 4 and 5. These children completed narrative writing tasks by handwriting, using a word processor, and using a word processor in conjunction with word prediction. Two out of the three participants demonstrated noticeably improved spelling with the use of word prediction; however, no method resulted in any changes in productivity. Unfortunately, it is unknown whether the use of word prediction resulted in any other changes in the mechanics of writing, as they were not measured.

A doctoral dissertation by Silió (2008) examined the effects of word prediction and text-to-speech software on narrative writing skills of students with learning disabilities using a

multiple baseline design. Participants were six Grade 5 boys with specific learning disabilities separated into two cohorts. All participants wrote narrative compositions for 15-minute sessions, and only used word processing in the baseline phase. During the intervention phase, one cohort used word prediction, followed by word prediction in conjunction with text-to-speech, while the other cohort used text-to-speech, followed by text-to-speech in conjunction with word prediction. The following four variables were measured for all writing samples: writing fluency (words per minute), syntax (number of T-units), spelling accuracy, and overall organization (holistic rubric). Results indicated that word prediction alone, or in combination with text-to-speech had a positive effect on writing, as the participants wrote more words, more T-units, spelled more words accurately and demonstrated an improved quality of their writing using these AT compared to word processing alone. When participants used text-to-speech alone, inconsequential results were obtained on all variables, with the exception of spelling accuracy. Thus, word prediction alone or in combination with text-to-speech helped students to write longer, higher quality narrative compositions, and should be considered as supports to facilitate narrative written production. However, the results of this study did not establish effectiveness of using text-to-speech in isolation.

A doctoral dissertation by Cunningham (2013) also investigated the effects of word prediction and text-to-speech on writing among ten elementary and middle school students with a written expression disorder. The researcher used a modified multiple case series design to collect data over a three-week period. The AT used in this study was WordQ, a program that assists in both reading and writing activities through word prediction and text-to-speech software. The study focused specifically converting ideas and knowledge into text. Participants

were asked to respond, in writing, to a picture-based writing prompt. The use of pictures was intended to limit the amount of planning required. Participants used a word processor during the pretest condition, while they used WordQ in the posttest condition. Results obtained suggested that using WordQ resulted in significantly better written work, characterized by fewer spelling errors and increased syntactic maturity (mean length of T-units). Therefore, these results provide support for the use of word prediction and text-to-speech software to facilitate writing.

Research conducted by Cullen et al. (2008) examined the use of software to enhance the writing skills of seven Grade 5 students, five of which were diagnosed with a Learning Disability, while the remaining two had a Mild Intellectual Disability. Thus, all students were eligible for special education services, and were enrolled in the same inclusive and resource classrooms. This study employed a modified multiple-baseline design, which involved three phases of journal writing: baseline, intervention using a talking word processor with spell check independently, and intervention using word prediction software in conjunction with the talking word processor and spell check. General results indicated that the impact of the writing software was positive, as significant improvements on all four variables were noted: decreased number of misspellings, increased accuracy, increased number of words, and increased overall score on a writing rubric that took both lower- and higher-order skills into consideration (e.g., spelling, punctuation, capitalization, sentence structure, word usage). However, it is important to note that individual differences were observed and uniform outcomes were not obtained across all students. This is an important consideration and suggests that a “one-size-fits-all” approach to AT selection will not be effective, since each student has unique learning needs and preferences.

The previously reviewed studies represent the small body of literature to date on this topic. This work reveals that even though some positive effects of AT on writing has been demonstrated, there is a lack of conclusive and replicated evidence to definitively state that different types of AT result in significant improvements in writing. Further, all of these studies examined the effect of AT on one writing genre: narrative (through narrative tasks, as well as picture prompts and journal writing). Therefore, further research is required surrounding the effect of AT on different writing genres.

Writing Genres

Children, like adults, engage in writing for many different purposes (MacArthur, Graham & Fitzgerald, 2006). There are a variety of writing genres that students are expected to master during their school years (Beers & Nagy, 2011). Two genres, narrative and expository (informational), tend to receive the most attention at school (MacArthur, Graham & Fitzgerald, 2006). However, another genre regarded as increasingly important in the 21st Century is that of persuasive (or argumentative) (Minsterial Order, 2013). Each genre has different rules, structures, and purposes. Even within the elementary grades, students are required to learn the communicative purposes and organizational structures of a variety of genres, including narrative, descriptive, explanatory, persuasive, and compare/contrast (Beers & Nagy, 2011). The present research focuses on two of these genres, narrative and persuasive, which are described below.

Narrative. Early in life, children are exposed to the narrative form through oral language and reading stories. As such, it is an easier and more natural transition from spoken language into written language (Crowhurst, 1990). In Alberta's Program of Study (Alberta Education, 2000), Grade 1 Language Arts outcomes include "experiment with different ways of exploring and

developing stories, ideas and experiences”, and “identify the main idea or topic of simple narrative and expository texts”. Thus, narrative writing, in its simplest form, is taught to students when they first enter elementary school. At its core, the purpose of a narrative is to relate events and/or experiences. This can be as basic as a story with a beginning, middle, and end, to a more complex narrative that establishes a context by describing characters and settings, and uses narrative devices (e.g., dialogue, pacing, reflection) to develop and sequence events (Common Core State Standards Initiative, 2014).

Persuasive. Although persuasion and argumentation are also experienced quite early in life, the written form is not explicitly taught until the middle years (Rutenberg, 2009). Alberta’s Program of Study (Alberta Education, 2000) includes some objectives related to persuasive writing at the junior high level. For example, students are expected to “justify own point of view about oral, print and other media texts, using evidence from texts”, in Grade 8, students are expected to “seek out and consider diverse ideas, opinions and experiences to develop and extend own ideas, opinions and experiences”, and in Grade 9, students are expected to “extend understanding by taking different points of view when rereading and reflecting on oral, print and other media texts”. As such, performance on persuasive writing in junior high is typically weaker than performance on narrative writing tasks (Crowhurst, 1998).

However, an increased emphasis has been placed on persuasive writing in the 21st Century in order to prepare students for effective communication in their future educational, professional, and personal lives (Newell, Beach, Smith & VanDerHeide, 2011). The purpose of a persuasive essay is to try to convince a reader to adopt the writer’s point of view, or take some action regarding a controversial topic (Nippold & Ward-Lonergan, 2010). Successful persuasive

writers are able to articulate a position, support it with clear and logical arguments, anticipate counter-arguments, and reply to opposing points of views in an organized fashion (Brown, Johnson, Smyth & Cardy, 2014). However, large individual differences exist among middle school students, where some demonstrate a one-sided perspective where they are unable to recognize and respond to opposing points of view (Nippold & Ward-Lonergan, 2010).

Persuasive writing has been considered by many to be a more sophisticated and cognitively demanding task than narrative writing (e.g., Brown et al., 2014; Crowhurst, 1990; Nippold & Ward-Lonergan, 2010). Persuasion requires perspective taking, which narrative does not necessarily require (Nippold & Ward-Lonergan, 2010). Additionally, successful organization of an argument is more challenging than the characteristic chronological order of events in narrative writing (Crowhurst, 1990). Finally, it is easier to generate content with the freedom of a narrative, compared to the narrow focus of controversial topics that persuasive essays are constructed from (Crowhurst, 1990). For these reasons, and due to the delayed instruction in persuasive writing, school-aged children's persuasive writing is generally not as strong as their narrative writing (Crowhurst, 1990).

Writing Development

Writing is the most complex language task that children must undertake (Zhang, 2000). It is important to understand how writing skills develop in order to support students in this challenging task. Therefore, a brief overview on the development of writing skills will be given. However, it must be noted that this is not a comprehensive review, since it has been acknowledged that writing is an extremely difficult and challenging developmental progression that requires the mastery and integration of many strategies and processes (De La Paz & Graham,

2002). Further, capturing the complexity of writing was not the focus of this study. Instead, the focus is on the application of knowledge, in a simplified and applied way that could be useful for teachers.

It is often assumed that writing development progresses from sensitivity to letter-sound correspondences, to word formation and then sentence formation, before finally reaching a level of extended discourse (MacArthur, Graham & Fitzgerald, 2006). However, writing has now been suggested to develop across many levels simultaneously (MacArthur et al., 2006). Although, the knowledge individuals acquire about texts will both guide and constrain their knowledge at other levels (MacArthur et al., 2006).

Governors and state commissioners of education from almost all of the United States launched the Common Core State Standards Initiative in 2009 to ensure all students, regardless of where they were from, graduate high school prepared for post secondary education, careers, and life (Common Core State Standards Initiative, 2015). These state leaders recognized the value of consistent, real-world learning goals, and set out to develop standards, which were informed by existing state standards, along with international benchmarks, as well as public feedback, and the experience of teachers, content experts and leading thinkers (Common Core State Standards Initiative, 2015). Teachers were highly involved in the development process of these standards by serving on work and feedback groups to draft the standards (Common Core State Standards Initiative, 2015). Ultimately, these standards establish what students need to learn, but do not dictate how they should be taught (Common Core State Standards Initiative, 2015). The Common Core represents a simplified developmental progression for narrative, persuasive, and expository writing which is applied, and thus, useful for teachers. An initiative

from the United States was used in this study to understand and assess writing proficiency because there lacked a similar set of standards in Canada.

Olinghouse (2008) explored student- and instruction-level predictors of the fluency and quality of narrative writing among 120 third-grade students. Results indicated that the main instructional predictor of narrative writing was the time that was allocated within the classroom to teaching specific writing and planning skills. Student-level predictors were separated into those that predicted fluency and those that predicted quality. Fluency and advanced planning ability were two strong predictors of narrative writing fluency, while full scale IQ, word reading ability, understanding of grammar, and narrative writing fluency were the predictors of narrative writing quality. Thus, it can be inferred that students with significant learning needs, who especially struggle in writing-related tasks, might struggle because they lack some of these predictors, such as advanced planning ability, word reading ability, understanding of grammar. Since one of the criteria that must be met in order to diagnose an Intellectual Disability is a deficit in intellectual functioning (American Psychiatric Association, 2013, p. 33), it would be expected that they would have a lower quality of narrative writing than someone with these skills and abilities. This highlights the importance of differentiated instruction, which is consistent with the provision of academic accommodations, such as AT.

Beers and Nagy (2011) investigated the writing development of students in two cohorts, Grades 3 and 5 (n=83) and Grades 5 and 7 (n=96), across four genres (narrative, descriptive, compare/contrast, persuasive) with respect to syntactic complexity and genre differentiation. Clauses per T-unit were found to be greatest in persuasive texts than the other genres, while words per clause was greatest in descriptive texts. Although these differences among genres were

obtained, there was limited evidence to suggest increased differentiation of these genres across grade levels. Further, these researchers suggested that students' ability to write effectively in the compare/contrast and persuasive genres was likely compromised by their limited knowledge surrounding the syntactic and organizational structures required for each genre. Thus, it is possible that students at these ages do not have the cognitive capacity to create appropriate mental representations of each genre, or that they lack the linguistic ability to meet the organizational requirements for different genres. Another possibility is that current instructional approaches do not include genre-specific writing instruction. This is true in Alberta, as the program of studies does not include persuasive writing instruction and objectives until the middle school years (Alberta Education, 2000). Overall, these results demonstrate that persuasive writing tends to be the most syntactically complex. However, Beers and Nagy concluded that limited development in genre-specific writing occurred between Grades three to seven. Therefore, students could benefit from genre-specific instruction.

Nippold, Ward-Lonergan and Fanning (2005) examined the syntactic, semantic, and pragmatic development of persuasive writing from childhood to adulthood. A total of 180 participants, with mean ages of 11 (childhood group), 17 (adolescent group) and 24 (adult group), composed persuasive essays on the controversial topic of animals being trained to perform in circuses. Developmental changes in the writing domains of syntax, semantics, and pragmatics were measured, and each were found to improve in the years between child- and adult-hood. Specific syntactic changes were increased mean length of utterance, and use of different types of clausal (e.g., independent and subordinate) and sub-clausal (e.g., fragment) elements. With regards to changes in semantics, a gradual increase in the use of literate words

was measured, including adverbial conjuncts (e.g., however), abstract nouns (e.g., kindness), and metalinguistic and metacognitive verbs (e.g., disagree). Finally, pragmatic changes included increases in productivity (number of words, utterances, and reasons). The researchers concluded that, as individuals develop, they develop the ability to see controversies from multiple perspectives and to generate arguments for both sides of an issue. This leads to higher-level content, clarity and cohesiveness of essays.

Therefore, it is evident that writing development among “typical” learners is a complex process involving many different domains. Although evidence suggests gradual growth in these domains, it is unknown what one might expect in terms of the variability in the rate of development among “typical” learners.

Writing Development Among Struggling Learners

Although a small body of research exists on the writing development for typical students, it is reasonable to believe that the writing development among students with significant learning needs deviates from the typical path. Unfortunately, even less research has been conducted on the development of writing among students with significant learning needs, such as those with a Learning Disability, Intellectual Disability, Autism Spectrum Disorder, or Attention-Deficit/Hyperactivity Disorder. The research on intellectual disabilities has focused on deficits more broadly, and no evidence has been published to date on the writing deficits often experienced by these individuals. However, a comprehensive literature search identified a few studies that have been published on the writing development of individuals with other learning needs.

Morris and Crump (1982) compared syntactic and vocabulary development in the written language of students with and without learning disabilities (LD) separated into four age groups, ranging from nine to 13 years of age. Each age group contained 18 male LD participants and 18 “normal” male participants, which resulted in a total sample of 72 LD participants and 72 “normal” participants (N=144). Participants were shown a film without narration, and given standard instructions to elicit written language samples. All writing samples were edited for spelling and punctuation in order to be read in a computer program that analyzed the samples for variables related to syntactic and vocabulary development. No differences were found with respect to T-unit length between groups, but this variable did increase consistently across age levels. Students with learning disabilities wrote with less syntactic maturity (e.g., subordinations, embeddings), and had a lower type/token ratio (less variety of word types) at all ages compared to their typically developing peers. These results indicate specific areas of weakness in terms of the writing development of students with learning disabilities: syntax and vocabulary.

Thomas, Englert and Gregg (1987) analyzed the errors and strategies in the expository writing of students with learning disabilities in comparison to both students matched to those with learning disabilities in IQ and reading ability, and typically developing peers (N = 108) across Grades three, four, six and seven. Effective expository writing requires the ability to explain and provide information on a specific topic, which is an important communication skill during the school years. Students were provided with paragraph stems read aloud, and then were instructed to complete the paragraph, in order to measure their expository writing. Results indicated that students with learning disabilities made more redundancies, irrelevancies, early termination, and mechanical errors in comparison to the typically developing group. Further,

students with learning disabilities also made more early termination and mechanical errors than their learning disability peers who were matched on IQ and reading ability. The occurrence of these errors suggest that students with learning disabilities are more insensitive to the purpose of expository writing, and the strategies of generating and producing expository idea than typically developing students.

Brown and colleagues (2014) explored the persuasive writing skills of students with high-functioning Autism Spectrum Disorder (HF-ASD), since it is known that the competencies required for successful persuasive writing (e.g., perspective taking) are considered weak among the HF-ASD population. Persuasive texts from 25 students with HF-ASD were compared to 22 typically developing students on 19 variables across six categories: productivity (words, clauses, T-units), grammatical complexity (mean length of T-unit, clausal density), lexical diversity (Type Token Ratio, frequency of multi-syllable, big and rare words), cohesiveness (connectives), writing conventions (errors in spelling, capitalization, punctuation), and overall quality (structure and organization, coherence, background information, tone). Results indicated that students with HF-ASD produced persuasive essays that were lower in quality, characterized by shorter and less syntactically complex texts. Further, they demonstrated vague and unclear ideas, inadequate development of ideas, and a tendency for details to be presented without a cohesive structure. Thus, there were clear deficits measured in the persuasive writing skills of students with HF-ASD compared to typically developing students.

Re, Pedron and Cornoldi (2007) examined expressive writing difficulties among 24 Italian children in Grades 6 and 7 described as exhibiting ADHD symptoms by their teachers. Students engaged in a series of expressive tasks, which included writing a description of an

image, as well as a narrative text. Results indicated that children with ADHD symptoms produced shorter texts, made more errors (e.g., spelling), and were also rated as less proficient on measures of adequacy, structure, grammar, and lexicon than typically developing children. Thus, children with ADHD presented general and widespread difficulties with expressive writing, as they scored lower than typically developing students on all measures of writing proficiency. Further, these difficulties were extended to different types of writing tasks, suggesting a global writing weakness.

Overall, this small body of research indicates that the development of writing skills among students with a diverse range of significant learning needs lags behind that of typically developing students. In the 21st Century, there has been a push to integrate technology into the classroom as a means of preparing students to function as contributing members of society. Thus, additional research is necessary on whether the use of AT can improve the writing skills of students within this population. An evidence base needs to be established in order to include AT support for writing as an evidence-based practice within classroom environments.

Present Study

The purpose of the present exploratory study is twofold: (1) the primary focus is to examine the impact of AT on the narrative and persuasive writing proficiency of junior high students with significant learning needs, focusing on both lower and higher order writing skills; (2) the secondary purpose is to explore the utility of a measure developed to assess writing skills.

For the purposes of this study, lower order writing skills refer to productivity, sentence complexity, word complexity, and conventions (spelling, capitalization, punctuation). Higher order writing skills refer to more complex text features that contribute to the overall quality of

the writing sample (e.g., engaging and orienting the reader, stating an opinion, providing a conclusion). The following research questions will be addressed:

1. Does the use of AT (i.e., Read & Write for Google™) improve the writing proficiency (i.e., lower and higher order writing skills) of students with significant learning needs?
2. Do students with significant learning needs show similar proficiency in the narrative and persuasive writing genres?

Based on the above literature review, it is hypothesized that:

1. The use of AT will improve the writing proficiency (both lower and higher order writing skills) of students with significant learning needs. Research has demonstrated improvements in various aspects of writing proficiency through the use of AT, including: spelling (Cullen et al., 2008; Cunningham, 2013; Handey-More et al., 2003; Silió, 2008), productivity (Cullen et al., 2008; Silió, 2008), syntactic maturity (Cunningham, 2013), and overall quality (Cullen et al., 2008; Silió, 2008).
2. Students with significant learning needs will demonstrate higher proficiency in the narrative genre than in the persuasive genre. Based on an examination of the Alberta Program of Study (Alberta Learning, 2000), as well as anecdotal teacher reports, it appears that less emphasis is placed on persuasive writing than narrative writing in the elementary school years, and persuasive skills are not explicitly included as an expected outcome until the junior high school years.

Chapter 2: Method

Research Design

A within-group repeated measures design (Creswell, 2012, p. 315) was utilized, in which a single group of participants were studied, and each participant in the single group completed two writing samples (narrative and persuasive) in each of the two conditions: unassisted (UA) and assisted (AT). Their writing proficiency was measured in each condition, and variations in their writing proficiency (the outcome measure) were assessed for differences between conditions.

Participants

Participants for the present exploratory study consisted of 10 students (40% Female, 60% Male), enrolled in Grades 5 to 7 (50% Grade 5, 10% Grade 6, 40% Grade 7) within a single segregated classroom in a rural Alberta junior high school (Mean age = 11 years, 8 months, range = 10 years, 10 months to 13 years, 3 months) (see Table 1 for demographic information). All students were participants in a larger project entitled *Flexible Pathways to Success: Technology to Design for Diversity* project, where their writing samples were collected. The original sample consisted of students whose teachers were participating in the larger study. This sample was chosen for the current study because all students were members of the same classroom and had received similar instruction. All participants had significant learning needs (60% Mild Cognitive Disability, 20% Learning Disability, 10% Communication Disability, 10% Physical/Medical Disability), which placed them within this segregated classroom.

Table 1

Participant demographic information

Student ^a	Gender	Age	Grade	Significant Learning Need	Language Spoken in Home	Socioeconomic Status (Teacher Judgment)
Sarah	F	12:11	7	Mild Cognitive Disability	English	Mid
Carter	M	12:7	7	Mild Cognitive Disability	English	Mid
Jackson	M	13:3	7	Mild Cognitive Disability	English	Mid
Cassidy	F	10:11	5	Physical/Medical Disability	English	Mid
Gwen	F	10:10	5	Mild Cognitive Disability	English	Mid
Garrett	M	12:9	7	Learning Disability	English	Low
Jeremy	M	11:9	6	Learning Disability	English	Mid
Kieran	M	11:8	5	Communication Disability	English	Mid
Katie	F	11:7	5	Mild Cognitive Disability	English	Low
Nathan	M	11:8	5	Mild Cognitive Disability	English	Mid

^a Names have been changed

Procedure

Student writing was collected for both narrative and persuasive genres from all participants in the Spring of 2015 in two conditions: unassisted (no AT used) and assisted (use of AT). A total of four samples were collected from each student: (1) narrative unassisted, (2) narrative assisted, (3) persuasive unassisted, and (4) persuasive assisted. Writing samples were assessed using a measure that was developed for the larger project, *Flexible Pathways to Success*, that utilized a ‘responsive evaluative’ theoretical framework. An evaluation is "responsive" if it orients more directly to program activities than to program intents, if it responds to audience requirements for information, and if the different value-perspectives

present are referred to in frequent reporting (Stake & Abma, 2005). In this study, the writing assessment was developed in an attempt to accurately assess writing development across two genres in a way that was accessible to teacher participants who may not be familiar with specialized linguistic terms used to describe writing development (e.g., T-Units, clausal density, lexical complexity). The responsive approach tries to respond to the natural ways in which people assimilate information and arrive at understanding.

Collection of unassisted writing samples. The writing samples where students were not permitted to use any AT were collected on laptops opened to a textbox with spelling and grammar check disabled. Responses were typed in order to avoid illegible handwriting from confounding or preventing the assessment of the samples. Students were given a different prompt for each sample to guide their writing. All prompts were obtained from examples of language sampling prompts described by Nippold (2014).

The following narrative prompt was used:

I would like you to write a story. Please write a story about something funny, sad, or scary that happened to you and a friend. You get to decide what to write about. It can be anything that was funny, sad, or scary. If you can't think of something that really happened, you can make it up. It doesn't have to be a true story. You can use your imagination, if you want. It's up to you.

As you do this work, please be sure to tell a complete story. Remember a story has a beginning, middle, and ending. Make sure you plan your story first and try to write as much as you can.

The following persuasive prompt was used:

Students are using computers and tablets at school a lot more these days. Some people think that we should do away with all paper and pencils/pens at school and just use computers or tablets. What do you think? Do you think schools should get rid of all paper and pencils and rely on computers as a learning tool?

I would like you to spend about 20 minutes writing an essay that would convince your school principal of your opinion. Make sure that you provide lots of reasons for your opinion and write as much as you can. “Schools SHOULD/ SHOULD NOT get rid of paper and pencils/pens as learning tools. Explain why...”

Collection of assisted writing samples. The writing samples where students were instructed to use their assistive technologies were collected on laptops opened to a Google Doc. Students were permitted to use whichever AT they regularly used within their classroom environment in order for the writing samples to represent work the students would regularly compose within the classroom. All participants used Read & Write for Google™ (R&W), which is user-friendly Chrome extension that works in conjunction with web pages and various files types in Google Drive (e.g., Google Doc). R&W offers a variety of support tools in a toolbar format to help students with both reading and writing activities, including: hearing passages read aloud, using picture and text dictionaries to see the meaning of words, hearing text translated into other languages, word prediction, speech-to-text, and highlighting text in documents.

The following narrative prompt was used:

Your parents call a family meeting to tell you that the family is moving to a different country. Make up a story that goes with that sentence. As you do this work, please be sure to tell a complete story. Remember a story has a beginning,

middle, and ending. Make sure you plan your story first and try to write as much as you can. When you are ready, please begin typing in the space below.

The following persuasive prompt was used:

People have different views on animals performing in circuses. For example, some people think it is a great idea because it provides lots of entertainment for the public. Also, it gives parents and children something to do together, and the people who train the animals can make some money. However, other people think having animals in circuses is a bad idea because the animals are often locked in small cages and are not fed well. They also believe it is cruel to force a dog, tiger, or elephant to perform certain tricks that might be dangerous. I am interested in learning what you think about this controversy, and whether or not you think circuses with trained animals should be allowed to perform for the public. I would like you to spend the next 20 minutes writing an essay. Tell me exactly what you think about the controversy. Give me lots of good reasons for your opinion. Make sure you plan your essay, include all elements of an opinion essay, and write as much as you can. When you are ready, please begin typing in the space below.

Order of completion. Students were randomly assigned to complete either the narrative or persuasive sample first for each condition (unassisted and assisted). The order that students completed the writing samples was counterbalanced in order to prevent any order effects from confounding the data.

Assessment procedure. Once all of the writing samples were collected, they were coded by the author using the writing assessment developed for the larger project, *Flexible Pathways to*

Success, described in detail below, which measured both lower and higher order text features. A score for each lower and higher order variable was obtained for each writing sample.

Case Studies. In order to illustrate the potential utility of the writing assessment for teachers, as well as to highlight the variability in writing proficiency within the sample, two participants were selected for a more in-depth exploration of their writing proficiency. Each participant's scores on all variables across each writing condition were examined in order to discuss how AT impacted their writing in both genres, and to suggest the kinds of information teachers could obtain through this coding scheme to help in goal setting and instructional planning.

Measures

The single measure used during data collection was a writing assessment designed to obtain quantitative information regarding narrative and persuasive writing proficiency. The writing assessment measured both lower and higher order text features.

Lower order text features. A coding scheme created by Brown (2013; personal communication) was modified in order to develop the first component of the writing assessment used in the current study. The lower order variables included in Brown's scheme were: productivity (e.g., total words, total clauses), syntactic complexity (e.g., mean length of T-units, clausal density), lexical complexity (e.g., frequency of big words, rare words, and multi-syllable words) and writing conventions (e.g., punctuation, spelling and capitalization errors).

The decision to modify this coding scheme was made in order to make the information obtained about student writing proficiency more easily translatable and practical for future use by teachers. As such, the primary goal in the creation of this assessment tool was for it to be

useful for teachers to inform their instructional practices and goal setting regarding the writing development of each student.

The lower order text features in the modified writing assessment used in the present study were: (1) productivity (total words), (2) sentence complexity (frequency of compound and complex sentences), (3) word complexity (frequency of multi-syllable words), and (4) spelling (percentage of spelling errors). A list of all lower order variables and their definitions can be seen in Table 2.

Productivity. The total number of words for each sample was obtained by conducting a word count in the Microsoft Word documents.

Sentence complexity. Each sentence in the sample was analyzed to determine if it was a simple, compound, or complex sentence. A simple sentence consisted of a subject, a verb, and a completed thought. A compound sentence was characterized by two independent clauses connected by a coordinating conjunction (i.e., for, and, nor, but, or, yet, so). Finally, a complex sentence contained an independent clause and one or more dependent clauses connected by a subordinating conjunction (e.g., because, if, when, as). The total number of compound and complex sentences was added together, and then divided by the total number of sentences to obtain a percentage of these sentence types used in the sample, which represented the frequency of sophisticated sentences in the sample.

Word complexity. The original samples were corrected for spelling errors in order to prevent the word complexity measure from being confounded by spelling errors. Then, these corrected samples were run through an online text analyzer (see Table 2 for website used) to determine the frequency of multi-syllable words in the sample, defined as words with three or

Table 2

Lower order writing variables

Construct	Variable	Definition	ICC ^a
Productivity	Total words	Number of words	1.00
Sentence complexity	% Sophisticated sentences	Percentage of sentences that were either (a) a compound sentence, which contains two independent clauses connected by a coordinating conjunction (e.g., for, and, nor, but, yet, so), or (b) a complex sentence, which contains one independent clause and one or more dependent clauses connected by a subordinating conjunction (e.g., because, if, since, before, when, while).	.83
Word complexity	% Multi-syllable words ^b	Percentage of words with three or more syllables	.99
Spelling	% Spelling errors	Percentage of words spelled incorrectly	.99

^a ICC: Intraclass correlation between raters

^b Multi-syllable words was scored using the following online text analyzer: <http://www.usingenglish.com/resources/text-statistics.php>

more syllables, and were represented in a different online analyzer as “hard words”. This online text analyzer calculated the number of hard words, which was then converted to a percentage by dividing it by the total number of words in the sample.

Spelling. The number of spelling errors in the sample was counted and then divided by the total number of words in order to obtain the percentage of spelling errors.

Higher order text features. In response to concerns about writing, almost all of the United States have adopted *The Common Core State Standards (CCSS)*, grade-based learning goals regarding English Language Arts/Literacy, which provide a clear and consistent framework for educators teaching K-12 (Common Core State Standards Initiative, 2015). The higher order text features measured in this study were obtained from these goals and expectations for the knowledge and skills that students need to learn (Common Core State Standards Initiative, 2015). For the current study, two “teacher friendly”, genre-specific rubrics were created

(narrative and persuasive writing) that mirrored the specific grade level expectations across various constructs suggested by the Common Core State Standards – Writing (Common Core State Standards Initiative, 2015). At each grade level, appropriate expectations for these constructs indicated a developmental progression of writing skills. The genre-specific constructs from the Common Core can be seen in Table 3, while the narrative and persuasive rubrics can be seen in Appendix A.

To assess the higher order text features, each writing sample was corrected for conventions (spelling, capitalization, punctuation) before they were evaluated using the genre-specific rubric. These corrections were made in order to reduce rater bias, as errors in conventions have been demonstrated to influence the ratings of overall quality (Olinghouse, 2008). To assess the overall quality of the sample, a grade level was first selected for each construct. Since some of the expectations across grades were identical (e.g., ‘state an opinion’ is an expectation in Grades 1 through 5), a decision was made that all of the identical expectations across grades would be selected initially. Then, a rule was created that the grade level assigned for each construct would be consistent with or closest to their assigned overall grade level. For example, ‘state an opinion’ would be initially selected in Grades 1 through 5, but if the student’s sample overall was at a Grade 2 level, then they would also be assigned Grade 2 for ‘state an opinion’. Once the sample was evaluated along each construct, a holistic judgment was made regarding the overall grade level of the sample. This judgment was based on a congregation of all the grade level expectations that were achieved for each of the constructs.

Table 3

Higher order text features, obtained from constructs in the Common Core State Standards

Narrative Construct	ICC ^a	Persuasive Construct	ICC ^a
Engage and orient reader by establishing context	.89	Introduce topic/claim(s)	1.00
Overall organization	.98	State an opinion	.63 ^b
Use transition words and phrases to convey sequence, time, and relationships among experiences and events	.98	Acknowledge opposing claim(s)	1.00
Use narrative techniques (e.g., dialogue, pacing, description)	.83	Create an organizational structure	1.00
Use precise words and phrases to provide detail	1.00	Provide reasons & support claim(s) with evidence	-
Provide conclusion	.82	Use language to clarify relationships among claim(s)	1.00
		Establish and maintain a formal style	1.00
		Provide conclusion	.97
	Overall rubric .81	Overall rubric	.89

Dash indicates that the ICC could not be computed, due to a lack of variability in one rater's scores (i.e., 1 rater scored each student at Grade 2)

^a ICC: Intraclass correlation between raters

^b This construct was not re-scored even though the ICC < 0.7 because this expectation is identical across Grades 1-5 (as seen in Appendix A). The variability in assigned grade levels for this construct is a result of different overall grades assigned for the samples, which were assigned in a consistent way based on a scoring rule (construct scored to reflect overall grade of sample when expectations are identical).

Reliability. The author scored the writing samples of all 10 participants using the writing assessment procedure. Then, a graduate student trained in the assessment procedure scored the writing samples from 30% of the participants. Intraclass correlations (ICC) between the two raters were computed for each variable (Tables 2 and 3 include the ICC for each lower and higher order variable). If any variable did not receive an inter-rater reliability score of at least 0.7, the raters discussed the discrepancy, and the variable was re-scored. Most of the ICC values for all lower order variables and higher order constructs were above 0.8. The ICC for one persuasive higher order construct ('state an opinion') was slightly below 0.7. Both raters examined and discussed the scores given to all samples for this construct. It is important to note that this expectation is identical across Grades 1 through 5. For these circumstances, the scoring rule in place was to assign a grade level to this construct that was consistent with or closest to the

overall grade level assigned for the sample. Through discussion, it was decided that the slight discrepancies (only one grade level difference) between raters for this construct would not be re-scored because it would interfere with the scoring rule in place. Therefore, the assessment procedure would no longer be consistent for all situations where expectations were identical across more than one grade level. This process allowed for confidence in the scores obtained through the writing assessment, as well as in conclusions drawn from these scores.

Chapter 3: Results

The collected data and analyses conducted relevant to the research questions outlined above will be described and summarized in the following sections. All statistical analyses were computed using the Statistical Package for the Social Sciences (SPSS for Mac: Version 22) software.

Preliminary Analysis

Prior to data analysis, the data set was checked for errors to determine whether any values were entered that fell outside the range of possible values for each variable. This was an important step in order to ensure all scores were accurate, and thus, would not distort the analyses. Two errors were found in the data file and then corrected.

Outliers were examined using the following technique. Histograms for each variable were inspected to look at the tails of the distribution. Next, boxplots for each variable were inspected to determine, if there were any outliers, and if so, which case was responsible for that score. A number of outliers existed in the data set in both lower order (e.g., total words, % of spelling errors) and higher order variables. This is likely attributable to the large variability in the writing proficiency present within the small sample ($N = 10$). Each outlier was examined to ensure the score was genuine. A decision was made to not remove the extreme scores from the data set because of the exploratory nature of this study; these outliers represent true variability present in these students' writing proficiency within the classroom, which is an important finding in itself. However, it was recognized that these outliers could affect the statistical analyses. Given the large variability and small sample size, if statistically significant differences were obtained, they could be trusted as true significant differences. It is also possible that more significant

differences could be found by removing these outliers in order to reduce the variability, or with a larger sample size.

Descriptive Analyses

No significant differences were found for lower and higher order variables based on age/grade, gender, or type of significant learning need. Therefore, the analysis did not need to be controlled for these demographic variables.

Tables 4 and 5 present the descriptive statistics (i.e., group means, standard deviations, minimum and maximum values) for each of the lower and higher order variables (respectively) in the unassisted and assisted conditions within the narrative genre. Similarly, descriptive statistics across the unassisted and assisted conditions in the persuasive genre are presented in Tables 6 and 7. These tables also display the 95% confidence intervals for the mean differences between the unassisted and assisted writing samples, as well as Cohen's d , a standardized measure of the magnitude of the effects of AT on writing proficiency. Cohen's d was used because it does not rely on sample size (Cohen, 1977), and represents the effect sizes of the lower and higher order differences between writing proficiency in the unassisted and assisted conditions for each genre. Cohen's (1977) interpretation is that a d value between 0 – 0.2 is a small effect, 0.3 – 0.5 is a medium effect, and 0.5 – 0.8 is considered a large effect. Results indicated large effects of AT on spelling in both the narrative ($d= -1.05$) and persuasive ($d= -1.70$) genres. Additionally, large effects of AT were found for overall narrative grade ($d= 1.43$), as well as the narrative constructs of organization ($d= 1.22$), use of precise words/phrases ($d=0.93$) and providing a conclusion ($d= 1.26$). Finally, large effects of AT were also found for one of the persuasive constructs, reasons provided ($d= 1.94$).

Table 4

Descriptive statistics for lower order constructs across the narrative unassisted and assisted conditions.

Construct	Unassisted		Assisted		95% CI	<i>d</i>
	M (SD)	Min, Max	M (SD)	Min, Max		
Total words	137.90 (74.02)	28.00, 242.00	154.00 (106.08)	65.00, 408.00	(-69.01, 38.81)	0.34
Sentence complexity	42.24 (25.93)	0.00, 80.00	41.49 (20.14)	16.66, 80.00	(-20.99, 22.49)	-0.04
Word complexity	1.94 (1.78)	0.00, 4.80	2.47 (1.02)	1.05, 3.92	(-2.02, 0.96)	0.37
Spelling	10.61 (6.40)	2.60, 21.73	5.72 (7.97)	0.00, 21.53	(0.04, 9.72)	-1.05

Table 5

Descriptive statistics for higher order constructs across the narrative unassisted and assisted conditions.

Construct	Unassisted		Assisted		95% CI	<i>d</i>
	M (SD)	Min, Max	M (SD)	Min, Max		
Overall grade level	2.80 (1.14)	1.00, 5.00	3.50 (1.58)	2.00, 7.00	(-1.29, -0.11)	1.43
Engage and orient	3.00 (1.70)	1.00, 7.00	3.30 (2.06)	0.00, 7.00	(-1.61, 1.01)	0.24
Organization	1.60 (2.22)	0.00, 6.00	3.00 (2.45)	0.00, 7.00	(-2.58, -0.22)	1.22
Transition words	3.10 (1.29)	1.00, 6.00	2.60 (2.22)	0.00, 6.00	(-0.73, 0.92)	-0.47
Narrative techniques	2.60 (1.65)	1.00, 6.00	2.60 (2.12)	0.00, 8.00	(-1.17, 1.17)	0.00
Precise words	0.50 (1.27)	0.00, 4.00	1.50 (2.59)	0.00, 7.00	(-2.39, 0.39)	0.93
Conclusion	1.80 (1.99)	0.00, 5.00	3.10 (2.23)	0.00, 7.00	(-2.37, -0.23)	1.26

Table 6

Descriptive statistics for lower order constructs across the persuasive unassisted and assisted conditions.

Construct	Unassisted		Assisted		95% CI	<i>d</i>
	M (SD)	Min, Max	M (SD)	Min, Max		
Total words	90.50 (38.97)	45.00, 178.00	97.10 (51.51)	45.00, 204.00	(-33.47, 22.27)	0.26
Sentence complexity	48.47 (24.60)	20.00, 88.88	43.10 (27.14)	0.00, 66.66	(-17.48, 28.12)	-0.24
Word complexity	2.95 (1.84)	0.00, 6.55	4.22 (3.18)	0.00, 10.00	(-3.62, 1.10)	0.57
Spelling	10.88 (8.91)	0.00, 29.12	2.44 (2.36)	0.00, 5.88	(2.21, 14.66)	-1.70

Table 7

Descriptive statistics for higher order constructs across the persuasive unassisted and assisted conditions.

Construct	Unassisted		Assisted		95% CI	<i>d</i>
	M (SD)	Min, Max	M (SD)	Min, Max		
Overall grade level	2.20 (0.79)	1.00, 4.00	2.50 (0.53)	2.00, 3.00	(-0.78, 0.18)	0.67
Introduction	0.00 (0.00)	0.00, 0.00	0.00 (0.00)	0.00, 0.00	-	-
Opinion stated	2.20 (0.79)	1.00, 4.00	2.50 (0.53)	2.00, 3.00	(-0.78, 0.18)	0.67
Opposing claims	0.00 (0.00)	0.00, 0.00	0.00 (0.00)	0.00, 0.00	-	-
Organization	0.00 (0.00)	0.00, 0.00	0.00 (0.00)	0.00, 0.00	-	-
Reasons provided	2.20 (0.92)	1.00, 4.00	2.80 (0.63)	2.00, 4.00	(-0.97, -0.23)	1.94
Word/phrase choice	1.80 (0.63)	0.00, 2.00	1.80 (1.03)	0.00, 3.00	(-0.34, 0.34)	0.00
Formal style	0.00 (0.00)	0.00, 0.00	0.00 (0.00)	0.00, 0.00	-	-
Conclusion	1.50 (2.07)	0.00, 6.00	1.60 (2.32)	0.00, 4.00	(-2.02, 1.82)	0.05

Significance testing

To be thoughtful of the number of significance tests performed in this exploratory study, given its small sample size, one-tailed paired *t* tests were conducted only on the lower and higher order variables that had a large effect size (i.e., Cohen's $d > 0.8$). To avoid inflation of Type I

error (i.e., rejecting the null hypothesis when it is true), alpha levels were adjusted for the two families of tests: narrative and persuasive. An a priori alpha of .01 (i.e., .05/5) was used for the narrative *t* tests, while an a priori alpha of .025 (i.e., .05/2) was used for the persuasive *t* tests. The null hypotheses for narrative spelling, organization, precise words, and conclusion could not be rejected. However, the overall grade in the narrative genre, $t(9) = -2.69$, $p = .01$, on average, improved with the use of AT. The percentage of spelling errors in the persuasive genre, $t(9) = 3.07$, $p = .013$, on average, decreased with the use of AT, while the quality of reasons provided in the persuasive genre, $t(9) = -3.67$, $p = .005$, on average, improved with the use of AT.

Narrative and Persuasive Proficiency

To answer the research question regarding whether students showed similar proficiency across the narrative and persuasive genres, the descriptive statistics (e.g., group means) presented in Tables 4 through 7 were visually inspected. Mean scores for productivity (total words) were higher in the narrative genre than in the persuasive genre (i.e., $M(\text{AT Narrative}) = 154.00$, $M(\text{AT Persuasive}) = 97.10$), while mean scores for word complexity (frequency of multi-syllable words) were higher in the in the persuasive genre than in the narrative genre (i.e., $M(\text{AT Persuasive}) = 4.22$, $M(\text{AT Narrative}) = 2.47$). However, mean scores were similar for sentence complexity and spelling in both genres. Finally, the mean score for overall writing quality (grade) was higher in the narrative genre in the persuasive genre. Students scored, on average, one grade level higher in their narrative samples (i.e., $M(\text{AT Narrative}) = 3.50$, $M(\text{AT Persuasive}) = 2.50$).

Chapter 4: Case Studies

When finalizing the writing assessment, the underlying consideration taken into account was whether it would be simple and applicable for teachers to use in goal setting for their students, as well as for instructional planning. Therefore, an in-depth exploration of how the writing assessment was used with two student's writing samples is provided to highlight the application of the writing assessment, as well as to reflect the variation on the impact of AT on their narrative and persuasive writing proficiency.

Sarah

Sarah was chosen for a case study because AT appeared to impact her writing proficiency on some lower and higher order constructs, and she appeared to be more proficient in the narrative genre than in the persuasive genre, which was consistent with the findings of the present study. Specific information about Sarah's writing was obtained through the assessment tool, which highlighted some lower and higher level constructs that could be targeted during instruction and goal setting. Sarah's scores on each variable across all of the writing conditions can be seen in Table 8, while her original and corrected samples, as well as her scored rubrics can be seen in Appendix B.

Narrative. Sarah's productivity (total words) appeared to improve with the use of AT. Sarah's sentence complexity was reduced with the use of AT, however, the majority of her sentences in both her unassisted and assisted samples were sophisticated. Sarah used both compound (e.g., "So my dad and my friend and sitter wan't with my sitter and got some tools to get me out of the hole and there ran back and they got me out of the hole") and complex (e.g., "So they ran home to go and get my dad, but he didn't get anything to get me out because he

Table 8

Sarah's scores on the lower and higher order constructs across the four writing conditions

Variable	UA Narrative	AT Narrative	UA Persuasive	AT Persuasive
Total words	194	241	118	138
% Sophisticated sentences	80	61	50	66.66
% Multi-syllable words	1.03	1.24	1.69	1.45
% Spelling errors	10.31	7.47	12.56	5.80
Overall grade level (Higher order)	3	5	2	2

thought that I was not in a hole but I was in a big, big hole”) sentences, which demonstrated her ability to write with coordinating (e.g., and) and subordinating conjunctions (e.g., because). Sarah’s use of multi-syllable words did not seem to improve with the use of AT, but she did make less spelling errors in her AT sample.

The overall quality of Sarah’s narrative writing was more sophisticated with the use of AT, as her overall score on the rubric improved from Grade 3 to Grade 5. Figures 1 and 2 demonstrate how Sarah’s writing in the unassisted and assisted conditions, respectively, met specific grade expectations for each of the narrative higher order constructs. Sarah’s AT narrative sample began in a much more engaging way than her UA sample, as she started with “I could not believe...” In both samples, experiences events unfolded naturally and were logically sequenced. However, Sarah used more transition words in her AT sample (e.g., today, it was the morning, ten years later) than in her UA sample (“one afternoon” was the only phrase used to manage the sequence of events). Further, she did not use many words to provide details in her UA sample, and just stated events sequentially. In contrast, Sarah used words to describe feelings (e.g., excited, sad, scared), thoughts (e.g., it felt like we were sitting there for 4 hours), and

One afternoon, my friend and sister and I were waking down a path in the trees and I did not see where I was going, so I walked in a big dip hole and I fell down it. My friend and sister looked down the hole at me so I asked them if they could get help. So they ran home to go and get my dad, but he didn't get anything to get me out because he thought that I was not in a hole but I was in a big, big hole. So he looked down the hole and said, "How did you get down there? Did you jump or did you fall?"

"No, I did not jump. I fell down and I did not see the hole, so can you get me out of the HOLE now, please?"

So my dad and my friend and sister went with my sister and got some tools to get me out of the hole and they ran back and they got me out of the hole. "Thank you for getting me out of the hole."

And we all went back home and I went to sleep.

Construct key:
Engage & orient reader... (Grade 3)
Use transition words... (Grade 3)
Use precise words/phrases to provide detail (Grade 3)
Provide conclusion (Grade 3)

Note: Sarah's overall organization met Grade 3 criteria, "Organize an event sequence that unfolds naturally".

Figure 1. Narrative higher order constructs in Sarah's unassisted narrative sample (corrected).

I could not believe that we are moving to Newfoundland. I was excited and really sad too because I did not want to leave my friends back in Canada, but it would be fun. I am scared too because I don't know what it is going to be like.

Today we leave to go to Newfoundland I am going to miss the house. It looks like we're just moved in, but we were living [there].

We are at the airport. We had to wait 2 hours, but it felt like were sitting there for 4 hours, but our plane just landed so it was like a jump and skip!

We had to find our seats with my sister and she could not wait to get to Newfoundland. I fell asleep on the plane.

It was the morning and we were there. I was so scared and I did not feel so good. And we got our bags and we got a taxi on the way to our new house and we found it. It is very nice. I don't know what I was so scared of so I walked into our new house. We all got our own rooms and our house was by the ocean. It looked so [nice].

Ten years later I still live in that same house. So I learned you don't need to be scared of new changes and you don't have to be scared too.

Construct Key:
Engage & orient reader... (Grade 5)
Use transition words... (Grade 6)
Use precise words/phrases to provide detail (Grade 2)
Use concrete words/phrases & sensory details ... (Grade 5)
Provide conclusion (Grade 7)

Note: Sarah's overall organization met Grade 5 criteria, "Organize an event sequence that unfolds naturally".

Figure 2. Narrative higher order constructs in Sarah's assisted narrative sample (corrected).

actions (e.g., it was like a jump and skip) in her AT sample. However, only her UA sample contained dialogue.

Persuasive. Sarah also demonstrated higher productivity (total words) with the use of AT in her persuasive sample. Sarah's sentence complexity improved with the use of AT, as the percentage of compound and complex sentences increased from 50% to 66.66%. Sarah's word complexity, as measured by the frequency of multi-syllable words, did not appear to improve with the use of AT. However, Sarah's spelling did appear to improve with the use of AT. In her UA sample, she made quite a few spelling errors (i.e., 12.56%), such as 'penclis' for pencils and 'reilly' for really). With the use of AT, only 5.8% of the words Sarah used were spelled incorrectly.

Sarah's overall quality of her persuasive writing did not appear to improve with the use of AT, as her overall grade on the rubric remained at Grade 2. Figures 3 and 4 demonstrate how Sarah's writing in the unassisted and assisted conditions, respectively, met specific grade expectations for each of the persuasive higher order constructs. In both her UA and AT samples, Sarah did not provide an introduction, but instead began by stating her opinion (i.e., "we should stil have paper and penclis.pen at school" (UA), "I think That animals should not be in the circuses" (AT). Further, neither of her samples contained an organizational structure, such as the use of paragraphs, and she did not maintain a formal style. In both samples, Sarah provided reasons to support her opinion, but did not support her reasons with facts and/or details, nor did she acknowledge opposing claims. In both samples, she used similar linking words between her reasons (e.g., because, and, so). Finally, Sarah ended both samples with a concluding statement

We should still have paper and pencils at school, because if we didn't have paper and pencils, we could not draw. And if we did not have paper and pencils, it would be really hard to draw on the computers. So I think that we should still have paper and pencils because if we didn't, it would be hard to write a test on the computer. So I still think we should have paper and pencils. So please don't get rid of paper and pencils. If you do it, would get really boring if we just had computers and more. So that is why we should still have paper and pencils at school.

Construct Key:
 Opinion stated (Grade 2)
 Reasons provided (Grade 2)
 Word/phrase choice (Grade 2)
 Provide conclusion (Grade 2)

Note: Sarah's sample did not meet any criteria for the following constructs: Introduction, acknowledge opposing claim, organizational structure, or formal style.

Figure 3. Persuasive higher order constructs in Sarah's unassisted persuasive sample (corrected).

I think that animals should not be in the circuses because they do deadly tricks like going on a tight rope and more. They don't give them food and are stuffed in small cases and they are used for money. They would be better off in the wild then being in cases. So I think they should not abuse animals in the circuses because they used lions, tigers, sea lions, monkeys, etc. If the circus is bad, they don't give their money back so they can keep their animals in the circuses. They have food for them, but do you know what their food is made of? So what are they really feeding their animals? That has been my question for them. So I still think that they should let them go to the wild.

Construct Key:
 Opinion stated (Grade 2)
 Reasons provided (Grade 2)
 Word/phrase choice (Grade 2)
 Provide conclusion (Grade 2)

Note: Sarah's sample did not meet any criteria for the following constructs: Introduction, acknowledge opposing claim, organizational structure, or formal style.

Figure 4. Persuasive higher order constructs in Sarah's assisted persuasive sample (corrected).

(i.e., “so that is way we so/uld still have aper and penclis.pen at school” (UA) and “so I still think that they should let them go to the wild” (AT)).

Summary and Implications. Overall, Sarah demonstrated more proficiency in her narrative writing than in her persuasive writing, as measured by her overall grade score on the higher order rubrics. Additionally, the use of AT improved her narrative writing from Grade 3 to

Grade 5; however, her persuasive writing remained at a Grade 2 level. Further, Sarah's productivity appeared to improve with the use of AT, and was also higher in the narrative genre compared to the persuasive genre. Sarah's spelling also improved with the use of AT in both genres.

For a teacher who might use this writing assessment to obtain information about Sarah's writing proficiency, it could be concluded that Sarah should continue using AT since it resulted in noticeable improvements in her writing proficiency. Additionally, this writing assessment identified areas that could be targeted during instruction, as well as where goals could be set to support Sarah's continued writing development. For example, with regard to lower order skills, Sarah's vocabulary could be more developed to prompt the use of more multi-syllable words in her writing. In terms of higher order narrative skills outlined in the rubric, Sarah could improve her writing by establishing a context in an engaging way, using more transition words and phrases to convey sequence and timing of events, and using more specific narrative techniques to describe experiences and events (e.g., dialogue, description, sensory details, pacing, reflection). Goals and instructional practices for persuasive higher order skills from the rubric could focus on introduction and conclusion sections, organization (e.g., introduction, body and conclusion paragraphs), supporting her reasons with facts and details, acknowledging opposite claims, maintaining a formal style, and incorporating more advanced linking words (e.g., therefore, for example, since, specifically).

Given that the quality of Sarah's narrative writing noticeably improved with the use of AT, it is possible that the quality of her persuasive writing also has the potential to improve. It could be that her persuasive writing did not improve because she lacked knowledge about the

genre, including the structure, organization, and purpose. Therefore, Sarah could benefit from specific instruction in the persuasive genre.

Kieran

In contrast to Sarah, Kieran was selected for the second case study to illustrate the large proportion of students (50%) in the sample whose writing proficiency did not improve with the use of AT. Additionally, Kieran's writing proficiency did not vary across genres. Although this case does not illustrate the main findings of the present study, it was selected to highlight the utility of the writing assessment in gathering information about his writing to use in goal setting, as well as designing instructional and intervention supports. Kieran's scores on each variable across all of the writing conditions can be seen in Table 9, while his original and corrected samples, as well as his scored rubrics can be seen in Appendix C.

Narrative. Surprisingly, Kieran's productivity, measured by total words, was reduced by approximately 50% with the use of AT. This could have resulted from a variety of factors, including fatigue or low motivation in regard to the writing prompt. Kieran's sentence complexity appeared to improve from 30% in his unassisted sample to 80% in his assisted sample. The majority of Kieran's sentences in his UA sample were simple (e.g., "the game was Dark legends"), while the majority of sentences in the AT sample were either compound (e.g., "I can meet new friends and new fruits and I could miss my old friend") or complex. There did not appear to be any change in the percentage of multi-syllable words Kieran between his two narrative samples. Kieran made a few spelling errors in his UA sample (e.g., 'custumize' for customize, 'legendry' for legendary), but did not make any spelling errors with the use of AT.

Table 9

Kieran's scores on the lower and higher order constructs across the four writing conditions.

Variable	UA Narrative	AT Narrative	UA Persuasive	AT Persuasive
Total words	181	95	92	101
% Sophisticated sentences	30	80	37.50	40
% Multi-syllable words	1.10	1.05	2.17	3.96
% Spelling errors	2.21	0	7.61	0
Overall grade level (Higher Order)	3	3	3	3

Kieran's overall quality of his narrative writing did not appear to improve with the use of AT, as his overall grade on the rubric remained at Grade 3. Kieran oriented the reader by establishing a situation in his UA sample (i.e., "On the weekend I was playing my ipad"); however, his AT sample simply described a series of events (e.g., "I can meet new friends and new fruits and I could miss my old friends"). Kieran used a variety of transition words and phrases to manage the sequence of events (e.g., on the weekend, after lunch, on this Monday, then) in both samples. He also used some descriptions of feelings (e.g., "I was so happy", "my leg was hurting so bad"). However, only in his AT sample did he provide a sense of conclusion ("Trinidad is a good place to be").

Persuasive. Kieran's productivity (total words) appeared to improve slightly with the use of AT, while his sentence complexity remained fairly consistent across his UA and AT samples. However, the majority of Kieran's sentences in both samples were compound and complex (e.g., "The owners should buy some food for circus animals and learn some tricks like dogs,tigers, and elephants"), which demonstrated his ability to use coordinating (e.g., and, so) and subordinating (e.g., because) conjunctions in his writing. Kieran's word complexity (frequency of multi-syllable words) increased by almost two percent (i.e., 2.17% to 3.96%) with the use of AT. Some

of the multi-syllable words he used were: computers, animals, circuses, and elephants. Kieran's spelling also improved with the use of AT as he made some errors in his UA sample (e.g., 'happend' for happened, 'dousen't' for doesn't, 'compluter' for computer); however, no spelling errors were made with the use of AT.

Kieran's overall quality of his persuasive writing did not appear to improve with the use of AT, as his overall grade remained at Grade 3. In both samples, Kieran did not write an introduction, and instead began with stating his opinion (i.e., "We should have both" (UA), "I think animals should be in the circus" (AT)). Additionally, Kieran supplied reasons to support his opinions, but these reasons were not supported by facts and/or details (e.g., "you can do the same things with both" (UA), "it's more fun" (AT)). Kieran also used the same linking words to connect his opinion and reasons in both samples (e.g., because, and, so). Finally, Kieran provided a concluding statement in both samples that was related to the opinion he presented (i.e., "That's why we should have both" (UA), "This is the reason animals should be in the circus" (AT)).

Summary and Implications. Overall, the use of AT seemed to lead to some improvements in Kieran's lower order skills (e.g., spelling, productivity); however, no improvements in the overall quality of his narrative and persuasive writing (as measured by the higher order rubrics) were observed with the use of AT. Further, Kieran demonstrated similar proficiency in both genres.

Since the use of AT did not improve the overall quality of Kieran's writing in either genre, it is possible that it was not useful for him. Nonetheless, this writing assessment could be used to inform teachers about specific areas that Kieran requires additional instruction or more

targeted interventions in, which could be used to help set appropriate goals for his continued writing development. Kieran is a Grade 5 student who is writing at a level consistent with Grade 3 expectations. Therefore, he would likely benefit from additional instruction specific to both the narrative and persuasive genres. Learning more about the purpose, structure and organization of these genres could improve the overall quality of his writing.

Specific narrative and persuasive higher order constructs could also be focused on to help Kieran improve the quality of his writing. In the narrative genre, instruction on the use of transition phrases to shift from one time frame or setting to another, dialogue and other narrative techniques (e.g., pacing, reflection), as well as the use of descriptive details to capture experiences and events could improve the quality of Kieran's writing. In the persuasive genre, Kieran could benefit from instruction in providing an introduction to a topic before stating his opinion, acknowledging opposing claims, using an organizational structure to list and group reasons, supporting his reasons with facts and/or details, adding more complex linking phrases (e.g., for example, in addition, therefore), and writing in a formal style.

Conclusion from Case Studies

The purpose of these two case studies was to demonstrate how this writing assessment can be used to obtain information about student writing proficiency for goal setting and instructional planning, and to illustrate (1) a student whose writing proficiency was consistent with the primary findings of the study (Sarah), and (2) a student whose writing proficiency was not consistent with the main findings of the study (Kieran). It is the hope that, through these case studies, readers can gain an understanding of the variety of skills that are required for skilled

writing, and how applying this writing assessment can provide specific information to support teachers in working with students on their writing development.

Chapter 5: Discussion

This study not only examined the impact of AT on the writing proficiency of junior high students with significant learning needs, but it also explored their writing proficiency across two different genres: narrative and persuasive. The decision to include more than one genre in this study was made to obtain a greater breadth of information about the writing skills of students with significant learning needs. This information was gathered through the use of a writing assessment that measured both lower and higher order skills. Overall, valuable information regarding AT use and writing proficiency was obtained.

The Impact of AT

It was hypothesized that the use of AT (specifically, Read & Write for Google™) would result in significant improvements in student's lower and higher order writing skills across both narrative and persuasive genres because AT had been proposed as a way to support the writing development for students with significant learning needs (MacArthur, 2009).

The results from the present study suggest that the use of AT leads to some improvements in writing proficiency. With respect to lower order skills, AT did not significantly impact productivity (total words), sentence complexity (percentage of compound and complex sentences), or word complexity (percentages multi-syllable words). However, a significant effect was found for spelling errors in the persuasive genre, as the percentage of words spelled incorrectly was reduced with the use of AT. With respect to higher order skills, a significant effect of AT was found in the narrative genre, as the mean overall grade level achieved increased from 2.8 to 3.5. However, it is important to note that this significant finding appeared to be driven by 50% of the sample. Specifically, some students (n=2) increased two grade levels,

others (n=3) increased by one grade level; however, some students (n=5) did not improve their grade level with the use of AT. While there was no significant effect of AT on overall grade in the persuasive genre, AT did lead to a significant improvement in one of the higher order constructs: reasons provided.

It was hypothesized that the use of AT would lead to noticeable improvements in lower and higher order skills. However, the results demonstrated that, although spelling appeared to be consistently improved across genres, no other lower order writing skill was significantly improved. The impact of AT on spelling is consistent with previous research. Handey-More and colleagues (2013) found noticeable improvements in spelling with the use of a word processor and word prediction. Results from Silió (2008) and Cunningham (2013) demonstrated that using word prediction alone, or in combination with text-to-speech, lead to fewer spelling errors, while Cullen et al. (2008) found fewer spelling errors with the use of word prediction, spell check and text-to-speech. Therefore, it seems as though spelling is consistently improved through the use of AT. Additionally, the results of the present study demonstrated significant improvement in higher order skills with the use of AT, as the overall grade level improved in the narrative genre, while providing reasons, a higher order skill in the persuasive genre, also improved. This is also consistent with previous literature (Cullen et al., 2008; Silió, 2008), which reported improvements in overall quality of writing. It should be noted that other higher order constructs in the narrative and persuasive genres did not improve with the use of AT in the present study.

However, results from previous research also found improvements in other lower order skills, which were not found in the present study. For example, Silió (2008), as well as Cullen et al. (2008) also found significant improvements in productivity (measured by total words and

total T-units) with the use of AT. Although the present study demonstrated a trend toward small improvements in productivity, these differences were not statistically significant. Additionally, Cunningham (2013) found increased syntactic maturity (mean length of T-unit). This lower order skill was not explicitly measured in the present study; however, other aspects of maturity (sentence complexity, word complexity) were measured, but did not significantly improve with the use of AT.

Writing Proficiency Across Genres

It was also hypothesized that students would demonstrate less proficiency in persuasive writing than in narrative writing. This hypothesis was informed by evidence that was both anecdotal, as well as through an examination of the Alberta Education Program of Studies, that concluded that persuasive writing is not explicitly taught in Alberta until the junior high years, in comparison to narrative writing, which is introduced in the classroom early in elementary school (Alberta Education, 2000). Further, persuasive writing is considered to be more sophisticated and cognitively demanding than narrative writing (Brown et al., 2014; Crowhurst, 1990; Nippold & Ward-Lonergan, 2010). Therefore, students are thought to typically produce persuasive writing that is lower in quality than their narrative writing.

A visual inspection of the descriptive analyses (i.e., mean scores) in the present study lead to observed differences in some of the lower and higher order skills between student's narrative and persuasive writing. Mean scores for productivity (i.e., total words) were higher in the narrative genre than in the persuasive genre. Additionally, higher mean scores were observed for overall writing quality (i.e., grade level) in the narrative genre than in the persuasive genre.

On average, students achieved one grade level higher in the narrative genre than the persuasive genre (i.e., 3.5 and 2.5, respectively).

These results were consistent with previous literature. Beers and Nagy (2011) suggested that students' ability to write effectively in the persuasive genre was compromised by their limited knowledge of the genre-specific structure of persuasion, which was consistent with the generally weaker performance demonstrated in the persuasive genre than in the narrative genre (i.e., overall grade) in the present study. Crowhurst (1990) also suggested that persuasive writing is generally weaker than narrative writing among school-aged children for a few reasons. It is more challenging to organize a persuasive argument than a narrative (chronological order of events), as well as to generate content around a narrative topic for persuasive writing, as opposed to the freedom in topic of a narrative, and finally, instruction of persuasive writing is delayed (Crowhurst, 1990).

It is noted that one of the results of this study was inconsistent with the hypothesis that students would be more proficient in the narrative genre. Mean scores were higher for word complexity (i.e., multi-syllable words) in the persuasive genre than in the narrative genre (e.g., 4.22% and 2.47%, respectively). However, the majority of the group mean scores did appear to indicate higher proficiency in the narrative genre.

Although the present study did not compare the narrative and persuasive writing of students with significant learning needs to typically developing controls, the results demonstrated that these students produced writing that is below their enrolled grade level (e.g., a Grade 7 student produced a Grade 3 level narrative and a Grade 2 persuasive text). Thus, it suggests that these students with significant learning needs experience deficits in various lower and higher

level skills, in which typically developing students in their same grades might not. Previous research has been conducted on the writing of students with various types of significant learning needs, and has described specific areas of deficits experienced by these students. Brown and colleagues (2014) described that the persuasive writing of individuals with ASD is lower in quality, shorter, and not as syntactically complex as the persuasive writing of typically developing controls. Further, their ideas are often vague or unclear, and inadequately developed. Additionally, Morris and Crump (1982) reported deficits in syntax and vocabulary among students with learning disabilities, while Thomas et al. (1987) reported that students with learning disabilities make more mechanical errors, terminate their text early, and include more redundant and irrelevant information than typically developing students. Finally, Re and colleagues (2007) described that the descriptive and narrative writing of individuals with Attention-Deficit Hyperactivity Disorder was shorter, less proficient in structure, grammar and lexical complexity, and was characterized by more spelling errors. Therefore, it should be considered that the writing proficiency of the participants in the present study might not be as strong as their typically developing peers.

Clinical Implications

Teachers were the targeted audience in the development of the writing assessment and in the present study. Therefore, it is hoped that teachers will find the writing assessment simple and applicable enough to apply it themselves, and that they will find the information obtained through the writing assessment useful in instructional planning and goal setting for their students. The two case studies presented in this paper demonstrate that this writing assessment has the ability to identify specific lower and higher order skills that might be areas of weakness for a

student, which could suggest a need for targeted instruction or more intensive intervention. For example, consider a student who used a small percentage of compound and complex sentences in their text, indicating that the majority of their sentences were simple. Their teacher could spend instructional time to enrich the vocabulary of this student by teaching them different types of coordinating and subordinating conjunctions to connect ideas in their writing. Additionally, vocabulary instruction could also be helpful for a student to learn more multi-syllable words, which would improve the word complexity of their writing. Use of the higher order rubrics could also identify more sophisticated writing skills to target for instruction or intervention based on the identified genre-specific constructs (e.g., engage and orient reader, provide reasons to support the opinion).

Additional clinical implications of the present study surround the practice of school psychology. A school psychologist would benefit from an increased understanding of various lower and higher order constructs that contribute to skilled writing. This understanding could strengthen assessment practices for suspected deficits in written expression by examining the presence or absence of these constructs in student's writing samples. Current assessment practices used by school psychologists to obtain information about student's written language abilities do not have the same breadth as the writing assessment used in the present study, as they do not investigate writing proficiency across various genres. For example, the writing tasks in the Wechsler Individual Achievement Test, Third Edition (WIAT-III) measure students' ability to compose sentences, as well as a descriptive essay. Therefore, the writing assessment developed in the present study could be beneficial to obtain a greater breadth of information, yet in a less formal way, as it is not a standardized measure. Finally, school psychologists who have an in-

depth understanding of writing are better equipped to work with teachers, as this information would enable them to provide more targeted recommendations for teachers to use in supporting the continued development of the written expression skills for the students in their classrooms.

Limitations

The results of the present study must be interpreted and generalized with caution for a number of reasons. First, this study used a very small sample size (N=10) composed of a heterogeneous group of students (e.g., grades, type of significant learning need), which limits the generalizability of the results. Additionally, the writing proficiency of these participants was characterized by a large amount of variability in both lower and higher order skills, which also impacted the results. It is possible that, had the sample size been larger, more significant effects of AT could have been obtained. Therefore, there might actually be a more widespread effect of the use of AT on lower and higher order writing skills than what was obtained in this study. Further, more noticeable differences between narrative and persuasive writing proficiency might also be obtained with additional participants. Although some important effects were obtained, these results might not represent the entirety of the effects of AT on writing. It is also important to consider that, within this small sample size, the significant effect of AT on narrative higher order skills (overall grade level) was driven by only 50% of the participants (n=5 did not improve in their grade level between UA and AT narrative samples).

Another important limitation to note is that the researcher had no control over the use of the AT in the collection of the participant's writing samples. These samples were collected in a naturalistic way, which meant that the students were simply allowed to use their AT in the way they use it within a regular classroom setting to explore the current impact of AT within the

participant's daily classroom routines. Unfortunately, it is possible that a large amount of variability existed in how their AT was used. Although each participant used Read & Write for Google™, there was no control over additional factors pertaining to its use. For example, it is unknown which features were used, how comfortable each student was with this technology, how frequently they utilized the technology in their writing sample, how much instruction and support they had received on this technology prior to data collection, or how frequently they used the technology in typical classroom tasks. Since these questions were not explored, and the participant's AT use was not quantified or monitored in any way, the results pertaining to the impact of AT must be interpreted with caution.

Finally, another limitation to take into consideration concerns the writing assessment used in data analysis. This writing assessment was created for the larger project, *Flexible Pathways to Success*, and had not been used in practice or for other research purposes to date. Therefore, this study also represents a trial of this writing assessment. Unfortunately, outside of the inter-rater reliability presented, no other reliability or validity information exists. As stated previously, some of the higher order constructs have identical expectations across certain grade levels. Although a rule was created to score these constructs in a systematic way, caution should still be taken when using this rubric, as it is possible that individuals could vary in their scoring if this rule is not applied, or is incorrectly applied. Additionally, the assigned grade levels were based on the expectations outlined in the Common Core, which is an initiative in the United States. Additional work is needed to determine whether these expectations are an accurate estimation of writing skills, and also whether these expectations align with curriculum in Canada, or more specifically, in Alberta. Therefore, the accuracy of the grade levels assigned in

the present study is unknown at this time. However, the strength of this tool is that it outlines a developmental progression of writing, which can be used as suggestions for how to goal set for continued writing development.

Although there are limitations to take into consideration when interpreting and generalizing the results of the present study, the results still demonstrate some important effects of AT on the writing proficiency of junior high students with significant learning needs, as well as noteworthy differences in their narrative and persuasive writing proficiency.

Future Research

The present study contributes to a small body of literature surrounding writing skills and AT. The results of this study provide a starting point for future research in this area; however, it is clear that additional research is necessary to fill this gap in the literature and inform practitioners about writing skills, how to assess writing skills, and how AT can support the continued development of writing skills.

As stated within the limitations, this study had a small sample size, which represented students with significant learning needs in a segregated classroom setting. Therefore, this study should be replicated with a much larger sample size to determine whether similar results exist within a larger body of students. Additionally, future research should monitor the participants' use of AT. For example, student proficiency with the AT could be measured to determine how comfortable they are with its use, as well as how frequently they use it in the classroom. This could potentially help determine whether their proficiency with the AT tool was associated to the impact of AT on their writing. Future research could also compare different features of AT (e.g.,

spell check, word prediction, speech-to-text), since it has been suggested that AT is not a “one-size-fits-all” approach (MacArthur, 2009).

Finally, given that research has been conducted comparing the writing skills of students with significant learning needs to their typically developing peers, it would be interesting to use a similar research methodology along with this writing assessment to determine any specific lower and/or higher order skills that might be deficient in students with significant learning needs, in comparison to their typically developing peers. This would be particularly important for inclusive classrooms, as it is likely that an even larger amount of variability in writing proficiency would exist within that type of educational setting.

Summary and Conclusion

Overall, the results of the present study suggested that the use of AT (i.e., R&W for Google™) resulted in a significant reduction of spelling errors across writing genres, as well as a significant improvement in the overall quality (grade level) for narrative writing, but not persuasive writing. However, a significant improvement was obtained for one of the persuasive constructs, provide reasons. Additionally, the results also demonstrated that narrative writing proficiency appeared to be higher than persuasive writing proficiency in terms of productivity, as well as higher order skills, while higher levels of word complexity was observed in the persuasive genre. However, there was a large amount of variability surrounding if and how much the participants benefited from the use of AT in both the narrative and persuasive genres. Although the use of AT was not monitored in the present study, 50% of the participants did not show noticeable improvements in the overall quality of their writing with the use of AT. This suggests that simply providing students with AT is not sufficient to improve their writing, and

AT cannot replace quality instruction. Further, explicit instruction in the persuasive genre is recommended, given the limited proficiency demonstrated in the present study, as well as the increased importance of this skill in the 21st century.

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words/phrases to provide detail	details regarding what happened	details to describe actions, thoughts, and feelings	and descriptions of actions, thoughts, and feelings to develop experiences and events, or show the response of characters to situations	and descriptions to develop experiences and events or show the responses of characters to situations	techniques, such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations	techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters	techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters	techniques, such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters	techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters	techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters
				Use concrete words and phrases and sensory details to convey experiences and events precisely	Use concrete words and phrases and sensory details to convey experiences and events precisely	Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters
Provide conclusion	Provide some sense of closure	Provide a sense of closure	Provide a sense of closure	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from and reflects on the narrated experiences or events	Provide a conclusion that follows from and reflects on the narrated experiences or events	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative

Persuasive Construct	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9-10	Grade 11 -12
Introduction	Introduce the topic (or name the book they are writing about)	Introduce the topic or book they are writing about	Introduce the topic or text they are writing about	Introduce a topic or text clearly	Introduce a topic or text clearly	Introduce claim(s)	Introduce claim(s)	Introduce claim(s)	Introduce precise claim(s)	Introduce precise claim(s)
										Establish the significance of the claim(s)
Opinion stated	State an opinion	State an opinion	State an opinion	State an opinion	State an opinion					
Acknowledge opposing claim							Acknowledge alternate or opposing claims	Acknowledge and distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims
Organizational structure			Create an organizational structure that lists reasons	Create an organizational structure in which related ideas are grouped to support the writer's purpose	Create an organizational structure in which ideas are logically grouped to support the writer's purpose	Organize the reasons and evidence clearly	Organize the reasons and evidence logically	Organize the reasons and evidence logically	Create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence	Create an organization that logically sequences claim(s), counterclaims, reasons, and evidence
Reasons provided	Supply a reason for the opinion	Supply reasons that support the opinion	Provide reasons that support the opinion	Provide reasons that are supported by facts and details	Provide logically ordered reasons that are supported by facts and details	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of topic or text	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text	Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's	Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that

									knowledge level and concerns	anticipates the audience's knowledge level, concerns, values, and possible biases
Word/phrase choice		Use linking words (e.g., because, and, also) to connect opinion and reasons	Use linking words and phrases (e.g., because, therefore, since, for example) to connect reasons and opinions	Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition)	Link opinion and reasons using words, phrases, and clauses (e.g., consequently, specifically)	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence	Use words, phrases and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims	Use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims
Formal style						Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing
Conclusion	Provide some sense of closure	Provide a concluding statement or section	Provide a concluding statement or section	Provide a concluding statement or section related to the opinion presented	Provide a concluding statement or section related to the opinion presented	Provide a concluding statement or section that follows from the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented

Appendix B: Sarah's Writing Samples and Scored Rubrics

Unassisted (UA) Narrative

Original

on afternoon my friend and sitter and I was waking down a path in the trees and I did not see were I has going so I waked in a big dip hole a I fall down it my friend and sitter looked down the at me so I ask them if there could get help so they run home to go and get my dad but he didn't get anything to get my out because he thot at I was not in a hole but I was in a big big hole so he look down the and said " how did you get down there did you jump or did you fall" No I did not jump I fall down and I did not see the hole so can you get out of the HOLE now please so my dad and my friend and sitter wan't with my sitter and got some tools to get me out of the hole and there ran back and they got me out of the hole thank you for geting my out of the hole and we all wan't back home and I wan't to sleep.

Corrected

One afternoon, my friend and sister and I were waking down a path in the trees and I did not see where I was going, so I walked in a big dip hole and I fell down it. My friend and sister looked down the hole at me so I asked them if they could get help. So they ran home to go and get my dad, but he didn't get anything to get me out because he thought that I was not in a hole but I was in a big, big hole. So he looked down the hole and said, "How did you get down there? Did you jump or did you fall?"

"No, I did not jump. I fell down and I did not see the hole, so can you get me out of the HOLE now, please?"

So my dad and my friend and sister went with my sister and got some tools to get me out of the hole and they ran back and they got me out of the hole. "Thank you for getting me out of the hole."

And we all went back home and I went to sleep.

provide detail	regarding what happened	actions, thoughts, and feelings	descriptions of actions, thoughts, and feelings to develop experiences and events, or show the response of characters to situations (descriptions: he thought that I was not in the hole; got some tools, ran back, got me out of the hole)	descriptions to develop experiences and events or show the responses of characters to situations	such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations	such as dialogue, pacing, and description, to develop experiences, events, and/or characters	such as dialogue, pacing, and description, to develop experiences, events, and/or characters	such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters	such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters	such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters
				Use concrete words and phrases and sensory details to convey experiences and events precisely	Use concrete words and phrases and sensory details to convey experiences and events precisely	Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters
Provide conclusion	Provide some sense of closure	Provide a sense of closure	Provide a sense of closure (And we all went back home and I went to sleep.)	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from and reflects on the narrated experiences or events	Provide a conclusion that follows from and reflects on the narrated experiences or events	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative

^a Grade 3 level was achieved overall because most expectations within the constructs were at a Grade 3 level

Red text represents assigned grade level overall and for each construct

Blue text represents identical expectations within each construct

Assisted (AT) Narrative

Original

I could not believe that we are moving to Newfoundland I was excited and really sad to because I did not won't to leave my friends back in Canada but it would be fun I am scared to because I don't know wasn't it is going to be like. The day we live to go to Newfoundland I am going to miss the house it looks like we're just moved in but we were living we are at the airport we had to wait 2 hours but it felt like were sitting there for 4 hours but are plan guess landed so it was like a jump and skip to the it was! We had to find are sets will my sister was so she could not want to get to Newfoundland I feel asleep on the plain.....it was the morning and we were there I was so scared and I did not feel so good and we got our bags and we got a tax on are way to our new house and we found it it very nice I don't know what I was so scared of so I walked into our new house we all got our own rooms and are house was by the ocean it look so ten years later I still live in that same house. So I learned you don't not need to be scared of new changes and you don't have to be scared too.

Corrected

I could not believe that we are moving to Newfoundland. I was excited and really sad too because I did not want to leave my friends back in Canada, but it would be fun. I am scared too because I don't know what it is going to be like. Today we leave to go to Newfoundland I am going to miss the house. It looks like we're just moved in, but we were living [there].

We are at the airport. We had to wait 2 hours, but it felt like were sitting there for 4 hours, but our plane just landed so it was like a jump and skip!

We had to find our seats with my sister and she could not wait to get to Newfoundland. I fell asleep on the plane.

It was the morning and we were there. I was so scared and I did not feel so good. And we got our bags and we got a taxi on the way to our new house and we found it. It is very nice. I don't know what I was so scared of so I walked into our new house. We all got our own rooms and our house was by the ocean. It looked so [nice].

Ten years later I still live in that same house. So I learned you don't need to be scared of new changes and you don't have to be scared too.

provide detail	regarding what happened	describe actions, thoughts, and feelings (excited, sad, scared, felt like we were sitting there for 4 hours, scared, didn't feel good)	descriptions of actions, thoughts, and feelings to develop experiences and events, or show the response of characters to situations	descriptions to develop experiences and events or show the responses of characters to situations	such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations	such as dialogue, pacing, and description, to develop experiences, events, and/or characters	such as dialogue, pacing, and description, to develop experiences, events, and/or characters	such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters	such as dialogue, pacing, reflection, and multiple plot lines, to develop experiences, events, and/or characters	such as dialogue, pacing, reflection, and multiple plot lines, to develop experiences, events, and/or characters
				Use concrete words and phrases and sensory details to convey experiences and events precisely	Use concrete words and phrases and sensory details to convey experiences and events precisely (It felt like we were sitting there for 4 hours, but our plane just landed so it was like a jump and skip!)	Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters
Provide conclusion	Provide some sense of closure	Provide a sense of closure	Provide a sense of closure	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from and reflects on the narrated experiences or events (Reflected: don't need to be scared)	Provide a conclusion that follows from and reflects on the narrated experiences or events	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative

^a Grade 5 level was achieved overall because most expectations within the constructs were at a Grade 5 level
Red text represents assigned grade level overall and for each construct
Blue text represents identical expectations within each construct

Unassisted (UA) Persuasive

Original

We should still have paper and pencils,pen at school. Because if we didn't have paper and pencils,pens we could not draw and if we did not have paper and pencils ,pens and it would be reilly hard to draw on the computers. So I think that we should still have paper and pencils,pens because if wepaper and pencils,pens it would be hard to right a test on the computer so I still think we should still have paper and pencils,pen. So please don't get rid of paper and pencils,pen. If you do it would get reily get boring if we gut had computer ans more so that is way we so\uld still have paper and pencils,pen at school.

Corrected

We should still have paper and pencils at school, because if we didn't have paper and pencils, we could not draw. And if we did not have paper and pencils, it would be really hard to draw on the computers. So I think that we should still have paper and pencils because if didn't, it would be hard to write a test on the computer. So I still think we should have paper and pencils. So please don't get rid of paper and pencils. If you do it, would get really boring if we just had computers and more. So that is why we should still have paper and pencils at school.

Persuasive Construct	Grade 1	Grade 2 ^a	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9-10	Grade 11-12
Introduction	Introduce the topic (or name the book they are writing about)	Introduce the topic or book they are writing about	Introduce the topic or text they are writing about	Introduce a topic or text clearly	Introduce a topic or text clearly	Introduce claim(s)	Introduce claim(s)	Introduce claim(s)	Introduce precise claim(s)	Introduce precise claim(s)
										Establish the significance of the claim(s)
Opinion stated	State an opinion	State an opinion (We should still have paper and pencils at school)	State an opinion	State an opinion	State an opinion					
Acknowledge opposing claim							Acknowledge alternate or opposing claims	Acknowledge and distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims
Organizational structure			Create an organizational structure that lists reasons	Create an organizational structure in which related ideas are grouped to support the writer's purpose	Create an organizational structure in which ideas are logically grouped to support the writer's purpose	Organize the reasons and evidence clearly	Organize the reasons and evidence logically	Organize the reasons and evidence logically	Create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence	Create an organization that logically sequences claim(s), counterclaims, reasons, and evidence
Reasons provided	Supply a reason for the opinion	Supply reasons that support the opinion (We could not draw, it would be hard to draw on computers, it would be hard to write a test on the computer, it would get boring)	Provide reasons that support the opinion	Provide reasons that are supported by facts and details	Provide logically ordered reasons that are supported by facts and details	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of topic or text	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text	Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge	Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the

									level and concerns	audience's knowledge level, concerns, values, and possible biases
Word/phrase choice		Use linking words (e.g., because, and, also) to connect opinion and reasons (Because, and, so)	Use linking words and phrases (e.g., because, therefore, since, for example) to connect reasons and opinions	Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition)	Link opinion and reasons using words, phrases, and clauses (e.g., consequently, specifically)	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence	Use words, phrases and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims	Use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims
Formal style						Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing
Conclusion	Provide some sense of closure	Provide a concluding statement or section (that is why we should still have paper and pencils at school)	Provide a concluding statement or section	Provide a concluding statement or section related to the opinion presented	Provide a concluding statement or section related to the opinion presented	Provide a concluding statement or section that follows from the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented

^a Grade 2 level was achieved overall because most expectations within the constructs were at a Grade 2 level

Red text represents assigned grade level overall and for each construct

Blue text represents identical expectations within each construct

Assisted (AT) Persuasive

Original

I think That animals should not be in the circuses because they do deadly tricks like going on a tight ropes and more they don't give them food and are stuff in small cases and they are used for money so.They would be more deter in the wild then being in case so i think that should not abuses in the circuses because they used lions,tiger,sea lions, monkeys.....If the circuses if it is bad they don't give their money-back so they can keep their animals in the circuses.they have food for the but do you know what there food is made of so what are they really feeding their animals that have dean my question for them so I still think that they should let them go to the wild. So I still think that i am still.

Corrected

I think that animals should not be in the circuses because they do deadly tricks like going on a tight rope and more. They don't give them food and are stuffed in small cases and they are used for money. They would be better off in the wild then being in cases. So I think they should not abuse animals in the circuses because they used lions, tigers, sea lions, monkeys, etc. If the circus is bad, they don't give their money back so they can keep their animals in the circuses. They have food for them, but do you know what their food is made of? So what are they really feeding their animals? That has been my question for them. So I still think that they should let them go to the wild.

Persuasive Construct	Grade 1	Grade 2 ^a	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9-10	Grade 11-12
Introduction	Introduce the topic (or name the book they are writing about)	Introduce the topic or book they are writing about	Introduce the topic or text they are writing about	Introduce a topic or text clearly	Introduce a topic or text clearly	Introduce claim(s)	Introduce claim(s)	Introduce claim(s)	Introduce precise claim(s)	Introduce precise claim(s)
										Establish the significance of the claim(s)
Opinion stated	State an opinion	State an opinion (I think that animals should not be in the circuses)	State an opinion	State an opinion	State an opinion					
Acknowledge opposing claim							Acknowledge alternate or opposing claims	Acknowledge and distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims
Organizational structure			Create an organizational structure that lists reasons	Create an organizational structure in which related ideas are grouped to support the writer's purpose	Create an organizational structure in which ideas are logically grouped to support the writer's purpose	Organize the reasons and evidence clearly	Organize the reasons and evidence logically	Organize the reasons and evidence logically	Create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence	Create an organization that logically sequences claim(s), counterclaims, reasons, and evidence
Reasons provided	Supply a reason for the opinion	Supply reasons that support the opinion (deadly tricks, small cases, used for money, what are they being fed)	Provide reasons that support the opinion	Provide reasons that are supported by facts and details	Provide logically ordered reasons that are supported by facts and details	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of topic or	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating	Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that	Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that

						text	an understanding of the topic or text	an understanding of the topic or text	anticipates the audience's knowledge level and concerns	anticipates the audience's knowledge level, concerns, values, and possible biases
Word/phrase choice		Use linking words (e.g., because, and, also) to connect opinion and reasons (because, so, and)	Use linking words and phrases (e.g., because, therefore, since, for example) to connect reasons and opinions	Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition)	Link opinion and reasons using words, phrases, and clauses (e.g., consequently, specifically)	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence	Use words, phrases and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims	Use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims
Formal style						Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing
Conclusion	Provide some sense of closure	Provide a concluding statement or section (I still think they should let them go to the wild)	Provide a concluding statement or section	Provide a concluding statement or section related to the opinion presented	Provide a concluding statement or section related to the opinion presented	Provide a concluding statement or section that follows from the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented

^a Grade 2 level was achieved overall because most expectations within the constructs were at a Grade 2 level
Red text represents assigned grade level overall and for each construct
Blue text represents identical expectations within each construct

Appendix C: Kieran's Writing Samples and Scored Rubrics

Unassisted (UA) Narrative

Original

On the weekend I was playing my ipad the game was Dark legends its a vampire games You can customize your own guy you start with double swords in levels. You can more other swords like double knives and stuff You can buy a hat or hoods and shirts and pants and glasses and You can buy packs for 15 coins or 10 or 5. each come with a 1 sword and get a chance to get a legendry sword I was playing till lunch time after lunch. My dad me and my brother went skating till 5:00 we went home I had dinner My brother and me played the wii. At night my leg was hurting so bad so i got a ice pack then i went back to sleep. on this monday I woke up at 6:30 when my dad left. when I was waiting to leave for school I was playing on my ipad. Then I turned off my ipad then I packed my lunch I and Then I told mom i packed my lunch then i left for school.

Corrected

On the weekend, I was playing my iPad. The game was Dark Legends. It's a vampire game. You can customize your own guy. You start with double swords in levels. You can more other swords like double knives and stuff. You can buy a hat or hoods and shirts and pants and glasses and you can buy packs for 15 coins or 10 or 5. Each comes with 1 sword and you get a chance to get a legendary sword. I was playing until lunchtime.

After lunch, my dad, my brother and me went skating until 5:00. We went home. I had dinner. My brother and me played the Wii. At night, my leg was hurting so bad so I got an ice pack then I went back to sleep.

On this Monday, I woke up at 6:30 when my dad left. When I was waiting to leave for school, I was playing on my iPad. Then I turned off my iPad. Then I packed my lunch. Then I told mom I packed my lunch. Then I left for school.

provide detail	regarding what happened	describe actions, thoughts, and feelings (Actions in the video game; leg hurt so bad)	descriptions of actions, thoughts, and feelings to develop experiences and events, or show the response of characters to situations	descriptions to develop experiences and events or show the responses of characters to situations	such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations	such as dialogue, pacing, and description, to develop experiences, events, and/or characters	such as dialogue, pacing, and description, to develop experiences, events, and/or characters	such as dialogue, pacing, and reflection, to develop experiences, events, and/or characters	such as dialogue, pacing, reflection, and multiple plot lines, to develop experiences, events, and/or characters	such as dialogue, pacing, reflection, and multiple plot lines, to develop experiences, events, and/or characters
Use precise words/phrases to provide detail				Use concrete words and phrases and sensory details to convey experiences and events precisely	Use concrete words and phrases and sensory details to convey experiences and events precisely	Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters
Provide conclusion	Provide some sense of closure	Provide a sense of closure	Provide a sense of closure	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from and reflects on the narrated experiences or events	Provide a conclusion that follows from and reflects on the narrated experiences or events	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative

^a Grade 3 level was achieved overall because most expectations within the constructs were at a Grade 3 level
Red text represents assigned grade level overall and for each construct
Blue text represents identical expectations within each construct

Assisted (AT) Narrative

Original

When I was sitting in my room playing battle bears gold on ipad mini my parent went in my room and told me we are moving to trinidad. Then I was so happy about it and I could see new thing there and new foods and the new house grandpa build and a new school and very sunny there. I can meet new friends and new fruits and I could miss my old friend my grandpa said theres no winter there and I can new games they play Trinidad is a good place to be.

Corrected

When I was sitting in my room playing Battle Bears Gold on my iPad mini, my parents went in my room and told me we are moving to Trinidad. Then I was so happy about it and I could see new things there and new foods and the new house grandpa build and a new school and it's very sunny there. I can meet new friends and new fruits and I could miss my old friend. My grandpa said there's no winter there and I can learn new games they play. Trinidad is a good place to be.

provide detail	regarding what happened	describe actions, thoughts, and feelings (I was so happy)	descriptions of actions, thoughts, and feelings to develop experiences and events, or show the response of characters to situations	descriptions to develop experiences and events or show the responses of characters to situations	such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations	such as dialogue, pacing, and description, to develop experiences, events, and/or characters	such as dialogue, pacing, and description, to develop experiences, events, and/or characters	such as dialogue, pacing, and reflection, to develop experiences, events, and/or characters	such as dialogue, pacing, reflection, and multiple plot lines, to develop experiences, events, and/or characters	such as dialogue, pacing, reflection, and multiple plot lines, to develop experiences, events, and/or characters
				Use concrete words and phrases and sensory details to convey experiences and events precisely	Use concrete words and phrases and sensory details to convey experiences and events precisely	Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters
Provide conclusion	Provide some sense of closure	Provide a sense of closure	Provide a sense of closure (Trinidad is a good place to be)	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from the narrated experiences or events	Provide a conclusion that follows from and reflects on the narrated experiences or events	Provide a conclusion that follows from and reflects on the narrated experiences or events	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative

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Red text represents assigned grade level overall and for each construct
Blue text represents identical expectations within each construct

Unassisted (UA) Persuasive

Original

We should have both because happend the power went out or the wifi dousen't work. If were doing math on the compluter what happend the wifi. Went out then we have to use paper and pencil so thats we should have both if we didn't had pencil and paper if we only had compluters if didn't. Had wifi the school could be so bourd and tired compluter you can do math, spelling, writing and telling time. And pencil and paper you can math, spelling, writing and telling time. Thats why we should have both.

Corrected

We should have both because what happens if the power went out or the Wi-Fi doesn't work? If were doing math on the computer, what happens it the Wi-Fi went out? Then we have to use paper and pencil. So that's we should have both. If we didn't have pencil and paper, if we only had computers, and if we didn't have Wi-Fi, the school could be so bored and tired. Computer, you can do math, spelling, writing and telling time. And pencil and paper, you can do math, spelling, writing and telling time. That's why we should have both.

Persuasive Construct	Grade 1	Grade 2	Grade 3 ^a	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9-10	Grade 11-12
Introduction	Introduce the topic (or name the book they are writing about)	Introduce the topic or book they are writing about	Introduce the topic or text they are writing about	Introduce a topic or text clearly	Introduce a topic or text clearly	Introduce claim(s)	Introduce claim(s)	Introduce claim(s)	Introduce precise claim(s)	Introduce precise claim(s)
										Establish the significance of the claim(s)
Opinion stated	State an opinion	State an opinion	State an opinion (We should have both)	State an opinion	State an opinion					
Acknowledge opposing claim							Acknowledge alternate or opposing claims	Acknowledge and distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims
Organizational structure			Create an organizational structure that lists reasons	Create an organizational structure in which related ideas are grouped to support the writer's purpose	Create an organizational structure in which ideas are logically grouped to support the writer's purpose	Organize the reasons and evidence clearly	Organize the reasons and evidence logically	Organize the reasons and evidence logically	Create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence	Create an organization that logically sequences claim(s), counterclaims, reasons, and evidence
Reasons provided	Supply a reason for the opinion	Supply reasons that support the opinion	Provide reasons that support the opinion (what if the power went out, or the Wi-Fi doesn't work? You can do the same things with both)	Provide reasons that are supported by facts and details	Provide logically ordered reasons that are supported by facts and details	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of topic or text	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text	Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge	Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the

									level and concerns	audience's knowledge level, concerns, values, and possible biases
Word/phrase choice		Use linking words (e.g., because, and, also) to connect opinion and reasons (because, then, so, if)	Use linking words and phrases (e.g., because, therefore, since, for example) to connect reasons and opinions	Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition)	Link opinion and reasons using words, phrases, and clauses (e.g., consequently, specifically)	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence	Use words, phrases and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims	Use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims
Formal style						Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing
Conclusion	Provide some sense of closure	Provide a concluding statement or section	Provide a concluding statement or section	Provide a concluding statement or section related to the opinion presented (That's why we should have both)	Provide a concluding statement or section related to the opinion presented	Provide a concluding statement or section that follows from the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented

^a Grade 3 level was achieved overall because most expectations within the constructs were at a Grade 3 level

Red text represents assigned grade level overall and for each construct

Blue text represents identical expectations within each construct

Assisted (AT) Persuasive

Original

I think animals should be in the circus. If it was only people doing circuses like clown and stuff everyone could be bored and tired. So that's why you should have animals in circuses and more fun and make some more money. The owners should buy some food for circus animals and learn some tricks like dogs, tigers and elephants. It's more fun stuff to And so that's why you should have animals in circus. People should be in circus because get more strength and fit and that's why animals should be in circuses. This is the reason animals should be in circus.

Corrected

I think animals should be in the circus. If it was only people doing circuses, like clowns and stuff, everyone could be bored and tired. So that's why you should have animals in circuses. And it's more fun and they make some more money. The owners should buy some food for circus animals and learn some tricks, like with dogs, tigers and elephants. It's more fun stuff too. And so that's why you should have animals in the circus. People should be in the circus because they get more strength and fit. And that's why animals should be in circuses. This is the reason animals should be in the circus.

Persuasive Construct	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9-10	Grade 11 -12
Introduction	Introduce the topic (or name the book they are writing about)	Introduce the topic or book they are writing about	Introduce the topic or text they are writing about	Introduce a topic or text clearly	Introduce a topic or text clearly	Introduce claim(s)	Introduce claim(s)	Introduce claim(s)	Introduce precise claim(s)	Introduce precise claim(s)
										Establish the significance of the claim(s)
Opinion stated	State an opinion	State an opinion	State an opinion (I think animals should be in the circus)	State an opinion	State an opinion					
Acknowledge opposing claim							Acknowledge alternate or opposing claims	Acknowledge and distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims	Distinguish the claim(s) from alternate or opposing claims
Organizational structure			Create an organizational structure that lists reasons	Create an organizational structure in which related ideas are grouped to support the writer's purpose	Create an organizational structure in which ideas are logically grouped to support the writer's purpose	Organize the reasons and evidence clearly	Organize the reasons and evidence logically	Organize the reasons and evidence logically	Create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence	Create an organization that logically sequences claim(s), counterclaims, reasons, and evidence
Reasons provided	Supply a reason for the opinion	Supply reasons that support the opinion	Provide reasons that support the opinion (if it was only people, everyone would be bored; it's more fun, they make more money)	Provide reasons that are supported by facts and details	Provide logically ordered reasons that are supported by facts and details	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of topic or text	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text	Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level and concerns	Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's

										knowledge level, concerns, values, and possible biases
Word/phrase choice		Use linking words (e.g., because, and, also) to connect opinion and reasons (if, so, and, because)	Use linking words and phrases (e.g., because, therefore, since, for example) to connect reasons and opinions	Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition)	Link opinion and reasons using words, phrases, and clauses (e.g., consequently, specifically)	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence	Use words, phrases and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims	Use words, phrases and clauses, as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims
Formal style						Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing
Conclusion	Provide some sense of closure	Provide a concluding statement or section	Provide a concluding statement or section	Provide a concluding statement or section related to the opinion presented (This is the reason animals should be in the circus.)	Provide a concluding statement or section related to the opinion presented	Provide a concluding statement or section that follows from the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented	Provide a concluding statement or section that follows from and supports the argument presented

^a Grade 3 level was achieved overall because most expectations within the constructs were at a Grade 3 level
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 Blue text represents identical expectations within each construct