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MORPHOLOGICAL FORMS IN THE WRITING OF MIDDLE SCHOOL STUDENTS
WITH DISABILITIES

by

Stacie Brady
A Dissertation
Submitted to the
Graduate Faculty
of
George Mason University
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of
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Dedication

This is dedicated to my wonderful, encouraging family. First, to my husband, Jon Brady. Without his continued love and support, this dissertation would not have been possible. Second, to my three brilliant, loving children Jessica, Clare, and Neal. Thank you for putting up with me through this process and encouraging me to continue and finish. Lastly, thank you to my parents, Robert and Thressia Parker. You gave me the needed Florida escapes that kept me going. Thank you for holding my hand through this journey.

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List of Abbreviations

Analysis of Variance	ANOVA
Close Reading	CR
Curriculum Based Measurement.....	CBM
Effect Size.....	EC
English Language Learner	ELL
Individual Education Program	IEP
Institutional Review Board	IRB
Morphological Awareness	MA
Morphological Processing	MP
National Assessment of Educational Progress.....	NAEP
Simple View of Reading	SVR

Abstract

MORPHOLOGICAL FORMS IN THE WRITING OF MIDDLE SCHOOL STUDENTS WITH DISABILITIES

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George Mason University, 2021

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The purpose of this study, secondary data analysis, was to analyze the argumentative and informative essay writing of middle school students with disabilities. Inflectional, derivational, and compound word morphological forms within 360 essays were coded and analyzed using descriptive and inferential statistics. Results are grouped into categories by grade, subject (science and social studies) and genre (argumentative and informative) of writing. Correlational analysis was used to examine the relationship between morphological form use and quality and quantity writing scores. Results indicate that students in middle school are able to use inflectional, compound, and derivational morphological forms in their content area writing. Implications for research and practice are included.

Chapter One

Speaking, listening, reading, and writing are language processes that are interrelated, but each has its own developmental trajectory (Berninger et al., 2002). Speaking and listening are oral language skills. Reading and writing are the consumption and production of textual language. The knowledge of written language (literacy) must be learned and is critical to a student's success in school and beyond. The Common Core State Standards for English Language Arts -Literacy. L4.1 state that students should "Use knowledge of language and its conventions when writing, speaking, reading, or listening" (Common Core State Standard Initiative, CCSS.ELA-Literacy.L4.3, 2020). Common Core State Standards English Language Arts state that to meet this fourth-grade literacy standard, students should "Choose words and phrases to convey ideas precisely" (Common Core State Standard Initiative, CCSS.ELA-Literacy.L.4.3A, 2020).

Although literacy is a primary focus of schools in the United States, many students with and without disabilities struggle to become competent, efficient readers and writers. The Nation's Report Card (The National Assessment of Education progress, NAEP) reported that only 27 percent of students in eighth grade were at or above the writing proficient level in 2017 and that reading scores were at 34 percent (Institute of Educational Science, The National Center for Educational Statistics, 2019).With the high

percentage of students struggling with literacy, educators need effective instructional strategies to support literacy growth.

Vocabulary instruction is an area that can be used to support literacy. The National Reading Panel (2000) recommended that vocabulary should be taught through specific word instruction (e.g., selecting words to directly teach) and word learning strategies (e.g., morphological analysis). The purpose of this chapter is to explain morphology (i.e., the study of morphemes), to discuss morphological literacy interventions for struggling readers, and to justify the need for further research in order to determine the use and accuracy of morphology vocabulary knowledge that students with disabilities are using in their writing. Analyzing the morphological forms that students with disabilities are able to use in their writing provides researchers and practitioners the knowledge required to develop appropriate vocabulary interventions to support students' reading and writing.

Morphology

Morphology plays an important role in vocabulary growth (Kuo & Anderson, 2006; Nagy et al., 2006; Reed, 2008). Morphology knowledge is generative vocabulary knowledge that addresses how meaningful word parts are combined. Students can learn to segment and blend words in order to infer the word meaning (e.g., break, breakable, unbreakable). This generative knowledge allows students to problem solve an average of three additional words for each word learned instead of memorizing thousands of morphologically complex words (Nagy & Anderson, 1984).

Morphology is the study of the internal structure of words and how they are formed, including parts such as roots, bases, and affixes (Nippold, 2016). Morphemes are the smallest unit of meaning in a language (Wolter & Pike, 2015). Morphemes include simple, whole word units such as “hot” and base words with affixes such as “car” in “cars,” “lock” in “unlock,” and “plant” in “planting.” Free or unbound morphemes can stand alone as a word (e.g., girl, in, he). Bound morphemes work in combination with other morphemes. They cannot stand alone. Bound morphemes include prefixes, suffixes, and bound roots (e.g., ex-, -ing, rasp-) (Carlisle, 2003; Moats, 2000).

As children learn language, they learn morphemes. As their language skills develop, they store these free and bound morphemes in memory. Access to these morphemes and their linguistic information, such as grammatical roles and semantic features, affect the linguistic process of gradually learning new morphologically complex words (Carlisle, 2010). Morphemes can facilitate pronunciation, spelling, and meaning of longer, morphologically complex words. Knowledge of the morphological structure of words is developmental and requires processing of phonology, semantics, syntax, and orthography (i.e., written language) (Carlisle, 2003).

Morphological Knowledge

Researchers refer to morphological knowledge using various terms such as morphological analysis, morphological processing (MP), and morphological awareness (MA). Derwing and Baker (1979) originally named the ability to analyze and make judgments about morphemes as word-structure analysis. More recently, Nagy et al. (2013) defined and clarified the use and differences in these terms that refer to

morphological knowledge. MP is defined as implicit processing of morphological information (Nagy et al., 2013). An individual is able to recognize known words and the links between the orthographic and phonological representation of a word. An individual with a greater ability to process morphological representations will be able to recognize known words more efficiently and identify redundant links between the word parts that contribute to word meaning, form, and syntax. As this information is efficiently processed, an individual is able to recognize and write known words more quickly.

MA refers to a conscious awareness of the morphemic structure of words and the ability to reflect on and manipulate that structure (Carlisle, 1995). MA focuses on the individual's ability to parse words into smaller meaningful parts. MA is a conscious reflection of both spoken and written morphemes including an understanding of what written affixes are and the rules that govern how affixes connect to base words (Apel, 2014).

Early Acquisition and Development of MA

Research reveals that an individual's growth of MA develops prior to formal reading instruction and continues to develop through high school (Berko, 1958; Nagy et al., 1993). As language develops and children are exposed to oral and written English, they become aware of the rules and features of language and develop a metalinguistic awareness (Moats, 2000). They learn that words are comprised of meaningful parts. Having this awareness of language, allows children to use morphological rules to infer word meaning of unfamiliar words. Research on the acquisition of MA has focused on

two primary types of morphology: inflections and derivations (Berko, 1958; Elbro & Arnbak, 1996; Tyler & Nagy, 1989).

Inflectional Morphemes. Inflectional morphemes change the grammatical function of the word (e.g., past tense), but do not change the part of speech (Apel et al., 2012). Inflectional morphemes alter base words by modifying their tense, number, possession, or comparison (e.g., walk to walking). Inflectional morphemes do not typically alter the meaning of the root part of speech; they involve grammatical suffixes (e.g. -ing, -ed, -s).

Berko (1958) conducted one of the first systematic studies of children's awareness of inflectional morphology. The study identified that preschool children, four to seven years old, have developed some knowledge of the functions of inflectional morpheme markers and may be able to manipulate them with new words. Berko also noted that inflectional morphology significantly improves from preschool to first grade. Therefore, children that are in first grade are better able to identify roots and affixes and use this knowledge to infer meanings of unfamiliar words.

Berko (1958) and Cazden (1968) identified that children develop an understanding and production of plurals before possessives, progressives (cooking), and past tense (cooked) inflectional morphemes. As children begin to learn inflection morphological rules, they overgeneralize to irregular words (e.g., singed). Although there are individual differences, by the early elementary grades, children have usually acquired the major inflectional principles (Kuo & Anderson, 2006).

Derivational Morphemes. Derivational morphemes develop later than inflectional morphemes (Kuo & Anderson, 2006). Derivational morphemes change the grammatical class and/or meaning of the base word. There are many derivational suffixes (e.g., -able, -ment, -ize.). First grade students usually have only a fundamental knowledge of derivational morphemes while third and fourth grade students begin to develop a more explicit awareness of these forms (Anglin, 1993).

As language develops, children begin to identify inflectional and derivational morphemes. Using receptive language skills, children parse verbal phrases and recognize that certain morphemes recur during connected speech. As their oral language and understanding of grammatical rules develop, children learn to combine morphemes to form novel words (Carlisle, 2003). During the elementary school years, there is considerable growth in awareness of the structure and meaning of inflections and derivations. Growth of MA contributes to reading development (Deacon & Kirby, 2004) and learning to read plays a key role in MA development through exposure to print (Carlisle, 2003).

MA and Reading

MA is a linguistic skill that supports the representation of a spoken language onto a written system (Carlisle, 2011). The connection between language skills and reading is explained in Gough and Tunmer's (1986) simple view of reading (SVR) framework. The SVR states that reading comprehension is the product of two components: linguistic (language) skills and decoding. MA primarily contributes to reading comprehension through its impact on vocabulary (Reed, 2008). Vocabulary is just one aspect of linguistic

comprehension (Braze et al., 2015). Catts et al. (2006) also include grammatical understanding and discourse comprehension as additional linguistic skills that affect comprehension.

MA also supports decoding of complex words. Carlisle (2017) explains that reading complex words involves the use of a variety of letter patterns (e.g., graphemes, syllables, morphemes). However, little research has been focused on the use of different letter patterns or units in reading. By being able to decode larger chunks of words, MA contributes to the speed and accuracy of decoding (Nagy et al., 2006). For example, the word “flower” is processed differently than “taller.” “Taller” can be segmented into two morphemes and “flower” only one. As reading skills develop, MA contributes to literacy outcomes in a variety of ways (e.g., vocabulary, decoding, reading comprehension) (Nagy et al., 2006).

Kuo and Anderson (2006) postulate three reasons why there is an intertwined relationship between MA and reading. The first reason is that morphemes provide semantic, phonological, and syntactic information. The second reason is that the efficient, mature reader utilizes morphological organization for processing complex words. MA word knowledge is used to store information regarding words and word parts. The more advanced reader may benefit by having more MA to efficiently store and retrieve morphologically complex words. The third reason researchers posit that MA is interwoven with reading is that MA provides information about the writing system. Morphemes remain static regardless of a phonological shift when a suffix is added to a

word (e.g., sign-signature). Increased MA allows the reader to recognize and identify morphologically complex words (Kuo & Anderson, 2006).

Early Research Regarding MA and Reading

Brittain (1970) was the first to examine the impact of MA on reading ability. To assess MA, Brittain completed a study with 79 first and second grade students using a revision of Berko's morphological assessment. The assessment consisted of 27 cards with colorful pictures that were named using pseudowords. For example, "This is a wug. Now there is another one. There are two _____ (*wugs*)" (Berko, 1958, p. 154.) A short text corresponded to each picture. The examiner read the text with a missing word. The student supplied the missing word containing an inflectional item (e.g., plural, past tense, or comparative).

After using Berko's revised morphological assessment to assess word recognition, word attack, and reading comprehension, the *Primary Reading Profiles*, Levels One and Two were administered (Brittain, 1970). Brittain compiled the reading subtests to determine a reading composite score. Results of the correlational analysis between the reading composite score and MA, indicated a significant relationship between MA and reading ability, after controlling for intelligence. The correlation of .71 for second grade was significant at the .001 level and 0.41 for first grade at the .01 level. Brittain determined that MA provides semantic (e.g., tense) and grammatical (e.g., word class) information which is crucial for reading comprehension.

MA and Writing

Most research on MA has focused on the contributions to spoken language and reading. However, Carlisle (1994) addressed MA and spelling and Green (2003) focused on MA and written composition. Although research in the area of MA and writing is not extensive (e.g., Allen & Lembke, 2020; Green et al., 2003), there are existing theoretical frameworks that connect morphology and writing acquisition.

The primary theory driving this proposal is the cognitive theory of developing the writing process by Flower and Hayes' (1980). The cognitive writing model focuses on three processes: planning, translating, and reviewing. Berninger and Swanson (1994) expanded upon this model, addressing developmental writing, and included two components within the translation process: transcription and text generation.

Transcription is the transformation of language representations into written symbols which involves the use of cognitive and physical abilities, such as spelling, handwriting, and typing (Green et al., 2003). Text generation refers to turning ideas into language representations (words, clauses, and paragraphs) in the working memory through the use of lexical, syntactic, and rhetorical processes. Morphological knowledge may support both transcription and text generation skills.

Green et al. (2003) examined the development of children's use of morphology in their spontaneous writing, including text generation skills, as well as the relationship between MA and spelling. Participants in the study included 247 students in third and fourth grade. To test the hypothesis that MA relates to transcription and text generation, the participants wrote a narrative essay following protocol described in *The Expression*

Connection: A Structured Approach to Teaching Storytelling to School-Age Children

(Klecan-Acker & Brueggerman, 1991). The participants' essays were scored, and the use of inflectional and derivational forms were identified using the *Morphological Coding System* based on Carlisle, 1996. Green and colleagues examined the prevalence and accuracy of morphological forms used.

Green and colleagues determined that students' development of MA in writing is similar to the progression observed in oral language (Berko, 1958; Carlisle, 1988). Students use of derived forms in their writing parallels the use of morphological forms in their spontaneous speech. Inflections were used more than derivational forms. Fourth grade students displayed more accurate use of derived morphological forms in their writing and showed more variance in their writing when compared to third grade students. The assessment that took place at the end of fourth grade indicated mastery of the use of inflections at 90% accuracy or higher. Accurate use of derived forms was lower at the beginning of the year (60%) but had increased by the end of the school year (87%). Green et al.'s findings support Carlisle's (2000) theory that the use of inflectional morphemes develops first and the use of derivational morphology forms begins in second and third grade.

MA and Transcription

Composition in the English language is morphophonemic and involves several linguistic levels, including handwriting at the subword level and spelling at the word level (McCutchen & Stull, 2015). At the word level, morphology is important because the English language represents both sound units (phoneme) and meaning units

(morphemes), meaning that morphological and phonological knowledge contribute to the students' ability to spell words. When students spell words such as *muscle* and *muscular*, the morphemic structure is preserved although the sound changes. Words that have different morphological roots may be pronounced the same but spelled differently (e.g., *genes* and *jeans*) (Moats, 2000).

Chomsky (1970) first used the term lexical spelling to identify how students must shift from spelling at the alphabetical level to using morphological rules to words with irregular spellings. For example, in English, plurals are spelled with an -s which follows the morphological principal for spelling instead of a -z, even if the pronunciation is with a /z/ (e.g., shoes). Writers must learn to spell words using phonemes and morphemes.

In 1987, Carlisle completed a study to obtain a more comprehensive understanding of linguistic deficits of students with spelling disabilities. Prior to Carlisle (1987), research to classify spelling and spelling disabilities focused on the dual-system model, or phonetic/nonphonemic approach. The dual-system model used whole word and phonetics without consideration for the use of morphological knowledge. Researchers and diagnosticians would classify students as having a phonetic or memory “nonphonemic” deficit (Carlisle, 1987).

Carlisle compared the use of morphological knowledge used in spelling tasks between typical developing fourth, sixth, and eighth grade students ($n = 65$) and ninth grade students with learning disabilities ($n = 17$). The participants in these grade levels were identified because students with learning disabilities are generally three to five years delayed in their spelling and morphological knowledge (Moats, 1983; Wiig et al., 1973).

The participants were administered the *Wide Range Achievement Test*, Spelling subtest, and three experimenter designed tests: Test of Morphological Structure, the Test of Suffix Addition, and the Spelling Test. Carlisle sought to understand the developmental trends of using derivational morphological forms in spelling. The researcher determined that spelling errors cannot be attributed solely to a lack of mastery of phoneme-grapheme correspondence rules (i.e., dual-system model). Spelling draws upon the knowledge of sound-letter correspondences, syntactic rules, orthographic rules, and knowledge of the word's morphology. Students with learning disabilities in the ninth grade were able to use morphological spelling accurately on derived words much like the fourth graders on the Base and Derived Spelling Test.

Carlisle (1996) stated that there is a reciprocal relationship with MA and written language. MA supports writing and learning to write also facilitates the acquisition of morphological knowledge. For example, students learn to spell the past tense marker -ed whether it is pronounced /d/, /t/, or /ed/. First grade students typically spell the past tense marker phonetically, but by second grade, these spelling errors are resolved.

Berninger et al. (2008) completed two intervention experiments using randomized, controlled designs with participants with learning disabilities in fourth through ninth grade that involved the comparison of orthographic or morphologic spelling treatments. The orthographic treatment taught students to spell words through visualizing written words and focus on the sequence of each letter. The morphological intervention focused on learning base words and affixes as well as word building, word dissecting, and identification of morphologically complex words. When comparing the

orthographical and morphological interventions, the morphological intervention group improved more in spelling pseudowords (partial eta squared = .006). Results from each intervention improved over time.

MA and Text Generation

At the word level, MA may assist struggling writers to improve fluency with retrieving the precise word to convey the appropriate meaning to the audience. Students with learning disabilities are often slower to retrieve lexical information (Messer & Dockrell, 2006). Reiche and Perfetti (2003) completed simulations with morphologically related words and determined that familiarity with a word provides lexical retrieval access to vocabulary. Stahl and Fairbanks (1986) stated that students process vocabulary through three levels: association, comprehension, and generation. A writer needs to be able to use lexical generation processing to choose the appropriate word to convey the meaning to the audience. A rich vocabulary allows the writer to choose the precise word to compose a sentence or clause to convey the appropriate meaning (Olinghouse & Wilson, 2013).

With sentence generation, there is an interplay between several linguistic processes (semantic, syntactic, and lexical) (McCutchen, 1984). Knowledge of derivational morphology allows the writer to manipulate a word from a verb to a noun (e.g., teaches/teacher) providing opportunity to manipulate the syntax of a sentence. Berninger et al. (2011) assessed first grade students using the morphological signals test. She found that suffixes which mark tense, number, and part of speech play a role in

learning how to use grammar and construct sentences with appropriate syntactic structures.

In addition to improving writing fluency and sentence generation, MA contributes to the production of morphologically complex words through word construction (McCutchen & Stull, 2015). McCutchen and Stull (2015) examined the contribution of MA in writing of ($n = 175$) fifth grade students. McCutchen and Stull used the *Woodcock Reading Mastery Tests*-revised word identification subtest, *Woodcock Johnson-III Test of Achievement*, researcher created MA task, morphological sentence combining task, and sentence completion task. A transcription (spelling) and text generation (word retrieval) score was achieved from the sentence combining task. MA was related to the production of complex morphological forms ($b = 1.592, p < .001$). McCutchen and Stull's results indicated that young writer's use MA to retrieve words as well as construct novel morphological forms.

To examine the use of MA in writing (spelling and text generation), McCutchen et al. (2013) completed a quasi-experimental study with fifth grade general education students ($n = 170$). Classroom teachers provided supplemental MA instruction for twelve weeks during a science unit. MA instruction contained scripted lessons regarding word structure (affix + root) and definitions. The supplemental instruction focused on multimorphemic vocabulary from the science curriculum (i.e., terrain, condense, cycle), not isolated morphemes. Students completed activities such as matching words to definitions and sentence completion. Students completed sentence combining and extended response writing assessments multiple times throughout the intervention. The

percentage of instructed and not instructed multimorphemic words spelled correctly and average length of sentences were calculated from each extended response writing assessment. Results of the sentence combining assessment indicated a significant effect of the intervention ($d = 1.03$) when the control and intervention groups were compared. Students in the intervention group improved their ability to generate and spell morphologically complex words during sentence combining assessment. The results of the extended writing assessment indicated that students wrote more words that were included during the intervention ($d = .89$). McCrutchén and colleagues noted that the students who struggled most with writing achieved the highest gains. This study identified that MA intervention increased students' ability to write more complex words in the sentence combining task as well as a transfer of vocabulary use to a more authentic extended writing task.

Northey et al. (2015) completed a correlational study to explore relationships between MA and text quality. The participants were in fifth and eighth grade ($n = 233$). Northey and colleagues used the *Wechsler Individual Achievement Test, Third Edition (WIAT-III)* essay subtest to assess the participant's overall writing quality. The *WIAT-III* yielded three standardized scores: word count, content and organization, and grammar and mechanics. To assess transcription skills, the *Woodcock Johnson-III Tests of Achievement (WJ-III)* was used. Students were required to complete a timed task of writing a sentence about a picture using three words given. For example, the words *boy*, *happy*, and *is* was given to write a sentence such as, *The boy is happy*. A sentence combining task was also given to assess the students' morpho-syntactic manipulation

within sentences (i.e., text generation). Northey and colleagues scored students on spelling and word production abilities (transcription and text generation). The researchers determined that writing fluency and morphological skills were positively predictive ($p < .05$) of writing quality. Northey et al. (2015) noted that MA may have implications for writing at the word, sentence, and text level. MA was predictive of the students' writing quality. MA and writing fluency were predictive of the writer's essay content and organization score.

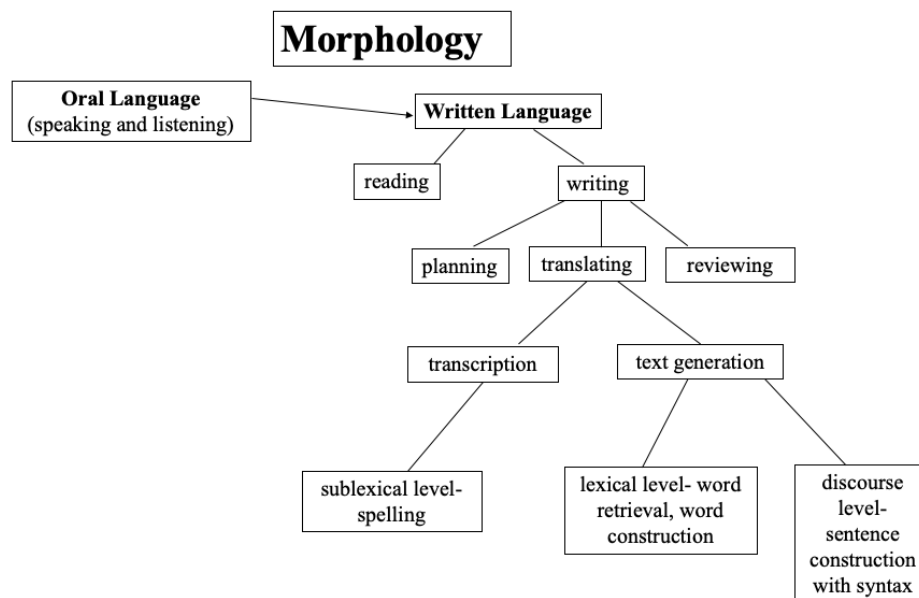


Figure 1

Morphological contribution to written language

Statement of the Problem

Many students in the U.S. public-school system struggle with reading, especially students classified as having a disability (Gilmour et al., 2019). In 2019, reading scores on the National Assessment of Educational Progress (NAEP) decreased when compared

to assessment conducted in 2017 (NCES, 2019). The NAEP used a 500-point scale with a score of 280 or higher being at least proficient. The nation's average reading score was 263, with only 34% scoring at or above proficient for eighth grade students. The nation's reading scores have not changed significantly since 1992. Reading is critical to learning in all areas of instruction. Students who fall below the proficient level may be less able to gain new knowledge and comprehend concepts introduced in grade-level text, regardless of disability status (Roberts et al., 2008).

Reading and writing are intertwined, and vocabulary knowledge is an integral component of each skill (LaFlamme, 1997; Truckenmiller, 2021). A writer must choose the exact word to convey ideas to the audience. The NAEP Writing Assessment evaluates the development of ideas, organization of ideas, and language facility and conventions. These broad writing domains include but are not limited to the development of ideas, style, varied sentence structure, and vocabulary. In 2017, the NAEP writing scale ranged from 0 to 300 and categorized students' scores as advanced, proficient, or basic. Students that have reached the proficient level demonstrated competency in subject matter and skills appropriate for that grade level. In 2017, only 27% of students in grade eight reached a proficient level in writing.

NAEP scores in reading and writing demonstrated the need for improving knowledge on how to support students' with increasing their literacy skills. To develop competent literacy skills, students need support and experiences with a variety of types of print, and through nurturing of vocabulary, syntactic, and discourse skills that are involved in understanding written language (Hemphill & Tivan, 2008). Vocabulary

instruction is especially important for students with limited vocabularies (Baumann & Kame'enui, 2004; Zoski et al., 2018). The National Reading Panel (2000) recommended that vocabulary be taught through specific word instruction (e.g., selecting words to directly teach) and word learning strategies (e.g., morphological analysis).

Purpose of the Study

The purpose of the study in this proposal is to examine the use of morphologically complex words in middle school students with disabilities science and social studies writing. This study determined how commonly and how accurately students with disabilities use inflections, derivations, and compound words spontaneously in their informative and argumentative writing. The study addresses the following three research questions:

1. What types of morphological forms are middle school students with disabilities using in their science and social studies informative and argumentative writing?
2. How are measures of writing quality and the number of words written related to morphological forms?
3. How accurate are middle school students with disabilities in their use of morphological forms in informative and argumentative science and social studies writing?

Definition of Terms

The following terms and definitions are used throughout this study:

Accuracy of use is defined as the “percentage of students who correctly used a given form on at least one occasion” (Green et al., 2003, p. 754).

Derivational forms are defined as “changes to a base word that transform the word from one grammatical category to another, such as quick to quickly or write to written” (Green et al., 2003, p. 752).

Generative vocabulary knowledge is defined as “the students’ ability to learn quite literally tens of thousands of words-words they study explicitly and words they encounter in their independent reading across all disciplines- by attending to the combinations of prefixes, suffixes, and roots” (Templeton, 2012, p. 101).

Morpheme is defined as “the smallest unit of meaning in language” (Moats, 2000, p.59).

Morphology is defined as “the study of word-formation processes, including inflections, derivations, and compounds” (Nagy et al., 2013, p. 4).

Morphological analysis is defined as “analyzing constituent morphemes and combining them in a generative process” (White et al., 1989, p. 285).

Morphological awareness is defined as “an awareness of both spoken and written morphemes, including an understanding of what written affixes (i.e. prefixes and suffixes) look like orthographically and the rules that govern how affixes attach to base words or roots” (Apel, 2014, p. 198).

Morphological knowledge is defined as “a superordinate that covers morphological awareness and morphological processing” (Nagy et al., 2013, p.4).

Morphological production is defined as “the unconscious use of morphemes” (Apel, 2014, p. 198).

Morphological processing is defined as “recognizing (identifying) or writing known words more quickly and easily because of stronger, redundant links between the orthographic and phonological representations of a word” (Nagy et al., 2013, p. 4).

Prevalence of use is defined as “the number of children attempting to use each form (whether accurate or not)” (Green et al., 2003, p. 755).

Writing Quality is defined as “*Number of response parts* (Scardamalia, Bereiter, & Goleman, 1982) will include counts for the following: (a) topic sentence, (b) content-area information units as supporting evidence, (c) each explanation of supporting evidence, and (d) ending sentence”(Mason et al., 2019-2023, p. 14).

Writing Quantity is defined as word count that was tabulated through Microsoft WORD (Mason et al., 2019-2023).

Chapter Two

Chapter Two presents the procedures and findings from the literature search for morphological interventions and literacy outcomes in students that struggle with literacy, including students with disabilities. The first section of the chapter discusses recent reviews or meta-analysis that have examined morphological awareness (MA) and literacy outcomes. The following section presents a systematic review in MA interventions for increasing literacy outcomes, for students with and without disabilities struggling with reading and writing. The purpose of this review was to examine the empirical research conducted using explicit MA interventions to improve word identification, reading comprehension, spelling, vocabulary, and sentence writing outcomes for struggling readers. The final section of Chapter Two summarizes the recent research and provides implications for further research in the area of MA and literacy.

Current Research Regarding MA and Literacy

Five literature reviews addressing MA and literacy have been completed: Reed (2008); Goodwin and Ahn (2010); Bowers et al. (2010); Carlisle (2010); and Goodwin and Ahn (2013). These reviews demonstrate the importance of MA to literacy development. However, the purpose, methods, interventions, and literacy outcomes included in the studies in the reviews varied significantly.

Reed (2008), for example, synthesized seven morphological intervention research studies for students in kindergarten through 12th grade that included students with varying reading ability levels. Studies were included that were conducted between 1986 to 2006.

She examined peer reviewed studies that used chunking multisyllable words, reading and spelling inflectional endings, and changing words with analogies (e.g., sing: singer; magic: _____). Use of Cohen's d effect sizes for six studies revealed mixed results with a range of negative to positive effect sizes ($d = -.93$ to $d = 1.76$) on literacy skills. Reed included seven studies in the review; however, calculation errors were discovered in the effect sizes for Wysocki and Jenkins (1987); therefore, these study results were not included in this paper. The strongest effect sizes were associated with instruction that focused on a learning a combination of affixes and root words not isolating affix intervention such as Baumann et al. (2003). Baumann et al. (2003) focused solely on eight frequently occurring prefix families and context clues. Reed's research suggests that morphological knowledge may generalize to increase a student's word reading level and may result in an exposure to more complex vocabulary. Reed further indicated that more research with MA needs to be completed to better understand the impact of morphology on literacy skills.

Of the articles synthesized by Reed (2008), Baumann et al. (2002) demonstrated a high effect size of 1.76. Baumann and colleagues completed a study to determine the efficacy of teaching fifth-grade students morphemic and contextual analysis to increase vocabulary and reading comprehension. The study employed a mixed method design using a between-subjects, pre-test/post-test, control-group, and quasi-experimental. The study consisted of 88 students divided into four intervention groups: morphemic only, context only, combined morphemic-context, and instructed control. The 12 intervention lessons were approximately 50 minutes in length. The researchers determined that there

was a strong immediate effect of morphemic and contextual analysis intervention. However, there was no evidence that the intervention enhanced students' reading comprehension.

Goodwin and Ahn (2010) conducted a meta-analysis focusing on the effects of specific morphological interventions on literacy skills, such as word reading accuracy and vocabulary development for struggling readers, poor spellers, and students with learning/reading disabilities. They examined published and unpublished literature including 17 studies from 1980 to 2009 using different morphologic instructional strategies such as affix and root word construction, building words with morphemes, and compound word instruction. The researchers coded studies across several characteristics including the type of reading instruction and the measure of literacy achievement. A relationship between morphological interventions and an increase in positive literacy outcomes in students who struggle to read efficiently was noted. A weighted-mean effect of morphological intervention was 0.33 indicating that the overall effect of morphological intervention on literacy outcomes was statistically significant. Statistically significant medium mean effect sizes were found for morphological awareness ($d = 0.40$), vocabulary ($d = 0.40$), reading comprehension ($d = 0.40$), and spelling ($d = 0.20$). Further analysis of data found that many curricula are lacking in direct, explicit morphological instruction for improving both phonological and morphological awareness, as well as spelling and vocabulary. Goodwin and Ahn (2010) recommended that morphological instruction be included in both remediation and instruction for struggling readers. The

most effective MA instruction occurred when MA was integrated with other literacy instruction (e.g., vocabulary) and aimed at struggling, younger readers.

Bowers et al. (2010) completed a systematic review of 22 studies that focused on morphological interventions in multiple languages for pre-school children to grade eight. Intervention included spelling of morphemes, morphological sorting, and morphological analogy. Although the interventions focused on MA, the researchers coded the studies by outcome of linguistic layer (sublexical, lexical, supralexical), participant characteristics, and type of instruction (integrated or isolated). Results indicate that the morphological analysis sublexical layer achieved the highest average effect size of $d = 0.65$. The effect size (ES) was calculated as the difference between the mean posttest score of the treatment group and that of the comparison group. At the word level, reading achieved an ES of $d = 0.41$ spelling $d = 0.49$, and vocabulary $d = 0.35$. An ES of $d = 0.28$ was achieved at the supralexical level which includes reading comprehension and fluency. The meta-analysis results indicated that morphological instruction had a positive influence on students' literacy skills such as reading, spelling and vocabulary skills. One limitation the researchers noted was the limited number of studies. The analysis also revealed a need for more experimental research regarding morphological instruction. The authors stated that further research questions could have been addressed if more studies were available. Bowers and colleagues suggested that morphological instruction may be more effective when infused into the curriculum instead of implemented as short-term intervention.

Carlisle (2010) completed a review of 16 studies and book chapters from 1989 to 2009 that focused on morphological instruction. Studies included were completed in five different languages. The integrative review sought to determine whether MA instruction contributed to improvements in literacy in the areas of phonology, orthography, and word meaning in order to provide information regarding MA instruction to educators and researchers. Carlisle identified five studies that focused on the relationship between MA and phonology, seven studies focused on MA and orthography, and four studies focused on MA and vocabulary development. Carlisle noted that models of literacy development rarely include MA. She stated that a goal of the integrative literature review was to examine theories of the role of MA in literacy development as well as consider the contributions of current research to evidence-based practice.

Results from Carlisle's review indicated that MA made contributions to literacy development of the experimental group when compared to a control or comparison group. There was diversity in the research designs, methods, and results that were examined. She noted that this diversity may be due to the lack of maturity of the research in the area of MA. Carlisle recommended that future research be exploratory studies that provide information regarding the students' thinking and learning to provide different approaches to instruction.

A meta-analysis of 30 studies completed by Goodwin and Ahn (2013) focused on morphological instruction for school-age children. The purpose of this meta-analysis was to explore the different instructional approaches of MA in relation to literacy. The researchers coded and analyzed published and unpublished studies in English. Seven

literacy categories were identified: reading comprehension, decoding, fluency, morphological knowledge, phonological awareness, spelling, and vocabulary. The weighted-mean effect size was 0.32, suggesting that students in the morphological intervention groups yielded statistically higher scores on literacy outcomes when compared to other groups. The researchers determined through moderator analyses that morphological instruction supported decoding, phonological awareness, vocabulary, and spelling. Supralexical processing effects, including reading comprehension and fluency, did not transfer. Students may have experienced difficulty transferring MA instruction to connected text.

Of the five reviews that are noted above, only one review focused on interventions of MA for students that struggle with reading (Goodwin & Ahn, 2010). Goodwin and Ahn (2010 & 2013) included published and unpublished studies. The most recent studies included in these reviews are from 2012. In order to better understand the impact of MA instruction on the reading ability of students that struggle with literacy, a review was completed to examine MA and literacy outcomes for students that struggle with reading using peer-reviewed research. This review focused on the recent (2006-2018) MA interventions and assessments used with struggling readers and writers. To determine research-based effective strategies, only peer reviewed studies were included.

Current Review

This literature review examined research using morphological interventions to increase literacy outcomes in students that struggle with literacy, including students with disabilities. The purpose of this review is to examine the research studies conducted using

explicit morphological awareness interventions to improve word identification, reading comprehension, spelling, vocabulary, and sentence writing outcomes for students struggling with reading and writing. Given the results of previous reviews the following research questions are addressed:

1. What are the characteristics on the intervention research used on MA with students struggling with reading and writing?
2. What impact does MA intervention have on literacy outcomes (word identification, reading comprehension, spelling, vocabulary, and sentence writing) for struggling with reading and writing?

Method

A search was conducted on the following four databases: Academic Search Complete, Education Research Complete, PsycInfo, and ERIC between the years 2006 to present. To perform this search, the following key terms were used in various combinations: morphology, affix, intervention, reading comprehension, morphological instruction, struggling reader, morphological awareness, morphological skills, morphological awareness skills, vocabulary, and instruction. In addition, ancestry and hand searches were also completed to find additional relevant research. Ancestry searches were conducted using Apel and Diehm (2013), Brimo (2016), Denston et al. (2018), and Allen and Lembke (2020). Allen and Lembke was contacted to inquiry about ongoing research regarding MA and literacy. To conclude the intervention research study search, a hand search was used for the Journal of Learning Disabilities from the year 2013 to present.

Criteria for Inclusion and Exclusion. Four criteria for inclusion were used for this review. First, all studies had to utilize randomized control and quasi experimental methods in order to evaluate the effectiveness of morphological awareness intervention on one or more literacy skills. Additionally, the study had to have been published after 2006 to expand upon the research reviewed by Reed (2008). Third, the study had to have included and disaggregated results for readers who had been identified as reading below grade level or at-risk for reading failure, including students with disabilities. Lastly, studies had to focus only on participants in grades kindergarten through 12th grade.

Data Analysis. In order to address the research questions, each study was coded by the author for participants (e.g., grade, exceptionality), design, and characteristics (e.g., intervention and outcomes). Table 1 displays features from the intervention studies including participants' characteristics and design characteristics. Intervention information, findings, and outcomes are included in

Table 2. The information was examined to determine patterns within the data.

Table 1

Features of Intervention Studies

Study	Study designs	<i>N</i>	Grade or age	Duration/ group size	Person implementing	Intended outcome type
Allen & Lembke (2020)	Experimental	26-at risk	2,3	(4-5 x week, 25 minutes)/13 in each group	Author, graduate students	Spelling, sentence writing
Apel et al. (2013)	Quasi- experimental	61-at risk	K,1,2	9 weeks (4 x week, 25 minutes)/ 4-5 in each group	Undergraduate, graduate students, former teachers, teacher assistants	MA, word identification, reading comprehension
Apel & Diehm (2013)	Experimental	151-at risk	K,1,2	8 weeks	Graduate students	MA, word identification, reading comprehension

				(4 x week, 25 minutes)/ 4-5 in each group		
Brimo (2016)	Experimental	10-LD	3	10 weeks (3x week, 25 minutes)/ 2-3 in each group	Graduate students	MA
Denston et al. (2018)	Quasi- experimental	36 - LD	4,5,6	39 sessions, (4x week, 30 minutes)/ small groups	Researcher	Reading comprehension
Good et al. (2015)	Experimental	16- LI	3	20 sessions (10 weeks)/	Researcher	Word identification, Spelling,

				2-4 in each		vocabulary
				group		
Harris et al. (2011)	Experimental	24- disabil ities (16 LD)	high school	10 lessons (45 minutes each)/ whole class	Researcher	Vocabulary
Kirk & Gillon (2009)	Experimental	16- SD	8-11 year old	31 sessions (2x week 45 minutes)/ 8 in each group	Researcher	Word identification, spelling
Ramirez et al. (2013)	Experimental	108- at risk	K	24 sessions (30 minutes	Teacher	Vocabulary

				each)/ whole		
				class (12-23)		
Wolter & Dilworth (2013)	Experimental	20- SD	2	9 days (90 minutes)/ 5 in each group	Researchers/ graduate assistants	Word identification, reading comprehension, spelling

Table 2

Outcomes by Assessment Type and Design

Study/ intervention	Measure	Findings/results non-standardized	Findings/results standardized
Allen & Lembke (2020)	Curriculum Based		WJ-III ACH Spelling mean
Affix lessons:	Measurement Task (CBM-		CLS ($g = .75$)
Listening activity,	W)		WJ-III ACH Writing
sorting, say it another	Spelling and Writing		Samples subtest (g
way, affix book	Samples		$= .52$)
	WJ-III		CELF-V intervention group
	WISC-IV		$= t(12) = -49, p =$
	CELF-V		$.64$
			comparison group $= t(13) =$
			$-.30, p = .77$

	4 MA researcher designed tasks: Rehit, Relatives, Affix identification, spelling multimorphemic words, CTOPP, TOWRE, TOSREC, CELF-IV	Rehit: K ES=2.19, 1 st ES= 1.72, 2 nd ES= 1.11; Relatives: K ES=1.11, 1 st ES= 1.33, 2 nd ES= 0.74; Affix ID: 1 st ES= 2.91, 2 nd ES= 2.96; SMW: 1 st ES= 2.34, 2 nd ES= 1.14; = 0.57, 2 nd ES = 0.87;	CTOPP K: ES=0.76. 1 st ES= 0.61, 2 nd ES= 0.3; TOWRE: Word identification K ES=0.85. 1 st ES= 0.58, 2 nd ES= 0.50; TOWRE: Decoding K ES=0.97, 1 st ES= 0.29, 2 nd ES= 0.44; TOSREC: 1 st ES= 0.57 2 nd = 0.87; CELF-4: K=0.11, 1 st = 0.32, 2 nd = 0.17
Apel & Diehm (2013)	4 MA researcher designed tasks: Rehit, Relatives,	Rehit: K ES=1.26, 1 st ES= 0.67, 2 nd ES= 0.86	TOWRE: Sight Word Efficiency K

Affix lessons: identification, sorting, say it another way activity, story, review	Affix identification, spelling multimorphemic words, TOWRE, TOSREC	Relatives: K ES=0.82, 1 st ES= 0.41, 2 nd ES= 1.07 Affix ID: 1 st ES= 2.54, 2 nd ES= 1.52 SMW: 1 st ES= 0.82, 2 nd ES= -0.03	ES=0.0, 1 st ES= 0.11, 2 nd ES= 0.12; TOWRE: Decoding K ES=0.0, 1 st ES= - 0.39, 2 nd ES= 0.28; TOSREC 1 st ES= 0.26, 2 nd ES= 0.14
Brimo (2016) Affix lesson: listen, sort, produce (say it another way), identify, write, review	4 MA researcher designed tasks: Rehit, Relatives, Affix identification, spelling multimorphemic words	Rehit: ES= 2.58 Relatives: ES= 1.71 Affix ID: ES= 0.48 SMW ES= 0.28	
Denston et al. (2018)	3 MA researcher designed tasks: morphological	Study 1 MA - Eta^2 = .21	Burt Reading- Eta^2 = .84

SevenPlus (decoding, vocabulary, fluency)	awareness judgement, morpho-syntactic task,	MP-MS - $Eta^2 = .55$ MP-WA - $Eta^2 = .77$	NARA-Accuracy - $Eta^2 = .81$
Moat's strategy (2010)	morphological awareness word analogy task	Study 2 MA - $Eta^2 = .37$	NARA-Comprehension - $Eta^2 = .64$
	Burt Reading Test-New Zealand Edition, Neale	MP-MS - $Eta^2 = .56$ MP-WA - $Eta^2 = .45$	NARA-Rate - $Eta^2 = .63$ Study 2
	Analysis of Reading Ability (NARA)		Burt - $Eta^2 = .83$ NARA-Accuracy - $Eta^2 = .43$ NARA-Comprehension - $v^2 = .70$ NARA-Rate - $Eta^2 = .41$
Good et al. (2015)	Researcher designed	Word Identification	
Word sorts, spelling instruction	vocabulary, spelling, and reading tasks	main effect for time $Partial\ Eta^2 = 0.651$	

		Spelling main effect for time	
		<i>Partial Eta</i> ² = 0.492	
		Vocabulary main effect for time	
		<i>Partial Eta</i> ² = 0.621	
Kirk & Gillon (2009)	Researcher designed word	Word Identification = $p < 0.001, f =$	WRMT-R $p = 0.09, f =$
Word patterns, sorting,	identification and spelling	2.55	0.41 main effect
spelling	task	Spelling = $p < 0.001, f = 2.82$	for time
	WRMT-R		TWS-4 $p = 0.004, f = 0.70$
	TWS-4,		main effect for
			time
Ramirez et al. (2013)	Making Words, EVT-2	Making Words <i>Partial Eta</i> ² = .61	EVT-2 <i>Partial Eta</i> ² = .53
Compound words			
Wolter & Dilworth	WRMT-R word attack,	Spelling $d = 0.85$	WRMT-R Word ID
(2013)	WRMT-R Word ID,		main effect for
	WRMT-R passage		time $d = 0.76$

Word sorts, word	comprehension,	WRMT-R Word Attack
building, applied pattern	Standardized spelling TWS-	main effect for
activities, reading	4, Non-standardized	time $d = 0.99$
comprehension strategies	orthographic spelling and	Reading comprehension $d =$
	morphological spelling	1.49
		TWS-4 $d = .66$

Note: CBM-W= Curriculum Based Measures; CELF-IV= Clinical Evaluation of Language Fundamentals-4th edition; CELF-V= Clinical Evaluation of Language Fundamentals-5th edition; CTOPP= Comprehensive Test of Phonological Processing; EVT-2=Expressive Vocabulary Test-Second Edition; MA= Morphological Awareness Judgement; MP-MS Morphological Production-Morpho-Syntactic; MP-WA= Morphological Production-Word Analogy; NARA= Neale Analysis of Reading Ability; TOSREC= ,TOWREC= Test of Silent Reading Efficiency and Comprehension; TWS-4= Test of Word Spelling-Fourth Edition; WRMT-R=Woodcock Reading Mastery Tests Revised/Normative

Results

Ten articles met the criteria for inclusion in this literature review. The articles were published between 2009 and 2020 in the following journals: *Language, Speech, and Hearing Services in Schools*, *Journal of Learning Disabilities*, *Communication Disorders Quarterly*, *Learning Disabilities Quarterly*, *Education and Treatment of Children*, *Reading Disabilities Quarterly*, and *Australian Journal of Language and Literacy*.

Across the studies, there were 464 students ranging from kindergarten to twelfth grade who were identified by their schools as having a learning disability or literacy learning difficulties, at-risk, poor spellers, struggling readers, reading below grade level, or had an Individual Education Program (IEP) addressing reading. In each of the studies, the participants received a morphological intervention to address reading outcomes, such as word identification, reading comprehension, spelling, and vocabulary. However, the studies used a variety of explicit instructional techniques. Each of the studies used a group design with a pretest assessment prior to intervention and a post-test following intervention. Three of the studies included multiple groups with varying interventions.

Study Features. To answer the research questions, results were analyzed by study characteristics and the literacy skill outcomes. The first research question asked what types of interventions are used to teach MA to struggling readers and writers. To address this research question, the intervention patterns were analyzed and summarized in the following sections to better explicate the findings.

Sample Characteristics. Within this review of ten studies, a total of 468 students who were categorized as struggling readers and writers were included. For this review, a

struggling reader or writer was defined as a student that had been identified by the school as reading below grade level, classified as at-risk for reading difficulties, or had an IEP addressing reading or writing. Of the total participants, 346 were categorized as at-risk and 108 were identified as having a disability (see Table 3).

Table 3

Disaggregated Results of Participant and Categorization

Category	Number of Participants
At-risk	346
Learning disability	62
Language impairment	16
Spelling deficit	36
Emotional disability	2
Intellectual disability	1
Other health impairment	4
Autism	1

The majority of participants (356 of 464) were students in primary elementary grades (kindergarten through second grade). Four studies (Brimo, 2016; Denston et al., 2018; Good et al., 2015; Kirk & Gillian, 2009;) focused on participants in the upper elementary grades. One study (Harris et al., 2011) included only high school students. No studies included students in seventh or eighth grade.

Intervention Implementation. The intervention duration and implementation varied by study. Intervention duration ranged from nine days (Wolter & Dilworth, 2013) to approximately fifteen weeks (Kirk & Gillon, 2009). One study (Wolter & Dilworth, 2013) was completed over nine consecutive days during a summer camp. Each study had a set intervention time which ranged from 25 to 90 minutes. In five of the studies, the interventions were implemented by researchers (Denston et al., 2018; Good et al., 2015; Harris et al., 2011; Kirk & Gillon, 2009; Wolter & Dilworth, 2013;), four by graduate students (Allen & Lembke, 2020; Apel et al., 2013; Apel & Diehm, 2013; Brimo, 2016) and one by teachers (Ramirez et al., 2013) in primarily small (2-5 students) groups. Two studies (Harris et al., 2011; Ramirez et al., 2013) completed the intervention using whole class instruction.

Intervention Activities. The interventions for each of the nine studies focused on affix and root word identification, segmenting, and word building activities. All ten studies included identification tasks such as word sorts, decoding, or initial instruction that included identification of word parts of morphologically complex words through oral or written strategies. For example, Apel et al. (2013), Apel and Diehm (2013), and Brimo (2016) all included word sorts where the student sorted word cards with and without target affixes. Denston et al. (2018) used a decoding strategy developed by Moats (2010). Students decoded morphologically complex words by first identifying vowel graphemes, then by morphemic units, and then orthographic patterns of letters. Ramirez et al. (2013) was the only study that focused on the use of tier II compound words as morphological

units (e.g., catfish, teapot) Ramirez and colleagues taught MA explicit and systematic strategies through the use of picture books to kindergarteners.

Four of the ten studies specifically addressed word segmenting. Harris et al. (2011) used a word mapping strategy. Harris and colleagues compared the generative MA word mapping strategy to a non-generative vocabulary strategy, LINCing. The students in the MA group would divide the word by prefix, root, and suffix, then define each morpheme to determine the word meaning. Apel et al. (2013), Apel and Diehm (2013), and Brimo (2016) utilized activities that tasked students with using letter blocks to add or remove affixes from base words or a written activity that tasked the students with circling the affix on each morphologically complex word from a word list.

To achieve word building, seven of the nine studies in this review included oral or written activities or manipulation of letter blocks. For example, Apel et al. (2013), Apel and Diehm (2013), and Brimo (2016) used activities such as, “Say it another way.” The researcher stated, “Say *to dance right now* another way.” The student replied, “Dancing.” Good et al. (2015) used blocks for spelling base words and then additional blocks for adding the affix(es). Wolter and Dilworth (2013) used games such as Jeopardy with morphological patterns to complete the sentence (e.g. “when a pin was stuck in a balloon it _____ *popped*” ; p. 47). Kirk and Gillon (2009) asked participants to spell morphologically complex words after teaching spelling prompts to assist students with using spelling changes when adding a suffix as needed (e.g., swim/swimmer).

MA Intervention Impact on Literacy. The second research question sought to determine what impact MA interventions had on the literacy outcomes (word

identification, reading comprehension, spelling, vocabulary, and sentence writing) of students struggling with reading and writing. To address this research question, outcomes are discussed by the type and focus of the assessments used to determine these results (see

Table 2).

Word Identification. Six (Apel et al., 2013; Apel & Diehm, 2013; Denston et al., 2018; Good et al., 2015; Kirk & Gillon, 2009; Wolter & Dilworth, 2013) of the nine studies assessed word level reading as a dependent measure prior to and following MA intervention. Four of the studies (Apel et al., 2013; Apel & Diehm, 2013; Denston et al., 2018; Wolter & Dilworth, 2013) used standardized measures. Apel et al. (2013) and Apel and Diehm (2013) used the *Test of Word Reading Efficiency (TOWRE)*. The *TOWRE* is a timed test that requires students to read as many real and pseudowords as possible within 45 seconds. Medium to large effect sizes using Cohen's *d* ($ds = 0.50$ to 0.85) were achieved comparing pre and posttest *TOWRE* scores with Apel et al. (2013). Small to nonsignificant effects ($ds = 0.00$ to 0.12) were achieved in the Apel and Diehm (2013) study. The small effect size may be due to a small sample size within groups ($n = 27, 22, 26$).

Denston et al. (2018) also used a standardized measure to obtain growth of word reading accuracy following MA intervention. Denston and colleagues used *The Burt Reading Test-New Zealand Edition*. Students with literacy learning difficulties increased their ability to read at the word level. This gain may be attributed to the MA intervention and increased decoding development of using morphemic units that are larger than phoneme-grapheme decoding units (e.g., transformation is decoded as trans, form, ation). Readers are then able to decode faster than at a phoneme-grapheme level.

Wolter and Dilworth (2013) used the *Woodcock Reading Mastery Test-Revised (WRMT-R)* subtests for word identification and word attack to assess word level reading

accuracy. Wolter and Dilworth (2013) compared pretest and posttest scores, a large effect size ($d = 0.76$) was achieved for word identification and ($d = 0.99$) for word attack, indicating that the MA treatment group significantly improved in word reading skills.

Kirk and Gillon (2009) also used the *Woodcock Reading Mastery Test-Revised* (WRMT-R) subtests for word identification and word attack to assess word level reading accuracy. compared pretest and posttest scores for word identification and revealed no significant main effect of time ($p = 0.09, f = 0.41$). The word attack subtest showed a significant main effect of time ($p = 0.01, f = 0.62$).

Kirk and Gillon (2009) also used a non-standardized reading probe. The reading probe consisted of 180 words that the participants read. A significant main effect of reading accuracy for time ($p < .001, f = 1.55$) was determined. This large effect was attributed to the large postintervention change in reading performance. The researchers noted that students displayed the ability to generalize to untaught words during post-testing.

Good et al. (2015) used only experimental measures to determine word level reading growth following intervention. The reading measure consisted of 100 words and included affixes taught and not taught during intervention. Results indicated a main effect for time (partial eta squared, $\eta_p^2 = 0.58$). Results indicated that generalization occurred to untaught words. Using the nested factor partial eta squared = 0.651 was achieved indicating generalization to new words did take place.

Reading Comprehension. Reading comprehension, as the dependent variable, was assessed using standardized measures for four studies (Apel et al., 2013; Apel & Diehm,

2013; Denston et al., 2018; Wolter & Dilworth, 2013). Reading comprehension measures were completed before and after MA intervention. Two studies (Apel et al., 2013; Apel & Diehm, 2013) used the *Test of Silent Reading Efficiency and Comprehension (TOSREC)* to assess first and second graders. To complete the *TOSREC*, students read a sentence silently and answered a true or false question. Effect sizes between pretest and posttest measures varied. In the study conducted by Apel et al., (2013), first and second grade students achieved $ds = 0.57$ and 0.87 , indicating a medium to large effect size. Apel and Diehm (2013) also gave a pretest and posttest *TOSREC* measure. First and second graders achieved $ds = 0.26$ and 0.14 , indicating a small effect size. The researchers attributed this small effect size to the focus on decoding morphologically complex words instead of directly targeting reading comprehension skills.

Denston et al. (2018) used the *Neale Analysis for Reading Ability (NARA)* as a dependent variable following an MA intervention for students in grades three, four and five with literacy learning disabilities. Results were an effect size of partial eta squared = 0.64 . Denston and colleagues note that this change from pretest to posttest indicated that upper elementary students with reading difficulties are susceptible to positive changes in reading outcomes. Although the focus was on MA, positive reading comprehension outcomes were achieved with a short-term intervention (approximately 20 hours). Denston and colleagues included the use of instructional text (StoryBytes, Sharp Reading, 2013) to provide additional practice decoding and discussing word meaning as a final component of the MA intervention.

Wolter and Dilworth (2013) used the passage comprehension subtest from the *Woodcock Reading Mastery Test Revised (WRMT-R)* as a dependent variable for reading comprehension. To complete this subtest, students had to supply a missing word in a sentence. Pre and post testing revealed a large effect of $d = 1.49$.

Spelling. Three studies (Good et al., 2015; Kirk & Gillon, 2009; Wolter & Dilworth, 2013) assessed the impact of MA interventions on the spelling skills of students that were identified by the schools as having a spelling or language deficit. The dependent measures and the results used for these three studies varied significantly. Using non-standardized spelling measures, the students in the study conducted by Good et al. (2015) achieved a significant main effect for time (partial eta squared, $\eta_p^2 = 0.492$). The non-standardized spelling measure consisted of 20 morphologically complex words. Half of the words were introduced during intervention and the remaining words were transfer words. The transfer words contained similar affix patterns that were addressed during the intervention. Students achieved a large post intervention change in the study by Kirk and Gillon (2009) ($f = 2.82$ for $p < .001$). Kirk and Gillon's non-standardized reading probe which included 60 spelling items, half of the items represented taught words and half were untaught during the intervention. Wolter and Dilworth (2013) used a similar experimental measure but included 100 words. Pretest and posttest comparisons determined a large effect size ($d = 0.85$)

Kirk and Gillon (2009) and Wolter and Dilworth (2013) used a standardized measure (*Test of Written Spelling-Fourth Edition; TWS-4*). Kirk and Gillon achieved large effects for time that can be attributed to changes in spelling performance ($f = .87$ for

$p < .004$). The large effect size is the result of an 8.1 standard score points difference on the pretest and posttest *TWS-4*. Wolter and Dilworth also achieved significant changes on the *TWS-4* for pretest and posttest intervention with an effect size of $d = .66$, indicating a medium effect size. Students in both studies (Kirk & Gillon, 2009; Wolter & Dilworth, 2013) demonstrated positive changes on the *TWS-4* following intervention.

Vocabulary. Three studies (Good et al., 2015; Harris et al., 2011; Ramirez et al., 2013) assessed students' vocabulary gains following MA intervention. Each of these studies demonstrated gains on researcher-created and standardized measures. Good et al. (2015) used researcher-developed measures that included fifteen taught and fifteen untaught words to assess the vocabulary gains of 16 third graders with language impairments. To assess vocabulary, the researchers asked the students to orally define a morphologically complex word (e.g., What does *unfair* mean?). The researcher-designed vocabulary measure indicated large posttest gains with an effect size of partial eta squared = 0.621 when compared to the control group.

Harris et al. (2011) also used researcher-designed vocabulary measures. The researchers used word knowledge tests to compare pre and posttest scores for 24 students with disabilities. *The Word Knowledge Test* was comprised of 20 taught words. The students responded by writing information about the word, defining the word, or using the word in a sentence. The paired sample *t*-test compared changes from pre and posttest scores, which revealed a significant difference ($d = 4.264$), indicating a large effect size. The *Word Knowledge Test* assessed words and word parts that were targeted during instruction.

The Ramirez et al. (2013) study used a researcher-designed (Making Words) measure and a standardized measure (*Expressive Vocabulary Test, Second Edition*) (EVT-2) to assess the vocabulary skills of 108 at-risk kindergarteners following a MA intervention targeting compound words. The Making Words measure included ten items and pictures. Students were asked to create a new word by combining two or three single morpheme words to form compound words. “For example, *We call a house that is built in a tree a tree house. How should we call a house that is built on a mountain?*” (Ramirez et al., 2013, p. 58.). Students achieved partial eta squared = 0.61 on the Making Words test and the standardized measure (EVT-2) indicated partial eta squared = 0.53. These effect sizes indicated that scores increased from pre to post testing. The greatest gains were made by students who were in the lowest ability group.

Sentence Writing. One study (Allen & Lembke, 2020) assessed the effects of MA intervention on construction of sentence writing. The researchers noted that no previous studies on MA have included connected writing as a literacy outcome measure. Allen and Lembke used Apel and Diehm’s (2014) researcher created MA activities that included a listening activity, word sort, “say it another way”, and affix writing book to record base words and target affixes. The study used a randomized control trial with an intervention ($n = 13$) and comparison group ($n = 13$). To assess spelling and writing skills. Participants completed the Woodcock Johnson-III ACH (Woodcock et al., 2007) Spelling and Writing Samples subtests and a Curriculum Based Measurement task (CBM-W). The assessments were given pre and post intervention. The CBM-W consisted of 12 pictures of nouns paired with a written verb (e.g., “paper”, “walk”). Students were asked to write

a sentence for each picture. The CBM-W was also used as a probe throughout the intervention period. After controlling for receptive language, working memory, and spelling ability the intervention did not have a significant effect ($p > .05$) on participant performance. It is noted that the intervention only lasted five weeks and may not have been long enough or explicit or powerful enough of an intervention. Longer sessions and the focus of the intervention to be on only one literacy outcome spelling or sentence writing.

Discussion

The purpose of this review was to explore the characteristics of MA interventions and the impact of these interventions on the word identification, reading comprehension, spelling, and vocabulary skills of student's at risk for reading failure. This review expanded upon the synthesis by Reed (2008). Her results indicated that students with reading difficulties may benefit from MA intervention, but included studies had a wide range of effect sizes. Reed also noted that limited information was known about the components of MA. Reed's synthesis included seven studies, only three of which specifically identified students that struggle with reading. This review sought to focus on the characteristics of MA interventions that may support those students at risk for reading difficulties.

Implications for Intervention. In regard to the first research question, what are the characteristics of the intervention research used to teach MA to students struggling with reading and writing the interventions included in this review primarily utilized small group (four to eight participants) instruction that took place over a relatively short period

of time, approximately nine (Wolter & Dilworth, 2013) to thirty-nine (Denston et al., 2018) sessions. These findings indicate small group instruction should be included with remediation and instruction of reading for struggling readers. According to Goodwin and Ahn (2010), MA instruction is not a major component of reading instruction in whole group. This small group instruction that focuses on MA may be ideal for Tier 2 and Tier 3 of a Response to Intervention or Multi-Tier Systems of Support to support students at risk for reading difficulties.

Additionally, interventions were implemented at a variety of grade levels. Participants in kindergarten through second grade comprised the bulk of the samples. Four of the studies addressed the MA abilities of 340 students in kindergarten through second grade. Some researchers (Adams, 1990; Anglin, 1993) have identified that students in primary grades do not demonstrate the ability to consciously identify and manipulate morphemes. Apel et al. (2013), Apel and Diehm (2013), Ramirez et al. (2013), and Wolter and Dilworth (2013) contradict the assertion that students do not develop MA until later years. After completing a relatively short intervention (eight to thirty-six sessions), the participants in these studies achieved positive outcomes in areas such as word identification, reading comprehension, spelling, and vocabulary. This demonstrates that interventions of relatively short duration make a difference in literacy outcomes of students in early elementary grades.

Although high school students were included in this review, no participants were included in seventh or eighth grade. Reed (2008) noted a previous study (Abbott & Berninger, 1990) using MA interventions that included middle school students who were

identified as low achieving readers. Following intervention, they achieved positive results in word reading. Abbott and Berninger (1990) recommended further research with a larger sample size and longer treatment duration to address MA intervention with middle school students. This is clearly an area for more research.

The types of interventions included in this review focused on affix and root word identification, word segmenting, and word blending. The intervention activities ranged from oral and written activities to manipulatives and storybooks. Two (Denston et al., 2018; Ramirez et al., 2013) of the intervention studies involved the use of stories. Although Ramirez et al. (2013) used picture books to build compound word vocabulary with kindergarteners, no intervention used subject area content, such as science or social studies academic vocabulary. Helman et al. (2015) stated that science text contains more morphologically complex vocabulary than text in any other content area. MA instruction addressing subject area text may be an area to explore in future studies.

The individual activities of each study varied. Apel et al. (2013), Apel and Diehm (2013), and Brimo (2016) focused intervention activities solely on MA using a relatively intensive intervention schedule focused on small groups of students identified as at-risk. Ramirez et al. (2013) focused on compound word activities and identified the participants by level of MA abilities. All four studies determined that students with lower MA abilities made greater gains even though the intervention activities varied.

Overall, the results indicated that students in the primary grades benefit from MA intervention when addressed in small groups over short time periods. Upper elementary and high school students benefited from generative morphological instruction and

displayed the ability to generalize to untaught words. Interventions included identification of affixes through word sorts, oral, written, and manipulative activities (i.e., letter blocks).

Effect of Intervention on Literacy Abilities. The second research question that guided this literature review refers to the impact that MA intervention have on literacy outcomes (word identification, reading comprehension, spelling, vocabulary, and sentence combining) for students struggling with reading and writing. The impact was first reviewed by examining the assessment process utilized in the studies. The primary literacy skill that was assessed following MA intervention was word identification skills using decoding of real and pseudo morphologically complex words. Using generative MA word identification strategies teaches students to identify unknown morphologically complex words.

MA intervention activities taught students to use strategies to generalize to identify untaught words. These activities are noted by Good et al. (2015), Harris et al. (2011), and Kirk and Gillon (2009). Good et al. (2015) focused on teaching students to identify common affixes through word sorts and letter blocks. During review lessons students were taught to apply that knowledge to other morphologically complex words. Kirk and Gillon (2009) included similar activities that focused their intervention on teaching regular orthographic patterns that included common affixes (e.g., -ed, -est, -en) that could be generalized to new words. Harris et al. (2011) used a word mapping intervention to teach students to segment morphologically complex words, analyze word

parts, and infer the word meaning. Harris and colleagues found that using MA is a powerful generative tool to identifying and understanding unknown words.

Denston et al. (2018) noted that students with literacy learning difficulties increased their ability to read at the word level and at the reading comprehension level. This gain may be attributed to the increased ability to decode using morphemic units that are larger than phoneme-grapheme decoding units allowing for the reader to decode larger more complex words. As students encounter more complex, multimorphemic academic vocabulary as they advance in school, MA intervention may help students segment words more quickly as well as retrieve letter patterns from memory, allowing the reader to use these skills to read more efficiently. Decreasing the cognitive demands for decoding allows the reader to focus on text comprehension. Denston et al. (2018) included the use of text to increase the ability to transfer knowledge from the morphological sublexical to supralexical (e.g., reading comprehension) linguistic layer.

Although researchers (Apel et al., 2013; Apel & Diehm, 2013; Denston et al., 2018) Woltier & Dilworth, 2013) used standardized assessments to measure reading comprehension outcomes achieved from pre to posttest, other than Denston et al. (2018), the use of connected text was not directly targeted during the MA interventions. The reading comprehension increases noted were achieved indirectly through an increase in the ability to analyze morphologically complex words.

In addition to word identification and reading comprehension, three studies (Good et al., 2015; Harris et al., 2011; Ramirez et al., 2013) assessed students' vocabulary gains following MA intervention. All three interventions varied but all showed gains in

vocabulary using both standardized and non-standardized measures. Good and colleagues used word sorting activities with suffixes, Harris et al. (2011) focused on word mapping, and Ramirez (2013) used storybook activities to address MA instruction. Harris et al. (2011) used whole class instruction and compared the generative MA intervention to a nongenerative LINCing strategy. The MA intervention demonstrated the ability to predict the meaning of unknown words.

Three studies (Good et al., 2015; Kirk & Gillon, 2009; Wolter & Dilworth, 2013) addressed spelling of morphologically complex words through the use of MA interventions (e.g., word sorts to target morphological patterns). Pre and posttest measures demonstrated generalization to untaught words with Good et al. (2015) and Kirk and Gillon (2009).

Overall, as in a previous review (Goodwin & Ahn, 2010), studies in this review indicate that MA interventions increased word identification, reading comprehension, spelling, and vocabulary skills of students in elementary and high school. MA interventions teach students to use a generative strategy that allows students to segment word parts to more easily decode, spell, and understand words. Being able to decrease the readers focus from decoding individual graphemes the reader is able to read and understand text more efficiently. This is supported by Nagy et al. (2006) Nagy et al. (2013), and Reed, (2008). Morphological knowledge directly contributes to decoding, vocabulary, and spelling (Nagy et al., 2006; Nagy et al., 2013). The students' ability to analyze morphologically complex words indirectly affects reading fluency and comprehension (Nagy et al., 2006; Reed, 2008).

Limitations and Implications for Future Research

The purpose of this literature review was to learn more about the characteristics of MA interventions that supports literacy outcomes for students struggling with reading and writing. Overall the results provided information regarding how MA interventions are currently being addressed to provide additional support for reading and writing. Through the review process, limitations were noted and a suggestion for future research was identified.

The first limitation is that the participants were not defined consistently across the studies. The search terms and inclusion criteria that were used included the term struggling reader. The term struggling reader included in this review were participants were identified or classified in various ways by their schools. Participants were included that had a learning disability, literacy learning difficulties, or an IEP addressing reading. Participants were also included that had been identified as at-risk, poor spellers, struggling readers, reading or below grade level. Several studies (Apel et al., 2013; Apel & Diehm, 2013; Ramirez et al., 2013) included students from low socioeconomic status (SES) homes. Ramirez et al. (2013) identified this population to study because students from low SES tend to have relatively limited academic vocabulary knowledge. Goodwin and Ahn (2010) recommended that students who struggle with literacy, such as the participants in the studies that were included in this review, may benefit from additional support in reading. These participants were included in this review to gain more knowledge on the types of MA instruction that benefitted these students.

The second limitation is that eight of the nine studies included participants in kindergarten through sixth grade (see Table 1). While the inclusion criteria included kindergarten through twelfth grade students, only one study (Harris et al., 2011) was identified that included high school students and no studies were identified that included seventh and eighth grade students. Reed (2008) noted that the lack of research with MA and students in secondary grades is surprising due to the importance of studying Latin and Greek roots which is related to the performance on college readiness tests.

Future experimental research is warranted that addresses the use of MA at the contextual level. More gains may have been achieved at the supralinguistic (reading comprehension) level if strategies that address the use of MA are explicitly and systematically taught for use at the contextual level as in Katz and Carlisle (2009). Katz and Carlisle (2009) completed a study that was identified but not included in this review due to the inclusion and exclusion criteria. The feasibility study was comprised of three case studies of three upper elementary participants. Katz and Carlisle (2009) approached MA intervention with an additional step. The researchers used MA and contextual analysis to develop a Close Reading (CR) program. The CR program initially teaches a sublexical MA intervention with affixes. Next, the researchers use connected text and story reading to model strategic behaviors to apply MA to context. Although the study only included three students, results indicated improvement with word reading and reading comprehension on both standardized and experimental measures.

Further research using a program, such as CR, that provides explicit and systematic application of MA is warranted. The CR program could be addressed with

secondary students to determine if this strategy provides support for students that struggle with reading expository text.

Summary

Chapter Two provided a literature review for morphological interventions that impact literacy outcomes of students struggling with reading or writing. Only 10 intervention studies were identified. The literature review indicated that MA interventions that were completed in small groups to upper elementary and high school students that struggled with literacy benefitted from generative morphological instruction and demonstrated the ability to generalize to untaught words.

Therefore, the purpose of this study is to further the research data base for the use of morphology in content classrooms (social studies and science). The study assess the use of inflectional, derivational, and compound forms of multimorphemic words in social studies and science writing of students with special education in inclusion classrooms. The study provides descriptive, correlational, and comparative data regarding the types of morphological forms used by students with disabilities in their argumentative and informative writing. The data obtained from this study will provide information to develop and use interventions in content area classrooms to increase students' vocabulary knowledge.

Chapter Three

Chapter three outlines the research methodology that was used for this study. First, primary data collection is described including the participants, materials, and setting. The subsequent sections include the research method, procedures, and planned data analysis. The purpose of this study is to examine the use of morphological awareness (MA) in informative and argumentative writing using a cross-sectional, non-experimental research design. A quantitative approach was utilized to examine the prevalence and accurate use of morphological forms in writing for science and social studies of students with an Individual Educational Plan (IEP). The relationship of writing quality and number of words written, and MA was also explored.

Primary Data Source

The data for this dissertation was obtained from four public middle schools in the mid-Atlantic and seven public middle schools in the south-central United States during the 2019-2020 school year through the *Writing in Middle School Science and Social Studies: Exploring Instruction and Support for Students with Disabilities Study* (Project Explore) (Mason et al., 2019-2023). *Project Explore* is funded by The Institute of Educational Sciences (IES) (Special Education Research Grants CFDA 84.324A). The Principal Investigator, Linda H. Mason, along with the Co-Principal Investigators, Sheri Berkeley, Stephen P. Ciullo, and Alyson A. Collins, approved the use of the writing data to be used for this dissertation.

Participants

As this study is a secondary data analysis, the data was obtained from *Project Explore*. The participants in this study ($n=178$) encompass a sample of students attending public middle-school in 2019-2020. Participants were identified from a mid-Atlantic region ($n=56$) and a south-central region ($n=124$) of the United States. Each school was comprised of grades six through eight, with diverse student populations. Each of the students included in this study had an IEP and participated in science and social studies coursework in an inclusive classroom.

Students reported demographic data include their grade, race/ethnicity, and gender (see

Table 4). The percentages calculated (e.g., sample $n = 178$) consist of 48% female and 51% male. The racial/ethnicity was 12% African American, 2% Asian, 27% Caucasian, 57% Hispanic, 1% other, and 1% multiple races. English Language Learner (ELL) comprised 23% of the sample.

Table 4

Student Demographic Information

Grade	Gender		Ethnicity					
	Female	Male	African American	Asian	Caucasian	Hispanic	Other	Multiple
6	32	51	10	3	24	45	2	0
7	29	26	10	0	20	28	0	1
8	26	14	2	1	6	33	0	0
Total	87	91	22	4	50	106	2	1

Protection of Human Participants and Informed Consent

Following Institutional Review Board (IRB) for *Project Explore* and school division approval, a meeting with teachers took place to discuss the *Project Explore* study objectives and procedures. Procedures were followed to achieve parent consent and student assent. Informed consent forms for parents and teachers, as well as student assent forms can be found in Appendices Appendix F, Appendix G, and Appendix H.

Setting

The *Project Explore* data that was used for this secondary data analysis was obtained from two school districts in the mid-Atlantic region and five school districts from the south-central region.

Mid-Atlantic Region. The *Project Explore* study was conducted in two school districts in the mid-Atlantic region. Four middle schools participated in the study, three from the first district and one from the second. The following demographics were reported by the school districts for the 2019-2020 school year.

School District One. The first school district in the mid-Atlantic region reported approximately 90,000 students representing 35% Hispanic, 20% black, 29% white, 9% Asian, and 6% other. Further, the school district reported that 26% of the students were classified as ELL and 13% had disabilities.

School District Two. The second school district in the mid-Atlantic region reported a total of 3,400 students representing 65% Hispanic, 7.9% black, 15.5% white, 5.3% American Indian, and 6.1% multiple races. Reported data indicated that 52% of the students were classified as ELL and 12.4% had disabilities.

South-Central Region. The *Project Explore* study was conducted in five school districts in the south-central region. Seven middle schools participated in the study. Two school districts had participation from two middle schools and the remaining three districts each had one school participate. While *Project Explore* was conducted during the 2019-2020 school year, the following is the most recent demographics.

School District One. The first school district in the south-central region reported approximately 20,000 students representing 64% Hispanic, 3% African American, 30% white, <1% Native American or Alaskan Native, and 2% multiple races. Reported data indicated that 15% of the students were classified as ELL and 11% had disabilities.

School District Two. The second school district in the south-central region reported approximately 8,000 students representing 72.5% Hispanic, 4.7% African American, 27.4 % white, 1% Asian, 0.1% American Indian, 2.4% multiple races, and 0.2% Pacific Islander. Reported data indicated that 10.3% of the students were classified as ELL and 12% had disabilities.

School District Three. The third school district in the south-central region reported approximately 6,800 students representing 20.5% Hispanic, 0.9% African American, 72% white, 0.3% American Indian, 1.8% Asian, and 4.1% multiple races. Reported data indicated that 4.5% of the students were classified as ELL and 10.2% had disabilities.

School District Four. The fourth school district in the south-central region reported approximately 7,300 students representing 70.3% Hispanic, 4.5% African American, 23.4% white, 0.1% American Indian, 0.4% Asian, 0.1% Pacific Islander, and 1.2% multiple races. Reported data indicated that 11.4% of the students were classified as ELL and 10.2% had disabilities.

School District Five. The fifth school district in the south-central region reported approximately 6,000 students representing 76.1% Hispanic, 3.1% African American, 18.6% white, 0.4% American Indian, 0.3% Asian, 0.1% Pacific Islander, and 1.4% multiple races. Reported data indicated that 24.2% of the students were classified as ELL and 11.2% had disabilities.

Materials

The writing assessments were conducted following a protocol for informative and argumentative writing that was used in previous studies (e.g., Mason et al., 2017; Mason et al., 2013). The writing assessments (i.e., Quick Writes) included two writing samples that were completed by each participant (Benedek-Wood et al., 2014, Ciullo & Mason, 2017). These assessments allow the students to compose a paper about a specific topic for ten minutes without focusing on writing mechanics. During *Project Explore*, the students completed two writing assessments: one informative and one argumentative. For each assessment, the students were given two pictures, each accompanied by a separate writing prompt. Each student chose one of the prompts and wrote for ten minutes (e.g., Do you believe recycling can help keep the planet clean?) on blank lined paper (see Appendix A, for examples of prompts). Students were asked to select a prompt and plan and compose a response in ten minutes. The science and social studies assessments that were completed for *Project Explore* were similar to those that have been used in prior studies (e.g., Mason et al., 2017; Mason et al., 2013; Mason et al., 2009).

The essays were then typed in Microsoft WORD and scored for quantity (word count) and quality by the *Project Explore* research team. The word count was tabulated through Microsoft WORD. Informational essays were scored, and points awarded for including a topic sentence, supporting evidence, explanation of evidence, and a concluding sentence. See Appendix B, for scoring rubric. Argumentative essays were scored for the context of the problem, definition of the problem, position statement, supportive reasons, elaborations, and conclusion. See Appendix C for scoring rubric.

Fidelity of Test Implementation. To ensure that the assessments were delivered with fidelity, written instructions and a checklist were used by the teachers when giving the writing assessments. Teachers read instructions and documented completed tasks. See Appendix D for the checklist used. The Project Explore research team observed 33% of the assessments while verifying completion of the checklist to assure fidelity of implementation. The fidelity of test implementation was 100%.

Fidelity of Scoring. Essays were scored for quantity (word count) and quality (content and organization). The Project Explore research team was divided into two groups of two researchers. Each group scored and cross-checked the results of the other group to ensure fidelity. Each essay was scored twice, and discrepancies were discussed and resolved resulting in 100% accuracy

Reliability

Reliability refers to the ability to repeat a research procedure and indicates the consistency and stability of a measurement (Muijs, 2011). In quantitative educational research, there are two main types of reliability, repeated measurement and internal consistency. Interrater reliability (IRR) can be a form of repeated measurement.

Several forms of repeated measurement were performed during the primary data collection. First, the teachers used a script and checklist to follow the sequence of events when giving the writing assessments. Thirty-three percent of the assessments were observed by the trained *Project Explore* research team. Reliability was determined to be 100%. Second, the *Project Explore* research team was divided into groups of two in order to score and record the essays for quantity and quality, the scores were checked by the

second group. Any discrepancies were discussed and resolved to reach a reliability score of 100% for scoring and recording the data.

Secondary Data Analysis

Participants

The participants in this secondary data analysis included 178 middle school students with disabilities. The participants included 83 students in sixth grade, 55 students in seventh grade, and 40 in eighth grade. There were 87 female participants and 91 male participants. All students had an IEP and participated in content area (science and social studies) inclusion classes.

Protection of Human Participants and Informed Consent

Institutional Review Board (IRB) application for George Mason University was completed. The project [1704198-1] Morphological Forms in the Writing of Middle School Students with Disabilities was approved on January 19, 2021.

Materials

Morphological Coding System. To provide descriptive data regarding the types of errors and morphological forms used in students' writing, the Morphological Coding System, based on Carlisle (1996) was used. The Morphological Coding System provided two types of information: description of error types (omission or commission) and the morphological form used (derivational or inflectional: past tense verbs, copulas, auxiliaries, plural noun inflections, possessives, and comparatives/superlatives). The coding system provides guidelines for coding the error type coupled with the morphological form used. For example, an error of copula omission would occur if a

participant wrote, “He a president” instead of “He is a president.” An error of copula commission includes statements such as, “He were the president” instead of “He was the president.” See Appendix E for the Morphological Coding System. See Appendix F for the codebook used to guide morphological coding.

Fidelity of Scoring

Essays were scored for morphological use and accuracy. The team that scored the data for *Project Explore* was utilized to cross-check 33% of the scoring results of this secondary data analysis to ensure fidelity. Discrepancies were discussed and resolved resulting in a fidelity score of 100% accuracy.

Research Design

The purpose of this study is to provide a descriptive, comparative, and correlational analysis regarding the morphological forms used by students with disabilities in their argumentative and informative writing. Information obtained from the results of this dissertation can guide researchers and practitioners in the development of protocols to increase students’ vocabulary knowledge, which is needed to comprehend and use grade level material presented in content area, inclusion classrooms. The following research questions were addressed.

1. What types of morphological forms are middle school students with disabilities using in their science and social studies informative and argumentative writing?
2. How are measures of writing quality and number of words written related to morphological forms?

3. How accurate are middle school students with disabilities in their use of morphological forms in informative and argumentative science and social studies writing?

For this study, a quantitative, non-experimental methodology was selected to describe the types of morphological forms that middle school students are using in their writing. Quantitative, non-experimental research can provide meaningful information to educators and guide research (Cook & Cook, 2008). A quantitative methodology explains “phenomena by collecting numerical data that are analyzed using mathematically based methods (in particular statistics)” (Aliaga & Gunderson, 2000 cited in Muijs, 2011, p.1). The quantitative approach to be used in this study is similar to previous research that has documented morphological development in third and fourth grade general education students (Green et al., 2003).

Table 5

Percentage of Students Using Morphological Structures Correctly by Grade

	Grade 6	Grade 7	Grade 8
	% accurately used		
Past tense inflections			
Participles			
Copulas			
Auxiliaries			
Plurals			
Possessives			
Comparatives/Superlatives			
Compound words			
Derived forms			

The research process begins with the research questions or problem. In this study, the research problem identifies the need for more information regarding the types of morphological forms that students with disabilities in middle school are able to use in their writing and how those forms relate to writing quality. In order to develop and accurately provide intervention for the growth of morphologically complex vocabulary in science and social studies, the accuracy and use of morphological forms in students' writing were examined.

Independent and dependent variables are key characteristics of the research questions (Gliner et al., 2009). In educational quantitative research, there are two main types of independent variables: treatment and attribute variables (Best & Kahn, 2006). Treatment variables may include a specific intervention or teaching method but were not utilized in this study. Attribute variables include characteristics that the researcher cannot alter such as age, gender, or intelligence. Attribute variables included in this study are the participants' grade, race/ethnicity, and gender. Dependent variables are the characteristics that are being measured or observed, such as a test score or number of errors (Best & Kahn, 2006). The dependent variables for this study are the types of morphological forms produced in written essays and rate of accuracy in the production of morphological forms (See

Table 5 and

Table 6 for an example of the table to display results).

Table 6

Percentage of Students Using Morphological Structures Correctly by Subject

	Science	Social Studies
	% accurately used	
Past tense inflections		
Participles		
Copulas		
Auxiliaries		
Plurals		
Possessives		
Comparatives/Superlatives		
Compound words		
Derived forms		

The secondary analysis in this study is a quantitative, non-experimental approach to be implemented by utilizing *Project Explore* study data and findings from rating the quality of students' writing and the number of words written. The goal of this research is to better understand the accuracy and prevalence of morphological forms used in writing in science and social studies classes. Research in this area provides information to researchers and educators to support the development of morphological awareness interventions.

Procedures

Following Institutional Review Board (IRB) approval, data was obtained from the *Project Explore* research team including student demographic information as well as quality and quantity writing scores.

Essays were scored using the Morphological Coding System, based on Carlisle (1996). Scores were obtained for use of complex morphological forms, number of errors, and type of error (commission or omission) for each type of morphological form (past tense, complex verb, plural, derived form; see Figure 2). Scores were recorded in SPSS version 26.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
Student #	Grade	Sex	Race	Dual Language	Type of Writing	Word Count	Writing Quality	Past Tense Verbs	Participle	Copula	Auxiliaries	Plurals	Possessives	Comparatives/Superlatives	Compounds	Derived Forms																		
								#	C	O	#	C	O	#	C	O	#	C	O	#	C	O	#	C	O	#	C	O	#	C	O	#	C	O

Figure 2

Example of data recording for type and number of morphological errors

Data Analysis

The data obtained for this study was analyzed to obtain answers to each research question. Non-experimental research questions can be categorized into three basic approaches: descriptive, correlational, and comparative (Gliner & Morgan, 2009). Descriptive research questions summarize data and use descriptive statistics. A correlational research question finds associations between variables. A comparative research question compares two or more different groups. The type of research question

asked determines the type of statistics that was used to answer the question. For example, comparative research questions require the use of inferential statistics to analyze the difference between groups (Gliner & Morgan, 2009).

For this study, there are three types of research questions: descriptive, correlational, and comparative. The research questions address the accuracy of different groups, find associations between variables, and identify the differences between the groups. Descriptive, inferential, and correlational statistical analyses was used to answer the research questions. To describe the types of morphological forms used by different groups, descriptive statistics was used. A correlational analysis was used to compare relationships between quantity and quality of writing to morphological forms used. To determine differences, inferential statistics using *t*-test and ANOVA was used (Gliner & Morgan, 2009).

Research Question One. For research question one, which examines with the types of morphological forms that are used by each grade, subject, and type of essay descriptive statistics was used to determine the frequency, central tendency, and spread (range and standard deviation).

Research Question Two. For research question two that examines the relationship between quantity, quality, and morphological forms used in writing, a correlational coefficient Pearson's *r* analysis was completed. This analysis provided information regarding the magnitude and direction of the relationship between the variables (Schreiber & Asner-Self, 2011).

Research Question Three. To address research question two, which examines with the accurate use of morphological forms, inferential statistics was used to determine the difference of use between groups. Statistical analysis using t-test and ANOVA was used to compare the differences between grade level and subject area (science and social studies), and genre of writing (informative and argumentative).

As previously stated, descriptive, inferential, and correlational analyses was used to analyze the study data.

Table 7 presents the specific data analysis in relative to each proposed research question.

Table 7

Analysis Plan for Research Questions

Question: What types of morphological forms are middle school students with disabilities using in their science and social studies informative and argumentative writing?		
Independent Variables	Dependent Variables	Analysis plan
Grade level (6, 7 ,8)	Morphological forms:	Frequency count
Subject (science, social studies)	inflectional, compound, derivational complex	Descriptive statistics
Essay type (argumentative, informative)	morphemes	

Question: How are measures of writing quality and number of words written related to morphological forms?

Independent Variables	Dependent Variables	Analysis plan
Quality score	Morphological forms:	Correlational coefficient
Quantity score	inflectional, compound, derivational complex morphemes	<i>Pearson's r</i> analysis

Question: How accurate are middle school students with disabilities in their use of morphological forms in informative and argumentative science and social studies writing?

Independent Variables	Dependent Variables	Analysis plan
Grade level (6,7,8)	Morphological forms:	Inferential statistics (<i>t</i> -test,
Subject (science, social studies)	inflectional, compound, derivational complex	ANOVA)
Essay type (argumentative, informative)	morphemes	

Validity and Reliability

Validity and reliability are two criteria used to judge the quality of research. Validity refers to the accuracy of the interpretation derived from scores (Johnson & Christensen, 2017). The morphological Coding System used for this secondary data analysis was based on a system established by content area experts, and therefore

provided a level of validity to constructs measured. No explicit reference of validity was noted in the original use of the Morphological Coding System (Carlisle, 1996).

Reliability refers to the ability to repeat a research procedure and indicates the consistency and stability of a measurement (Muijs, 2011). The scoring and coding using the Morphological Coding System was checked by the *Project Explore* research team for reliability. The team examined 33% of scores, discrepancies were discussed and resolved. An IRR of 100% accuracy was achieved.

Summary

Chapter Three provided an overview of the research methods that was used to examine the accurate use and types of morphological forms that middle school students with IEPs are using in their writing in science and social studies classrooms. The study used secondary data from the IES research Project Explore study. The first research question compared the differences among groups (grade level) using descriptive analysis. The second research question used correlational analysis to provide information regarding the strength and direction of the relationship between the quantity and quality of writing and the morphological forms used. The final research questions used a statistical analysis with *t*-test and ANOVA. This study provides a unique and valuable perspective on the types of morphological forms middle school students with an IEP use in their writing in science and social studies classes. This research provides information for researcher and practitioners to develop appropriate intervention to support students' vocabulary in science and social studies inclusion classrooms.

Chapter Four

Chapter four details the findings from this secondary data analysis regarding the prevalence and accuracy of use of morphological forms in the writing of middle school students with disabilities (see Definitions, p.18). The study used a quantitative approach to provide descriptive, correlational, and comparative information regarding the morphological forms in writing for science and social studies of students with an Individual Educational Plan (IEP).

The chapter details the results of a non-experimental, quantitative study that examined a sample of 360 student essays in 11 schools in two regions of the United States. Data were analyzed using SPSS version 26. Analyses used were descriptive, correlational, and comparative.

Three research questions guided the study and analysis of the data. Results are presented by data analysis for following research questions:

1. What types of morphological forms are middle school students with disabilities using in their science and social studies informative and argumentative writing?
2. How are measures of writing quality and number of words written related to morphological forms?
3. How accurate are middle school students with disabilities in their use of morphological forms in informative and argumentative science and social studies writing?

Research Question One

The first research question examined the types of morphological forms used by middle school students with disabilities in their writing in content area classes.

Descriptive statistics were used to determine the frequency, central tendency, and spread.

These results are grouped into categories by grade, subject, and genre of writing. Grade includes a description of morphological forms used by grades, six, seven, and eight.

Subjects include two content areas, science and social studies. Within the content area classrooms students wrote two essays, one argumentative and one informative essay.

Descriptive Statistics by Morpheme Use

Table 8,

Table 9, and

Table 10 display the descriptive statistics of each group. Table 8 displays the mean, standard deviation, minimum and maximum uses of each morphological form by grade. The mean score is the average number of times each grade level used a morphological form (e.g., students in grade six used copulas on the average of 1.82, $SD = 2.23$). The morphological form of plural by grade seven students was noted to have the highest number of uses with 30 total uses. The minimum in each category was determined to be zero.

The mean score for derived forms for grade six ($M = 3.38$, $SD = 3.19$), seven ($M = 4.12$, $SD = 3.21$), and eight ($M = 4.04$, $SD = 3.29$) is higher than inflectional forms such as past tense mean scores for grade six ($M = 0.42$, $SD = .84$), seven ($M = 0.58$, $SD = 1.23$), and eight ($M = 1.13$, $SD = 2.02$). To clarify the inflectional forms are sub divided into complex verb categories, plural, possessive, and comparative/superlative forms.

Table 8

Descriptive Statistics of Morphological Forms Used by Grade

		Inflectional Morpheme Forms							Comp	Derived
Grade		Past	Copula	Aux	Part	Plural	Poss	C/S		
6	<i>N</i>	158	158	158	158	158	158	158	158	158
	Mean	.42	1.80	2.63	.94	3.61	.13	.23	1.09	3.68
	<i>SD</i>	.847	2.230	2.406	1.435	4.108	.588	.695	1.966	3.191
	Min	0	0	0	0	0	0	0	0	0
	Max	6	11	13	7	30	5	5	13	18
7	<i>N</i>	102	102	102	102	102	102	102	102	102
	Mean	.58	1.36	2.85	1.13	4.34	.19	.25	1.49	4.12
	<i>SD</i>	1.238	1.514	2.683	1.405	3.827	1.132	.655	1.923	3.216
	Min	0	0	0	0	0	0	0	0	0
	Max	5	6	11	5	17	11	4	9	16

8	<i>N</i>	79	79	79	79	79	79	79	79	79
	Mean	1.13	1.81	4.24	1.08	4.43	.18	.43	1.49	4.65
	<i>SD</i>	2.028	2.026	4.007	1.492	3.594	.594	.827	1.709	3.519
	Min	0	0	0	0	0	0	0	0	0
	Max	14	11	26	8	15	4	3	9	13
Total	<i>N</i>	339	339	339	339	339	339	339	339	339
	Mean	.63	1.67	3.07	1.03	4.02	.16	.28	1.30	4.04
	<i>SD</i>	1.349	1.996	2.995	1.438	3.917	.791	.719	1.901	3.290
	Min	0	0	0	0	0	0	0	0	0
	Max	14	11	26	8	30	11	5	13	18

Note. Past = Past Tense, Aux = Auxiliary, Part = Participle, Poss = Possessive, C/S = Comparative/Superlative, Comp =

Compound words, *N* = number of essays, *SD* = Standard Deviation, Min = Minimum, Max = Maximum

The same essays were used to analyze morphological use by subject area in

Table 9. As the data shows there were a noted difference in number of participants in science ($n = 107$) and social studies ($n = 232$). Auxiliary verb forms ($M = 3.07$, $SD = 2.99$) and plural forms ($M = 4.02$, $SD = 3.91$) were used the most frequently.

When comparing the use of derived forms, the mean use for science students ($M = 5.27$, $SD = 3.25$) is higher than the mean use for social studies students ($M = 3.47$, $SD = 3.15$). With the past tense inflectional morphological form, social studies ($M = 0.78$, $SD = 1.53$) with a maximum use of 14 was higher than science ($M = 0.30$, $SD = 0.70$) with a maximum use of three.

Table 9

Descriptive Statistics of Morphological Forms Used by Subject

		Inflectional Morpheme Forms							Comp	Derived
Subject		Past	Copula	Aux	Part	Plural	Poss	C/S		
Sc	<i>n</i>	107	107	107	107	107	107	107	107	107
	Mean	.31	2.23	2.42	1.08	4.87	.14	.23	1.31	5.27
	<i>SD</i>	.706	2.370	2.355	1.505	4.870	1.103	.667	2.002	3.252
	Min	0	0	0	0	0	0	0	0	0
	Max	3	11	11	7	30	11	5	13	18
SS	<i>n</i>	232	232	232	232	232	232	232	232	232
	Mean	.78	1.41	3.37	1.00	3.63	.17	.31	1.30	3.47
	<i>SD</i>	1.536	1.744	3.207	1.408	3.329	.597	.742	1.857	3.155
	Min	0	0	0	0	0	0	0	0	0
	Max	14	11	26	8	17	5	4	10	16

Total	<i>N</i>	339	339	339	339	339	339	339	339	339
	Mean	.63	1.67	3.07	1.03	4.02	.16	.28	1.30	4.04
	<i>SD</i>	1.349	1.996	2.995	1.438	3.917	.791	.719	1.901	3.290
	Min	0	0	0	0	0	0	0	0	0
	Max	14	11	26	8	30	11	5	13	18

Note. Past = Past Tense, Aux = Auxiliary, Part = Participle, Poss = Possessive, C/S = Comparative/Superlative, Comp =

Compound words, N = number of essays, SD = Standard Deviation, Min = Minimum, Max = Maximum.

Table 10 displays the descriptive statistics for the essays analyzed by genre. Informative essays display higher means in the past tense, copula, participle, plural, possessive, compound words, and derived forms categories. Argumentative essays displayed a higher means in auxiliary verbs ($M = 3.82$, $SD = 3.34$) and inflectional comparative/superlative forms ($M = 0.39$, $SD = .896$).

Table 10

Descriptive Statistics of Morphological Forms Used by Genre

		Inflectional Morpheme Forms							Comp	Derived
Genre		Past	Copula	Aux	Part	Plural	Poss	C/S		
Argumentative	<i>n</i>	168	168	168	168	168	168	168	168	168
	Mean	.51	1.41	3.82	.99	3.27	.11	.39	1.24	4.53
	<i>SD</i>	1.003	1.779	3.349	1.433	3.260	.502	.896	1.738	3.413
	Min	0	0	0	0	0	0	0	0	0
	Max	5	8	26	8	21	5	5	10	16
Informative	<i>n</i>	171	171	171	171	171	171	171	171	171
	Mean	.75	1.93	2.34	1.06	4.77	.21	.18	1.37	3.55
	<i>SD</i>	1.612	2.163	2.392	1.446	4.353	.995	.465	2.052	3.099
	Min	0	0	0	0	0	0	0	0	0
	Max	14	11	11	7	30	11	2	13	18

Total	<i>N</i>	339	339	339	339	339	339	339	339	339
	Mean	.63	1.67	3.07	1.03	4.02	.16	.28	1.30	4.04
	<i>SD</i>	1.349	1.996	2.995	1.438	3.917	.791	.719	1.901	3.290
	Min	0	0	0	0	0	0	0	0	0
	Max	14	11	26	8	30	11	5	13	18

Note. Past = Past Tense, Aux = Auxiliary, Part = Participle, Poss = Possessive, C/S = Comparative/Superlative, Comp =

Compound words, N = number of essays, SD = Standard Deviation, Min = Minimum, Max = Maximum

Morphological Prevalence of Use by Student

To examine the prevalence of each morphological form used by students, percentages were calculated of students using each morphological category at least once in the written essays (e.g., How many sixth graders used the past tense morphological form at least once in the argumentative and informative writing essays?). This analysis allowed for examination of differences in the number of students who chose to use the various morphological structures in their writing. The percentages include students who attempted to use a particular form at least once in their writing. These percentages are presented in Table 11,

Table 12, and Table 13. Grade eight displayed the most students using past tense inflections (45.6%), copulas (75.9%), auxiliaries (84.8%), possessives (11.4%), comparative and superlative (25.3%), compound words (65.8%), and derived forms (88.6%).

Table 11

Percentage of Students Using Complex Morphological Forms in Argumentative and Informative Essays by Grade

Morphological Form	Grade 6	Grade 7	Grade 8
Percentage of students using morphological forms			
Past tense inflections	27.8	24.5	45.6
Participles	44.3	52	51.9
Copulas	64.6	65.7	75.9
Auxiliaries	81.6	78.4	84.8
Plurals	85.4	90.2	86.1
Possessives	7	5	11.4
Comparative/ Superlative	13.9	17.6	25.3
Compounds	45.6	57.8	65.8
Derived forms	86.7	87.3	88.6

Note. $N = 360$.

Table 12

Percentage of Students Using Complex Morphological Forms in Argumentative and Informative Essays by Subject

Morphological Form	Science	Social Studies
Percentage of students using morphological forms		
Past tense inflections	18.7	36.6
Participles	51.4	47.4
Copulas	18.7	36.6
Auxiliaries	76.6	83.6
Plurals	92.5	84.5
Possessives	2.8	10.3
Comparative/Superlative	15.9	18.5
Compounds	55.1	53.4
Derived forms	94.4	84.1

Note. $N= 358$.

Table 13

Percentage of Students Using Complex Morphological Forms in Essays by Genre

Morphological Form	Informative	Argumentative
Percentage of students using morphological forms		
Past tense inflections	31	31
Participles	50.3	47
Copulas	73.1	61.9
Auxiliaries	74.9	88.1
Plurals	90.1	83.9
Possessives	9.4	6.5
Comparatives/Superlatives	14	21.4
Compound words	52.6	55.4
Derived forms	83	91.7

Note. N= 330

The inflectional morphological category was initially expanded to analyze developmental differences including complex verbs (auxiliaries, copulas, participles). To analyze the three types of morphemes,

Table 14,

Table 15, and

Table 16 display the results of percentage of middle school students using the three types of morphological forms (inflectional, compound, and derivational) with a collapsed verb category.

Table 14

Percentage of Students Using Complex Morphological Forms by Grade

Morphological Form	Grade 6	Grade 7	Grade 8
Percentage of students using morphological forms			
Complex verb inflections	54.6	55.4	64.6
Plural inflections	85.4	90.2	87
Compound	45.6	57.8	65.8
Derivational	86.7	87.3	88.6

The derivational use is the highest use amongst the three types of morphological forms (inflectional, compounds, and derivational).

Table 15

Percentage of Students Using Complex Morphological Forms in Argumentative and Informative Essays by Subject

Morphological Form	Science	Social Studies
Percentage of students using morphological forms		
Complex verb inflections	18.7	36.6
Plural inflections	92.5	84.5
Compound	55.1	53.4
Derivational	94.4	84.1

Percentage of students using derived (94.4%), compound words (55.1%), and plural inflections (92.5%) is higher in science. Social studies displayed the highest use of complex verb inflections with 36.6%.

Table 16

Percentage of Students Using Complex Morphological Forms in Essays by Genre

Morphological Form	Informative	Argumentative
Percentage of students using morphological forms		
Complex verb	95.9	94.6
inflections		
Plural inflections	90.1	83.9
Compound	52.6	55.4
Derivational	83	91.7

Descriptive statistics were used to describe the quality and quantity of essays written by grade level, subject, and genre. Table 17, Table 18, and Table 19 display the quality and quantity results. Students in grade eight displayed the highest quality score (3.86) and quantity score (82.75).

Table 17

Quality and Quantity Descriptive Statistics by Grade

Grade		Quality	Quantity
6	Mean	3.09	58.68
	<i>SD</i>	2.211	37.208
	Min	0	0
	Max	11	200
7	Mean	3.64	64.86
	<i>SD</i>	2.400	37.583
	Min	0	0
	Max	12	209
8	Mean	3.86	82.75
	<i>SD</i>	2.240	50.940
	Min	0	11
	Max	10	243
Total	Mean	3.44	66.15
	<i>SD</i>	2.293	41.892
	Min	0	0
	Max	12	243

Note. SD = Standard Deviation, Min = Minimum, Max = Maximum.

The same essays were analyzed by subject (science and social studies) with the results displayed in Table 20. The science quality (4.04) and quantity score (68.11) displayed the highest results.

Table 18

Quality and Quantity Descriptive Statistics by Subject

subject		Quality	Quantity
Sc	Mean	4.04	68.11
	SD	2.506	39.539
	Min	0	0
	Max	12	200
SS	Mean	3.16	65.24
	SD	2.137	42.987
	Min	0	0
	Max	10	243
Total	Mean	3.44	66.15
	SD	2.293	41.892
	Min	0	0
	Max	12	243

Note. Sc = science, SS = social studies, SD = Standard Deviation, Min = Minimum, Max = Maximum.

The essays were analyzed and grouped according to genre (argumentative and informative) and displayed in Table 19. Argumentative essays displayed the highest quality score (3.79) and quantity score (67.10).

Table 19

Quality and Quantity Descriptive Statistics by Genre

genre		Quality	Quantity
A	<i>n</i>	168	168
	Mean	3.79	67.10
	<i>SD</i>	2.405	42.994
	Min	0	0
	Max	12	243
I	<i>n</i>	171	171
	Mean	3.09	65.21
	<i>SD</i>	2.128	40.885
	Min	0	0
	Max	11	212
Total	<i>N</i>	339	339
	Mean	3.44	66.15
	<i>SD</i>	2.293	41.892
	Min	0	0
	Max	12	243

Note. A = argumentative, I = informative, *N*= number of essays, *SD* = Standard Deviation, Min = Minimum, Max = Maximum.

Research Question Two

The second research question examines the relationship between quality, quantity, and morphological forms in writing. A correlational coefficient Pearson's r analysis was conducted to examine the relationship between essay quality score and each morphological form. First, a correlational coefficient Pearson's r analysis was conducted to examine the relationship between quality score and each morphological form. Derived use $r(337) = .39, p < .001$ had a stronger positive correlation to quality score, than participle morpheme use $r(337) = .14, p < .001$. A complete list of correlations for quality is presented in Table 23. The effect size for derived use ($r^2 = .15$) indicated that the use of derived forms in essay writing account for a small percent (15%) of the variability in writing quality.

Table 20

Bivariate Correlations for Quality of Writing

	Quality	Past	Copula	Aux	Participle	Plural	Poss	Comp/ Sup	Compound	Derived
Quality	1	.283*	.287**	.281**	.142**	.385**	.028	.197**	.266**	.390**
		.000	.000	.000	.009	.000	.602	.000	.000	.000
Past		1	.157**	.209**	.155**	.219**	.046	.232**	.190**	.234**
			.004	.000	.004	.000	.394	.000	.000	.000
Copula			1	.011	.197**	.340**	-.046	.139*	.254**	.322**
				.840	.000	.000	.403	.010	.000	.000
Aux				1	.134*	.151**	.008	.207**	.231**	.340**

			.013	.005	.890	.000	.000	.000
Participle		1	.142**	-.038	.004	.195**	.161**	
			.009	.491	.939	.000	.003	
Plural	.	1	-.031	.103	.369**	.376**		
			.572	.059	.000	.000		
Poss		1	-.017	.023	.029			
			.753	.676	.601			
Comp/Sup		1	.132*	.182**				
	.		.015	.001				
Compound		1	.234**					

.000

Derived

1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Note. $N=339$

Second, a Pearson's r data analysis was conducted to examine the relationship between quantity score and each morphological form. Plural use $r(337) = .53, p < .001$ and derived use $r(337) = .52, p < .001$ had a stronger positive correlation to quantity score, than comparative/superlative morpheme use $r(337) = .32, p < .001$. However, the results revealed no significant correlation between possessive use $r(337) = .09, p = .083$ and quantity. A complete list of correlations for quantity is presented in Table 21. The effect size for derived use ($r^2 = .27$) indicated that the use of derived forms in essay writing account for a small percent (27%) of the variability in writing quantity.

Table 21

Bivariate Correlations for Quantity of Writing

		Comp/								
Quantity		Past	Copula	Aux	Participle	Plural	Poss	Sup	Compound	Derived
Quantity	1	.329**	.452**	.531**	.363**	.538**	.094	.324**	.485**	.527**
		.000	.000	.000	.000	.000	.083	.000	.000	.000
Past	1		.157**	.209**	.155**	.219**	.046	.232**	.190**	.234**
			.004	.000	.004	.000	.394	.000	.000	.000
Copula			1	.011	.197**	.340**	-.046	.139*	.254**	.322**
				.840	.000	.000	.403	.010	.000	.000
Aux				1	.134*	.151**	.008	.207**	.231**	.340**
				.	.013	.005	.890	.000	.000	.000

Participle	1	.142**	-.038	.004	.195**	.161**
		.009	.491	.939	.000	.003
Plural	1	-.031	.103	.369**	.376**	
		.572	.059	.000	.000	
Poss	1	-.017	.023	.029		
		.753	.676	.601		
Comp/Sup	1	.132*	.182**			
		.015	.001			
Compound	1	.234**				
		.000				

Derived

1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Note. N=339

Research Question Three

The third research question examines the accurate use of morphological forms using inferential statistics to determine the difference between groups. ANOVA was used to compare group differences between grades six, seven, and eight. *T*-tests were used to examine the differences between subject (science and social studies) and genre (argumentative and informative) writing. Initially, an analysis was completed to calculate accurate use of morphological forms. The coded errors were subtracted from the total use and an accuracy percentage was calculated (See Table 22). Next, an analysis was completed with each group using the percent of accuracy for each morphological form.

Table 22

Prevalence and Accuracy of Morphological Use

		Grade			Subject		Genre	
		6 (<i>n</i> = 158)	7 (<i>n</i> = 102)	8 (<i>n</i> = 79)	Science (<i>n</i> = 107)	social studies (<i>n</i> = 232)	Argumentative (<i>n</i> = 168)	Informative (<i>n</i> = 171)
Past tense	Prevalence	67	59	89	33	189	86	129
	of Use							
	Percent	70	76	89	79	79	76	82
	Accurate							
Copula	Prevalence	285	139	143	239	342	237	330
	of Use							
	Percent	86	71	78	79	82	74	85
	Accurate							

		Grade			Subject		Genre	
		6 (<i>n</i> = 158)	7 (<i>n</i> = 102)	8 (<i>n</i> = 79)	Science (<i>n</i> = 107)	social studies (<i>n</i> = 232)	Argumentative (<i>n</i> = 168)	Informative (<i>n</i> = 171)
Auxiliary	Prevalence	416	169	335	259	833	642	400
	of Use							
	Percent	90	82	89	88	90	89	91
	Accurate							
Participle	Prevalence	148	115	85	116	238	167	181
	of Use							
	Percent	91	91	92	91	92	92	91
	Accurate							
Plural	Prevalence	571	443	350	521	903	549	815
	of use							

		Grade			Subject		Genre	
		6 (<i>n</i> = 158)	7 (<i>n</i> = 102)	8 (<i>n</i> = 79)	Science (<i>n</i> = 107)	social studies (<i>n</i> = 232)	Argumentative (<i>n</i> = 168)	Informative (<i>n</i> = 171)
	Percent	83	86	86	92	80	87	84
	Accurate							
Possessive	Prevalence	21	19	14	15	40	18	36
	of Use							
	Percent	10	5	14	0	13	11	8
	Accurate							
Comparative/ Superlative	Prevalence	36	26	34	18	79	66	30
	of Use							
	Percent	78	88	88	83	85	83	87
	Accurate							

		Grade			Subject		Genre	
		6 (<i>n</i> = 158)	7 (<i>n</i> = 102)	8 (<i>n</i> = 79)	Science (<i>n</i> = 107)	social studies (<i>n</i> = 232)	Argumentative (<i>n</i> = 168)	Informative (<i>n</i> = 171)
Compound	Prevalence	131	152	118	140	324	208	234
	of Use							
	Percent	53	77	72	66	71	75	68
	Accurate							
Derived	Prevalence	581	420	367	564	842	761	607
	of Use							
	Percent	83	84	84	85	83	86	81
	Accurate							

Note: *n* = number of essays

Inferential Statistics by Morpheme Use

The assumption of homogeneity of variance was tested by using the Levene's Test. Levene's test uses the level of significance of 0.05. For participle, plural, possessive, compound, and derived forms equal variances are assumed. The independent one-way ANOVA was conducted to compare the effect of grade six, seven, and eight use of morphological forms in argumentative and informative essays. The ANOVA yielded a statistically significant effect for past tense $F(2, 336) = 7.55, p = .001$ and auxiliary verbs $F(2, 336) = 8.33, p = .000$. See

Table 23 for complete ANOVA results.

Table 23

One-way ANOVA by Grade

	SS		df		MS		<i>F</i>	<i>p</i>	η^2
	BG	WG	BG	WG	BG	WG			
Past Tense	26.45	588.20	2	336	13.22	1.75	7.55	.001	.043
Copula	14.01	1332.65	2	336	7.00	3.97	1.77	.173	.010
Auxiliary	143.22	2887.93	2	336	71.61	8.60	8.33	.000	.004
Participle	2.51	696.26	2	336	1.25	2.07	.61	.547	.010
Plural	50.01	5135.81	2	336	25.00	15.29	1.64	.196	.001
Possessive	.21	211.19	2	336	.11	.63	.168	.846	.013
Comparative/ Superlative	2.28	172.53	2	336	1.14	.51	2.22	.111	.011
Compound	13.71	1207.10	2	336	6.85	3.60	1.91	.150	.014
Derived Forms	50.37	3609.20	2	336	25.19	10.74	2.35	.097	.043

Note. η^2 (Eta squared) = Effect size, BS = Between Groups, WS = Within Groups df =

Degrees of Freedom, MS = Mean Square

Following the ANOVA, Post hoc testing occurred for the significant ANOVA, which included past tense and auxiliary verbs. Using the Levene's Test, an equal variance was not assumed for past tense ($M = 0.63$, $SD = 1.35$) and auxiliary verbs ($M = 3.07$, $SD = 3.0$) therefore The Games-Howell post hoc test was used to determine which pairs of the three grade levels morphological forms use means differed significantly. There was a significant difference between grade six and eight for past tense verbs, $p = .011$. There was a significant difference between grades six and eight for auxiliary verbs, $p = .004$ and between the grade seven and eight, $p = .024$. See

Table 24 for Games-Howell post hoc how results.

Table 24

Games-Howell Comparison by Grade

Morphological Form	Grade (I)	Grade (J)	Mean difference (I-J)	<i>p</i>
Past Tense	6	7	-0.15	.513
	6	8	-0.70	.011
	7	8	-0.55	.091
Auxiliary	6	7	-0.22	.780
	6	8	-1.61	.004

7 8 -1.39 .024

Note. p = p value

An independent-samples t -test was conducted to compare the science and social studies morphological use. There was a no significant difference when comparing the use of participles $t(337) = .500$; $p = .617$; possessives $t(337) = -.302$; $p = .763$; comparative/superlatives $t(337) = -.861$; $p = .390$; and compound words $t(337) = .030$; $p = .976$. Means and standard deviations for science and social studies use of morphological forms are given in Table 24. Effect size refers to the difference between groups and is interrupted using Cohen's d as 0.2 represents a small effect size, 0.5 is medium effect size, and 0.8 represents a large effect size (Ferguson, 2016). Cohen's d was calculated, and medium effect size is noted for the use of derived forms ($d = 0.56$). Effect sizes for each type of morphological use are given in

Table 25.

Table 25

Comparison Groups- Science and Social Studies Independent Samples t -Test Results

Variable	Science		Social Studies		t	p	d
	M	SD	M	SD			
Past Tense	.31	.70	.78	1.53	-3.90	.001	0.39
Copula	2.23	2.37	1.41	1.74	3.20	.002	0.39
Auxiliary	2.42	2.35	3.38	3.20	-3.07	.002	0.34

Participle	1.08	1.50	1.00	1.40	0.50	.617	0.05
Plural	4.87	4.87	3.63	3.32	2.38	.190	0.29
Possessive	0.14	1.10	0.17	0.59	-0.30	.763	0.03
Comparative/ Superlative	0.23	0.66	0.31	0.74	-0.86	.390	0.11
Compound Words	1.31	2.00	1.30	1.85	0.30	.976	0.00
Derived Forms	5.27	3.25	3.47	3.15	4.84	.001	0.56

Note. Science ($n = 107$), Social Studies ($n = 232$), $df = 337$. d represents Cohen's d , M = mean, SD = standard deviation

A second independent-samples t -test was conducted to compare the morphological use in argumentative and informative essays. There was a no significant difference when comparing the use of past tense, participle, possessive, and compound words. Means and standard deviations for use of morphological forms in argumentative and informative essays are given in

Table 26. Cohen's d was calculated, and medium effect size is noted for the use of auxiliary verbs ($d = 0.50$). Effect sizes for each type of morphological use are given in

Table 26.

Table 26

Comparison Groups- Argumentative and Informative Essays Independent Samples t-Test

Results

Variable	Argumentative		Informative		<i>t</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Past Tense	0.51	1.00	0.75	1.61	-1.66	.097	0.17
Copula	1.41	1.77	1.93	2.16	-2.41	.016	0.26
Auxiliary	3.82	3.34	2.34	2.39	4.69	.001	0.50
Participle	0.99	1.43	1.06	1.44	-0.41	-.064	0.04
Plural	3.27	3.26	4.77	4.35	-3.59	-1.498	0.39
Possessive	0.11	0.50	0.21	0.99	-1.21	.227	0.12
Comparative/ Superlative	0.39	0.89	0.18	0.46	2.79	.217	0.29
Compound Words	1.24	1.73	1.37	2.05	-0.63	-.130	0.06
Derived Forms	4.53	3.41	3.55	3.09	2.76	.980	0.30

Note. Argumentative ($n = 168$), Informative ($n = 171$), $df = 337$. *d* represents Cohen's *d*,

M = mean, *SD* = standard deviation

Inferential Statistics for Morphological Accuracy

The Levene's Test for equality of variances was used to test the assumption of homogeneity of variance. Levene's test uses the level of significance of 0.05. The equal variances are assumed for past tense, auxiliary, participle, plural, possessive, compound, and derived for accuracy of use. The independent one-way ANOVA was conducted to compare the effect of grade six, seven, and eight accurate use of morphological forms in argumentative and informative essays. The ANOVA yielded a statistically significant effect for copulas $F(2, 226) = 4.46, p = .013$. See

Table 27 for complete ANOVA results.

Table 27

One-way ANOVA Morphological Accuracy by Grade

	SS		<i>Df</i>		<i>MS</i>		<i>F</i>	<i>p</i>	η^2
	BG	WG	BG	WG	BG	WG			
Past Tense	0.42	14.84	2	103	0.21	0.14	1.46	.237	0.03
Copula	0.96	24.27	2	226	0.48	0.11	4.460	.013	0.04
Auxiliary	0.16	17.06	2	272	0.08	0.063	1.30	.276	0.01
Participle	0.01	11.61	2	162	0.06	0.72	0.90	.914	0.00
Plural	0.03	23.74	2	292	0.02	0.08	0.18	.837	0.00
Possessive	0.08	1.98	2	24	0.04	0.08	0.47	.630	0.04
Comparative/ Superlative	0.26	7.80	2	57	0.13	0.14	0.93	.399	0.03
Compound	0.08	33.67	2	180	0.04	0.19	0.22	.807	0.00
Derived Forms	0.03	27.06	2	293	0.02	0.09	0.18	.835	0.00

Note. η^2 (Eta squared) = Effect Size, SS = Sum of Squares, BG = Between Groups, WG =

Within Groups *df* = Degrees of Freedom, *MS* = Mean Square

Following the ANOVA, post hoc testing occurred for the significant ANOVA for copula verbs. Using the Leven's Test, an equal variance was not assumed for copulas ($M = 0.76$, $SD = 0.38$) therefore the Games-Howell post hoc test was used to determine which pairs of the three grade levels morphological forms accurate use means differed significantly. There was a significant difference between grades six and seven for copulas, $p = .022$. See

Table 28 for Games-Howell post hoc results.

Table 28

Games-Howell Comparison for Morphological Accuracy

Morphological Form	Grade (I)	Grade (J)	Mean Difference (I-J)	p
Copula	6	7	0.154	.022
	6	8	0.054	.511
	7	8	-0.99	.305

An independent-samples t -test was conducted to compare the morphological accuracy in science and social studies essays. There was no significant difference when comparing the use of past tense, copulas, auxiliaries, participle, possessives, comparatives/superlatives, compound words, and derived forms. Means and standard deviations for accurate use of morphological forms in science and social studies' essays

are given in

Table 29. Cohen's d was calculated, and a small effect size is noted for past tense ($d = 0.28$), plural ($d = 0.37$), and compound word ($d = 0.23$) accurate use. Effect sizes for each type of morphological accurate use are given in

Table 29.

Table 29

Comparison Groups- Science and Social Studies Percent Accurate Independent Samples
t-Test Results

Variable	Science			Social Studies			t	p	d
	n	M	SD	n	M	SD			
Past Tense	20	0.84	0.30	86	0.74	0.40	1.24	.222	0.28
Copula	79	0.79	0.36	150	0.84	0.32	-1.09	.276	0.14
Auxiliary	81	0.87	0.28	194	0.89	0.23	-0.70	.484	0.07
Participle	55	0.91	0.23	110	0.89	0.03	0.40	.688	0.12
Plural	99	0.89	0.23	196	0.79	0.30	3.13	.002	0.37
Possessive	3	0.00	0.00	24	0.13	0.30	-0.73	.474	0.00
Comparative/ Superlative	107	0.21	0.66	232	0.25	0.66	-0.63	.529	0.06

Compound	59	0.59	0.45	124	0.69	0.42	-1.49	.138	0.23
Words									
Derived	101	0.82	0.28	195	0.79	0.32	0.75	.456	0.09
Forms									

Note. d represents Cohen's d , n = sample size, M = mean, SD = standard deviation

An independent-samples t -test was conducted to compare the morphological use accuracy in argumentative and informative essays. There was no significant difference when comparing the use of past tense, auxiliaries, participles, plurals, possessives, compound words, and derived forms. Means and standard deviations for accurate use of morphological forms in argumentative and informative essays are given in Table 29. Cohen's d was calculated, and a small effect size is noted for copula ($d = 0.42$), plural ($d = 0.21$), and comparative/superlative ($d = 0.27$) accurate use. Effect sizes for each type of morphological accurate use are given in

Table 30.

Table 30

Comparison Groups- Argumentative and Informative Essay Percent Accurate

Independent Samples *t*-Test Results

Variable	Argumentative			Informative			<i>t</i>	<i>p</i>	<i>d</i>
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>			
Past Tense	52	0.78	0.38	54	0.74	0.39	0.40	.684	0.10
Copula	104	0.75	0.40	125	0.89	0.26	-2.99	.002	0.42
Auxiliary	148	0.88	0.24	127	0.89	0.26	-0.25	.802	0.03
Participle	79	0.90	0.26	86	0.89	0.03	0.24	.812	0.05
Plural	141	0.86	0.25	154	0.80	0.31	1.71	.088	0.21
Possessive	11	0.11	0.30	16	0.11	0.28	-0.05	.961	0.00
Comparative/ Superlative	168	0.33	0.82	171	0.15	0.43	2.45	.015	0.27
Compound Words	93	0.68	0.43	90	0.63	0.43	0.77	.445	0.12
Derived Forms	154	0.82	0.29	142	0.78	0.32	1.29	.198	0.13

Note. *d* represents Cohen's *d*, *n* = sample size, *M* = mean, *SD* = standard deviation

Summary

The purpose of this study was to examine the use of morphological awareness (MA) in informative and argumentative writing of middle school students with

disabilities. Additionally, the relationship between writing quality and quantity, and MA was investigated. The data for this secondary analysis was obtained from the *Project Explore* research team. Three hundred and sixty essays written in content area classrooms by middle school students with disabilities were analyzed by grade, subject, and genre. The scores yielded both expected and unexpected results, which will be discussed in Chapter 5.

For research question one, descriptive statistics results indicated the prevalence of use of morphological forms by grade, subject, and genre. Means, standard deviations, minimal, and maximum use for each morphological form were calculated. Grade eight produced the highest mean for use of derivational morphemes. Derivational morphological forms produced higher means than inflectional morphological forms in all grades. Means were calculated by subject and science produced higher derivational morphological use, but the social studies mean was higher for past tense verbs used. Results for argumentative and informative essays indicated that complex verb inflections were higher with informative essays. For both quantity and quality, science produced the highest mean score. Quantity and quality were then examined further with a correlational analysis for research question two.

For research question two, a Pearson's r correlational data analysis was conducted. The analysis examined the relationship between quality and quantity of writing with each morphological form. Plural use and derived use had a low correlation to quality. Auxiliary verb use, plural use, and derived use had a moderate correlation to quantity. For both quality and quantity, possessive use demonstrated no relationship.

Research question three used inferential statistics to examine the accurate use of morphological forms. Between grade data analysis used the one-way ANOVA to compare differences in accurate use of morphological forms between grade levels. The analysis revealed significant differences between grades on one morphological form. *T*-test was used to compare differences between subject area and genre. When comparing science and social studies a small effect size is noted for past tense, plural, and compound words. Comparing the means for argumentative and informative essays, copulas, plurals, and comparative/superlative forms yielded a small effect size.

Chapter 5 will include a discussion of these results and how they are related to previous research, as well as why some of the expected or unexpected results that occurred along with possible focuses for future research.

Chapter Five

The purpose of this study, a secondary data analysis, was to analyze the morphological forms that middle school students with disabilities use in their argumentative and informative essay writing in content area classrooms. Students that use morphological awareness may be able to extend their vocabulary by using morphological knowledge to segment and blend words to infer word meaning (McCutchen & Stull, 2015). The analysis provides information to researchers and practitioners for developing appropriate vocabulary interventions to support students' reading and writing.

A quantitative, non-experimental approach was used to examine secondary data obtained from *Project Explore*. The primary data obtained from *Project Explore* was analyzed to answer the following three research questions:

1. What types of morphological forms are middle school students with disabilities using in their science and social studies informative and argumentative writing?
2. How are measures of writing quality and number of words written related to morphological forms?
3. How accurate are middle school students with disabilities in their use of morphological forms in informative and argumentative science and social studies writing?

Chapter five provides a discussion of the results and limitations of the study. Subsequent implications for both researchers and practitioners that are derived from this secondary data analysis are also discussed.

Discussion

Middle school students are exposed to content area texts that contain many unfamiliar, multimorphemic vocabulary words (Helman et al., 2015; Katz & Carlisle, 2009). Often struggling readers are less able than efficient readers to decode and understand complex words in isolation and in texts. Morphological awareness (MA) is a tool that could support vocabulary development by assisting struggling readers with decoding and inferring the meaning of words with a complex but transparent morphological structure (e.g., magnify, magnification).

To determine what morphological forms middle school students with disabilities, use in their writing in content area classrooms, essays were examined utilizing a coding system adapted from Carlisle (1996). The coding system provided information regarding the types of morphological forms (e.g., plurals, possessives, derivational forms) used in argumentative and informative writing. Three grade levels, two subject areas, and two writing genres were examined. The analysis of the frequency in morphological forms use showed differences by grade (six, seven, eight) and by text group (science, social studies; argumentative, informative). The results of the study indicated that middle school students with disabilities use inflectional, compound words, and derived forms in their content area writing.

Morphological Form Use

The results of the study provide descriptive information regarding the types of morphological forms used by middle school students in their writing by grade, subject, and writing genre. Use of derived morphemes was similar to the use of inflectional morphemes in each grade. Subject area and genre differences were noted.

Grade. The students in grade eight used a more extensive variety of morphological forms than those in grades six and seven (e.g., past tense). Further, grade eight students used a greater number of past tense inflections (grade 6 $M = 0.42$, $SD = 0.84$; grade 7 $M = 0.58$, $SD = 1.24$; grade 8 $M = 1.13$, $SD = 2.03$), copulas (grade 6 $M = 1.80$, $SD = 2.23$; grade 7 $M = 1.36$, $SD = 1.51$; grade 8 $M = 1.81$, $SD = 2.03$), auxiliaries (grade 6 $M = 2.63$, $SD = 2.40$; grade 7 $M = 2.85$, $SD = 2.68$; grade 8 $M = 4.24$, $SD = 4.01$), comparative/superlative forms (grade 6 $M = 1.09$, $SD = 1.97$; grade 7 $M = 0.25$, $SD = 0.66$; grade 8 $M = 0.43$, $SD = 0.83$), and derived forms (grade 6 $M = 3.68$, $SD = 3.19$; grade 7 $M = 4.12$, $SD = 3.22$; grade 8 $M = 4.65$, $SD = 3.52$; see Table 8).

The descriptive results regarding the types of morphological forms used by middle school students with disabilities in their writing are similar to the findings in Green et al. (2003). Green et al. examined the narratives of students in grades three and four. Her findings indicated there was a progression in morphological development. Green and colleagues noted that general education students in fourth grade displayed more attempts than third grade students to use derived morphological forms. The same developmental progression is noted with this secondary data analysis with middle school

students writing. Eighth grade students displayed greater and more extensive variety of morphological form use than those in grade six and seven.

Subject. Student essays written in science produced a greater number of morphemes in the areas of copula (science $M = 2.23$, $SD = 2.37$; social studies $M = 1.41$, $SD = 1.74$), participle (science $M = 1.08$, $SD = 1.50$; social studies $M = 1.00$, $SD = 1.40$), plural (science $M = 4.87$, $SD = 4.87$; social studies $M = 3.63$, $SD = 3.32$), compound (science $M = 1.31$, $SD = 2.00$; social studies $M = 1.30$, $SD = 1.85$), and derived (science $M = 5.27$, $SD = 3.25$; social studies $M = 3.47$, $SD = 3.15$) forms than social studies. This supports research conducted by Helman et al. (2015) regarding the importance of morphological awareness instruction in science. When compared to other content areas, science text contains the highest amount of complex vocabulary (Helman et al., 2015).

Content area morphologically complex words are often technical terminology and not encountered in everyday conversations, therefore explicit teaching of new vocabulary and strategies to analyze word-structure (morphological analysis) is required (Helman et al., 2015; National Reading Panel, 2000). Students need to be taught that morphologically complex words have structures that can be segmented and blended to form a new word (e.g., molecule, molecular). Generative knowledge (i.e., how meaningful word parts are combined) allows students to problem solve and separate a word into different substructures (e.g., base word, prefix, suffix; Nagy & Anderson, 1984; Templeton, 2012). Students can infer word meaning from the meaningful parts that are combined instead of memorizing morphologically complex words.

Social studies essays displayed more past tense morphological forms (science $M = 0.31$, $SD = 0.70$; social studies $M = 0.78$, $SD = 1.53$). The prompt may have attributed to the morphological forms produced in the essays. In response to the social studies prompts (e.g., “Throughout history, there are many famous people who have done important things. Pick one famous person from history and explain what they did.”), students used more past tense inflections in social studies than science. Northey et al. (2016) noted that an essay prompt may affect the writing outcome.

Genre. Previous research regarding morphology and writing has examined three types of writing including story writing (Carlisle, 1996; Green et al., 2003), essay writing using a standardize measure (*WIAT-III*; Northey et al., 2016), and sentence combining (McCutchen & Stull, 2013). The research conducted in this secondary data analysis extends the prior research by providing descriptive information regarding argumentative and informative essay writing using content area writing prompts.

Using descriptive statistics, differences in use of morphological forms between genres were noted. Informative writing consistently displayed the use of a greater number of past tense forms (informative $M = 0.75$, $SD = 1.61$; argumentative $M = 0.51$, $SD = 1.00$), copulas (informative $M = 1.93$, $SD = 2.16$; argumentative $M = 1.41$, $SD = 1.77$), participles (informative $M = 1.06$, $SD = 1.44$; argumentative $M = 0.99$, $SD = 1.43$), plurals (informative $M = 4.77$, $SD = 4.35$; argumentative $M = 3.27$, $SD = 3.26$), possessives (informative $M = 0.21$, $SD = 0.99$; argumentative $M = 0.11$, $SD = 0.50$), and compound words (informative $M = 1.37$, $SD = 2.05$; argumentative $M = 1.24$, $SD = 1.73$).

Argumentative essays ($M = 4.52$, $SD = 3.41$) produced a greater number of derived word forms than informative essays ($M = 3.55$, $SD = 3.09$).

The greater number of morphological forms used in informative writing supports previous research of Olinghouse and Wilson's (2012) findings. When studying the relationship between different writing genres and vocabulary usage, Olinghouse and Wilson (2012) found that different patterns of vocabulary emerged within different writing genres. Informational text contained a higher number of content words (i.e., domain-specific vocabulary such as synthesize and deduce).

Quality and Quantity Correlation

Analysis of morphological forms use revealed a significant positive relationship between the quality and quantity score and derived morphological form use $r(337) = .39$, $p < .001$; $r(337) = .52$, $p < .001$, respectively. These results support the previous research of Northey et al. (2016). Northey and colleagues studied the relationship of essay writing quality and morphological skills of students in grades five and eight. They found that morphological skill was predictive of the essay writing quality. Furthermore, in this secondary data analysis, the relationship between possessive use and quality was not significant at any level $r(337) = .028$, $p = .602$. This secondary data analysis also provided information regarding the positive correlation of quantity score to derived morphological use (see Table 21).

Morphological Form Accuracy

Percentage of accurate use and inferential statistics were used to examine the accuracy of morphological use. When comparing the effect of accurate morphological

use at each grade level, the possessive morphological form was determined to have the weakest percentage of accuracy (grade 6 = 10%, grade 7 = 5%, grade 8 = 14%).

Accuracy of derived forms was similar at each grade level (grade 6 = 83%, grade 7 = 84%, grade 8 = 84%). This similarity of accurate uses between grade levels is different from the results of Green et al. (2003). Green and colleagues found that accurate use among students in grade four was greater than students in grade three. Derived forms develop later than inflectional morphemes (Kou & Anderson, 2006). Knowledge of derivational morphology allows the writer to manipulate a word from a verb to a noun (e.g., magnify, magnification) providing opportunity to manipulate the syntax of a sentence.

The results of this study revealed that middle school students with disabilities were able to use derived morphological forms with a least 83% accuracy. The accuracy of derivational form use demonstrates the readiness to learn more about generative vocabulary knowledge (Nagy & Anderson, 1984; Templeton, 2012).

When comparing the essays by subject (science compared to social studies) a small effect size was noted for the use of past tense ($d = 0.39$), copula ($d = 0.39$), auxiliary ($d = 0.34$), and plural ($d = 0.29$). A medium effect size was noted for the use of derived forms ($d = 0.56$). The medium effect size indicates there is a difference between the use of derived morphological forms. The ability to use derived forms indicates a readiness to learn more about word structure to create and understand newly encountered vocabulary. Science and studies educators need to explicitly teach how to approach new vocabulary when encountered in reading and writing (Mason, et al., 2019-2023).

When comparing essays by the type of genre (argumentative compared to informative), a small effect size was noted for the use of copula ($d = 0.26$), plural ($d = 0.39$), comparative/superlative ($d = 0.30$). A medium effect size is noted for the use of auxiliary verbs ($d = 0.51$). Overall, a small effect was noted however research to explore these differences may provide knowledge regarding vocabulary differences used in writing genres.

Limitations

The limitations of this study include (a) a lack of specificity of information in students' Individual Educational Plan (IEP), (b) constraints in student assessment data, (c) data collection, and (d) coding. All participants included in this study had an IEP and participated in a content area inclusion classroom. No other information was available regarding IEP goals or type of disability.

Several limitations are noted regarding the assessment data that was obtained. First, the writing assessments occurred in two states although the prompts for the different states were different genres, it is likely some variances caused by potential differences in curriculum. In addition, the 10-minute Quick Write assessment procedures may have limited the students time to plan, edit, and compose a longer more thorough essay (Ciullo & Mason, 2017).

A comparison of morphological growth would have strengthened the findings in this study. Longitudinal data regarding the development of the use of morphological forms in students writing could have been analyzed if collected. Furthermore, comparison

data such as oral morphological markers would have provided more information regarding the student's current level of morphological knowledge. Green et al. (2003) stated that oral and written morphological awareness is often parallel. By not having comparison data, this limited the ability to compare growth, differences, and changes that may have occurred during the school year.

Another limitation is the coding system that was used to score the morphological forms. The coding system included an expanded inflectional category to account for morphological development however, more information could be obtained by subdividing the derivational forms category. Specific information regarding derivational morphological forms would provide researchers and practitioners more knowledge regarding the middle school students ability to accurately use specific affixes.

Despite these limitations, the findings of this study demonstrate that, students in middle school use a variety of morphological forms, including inflectional, compound words, and derivational morphemes in their content area writing. This knowledge, in combination with the results from other studies, can be used to describe the development of the use and accuracy of morphological word forms and has implications for intervention research and instructional practice.

Implications for Research

This study provides descriptive information regarding the use and accuracy of morphological forms in the writing of middle school students with disabilities. The results indicated that middle school students with disabilities demonstrated the ability to use inflectional and derivational morphemes, as well as compound words in their writing.

The inflectional morpheme category was sub-divided (e.g., past tense, copula, auxiliary) to provide specific information regarding the types of morphological forms. Further research should include more specific information regarding the types of derivational morphological forms used (e.g., adding a prefix, adding *-ful* to turn a verb into an adjective).

Further research should also examine the types (e.g., possessive, contraction) and use of apostrophes. The percent of accurate use of apostrophe was significantly lower than use of other types of morphemes. This extends the research of Carlisle (1996) who found that second and third grade students used the apostrophe primarily with contractions and only with 25% accuracy.

Further research should examine the types of errors documented. Green et al. (2003) and McCutchen and Stull (2015) examined the types of errors to determine if students are using morphological inventions, novel pairings of base words and affixes. Analysis of types of errors could provide information regarding the students' ability to experiment with complex morphological forms and use generative morphological rules.

Implications for Practice

Morphological awareness allows students to decode, comprehend, and spell more effectively (Green et al., 2003). An increase in vocabulary and spelling knowledge can affect a student's writing skills, including transcription and text generation. Students with disabilities in middle school often struggle with literacy skills that require the use of complex, multimorphemic, content area vocabulary. They can encounter up to eight to ten complex, content words on each page when reading a science text (Zoski et al., 2018).

The results of this secondary data analysis indicate that middle school students displayed the ability to use a variety of morphological forms with similar use of derivational forms. When students understand derivational morphemes, practitioners can illustrate how to change a base word into a variety of parts of speech (Green, 2003). One program that reported positive results using morphological analysis is the Close Reading program by Katz and Carlisle (2009).

The Close Reading program combines instruction in morphological analysis and contextual analysis. Combining these strategies helps link decoding with comprehension. Katz and Carlisle (2009) reported positive results regarding their feasibility study with three students with reading and language difficulties in grade four. Explicit teaching of morphological analysis, such as the Close Reading program, may benefit students in middle school with disabilities.

Conclusion

The purpose of this study is to provide descriptive information regarding the use of morphological forms in writing. The present study adds to the literature on the development of student's morphological knowledge by providing descriptive information regarding the use of morphological forms in argumentative and informative writing of middle school students with disabilities. Analyzing the writing of middle school students with disabilities provides information regarding students' ability to use morphological forms in their writing in content areas. Middle school students with disabilities displayed the ability to use inflectional, compound, and derivational morphemes in writing. The

study provides researchers and practitioners information on where to begin with intervention research and instructional practice.

Appendix A

Social Studies Writing Prompt

Set A – Select a prompt to write about.



**Do you believe recycling can help keep the planet clean?
Write to explain why or why not.**



**Is it important to explore space and the surrounding planets?
Write to explain why or why not.**

Appendix B

Appendix Scoring Rubric for Informational Writing

*Adapted from Mason, Dunn Davison, Hammer, Miller, & Glutting (2012)

Topic sentence: (1 point maximum)

- Student must write make reference to the topic

Information units: (1 point for each new *content-area information unit*—no maximum limit)

- Information unit *must* present a main idea about the topic.
- An information unit can be stated in its own sentence.
 - “Thomas Edison created electric light. Edison also had over 1,200 inventions.”
- One sentence can include multiple information units
 - “Edison had over 1,200 inventions, and he created electric light.” (2 information units = 2 points)
- Do not count the same information unit more than once.
- Count items that fall under one category as one reason
 - “Thomas Edison invented electric light, known as the incandescent light bulb.” (1 information unit—inventing light)
 - “Thomas Edison invented electric light and the dictaphone.” (2 information units: electric light and dictaphone)

Explanation: (1 point for each new explanation—no maximum limit)

- Explanation must clarify why or how the informational unit is important or interesting.
- The explanation may be tagged at the end of the “informational unit”
 - “Thomas Edison invented electric light, and this invention is still used all around the world today.” (1 information unit—invented electric light and 1 explanation—used all around the world today)
- The explanation may be its own sentence
 - “Thomas Edison invented over 1,200 inventions. His inventions changed peoples’ way of life. (1 information unit—invented 1,200 inventions and 1 explanation—changed people’s way of life).
- Explanation clarifies why or how the information unit relates to the topic.
- A student can give 2 explanations for 1 information unit.

Ending

- Statement clearly indicates that the essay has ended and restates the topic.

Appendix C

Scoring Rubric for Argumentative Writing

*Adapted from Mason, Kubina, & Hoover (2013); Mason, Kubina, Kostewicz, et al. (2013); Mason, Kubina, & Taft, (2009), and Mason, Mong et al., (2017)

Belief/Topic sentence: (1point maximum)

- Student must write a belief and make reference to the topic

Reason: (1 point for each new *supporting* reason—no maximum limit)

- Reason *must* support position stated in belief.
- A reason can be stated in its own sentence.
 - “Students should have summer vacations. They can go swimming.”
- One sentence can include multiple reasons.
 - “Students should have summer vacation so they can go swimming, relax, and visit people.” (3 reasons – swimming, relax, visit)
- Do not count the same reason more than once.
- Count items that fall under one category as one reason
 - “Students should have summer vacation so they can visit their grandparents, cousins, aunts, uncles, and friends.” (5 items, but 1 reason—to visit people)
 - “Students should have summer vacation so they can visit their grandparents, go to the beach, and relax.” (3 reasons: visit people, beach, and relax.)
- If a reason supports opposing position, give 1 point for counter reason (see below)

Explanation: (1 point for each new explanation—no maximum limit)

- Explanation must clarify why or how the reason supports the student’s argument
- The explanation may be tagged at the end of the “reason sentence”
 - “Uniforms are ugly and this would make students angry.”
 - 1 reason (ugly) and 1 explanation (make students angry)
- The explanation may be its own sentence
 - “Uniforms are ugly. If students had to wear ugly clothes, they would be angry.”
 - 1 reason (first sentence and beginning of second sentence - ugly) 1 explanation (second sentence - angry)
- Explanation clarifies why or how the reason supports student’s belief:
- A student can give 2 explanations for 1 reason.

Counter Reason (1point maximum)

- An actual reason must be provided, just stating the opposite side does not count.
- No additional points for explanations or additional counter reasons.

Refute (1point maximum)

- An actual refute must be provided, just saying “I don’t agree” does not count.
- No additional points for explanations or additional refutes

Ending

Statement clearly indicates that the response has ended and restates belief on the topic

Appendix D

Informative Quick Write Assessment – ASSESSMENT #2

Materials:	Time Limit:	Repetitions:	Student Questions:	Erasing:
Assessment Sheet Pencils/pens Lined paper Prompt set Stopwatch/Timer/Phone	Allow 10 minutes	Instructions may be repeated as necessary. You may reread the prompt as necessary.	If a student asks a question, say, "Please do your best."	Say, "Remember to not use erasers," if you see students erasing during test writing time.

Mark each step with a checkmark as it is completed:

___ To begin administration, ask each student to clear their desk & get out a pen or pencil.

___ Say, **"Do not write anything until I say BEGIN."**

___ Pass out 2 sheets of lined paper to each student. Give each student a copy of the prompt, face down on the desk. Say, **"Do not turn the page over until I ask you to."**

___ Say, **"You will be using a pen or pencil to complete this assignment. If you make a mistake, do not use an eraser. Just cross out any errors and continue writing."**

___ Say, **"I would like you to write an informative response on the lined paper I gave you. You may turn over the other sheet on your desk. Please select one of the prompts on the page with the pictures."**

___ Read each prompt twice.

___ Say, **"Do your best writing, and also write neatly so I can read it later."**

___ **"If you'd like, you can use the second sheet of lined paper to plan what you will write. Do not write on the paper with the pictures and the prompt."**

- ___ When the students are ready, say, “**Begin.**” Start the timer.
- ___ If students are writing at the end of 5 minutes (300 seconds), say “**You have 5 more minutes to write.**”
- ___ If students are writing at the end of 9 minutes (5400 seconds), say “**You have 1 more minute to finish.**”
- ___ At the end of 10 minutes, say “**Stop**” and check the box marked 1

Appendix E

Morphological Coding System (Based on Carlisle, 1996)

Description of Error Types

1. Errors of omission: Determined by the lack of a morphological marker in an obligatory context. An obligatory context is the linguistic context, including the influences of prior and subsequent context, which determines the need for a given marker (e.g., subject–verb agreement).
2. Errors of commission: Involve the use of incorrect morphemes or forms of words. Morphemes must be spelled correctly. There can be a misspelling in the root word, but not the morphological ending. If a spelling rule for adding the ending is violated (e.g., comeing), an error of commission is recorded.

Morphological Forms to Be Coded and Guidelines for Error Coding

1. Past tense verbs: regular (e.g., jumped) or irregular (e.g., swam). The irregular form must be spelled correctly.
 - a. Error of omission: “She has a friend name Sarah.”
 - b. Error of commission: “I like to talked to my sister.” “She seen him yesterday.”
2. Participles, whether used with auxiliary verbs, participles, or gerunds
 - a. Error of omission: “The boys are eat lunch.”
 - b. Error of commission: “She going to the store yesterday.”
3. Copula (contractible and uncontractible): A form of the verb to be used with a predicate noun or a predicate adjective.
 - a. Error of omission: “He a fireman.”
 - b. Error of commission: “He were a fireman.”
4. Auxiliaries (contractible and uncontractible)
 - a. Error of omission: “We playing baseball.”
 - b. Error of commission: “She are eating a hot dog.”
5. Plurals (regular and irregular)
 - a. Error of omission: “The boy played with all the dog.”
 - b. Error of commission: “The cats is in the box.”
6. Possessives
 - a. Error of omission: “The monkey banana is on the floor.”
 - b. Error of commission: “The cup’s are in the kitchen.”
7. Comparatives and superlatives
 - a. Error of omission: “He is big than she is.”
 - b. Error of commission: “That is a biggest ball.”
8. Compounds: Words containing two or more root words (e.g., everyone, baseball, cowboy, sunshine, clubhouse). Count as either correct or incorrect (no differences between omission and commission errors).

9. Derived form: Any derivationally affixed word with a free root word (e.g., teacher, quickly, national, thoughtful).

Appendix F

Codebook

*Adapted from Carlisle, 1996

What is a morpheme?

- Smallest meaning unit in language
- Consist of a base word “boat” + affix (s) = boats
 - Affix includes both suffix and prefix
 - cats = cat + suffix (s)
 - regroup = prefix (re) + group

How many morphemes are in each word?

- Dogs = dog + s (2)
- Railroad = rail + road (2)
- Respelled = re + spell + ed (3)
- Misunderstanding = mis + under + stand + ing (4)

3 **types** of morphemes (in developmental order)

Inflectional- Inflectional morphemes convert base words by modifying time, number, possession, or comparison such as adding “-ing” to “jump” to create “jumping”. Inflectional morphemes do not change the grammatical category of the word, for example “jump” and “jumping” both continue as verbs.

Compounds- Words containing two or more root words (e.g., everyone, baseball, cowboy, sunshine, clubhouse).

Derivational- Derivational morphemes alter base words by modifying their meaning and changing their grammatical category such as adding “-er” to “sing” to form the new word “singer” (Apel et al., 2013).

Morphological Forms to Be Coded and Guidelines for Error Coding

Description of Error Types

1. Errors of Omission: Determined by the lack of morphological marker in an obligatory context. An obligatory context is the linguistic context, including the influences of prior and subsequent context, which determines the need for a given marker (e.g., subject-verb agreement)
2. Errors of Commission: Involve the use of incorrect morphemes or forms of words. Prefixes and/or suffixes must be spelled correctly. There can be a misspelling in the root word, but not the morphological affix. If a spelling rule for adding the ending is violated (e.g., comeing), an error of commission is recorded.

Inflectional Forms

1. **Past tense verbs:** regular (e.g., jumped)
irregular (e.g., swam) (Irregular form must be spelled correctly)

Regular Examples:

- a. Correct usage: “She has a friend named Sarah.”
- b. Error of omission: “She has a friend name Sarah.” (should be named)
- c. Error of commission: “I like to talked to my sister.” (should be talk)

Irregular Examples:

- a. Correct usage: “She saw him yesterday.”
- b. Error of omission: “She see him yesterday.” (should be saw)
- c. Error of commission: “He went tomorrow. (should be goes)

2. **Copula:** (contractible or uncontractible)

A linking verb, often a form of the verb “to be”, used with a predicate noun or predicate adjective (modifies the subject and linked to the subject with a linking verb.)

Connects subject to subject complement (describes or identifies the subject.) A stand-alone linking verb.

Contractible example: That's, it's

- a. Correct usage: "He's a fireman."
- b. Error of omission: "That a fireman." (should be That's)
- c. Error of commission: "Thats the end." (should be That's) (a spelling rule for adding the ending is violated)

Uncontractible example: is good, are small

- a. Correct usage: "He is a fireman."
- b. Error of omission: "He a fireman." (needs is)
- c. Error of commission: "He were a fireman." (should be was)

3. **Auxiliaries:** (contractible and uncontractible)

A helping verb, often in the form of "be, have, do, may, might, would"

Helping verbs: am, is, was, were, be, being, been, have, has, had, do, does, did, may, might, must, will, would, shall, should, can, could

Examples: do believe, don't think, should have, I'm picking, you're

Contractible example:

- a. Correct usage: "I don't think it is right."
- b. Error of omission: "Your going to the store." (should be you're)
- c. Error of commission: "I dont think it is right." (should be don't) (spelling rule for adding the ending is violated)

Uncontractible example:

- a. Correct usage: "We are playing baseball."
- b. Error of omission: "We playing baseball." (needs are)
- c. Error of commission: "She are eating a hot dog." (should be is)

4. **Participles:** (words derived from verbs that can be used as an adjective, noun, or combined with the verb "to be" to construct different verb tenses. Often ending in -ing or -ed.)

a participle will look like a verb (*running*) but may have a different role in the sentence: *the running water*. In this example, "*running*" functions as a participle and is describing the water and performing the function of an adjective.

- a. Correct usage: "The boys are eating lunch."
- b. Error of omission: "The boys are eat lunch." (should be eating)
- c. Error of commission: "She going to the store yesterday." (should be went)

5. **Plurals:** (regular and irregular)

Regular Examples:

- a. Correct usage: "The boy played with all the **dogs**."
- b. Error of omission: "The boy played with all the **dog**." (should be **dogs**)
- c. Error of commission: "The **cats** is in the box." (should be **cat**)

Irregular Examples:

- a. Correct usage: "The **men** are talking."
- b. Error of omission: "Get new **clothe**." (should be **clothes**)
- c. Error of commission: "The **mans** are talking." (should be **men**)

6. Possessives:

- a. Correct usage: "The **monkey's** banana is on the floor."
- b. Error of omission: "The **monkey** banana is on the floor." (should be **monkey's**)
- c. Error of commission: "The **cup's** are in the kitchen." (should be **cups**)

7. Comparatives/Superlatives:

- a. Correct usage: "He is **bigger** than she is."
- b. Error of omission: "He is **big** than she is." (should be **bigger**)
- c. Error of commission: "That is a **biggest** ball." (should be **big**)

Compounds: Words containing two or more root words

Count as either correct or incorrect. No difference between error of omission or commission.

Examples: everyone, baseball, cowboy, sunshine, clubhouse, today, awesome

Non examples: Monkeybanana

Errors include misspelled words (e.g., outsied instead of outside).

Errors include compound words that are separated (e.g., out side)

Derived Forms: Any derivational affixed word with a free root word

Count as either correct or incorrect. No difference between error of omission or commission.

Examples: teacher, quickly, national, thoughtful, believe, because, important, around, recycling, again, every, tradition, until

Errors include misspelled affixes (e.g., mostly instead of mostly).

Coding Steps

1. Open Coding Spreadsheet from Master Templates folder.

2. Save new spread sheet with student number and A or I + initials (e.g., 010101A SB) in reliability folder.
3. List all morphologically complex words on the new spreadsheet exactly as written by student (include title).
4. Code use of morphological form as the number “1” in the correct column.
5. If an error is identified, code the type of error as omission or commission for inflectional forms as a number “1” under “type of error” or “# of errors” in derivational or compound.
6. Save
7. Copy totals from last row and Paste to your identified “Combined Coding Scores” sheet.
8. Add student number in first column.

Extras

1. If a morphologically complex word can fit into 2 categories (e.g., recycling) place in highest developmental category (derivational).
2. Count both uses if following 2 morphological rules (e.g., lightbulbs - compound and plural)
3. If apostrophe is omitted, code as an error of commission.
4. If an apostrophe is added to show plurality, code as an error of commission (e.g., Christmas’s instead of Christmases)
5. Abbreviations (e.g., b/c, cus) mark as an error.
6. Do not code proper nouns (e.g., Washington) unless an ending is added or omitted.

Common Coding Errors

Code as correct usage: “recycling” because there is no error in the morphological prefix or suffix.

Code as Participle error of omission: “gonna” because there is not a complete suffix.

Code as Plural error of commission: “mountain’s” because there is a spelling error in the suffix.

Appendix G

Parental Informed Consent Form



PARENTAL INFORMED CONSENT FORM

Study Title: Writing in Middle School Science and Social Studies: Exploring Instruction and Support for Students with Disabilities (Project Explore)

Dear Parent/Guardian:

My name is Linda Mason (lmason20@GMU.EDU). I am a Professor in the Division of Special Education and disAbility Research at George Mason University. I am asking for your permission to include your child in my research. Your school district has approved this project.

This letter explains why I am doing this project. It explains why your child is being asked to participate. It says what your child will do. It also describes any known risks or discomforts that may happen. Please ask me questions at any time. Please sign this form if you allow your child to participate. This form is a record of our agreement. Please keep a copy of the form.

This project will be supported by grant funding from the Institute of Educational Sciences, United States Department of Education.

RESEARCH PROCEDURES

This research is being conducted to better understand how reading and writing is integrated within inclusive middle school content-area classrooms. If you agree to allow your child to participate in this project, your child will be asked to take three short writing assessments (10-15 minutes each), once in the beginning and once at the end of your child's science class this year, to help researchers understand how instruction influences student writing. Your child will receive small prizes (notebooks, pens, pencils) after they take the tests.

Researchers will also ask for descriptive information from your school records about your child including: demographics (gender, race, English language learner status, subsidized lunch eligibility), special education classification (e.g., learning disability, autism spectrum disorder) and information about the severity of your child's writing difficulties (e.g., IEP goals in writing) if applicable.

RISKS

There are no foreseeable risks for participating in this research.



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BENEFITS

There are no benefits to you or your child as a participant other than to further research about typical classroom practice that will inform future intervention development and recommendations for classroom practice.

CONFIDENTIALITY

The data in this study will be confidential. Your child will be assigned a numeric identifier that will be used rather than your child's name on all study data. The identification key linking your child's name to his/her numeric identifier will be kept in a password protected file. All data collected about your child will be stored in locked cabinets or password protected computers stored in one of the researcher's offices. Only researchers on the project will have access to the identification key and data collected in the study. De-identified data could be used for future research without additional consent from participants.

PARTICIPATION

Your child's participation is voluntary, and you may withdraw your child from the study at any time and for any reason. If you or your child decide not to participate or if you or your child withdraw from the study, there is no penalty or loss of benefits to which you or your child are otherwise entitled. There are no costs to you or any other party.

CONTACT

This research is being conducted by Dr. Linda Mason and Dr. Sheri Berkeley at George Mason University. They may be reached at 703-993-5080 for questions or to report a research-related problem. You may contact the George Mason University Institutional Review Board office at 703-993-4121 if you have questions or comments regarding your or your child's rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your or your child's participation in this research.

CONSENT

I have read this form, all of the questions I have at this time have been answered by the research staff, and I agree to allow my child to participate in this study.

Signature

Date of Signature

Name of child



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Appendix H



My name is _____ and I am from George Mason University.

I want to talk to you about a research study I am doing. In our study, we want to learn more about what happens in your science class and how it helps you with writing. Your parents have already agreed that you may take part in the study, so feel free to talk with them about it before you decide whether you want to join the study.

What will happen to me in the study?

If you would like to participate in the study, you will be asked to take three short writing tests, once in the beginning and once at the end of your science class this year. In each test, you will only be asked to write for 10 minutes. We will also get some information about you from your school records that your parents have said is okay.

What are the risks?

Nothing bad will happen to you if you participate in the study.

What are the benefits?

Nothing good will happen to you either, but you will help us to better understand what helps students like you to learn.

Will anyone know that I am in the study? (Confidentiality)

Nothing about you will be shared with anyone except the other researchers working with me.

What if I do not want to participate or decide later to withdraw?

Being in this study is voluntary. You don't have to be in this study if you don't want to or you can stop being in the study at any time.

Will I receive anything for being in the study?

You will not receive anything for being in the study.

Who can I talk to about this study?

If you have questions about the study or have any problems, you can talk to your parents, or call Dr. Linda Mason, the Principal Investigator for this study at 703-993-5080. If you have questions about the study but want to talk to someone else who is not a part of the study, you can call the Institutional Review Board office at George Mason University at 703-993-4121.

Your signature below means that you have read the above information about the study, have had a chance to ask questions to help you understand what you will do in this study, and you are willing to be in the study. Your signature also means that you have been told that you can change your mind later if you want to.

Child's Name (printed)

Signature

Date



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Appendix I



TEACHER INFORMED CONSENT FORM

Study Title: Writing in Middle School Science and Social Studies: Exploring Instruction and Support for Students with Disabilities (Project Explore)

RESEARCH PROCEDURES

This research is being conducted to better understand how reading and writing is integrated within inclusive middle school content-area classrooms. You have been selected for participation because you teach middle school science. If you agree to participate in this 2-year project, you will be asked to allow researchers to observe one of your inclusive science classes four times each year. In addition, you will participate a 30-minute follow up interview each spring (Years 1 and 2) and in one 45-minute focus group in spring Year 2. In Spring Year 2, you will also complete an on-line 25-minute survey. The focus groups and interviews will be audio-recorded.

RISKS

There are no foreseeable risks for participating in this research.

BENEFITS

There are no benefits to you as a participant other than to further research about typical classroom practice that will inform future intervention development and recommendations for classroom practice.

CONFIDENTIALITY

The data in this study will be confidential. You will be assigned a numeric identifier that will be used rather than your name on all study data. The identification key linking your name to your numeric identifier will be kept in a password protected file. All data collected about you will be stored in locked cabinets or password protected computers stored in one of the researcher's offices. Only researchers on the project will have access to the identification key and data collected in the study. Audio files will be destroyed upon transcription. Although focus group participants will be asked to keep the contents of the discussion confidential, due to the nature of a focus group, the researcher cannot control what participants might say outside of the research setting. The survey you will complete will be online. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission. De-identified data could be used for future research without additional consent from participants.

PARTICIPATION

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.



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To compensate you for time spent participating in the project, you will be given \$150 after each year you complete the study.

CONTACT

This research is being conducted by Dr. Linda Mason and Dr. Sheri Berkeley at George Mason University. They may be reached at 703-993-5080 for questions or to report a research-related problem. You may contact the George Mason University Institutional Review Board office at 703-993-4121 if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT

I have read this form, all of my questions have been answered by the research staff, and I agree to participate in this study.

Signature

Date of Signature



Project Number: 1409579-3

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Biography

Stacie Brady received her Bachelor of Arts in Early Childhood and Elementary Education from the University of West Florida in 1991. She taught school for two years in Florida. In 1997, Stacie earned her Master of Science degree in Communication Disorders from the University of South Alabama in 1997. Stacie worked as a speech-language pathologist in a children's hospital in Florida for five years. After moving to the Northern Virginia area, she worked as a speech language pathologist using evidence-based programs to address student's significant communication and literacy needs. Beginning in 2016, Stacie was employed at George Mason University as a trainer for the Accessible Instructional Materials Center, a Virginia Department of Education funded center, where she provided professional development to educators and administrators regarding the benefits of accessible reading and how to use assistive technology. While employed by George Mason University, Stacie completed a second Master's degree in 2017 in Curriculum and Instruction with a focus on Assistive Technology.