Morphological Awareness Analysis in the Writing of Grade 3 and 5 English First and Second Language Learners

by

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B.A.H. Queen's University, 1987
PDP Simon Fraser University, 1993

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Abstract

The current longitudinal study examined the development of morphological awareness (MA) in the writing of 59 (27 EL1, 32 ELL) participants in grade 3 and grade 5, using an experimental morphological error type scoring (METS) guide. The researcher -developed METS guide provided an in-depth analysis of inflectional and derivational morphological usage across five categories: omissions (MO), morphological spelling errors (Msp), morphological attempts (Mat), wrong word (WW) and wrong homophones (WH). Standardized literacy measures evaluated spelling, oral vocabulary and oral syntax. For all grade 3 to grade 5 participants the total morphological errors (TME) and morphological omissions (MO) decreased and the morphological attempts (Mat) increased. Increases in oral syntax and vocabulary correlated to increased writing performance and decreased total morphological errors (TME). Differences were observed in the correlation analysis across all morphological measures between language groups (EL1, ELL). Using a detailed morphological error analysis in children's writing may provide an accurate measure of the development of morphological awareness and patterns of usage for morphological structures in the writing samples of diverse language groups.

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Acknowledgments

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Introduction

The recognition and inclusion of diverse student populations in Canadian schools has increased the need for a more thorough understanding of the developmental trajectory of literacy skills. It is accepted that early literacy skills impact later literacy gains and children who lag behind in early reading and writing development encounter greater difficulties as the literacy demands increase with grade level (Deacon & Kirby, 2004; Nagy, Berninger, & Abbott, 2006). The role of morphology in early literacy development has been linked to spelling, vocabulary acquisition and reading comprehension (Nagy, Carlisle, & Goodwin, 2013; Bahr, Silliman, Berninger, & Dow, 2012; Pacton & Deacon, 2008; Bryant & Nunes, 2008). Understanding the complex development of morphological awareness in children's writing depends on an accurate method of measuring the morphological structures being used in their writing. The words on the page do not change but the method by which they are scored and analyzed may produce very different results (Deacon, S.H., 2008).

The development of morphological awareness in children's paragraph writing will be examined using an experimental measure of morphological error types and this study will provide the opportunity to trial the researcher designed measure and determine the effectiveness of a detailed morphological error scoring (METS) guide for identifying and analyzing the type and category of morphological errors in the writing samples of Grade 3 followed to Grade 5 writers with diverse linguistic backgrounds. The experimental

METS guide used in this study has been designed to measure inflectional and derivational morphological usage in five categories: omissions (MO), morphological spelling errors (Msp), morphological attempts (Mat), wrong word (WW) and wrong homophones (WH). Identifying patterns of morphological usage across language groups and longitudinally may contribute to a broader understanding of the development of MA in relation to the production of written output by identifying similarities and differences in the pattern of MA development of diverse language groups. The writing samples for this study are taken from a larger longitudinal project with first wave grade 3 results recently published (Harrison, Goegan, Jalbert et al., 2016). Measures of oral syntax, oral vocabulary, spelling and overall writing performance from the original study have been included to provide a broader understanding of possible influences on the development of morphological awareness in children's early writing. It is important to first establish a clear definition of morphology and morphological awareness; explore relevant theories of the writing process for ELL and EL1 in relation to other literacy skills (oral vocabulary, oral syntax, spelling and overall writing); and provide connections supporting the design and use of the experimental measure.

This study accepts morphology as a unique and valid construct, acknowledged in the study of linguistics, speech and language pathology, education, and second language acquisition. This provides a rich collection of information but has also resulted in variations in definitions and approaches that may impact the validation of specific measures for evaluation morphological awareness (Apel, 2014; Deacon, 2008; Northey et al., 2016). Within the study of linguistics there is some debate over the best approach to the understanding of morphology: a *morpheme based* approach (a building block

approach where words are constructed and deconstructed; a *lexical based* approach (words are assembled based on function and meaning); and a *word based* approach (a combination of the other two approaches) (Hockett, 1947). Historically, the *morpheme-based* approach has been used in educational research but this is now changing to a *word-based* approach as it recognizes the morpheme and the lexeme, and relates both to grammatical structures (Giraudo, 2007). This study assumes a *word- based* approach as it provides the most comprehensive and inclusive understanding of morphology. This study also accepts the definition of morphological awareness as "the awareness of spoken and written forms of morphemes; the meaning of affixes and the shift in meaning and grammatical class they bring to base and root words; and the relation between base words and their inflected or derived forms in terms of meaning" (Apel, 2004; Northey, McCutcheon, & Sanders, 2016).

Children are first exposed to morphological structures in the spoken language around them (Brown, 1973). The oral use of morphological structures is considered to be *tacit* (unconscious) and as morphological awareness develops, the use of morphological structures to manipulate and create meaning become *explicit* (conscious); children recognize the different ending between the morphemes *star* and *start* and are able to consciously choose the more appropriate word to express their meaning (Nagy et al., 2013, Spencer, 1994). Brown (1973) established a 5 -stage development of morphological structures in oral language based on the mean length of utterance (MLU) *and* he determined that by age five, the average child was able to use verbally, most of

the major morphological manipulations (inflectional forms)[1] of the English language. Brown (1973) also found that linguistic complexity and not the frequency of exposure to morphemes (listening to adults speak) predicted the order of acquisition. Linguistic complexity combines the number of rules required for a morpheme and the number of meanings encoded in the morpheme. For example, the plural morpheme encodes only number and is therefore number four on Brown's list of the first fourteen morphemes while the third person singular (he jumps) includes both number and time it is 10th on the list. Brown (1973) studied the development of 14 grammatical morphemes in children's early speech and determined that the first morphemes to be acquired were prepositions (in, on), plural 's', and the present progressive inflection 'ing.' Children consistently used these same morphemes in their early writing (Turnball, Deacon, & Kay-Raining Bird, 2011 cited in Bahr et al., 2012). Parallels have been observed for older children between the development of oral language and the production of written text (Abbot & Brenner, 1993); Hidi & Hidyard, 1984; McCutcheon, 1986; Shanahan, 2006). Inflectional structures and some familiar derivational structures appear first in children's writing, followed by more complex derivational structures (Anglin, 1993; Berninger, et al., 2009; Carlisle, 2000; Kemp, 2006; Rubin, Patterson & Kantor, 1991; Tyler & Nagy, 1989). Research continues to investigate the use of morphological structures in the early speech patterns of young children (EL1 and ELLs) to build a more comprehensive understanding of the development of morphological awareness (Nunes, Bryant, & Bindman, 1997;

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[1] ***Inflectional*** *morphemes*: changes the form of the word to meet syntactical requirements (grammatical) and are considered semantically regular (grammatical meaning change only). Categories include: plurals, possessive, comparatives, superlative, verb forms and suffixes. ***Derivational*** *morphemes*: changes the meaning of the word, part of speech, and are not considered semantically regular. Categories include: affixes (suffix and prefix) that create adjectives, nouns, and adverbs with new meaning different from the base.

Keiffer & Leseaux 2012). While this may at first appear to be a linear development, there is some evidence to suggest a more complex, multidirectional pattern in the case of MA development and writing (Rubin et al., 1991).

The triple word form theory provides an important understanding of the differences in morphological usage in English. According to this theory, phonological, orthographic and morphological strategies are evident at most levels of language development, but the level of influence of the individual strategies may differ with experience and age (Berninger et al., 2009). Using a combination of strategies to spell new words (letter and word recognition, sounding out, application of rules, word meaning) requires an increasingly broader exposure to morphological structures and may occur with increases in age and grade (Senechal & Kearnan, 2007). For this reason, the development of MA may contribute to writing on several different levels (decoding, word meaning and grammar) through its connection to spelling (Deacon, Kirby & Casselman-Bell, (2009). Beers & Beers (1992) examined the use of the following morphological structures in children's spelling: *s* (plural), *ed* (past regular verb) and *ing* (continuous verb). Children in Grade 3 have a higher dependence on phonological and orthographic strategies (in spelling), but by Grade 4 begin to increase their use of morphological strategies (Bahr et al., 2012; Berninger et al., 2009). The use of multiple strategies is evident in the correctly written word *cows* in the sentence; *there are two cows in the barn*. The writer is aware that cow is spelled with a c not a k (phonological and orthographic understanding) and that the word *two* means more than one and therefore adds a (morphological structure) plural 's' to the related noun (*cow*) to correctly indicate the plural form. Identifiable plural forms (s, es or new word) represent the idea of more

than one. Using the correct form in context suggests an awareness of morphological structures and this may contribute to more successful writing achievement. However, a writer who writes *kow* in place of *cows* demonstrates a correct phonological awareness but an incorrect orthographic (K for C) and morphological (omits the plural). Children who rely on a single strategy (e.g. phonological) may experience delays in later literacy development as their skill level may be limited by a dependence on lower level strategies (Bahr et al., 2012; Kemp, 2006; McCutcheon, Stull, Herrera, Lotas and Evans, 2013; Nagy et al., 2013). MA continues to develop through the school years, with a shift from inflectional to derivational between grades 4 and 6 (Bahr et al., 2012). However, it is not yet known if this remains consistent for children coming from diverse language backgrounds.

Early studies assumed a linear progression from oral to written morphological development, and from inflectional to derivational structures. Nunes et al., (1997) in a longitudinal study of the spelling patterns of children ages 6 to 10 years, found signs of attempted inflectional morphological structures in the plurals *s* and past *ed*. The contribution of attempts to the understanding of the development of morphological awareness was a basis for the design of the METS guide. The error categories for the experimental scoring guide (METS) may capture possible trends within inflectional, derivational and grammatical structures by recording an omission of morphological structures, an attempt at morphological structures, or a misspelling of a morphological structure. This is further complicated by the fact that writing is componential, relying on the interplay of a variety of skills including spelling, vocabulary, and syntax. Research has established that morphology plays a role in each of these areas of literacy

development but morphology itself is not a single skill (Nagy, et al. 2013). Looking at specific skill areas may provide further insights in to the developmental role of morphological awareness in literacy outcomes.

Including a measure of children's spelling may be helpful in isolating linguistic features (e.g. plurals, subject verb agreement, adjective formation) that may contribute to the development of MA. Spelling is a complex process that combines a complex range of sub-skills including working memory, the letter to sound (phonology) and vocabulary meaning (Berninger, 1999; Schoonen et al. 2012). Current research in spelling development (phonological, orthographic and morphological) suggests that individual variability may also contribute to writing performance (Bahr, Stillman, Berninger & Dow, 2011; McCutcheon, Stull, Herrera, Lotas, Evans, 2013). Children are exposed to increasingly more complex morphological words in speech and in print, and their ability to manipulate these complex morphemes in writing to create meaning may be aided by their level of MA (Bahr et al. 2012; Nagy et al., 2013). These findings suggest that the development of MA may reflect more sophisticated literacy knowledge and result in greater spelling outcomes. Berninger (1999) demonstrated that spelling predictors in early grades included non- word reading (orthographic and phonological coding), rapid alphabet letter printing, verbal IQ (vocabulary meaning) and the ability to analyze and reproduce new geometric shapes; predictors in later grades were primarily letter-sound relationship in non -word reading (orthographic and phonological coding) and vocabulary knowledge. This is further explained in Bahr et al. (2012) study of grades 1 to 9 writing and spelling development as *non-linear*, supporting a word -specific approach that involved phonology, orthography and morphology (*triple word-form*). Deacon, Kirby and

Casselman-Bell (2009) found in their study of children 7 years old that MA made a unique contribution to spelling outcomes at the word level. Kemp (2006) proposed that MA played an important role in the early learning of morphological structures (e.g. plural forms ‘s’ ‘es’) and suggested that the explicit level of MA may be a determining factor in the correct usage of morphological structures. The spelling strategy used by children may be dependent on the level of explicit MA. For example, many of the spelling patterns in complex morphological words can be explained with morphological rules (inflectional and derivational) such as, change the letter *y* to *i* and add *es* when forming a plural of the word *pony (ponies)*. Tyler and Nagy (1989) identified differences between the use of derivational affixes from grade 4 to grade 8. According to their study, the use of neutral (stand alone root word e.g. farmer) was readily accessible to younger grades but an understanding of non-neutral (quantity) affixes was not fully represented until grade 8. Nunes, Bryant and Olsson (2003) examined psuedoword spelling of 8 and 10 year olds and found that children showed some awareness of the *ion* and *ian* differences but this awareness did not lead to consistently correct spelling and there is continued debate as to whether or not knowing and understanding the rules helps children to predict accurately the spelling patterns of more complex morphemes (Nunes, et al., 2003; Pacton & Deacon, 2008). This is particularly interesting as ELLs may also be unfamiliar with the morphology associated with English spelling patterns.

Studies of children’s written English (word level measures) in grade 1 and grade 2 show minimal signs of knowledge of morphological patterns orally and written; correct *inflectional* structures have been shown to occur more readily after grade 3 and more reliably between grades 4 and 6 (Carlisle, 1996; Green, L., McCutchen, D., Schwiebert,

C., Quinlan, T., Eva-Wood, A., & Juelis, J., 2003; Nagy, et al., 2006). The use of derivational structures is less frequent in children's writing before Grade 5 (Tyler & Nagy, 1989; Green et al., 2003). However, findings by Deacon (2008) suggest that children's knowledge of morphological spelling patterns (inflectional and derivational) may be stronger at an earlier age but the children may not demonstrate this across all conditions for a variety of reasons including the measure used to evaluate the spelling, the context and the age of the child. Returning to the previous discussion of the morphological awareness in early oral language, children were found to use simpler morphological structures before more complex structures (Brown, 1975). Similarly, in children's writing samples it is expected that younger children will use less complex morphological forms and with less accuracy (Deacon et al., 2009; Green et al, 2003). In terms of production, children may demonstrate limited morphological awareness but this is not to say that children do not have knowledge of more complex forms, enabling their comprehension in reading and listening.

Research suggests that MA may contribute more than previously thought to reading and spelling development in ELLs (Geva, Massey-Garrison, 2012); Marinova-Todd, Siegel, Mazabel, 2013; Schoonen et al. (2012).). Consistent with the componential view of writing, researchers agree that spelling is a predictor of writing for ELLs (Harrison, Ogle & Keilty, 2013; Schoonen et al. 2012). Current research in spelling development (phonological, orthographic and morphological) suggests that individual variability (e.g. language, learning preference, cognitive ability, exposure) may contribute to writing performance (Bahr, Stillman, Berninger, Dow, 2011; McCutcheon, Stull, Herrera, Lotas, Evans, 2013). However, it is not yet determined if ELLs follow the same

literacy developmental trajectory as their EL1 peers. Keiffer & Leseaux (2008) found evidence to suggest that ELLs may use a different order of strategies or different strategies for a variety of reasons (e.g. the morphology of their native language and exposure to instruction). Given that different languages support different morphologies it would seem reasonable to assume that having more than one language may contribute to a greater sensitivity to morphological structures. It is expected that there will be differences in the number and category of morphological errors and attempts from grade 3 to grade 5 writing for all participants. According to the above research, ELLs may employ different strategies in their writing but it is not expected that these will be reflected in the number of total morphological errors.

Approximately half of the words in the English language are considered to be morphologically complex and learners are exposed to increasingly morphologically complex words as they move up in grade levels, thus demanding a greater level of MA (Anglin, 1993; Nagy & Anderson, 1984). Vocabulary is not just the definition of words, it is the combination of the sound, the spelling and the structure used to build the word meaning for its application in a particular context (Bahr et al., 2012; McBride-Chang, Wagner, Muse, Chow and Shu (2005). A study of children grades 1 to 9 by Bahr et al. (2012) suggests that *word-specific* spelling patterns, pronunciations, and morphological structures are all stored and retrieved through a mental lexicon (store of words and word parts). Building a stronger mental lexicon involves understanding how words are constructed (morphemes, affixes) and how they fit together (grammatically) to create meaning. The increasing application of morphological structures is thought to correspond to an increasing exposure to more complex morphological structures in speech and in

print both in school and at home (Deacon & Kirby, 2004; Nagy, et.al, 2006). Producing and understanding precise word choices that convey concise meaning indicates a higher level of MA (eg. the word *farmer* replaces the descriptive phrase *the people who farm)* (Apel, 2014). A study by Tyler and Nagy (1989) examined the knowledge of derivational suffixes for children in grades 4, 6 and 8 and found that neutral derivational suffixes (no vowel/stress change and can attach to *a free* base *as in* happi-ness and curious-ness) were more likely to be overgeneralized than non-neutral derivational suffixes (may affect vowel/stress and can attach to *bound* roots such as *ity (ident-ity, univers-ity, curios- ity*) as children can apply knowledge (general rules) in the first instance to a wider range of words (e.g. add er to the verb to name the person doing the action) but rely on repeated exposure to the whole word in the case of the second instance. A longitudinal study among monolingual children grades 2 and 3 by Sparks and Deacon (2012), found that MA contributes to vocabulary growth but vocabulary growth does not contribute to greater MA. From this Sparks and Deacon (2012) proposed that vocabulary growth appears to be dependent upon the increasing development of MA in children. Reviews of targeted vocabulary interventions concluded that vocabulary instruction without considering morphological awareness contributed little to overall literacy gains (Marulis & Neuman, 2010).

A longitudinal study by Jean and Geva (2009) found that ELL participants (grade 5 to 7) had less vocabulary knowledge compared to their EL1 peers. Differences in vocabulary between EL1 and ELLs may be related to sub skills influencing MA at the word level (Sparks & Deacon, 2012). Research shows that lower levels of vocabulary growth have been associated with gaps in reading comprehension for ELLs; this in turn

may limit exposure to more complex morphological forms and result in lags in vocabulary development (Deacon & Kirby, 2004; Geva & Massey-Garrison, 2012; Goodwin et al., 2013; Nagy & Anderson, 1984; Silverman, Proctor, Harring, Hartranft, Doyle and Zelinke,). Jean & Geva (2009) found that the speed of receptive vocabulary growth was greater for EL1s than ELLs by grade 6. Harrison et al. (2015) found that EL1s and ELLs in grade 3 demonstrated similar writing skills despite differences in oral vocabulary and oral syntactic knowledge. ELLs may be relying on other skills and strategies to support early writing attempts and for this reason MA may play an underlying role as it has been shown to influence spelling, vocabulary and oral syntax. Studies involving ELL literacy propose that the link between MA and vocabulary may be *language specific*, and exposure to other languages (orally) may have an impact on writing strategies *(*Marslen-Wilson, Tyler, Waksler, and Older, 1994; Ku & Anderson, 2003; Keiffer &Lesaux, 2012; Sparks & Deacon, 2013*)*. Being able to assess the oral syntax and oral vocabulary in relation to the morphological errors may provide more information regarding differences between MA children express orally and the MA evident in their writing. As previously stated, the development of MA in writing is expected to parallel the development of MA in oral language.

Morphological awareness has been identified at all levels of literacy learning and as a sub-skill it plays an important albeit poorly understood role in writing development, "morphology stands at the interface between the lexicon (mental store of words), phonology and syntax" (Spencer, 1994). The ability to link single words to create meaning requires a complex series of processes that interact to translate thoughts into comprehensible written communication (Abbott & Berninger, 1993; Berninger, 2000;

Schoonen et al., 2002). Hayes and Flower (1980) proposed a cognitive theory of writing based on three stages: planning ideas, translating ideas into words and revising. Berninger and Swan (1994) refined the translation process into smaller sub processes: *transcription* (spelling & handwriting) and *text generation* (word retrieval & sentence construction). It is during the translation process that morphological structures are manipulated to create meaning at the word and text level. It is the interplay of a variety of skills and strategies that contribute to the writing process. For example, knowing how to spell a word (letter by letter) or knowing the definition of that word based on the root and prefix may not guarantee the meaningful and correct usage of that word in a sentence without an understanding of syntax. Similarly, memorizing the morphological 'rules' dictating the formation of the English language does not ensure that a student will demonstrate proficiency in the application of those rules. Children with a more sophisticated awareness of morphology in writing may be considered better writers due to a greater fluency during *transcription* and *text generation.* As Brown (1973) suggested, there may be a progression in the development of morphological awareness that may contribute to the successful interaction of linguistic skills (phonology, morphology, syntax, semantics) and lead to overall writing fluency (Harrison et al., 2015; McCutcheon, 2000; Schoonen et al., 2002).

McCutcheon (1996) found that children lacking *transcription* skills spent more energy on letter formation and spelling, the increased focus on *transcription* reduced the cognitive resources available for more complex processing required for *text generation*. For example, automatic word recall in short term memory may free up working memory for higher level processing attempts such as manipulating more complex morphemes. In

this way, a higher MA may allow writers to communicate complex ideas more fluently due to the reduced cognitive load during *transcription* and *text generation* (McCutcheon et al., 2013). Berninger, Nagy & Beer, (2011) found that *text generation* was improved with the use of targeted, morphological strategies that included both *inflectional* and *derivational* forms. There is some debate as to the role of MA in the writing process. Explicit instruction has been shown to improve the writing of unskilled learners (Nagy et al. 2013; Bowers et al., 2010). However, in studies of morphological interventions, gains in the targeted area of instruction have not been shown to transfer to more complex literacy tasks such as *text generation* (Deacon et al., 2010; McCutcheon et al., 2013; Apel & Diehm, 2013; Nagy et al., 2013). MA is embedded in a number of skills related to language development, making it more difficult to accurately measure.

Research in literacy for ELL and EL1s has demonstrated a relation between MA and literacy skill level but it is still not completely understood where MA development intersects with other sub skills during *transcription* and *text generation* for ELLs (Anderson & Li, 2006; Deacon et al., 2012; Ku & Anderson, 2003; Schoonen et al., 2002). It has been established that ELLs perform the same or higher than EL1 peers on overall word level tasks (i.e., reading and spelling in isolation), suggesting a similar phonological and orthographical development (August & Shanahan, 2006; Harrison et al., 2013; Schoonen et al., 2002). A correlational study of grade 5 and grade 8 students by Northey, McCutcheon & Sanders (2015) found evidence that morphological skills related to vocabulary and syntax influenced writing performance. Similarities and differences in EL1 and ELL writing in the early and later years may be explained in part by the triple word theory as developing writers progress to using more sophisticated morphological

strategies and complex structures. Early exposure to a second language has been linked to stronger first language and second language writing skills; the awareness of different languages and cultures provides a broader exposure to structural differences in languages resulting in a greater awareness of words and their function (Arecco & Ransdell, 2002). However, the morphology of the first language in relation to the morphology of English has been shown to be a factor; Korean native speakers were found to be more disadvantaged than Slavic native speakers (Arecco & Ransdell, 2002). The impact of social and cultural experiences plays a role in the development and patterning of strategies as the exposure to the morphological structure of more than one language may broaden the awareness of the function of words and syntax to create meaning (Arecco &Ransdell, 2002; Marinova-Todd et al., 2013). This is further supported by the findings in Harrison et al., (2015) that ELL writing skills were the same as their EL1 peers even though the ELLs were shown to have lower oral vocabulary and syntactic knowledge.

Developing an accurate measure of the use of morphology in children's writing has been mostly focused on isolated word tasks requiring children to choose or manipulate affixes. There is an ongoing debate about which tasks measure the explicit application of morphological rules in children's writing (Apel, Diehm & Apel, 2013; Pacton & Deacon, 2008). Morphology in written expression is linked to spelling (affixes), vocabulary (word choice and meaning) and syntax (grammar) (Anglin, Miller, & Wakefield, 1993; Berninger, Abbott, Nagy & Carlisle, 2009; Carlisle, 1994; Green, et al, 2003; Ku & Anderson (2003); Nunes & Bryant, 2006). This has contributed to the diversity in approaches to measuring MA development. Numerous tasks have been used, each capturing a particular morphological structure at the word level. Examples include

oral and written tasks such as: segmenting tasks (clap out how many parts you hear in the word); affix identification tasks (circle the ending e.g. running); analogy tasks (e.g. *a person who does art is an* ...?); spelling multi-morphemic words (dressing); and complete the sentence task (He works on a farm. He is a farmer.). Using isolated word tasks designed for measuring reading comprehension and word knowledge (e.g. word completion: choosing correct past tense affix 'ed' to create past tense) may be only partially accurate in evaluating MA in writing samples due to the complex role of morphology during the writing process (Apel, 2014; Deacon, 2008). Similarly, tasks designed to measure MA in relation to reading comprehension may not be appropriate for measuring MA in writing (Apel, 2014). More recently, studies have begun to use authentic student writing samples to look specifically at the development and role of MA specifically in writing (Apel, 2014; McCutcheon, Stull, Herrera, Lotas, Evans, 2013); Northey, McCutcheon, & Sanders, 2016).

The current study uses morphological error analysis of student's writing as it provides a rich collection of information relevant to the understanding of literacy acquisition in a variety of learning environments (Baedeker, 1987; Berninger et al.2011; Bahr et al., 2012). A detailed spelling error analysis of children's writing provides the opportunity to look more closely at the patterns of morphological errors and how these may be related to literacy development, specifically writing. Bahr et al., (2012) argues for the use of an *unconstrained*[2] approach to scoring errors as this encourages a precise understanding of error patterns. Looking at previous research using error analysis provides valuable insights that have guided the development of the scoring guide used in

[2] *unconstrained*: words may be spelled incorrectly but there is an identifiable match to error type based on phonology, orthography or morphology.
constrained: allowable spellings include those that have an acceptable phonological spelling.

this study. Bahr et al. (2012) provided a more comprehensive *Phonological, Orthographic and Morphological Assessment of Spelling* (POMAS), including inflectional and derivational affixes. McCutcheon and Stull (2015) included three categories of error type in their study of MA in children's writing: 1) *errors* indicate what students are still struggling to learn; 2) the *attempted* show what they have learned (but not yet fully mastered); and 3) *correct* usage demonstrates what learners have mastered. The use of a detailed morphological error type scoring may reveal patterns not discernable in previous studies that used a single 'morphological error' coding with limited separation between and within inflectional and derivational structures. Knowing how students choose and produce words during text production may help to establish a clearer picture of the developmental path of morphological awareness in writing (Bahr et al., 2012; Deacon, 2008; Green et al., 2003; McCutcheon & Stull, 2015). This longitudinal study uses an experimental morphological error scoring guide to examine the use of morphological structures in the writing sample of grade 3 and grade 5 participants from diverse language backgrounds. Including of a measure of overall writing performance and relevant sub-skills (spelling, vocabulary, oral syntax, oral vocabulary) may contribute to a more comprehensive analysis of patterns in the use of morphological structures over time.

The current study investigates four research questions to determine the effectiveness of the experimental scoring guide (METS): 1) Are there significant differences in the total morphological errors (TME) for grade 3 and grade 5 writers? 2) Are there significant differences in the total morphological errors (TME) between language groups (EL1 and ELL)? 3) Are there differences in the category of

morphological errors for grade 3 and grade 5 writers (morphological omissions (MO), morphological attempts (MAt), morphological spelling errors (Msp), Wrong Word (WW), and Wrong homophone (WH)? 4) Are there differences in the category of morphological errors between language groups (morphological omissions (MO), morphological attempts (MAt), morphological spelling errors (Msp), Wrong Word (WW), and Wrong homophone (WH)?

Method

In order to address the research questions, data from a longitudinal study was used and an experimental scoring guide was developed and used for an in depth analyses of morphological errors in writing samples of grade 3 and grade 5, ELL and EL1 students. The writing samples examined were collected as part of a larger longitudinal study (Harrison et al. 2016) examining writing development in ELL and EL1 children from grades 3 to 5. Writing samples were first examined for morphological errors that were scored using an experimental morphological scoring guide (METS). The present study includes concurrent and longitudinal measures for only the group of students who participated in both grade 3 and grade 5 data collection (*n*=59).

Participants

Participants were 59 students (32 ELL; 13boys, 19 girls) (27 EL1; 16 boys, 11 girls) drawn from a larger study in a predominantly middle class neighborhood in a mid-size Canadian city (Harrison et al. 2015). In the original study, the students' language status (EL1 or ELL) was determined by teacher interviews and school collected information; it was determined that Punjabi was the first language for 90% of the ELL participants (Harrison et al., 2016). Data for the original study was collected mid school

year (February) and children completed all tasks individually during a one hour testing in the classroom. The schools were representative of the district and instruction in writing in all schools followed the grade 3 British Columbia writing curriculum and included: journaling; writing to communicate ideas and information; creative writing; and explicit instruction in spelling, grammar, punctuation and paragraph development (Harrison et al., 2016). The ELL participants began formal literacy and language instruction in English at Kindergarten, consistent with previous ELL studies (Geva & Massey-Garrison, 2012).

Only those students who participated in both the grade 3 and grade 5 assessments were included in the current study. There was a loss of 53 participants from the original grade 3 total of 112 participants (50 EL1, 62 ELL). The attrition for the missing at random data was 47% and considered to be within acceptable boundaries according to the What Works Clearing House standards. Further investigations using a one-way ANOVA compared the means for the literacy measures chosen for the Morphological study (PPVT4, WRAT 3, CASL, WIAT 2) between those grade 3 participants who continued to grade 5 and those who did not. There were no statistically significant differences found between the missing and continuing grade 3 data. The morphological data was not evaluated for attrition, as it was unique to the current study.

Measures

Measures assessing a variety of cognitive, linguistic, and literacy skills were administered at two time points, grade 3 and grade 5. Only those linguistic and literacy measures relevant to the current study are described below. The spelling, vocabulary, oral syntax and morphological error measures for the current study evaluated verbal and written output. Raw scores were used in all analyses since there are no norms are

available for the norm-referenced measures used for ELL students and the current study used only those participants retained in both waves grade 3 and grade 5 of the data collection.

Spelling. Participants' spelling skills were assessed in isolation with the *Spelling sub test* from the *Wide Range Achievement Test – 3rd Edition (WRAT 3, Wilkinson, 1993),* (Harrison et al., 2015). Children were required to spell (written) increasingly difficult, dictated words in isolation. The spelling subtest is designed to measure the ability to encode sounds into written form (WRAT 3, Wilkinson, 1993). Scores reflect the number correct. The technical manual reports adequate validity, with reliability coefficients reported in the upper .80s and .90s. The internal consistency of the items on the WRAT-3 ranges from .85 to .95. As spelling plays an important role across all areas of literacy development it is assumed that there will be some association between MA and spelling performance.

Vocabulary. Participants receptive (oral) knowledge of vocabulary was assessed with the *Peabody Picture Vocabulary Test Fourth Edition (*PPVT IV, Dunn & Dunn, 2007*)*. Participants were asked to point to one of four possible pictures that best represented a dictated word. The words increased in difficulty and children were required to use prior word exposure (context) and word knowledge to match the picture to the word presented; no reading was required. This provided a norm-based measure of each student's level of vocabulary in terms of oral word recognition and meaning. Scores reflect the number of correct responses. According to the technical manual. The internal consistency validity of the items on the PPVT- 4 range from .89 to .94 *(*PPVT IV, Dunn & Dunn, 2007). The

relationship between morphology and word meaning is a key component of vocabulary development and therefore may contribute to MA development.

Oral Syntax. Participants' level of oral syntactical knowledge was assessed with the *Syntax Construction* subtest of the *Comprehensive Assessment of Spoken Language (CASL, Carrow-Woolfolk, 1999).* Participants are asked to (verbally) give a word that syntactically matched a visual or verbal prompt. Patterns in written morphological development have been shown to follow oral morphological usage; research suggests that there may be a relationship between oral syntax and compositional fluency (Kim et al., 2011). Internal reliability for this subtest for ages 3-19 ranges from .79-.92. Test-retest reliability for this subtest for ages 5 to 17 ranges from .66 to .85. The technical manual reports adequate construct and criterion-related validity. Studies have shown that oral language skills are predictors of later literacy development.

Overall Writing. Participants' writing performance was assessed using the *Paragraph Writing* subtest of the *Weschler Individual Achievement Test 2nd Edition (WIAT II,* The Psychological Corporation, 2002*)*. Following the administration instruction for the Paragraph Writing subtest of the WIAT II, Participants were asked to write a paragraph about their favourite vacation In accordance with WIAT II administration guide and instructions, students were given ten minutes to complete their paragraph. Paragraphs were evaluated for spelling accuracy in text (100 minus percentage of errors), text fluency (word count in 10 minutes), and text content and structure (based on analytical scoring criteria as described in the WIAT-II manual evaluating text organization and vocabulary). The overall composite score for writing provides the most reliable measure of writing skill as it is using multiple points of information to determine writing skill. The

test manual for the WIAT II reports an inter-rater reliability of .82 for grade 5. (1 or 0 score you can see if internally consistent). Harrison et al. (2015) reported an inter-rater agreement of .88, consistent with inter-rater reliability estimates in the WIAT-II technical manual.

Word Count. For each writing sample the total number of words written in 10 minutes was recorded and checked against the original data in Harrison et al., (2015). Each writing sample used in the study had a minimum of 9 words. Word count was used to create a ratio to determine the number of errors in relation to the written output (productivity). It is expected that the word count will increase from grade 3 to grade 5 contributing to a greater number of opportunities for errors and correct usage. Bahr et al., (2012) used a ratio of error types (phonological, orthographic, morphological) and determined that morphological errors in relation to all error types, increased from grade 1 to 9 and mostly between grade 3 and 5. As this study attempts to isolate only morphological usage the raw data was used for statistical analysis rather than a ratio of error to word count.

Experimental Measure of Morphological Error Types (METS). The morphological error analysis looked at 59 writing samples for each Grade 3 and Grade 5, for a total of 118 writing samples (54 samples for ES1 and 64 samples for ELL). Each of the paragraphs was scored using The Morphological Error Type Scoring guide (METS) guide developed by the researcher for use in this study was adapted from the *Phonological, Orthographic, and Morphological Assessment of Spelling* (POMAS) used in Bahr et al. (2005), and focuses primarily on detailed morphological structures. The POMAS is an unconstrained, qualitative scoring system that identifies errors in three

main categories: phonological; orthographic; and morphological (Bahr et al. 2012). The error types and categories used in the METS are consistent with previous research using error analyses (Bahr et al. 2012; McCutcheon & Stull, 2015). Deacon (2008) found that error coding for parts of word spelling (e.g. affixes) rather than whole word spelling produced a more accurate evaluation of children's appreciation of morphological spelling regularities from grade 2 to grade 4. In keeping with this finding, only those errors requiring a morphological manipulation were scored for this study in an attempt to provide an accurate measure of children's awareness of morphological spelling patterns as determined by their level of MA.

To ensure reliability of scoring examples, the sample of words used in the METS were taken from errors in the children's written paragraphs as well as the *Basic Spelling Vocabulary List* grades 3 to 5 (Graham S., Harris K, & Loynachan C., 1993). Target words were identified by a combination of context and common errors consistent with the examples provided in the METs guide. The METS guide allows for the analysis of overall morphological error type (e.g. omissions, attempts, spelling errors) as well as the subsequent and more detailed analysis of the specific category of error within each error type (inflectional suffix, regular plural e.g. 's' or 'es'). Table 1 and Table 2 show the criteria for scoring morphological error type and category respectively.

Table 1. Morphological Error Type

0 – no error *1 – spelling error; omission; attempt; correct usage*	*Morphological error type (Omission, spelling error, attempt, correct)* *These are coded (O, sp, A, C) at the end of each identified structure.*	*Notes and examples*

1	Morphological spelling error (sp)	Spelling error in any of the listed inflectional or derivational structures requiring manipulation.
1	Omission (O)	Omitted morphological structure.
1	Attempt (A)	Correct morphological structure (inflectional or derivational) but incorrect application e.g. birdes (correct plural structure (s or es) but incorrect application (target: birds).
1	Correct (C)	Correct morphological structure and application
0	No error recorded	

Table 2. Morphological Categories

Category	***Sub category***	***Notes/examples***
Inflectional suffix	***Verb forms:*** *Present simple* *Simple past* *Simple past irregular* *Past participle (ed) with auxiliary* *Past participle (en) with auxiliary* *Past participle irregular* *Present participle (to be + ing)* ***Plurals:*** *regular (s, es)* *irregular* ***Possessive:*** ('s) plural (s') **Comparative** (er) Comparative irregular (more/less than)	*(see METS guide for detailed examples and notes)*

	Superlative (est) Superlative irregular (most/least)	
Pronouns	Personal Possessive Reflexive Reciprocal Relative	*I, he, she, it, ...* *His, hers, mine...* *Myself, himself ....* *Each other, one another* *That, which, whose ...*
Modals	*Should, could, would, can,* *Must, shall will ...*	*Auxiliary verb*
Derivational suffix (change to lexical category (e.g. noun to adjective)	**Lexical category** Adjective Adverb Noun	ability, acle, acy, al, ance, ate, ed, eer, ence, er, ery, ian, ibiliby, icles, ing, ion, ique, ism, ity, ive, ize, or, ory, ous, ule, ure, cy, dom, ful, hood, less, let, ling, ly, ment, ness, ry, s, ship, some, st, th, ty, war
Derivational prefix (does not change lexical category)	e.g. **un**happy	a, ad, al, be, bi, com, contra, de, di, dia, dis, en, ex, in, inter, intro, mis, non, ob, para, per, pre, re, se, sub, syn, tele, trans, un
Compound word	boathouse	Considered both inflectional and derivational. No score for omission; attempts are type of compounding (no space or hyphen as these may vary).
Root/stem/base	Noted but not scored	Root words were not included in this study to avoid possible confusion with orthographic or phonological related errors.
Homophone	Sounds the same/different	To/two (attempt)

	spelling	Tow/two (sp. error) No omission possible.
Wrong word	Correctly spelled word but does not fit context	
Word Boundary	Abook (a book)	Only correct or incorrect category used (no attempted or omission)
Not legible	Noted but not scored	

Procedure

Data collection for the larger study took place in February of the school year at each time point (grade 3 and grade 5) and students completed all activities in a quiet room during a one-hour session (Harrison et al. 2012). All measures were given in blocks with a fixed order of tasks for each block. Data was collected and scored by the first author and trained graduate students. Data from the relevant measures were used directly in the current study.

Writing samples (WIAT II paragraphs) from the longitudinal cohort from grades 3 and 5 were examined for the morphological development analysis. Morphological structures were identified then analyzed and scored according to the morphological error/correct category (see table 1). The morphological structures were then coded according to their specific morphological error type (see Table 2). The example, *He swimmed* is classified as an attempted (A) morphological structure as the *ed* is the correct past tense structure but in the wrong application. It is recorded as an inflectional suffix (IS), simple past tense irregular (par) attempted (A) and would be coded as ISparA. This error type would add a score of 1 for the larger category of morphological attempts (MAt).There may be multiple error/correct scores in one word. For example, *fols* (target

word fools) was first highlighted as an error then analyzed for the morphological category. It would be scored as both as an *inflectional suffix regular plural correct* (ISplC) and as a *root word spelling error* (RSP*)*. The inflectional suffix, regular plural form *s* is correct, the error is in the root word *fool*. For this reason the error would be scored as an RSP. RSP errors were scored and entered into the database but they were not used in the analyses. An increase in score indicates a greater number of errors. Raw scores were totaled for each morphological error type (MO, MA, Msp, WW, WH). The total morphological error (TMEsqrt) was calculated as the sum across each error type (MO+ Msp+WW+WH) for grade 3 and grade 5 separately. A ratio was then determined for each error type using the total word count written for each writing sample. The morphological error scores for each type were summed and then divided by the total words written to create a ratio for the total morphological error (TMEsqrt/WC). This ratio represents the percent of morphological errors in the total number of words written. The ratio value was used for analysis across grades as word count was expected to increase from grade 3 to grade 5.

Inter- rater reliability

To ensure *inter-rater reliability* a trained research assistant recorded and scored a randomly selected 20% of the writing samples (Bahr et al, 2015; Harrison et al. 2015). *Research Randomizer* was used to select the samples. A minimum 75% agreement is considered acceptable for this study as the level of agreement in scoring error type may be coded differently due to interpretation rather than error (Bahr et al., 2015). This is a preliminary use of the experimental METS scoring guide.

Results

Preliminary investigations found the data to have independent cases with one per student and the data was found to be linear. Assumptions of variance based on Levene's test of variance were found to be true. However, preliminary investigations indicated that the data for the total morphological error for grade 3 and grade 5 were not normally distributed. Q-Q plots revealed a high number of zeros (no errors found) in the data with only a few high counts of errors. Data for the total morphological errors was transformed using square root (Tukey, 2000). The transformed value was used for all analysis and represented as with 'sqrt' (TMEsqrt3, TMEsqrt5).

Tables 4 and 5 report the means and standard deviations for each of the literacy measures in grade 3 and grade 5 respectively and between language groups (EL1, ELL). Tables 3 and 4 report the means and standard deviations for each of the morphological categories measured according to grade (grade 3 then 5) and by language group (EL1, ELL). Grade 3 and grade 5 EL1 participants performed consistently better than grade 3 and grade 5 ELL participants on the vocabulary and syntax measures (Tables 1 & 2).

Table 3. Descriptives for Grade 3 Literacy Measures (EL1, ELL)

	Grade 3					
Measure	EL1 (n=27)		ELL (n=32)		Total (n=59)	
	M	*SD*	*M*	*SD*	*M*	*SD*
TMEsqrt3	.86	.82	1.16	.83	1.02	.83
WRAT 3(spelling)	29.14	4.48	28.34	3.03	28.71	3.75
PPVT4 (vocab)	151.15	16.95	121.16	20.99	134.88	24.32
CASL (syntax)	34.04	5.3	29.50	4.56	31.58	5.42
WIAT 2 (paragraph)	11.41	3.5	11.31	3.36	11.35	3.43

Table 4. Descriptives for Grade 5 Literacy Measures (EL1, ELL)

	Grade 5					
Measure	EL1 (n=27)		ELL (n=32)		Total (n=59)	
	M	*SD*	*M*	*SD*	*M*	*SD*
TMEsqrt5	.73	.56	1.19	.72	.98	.68

WRAT3 (spelling)	35.52	4.67	32.78	3.56	34.03	4.30
PPVT4 (vocab)	175.78	18.54	151.31	18.55	162.51	22.12
CASL (syntax)	43.15	5.79	38.00	5.35	40.36	6.08
WIAT 2 (paragraph)	12.55	3.58	11.21	3.31	11.83	3.38

The total number of morphological errors decreased for ELLs and EL1s from grade 3 to grade 5 (Table 3 & 4). For both language groups (ELL & EL1) the number of morphological omissions, wrong homophones and wrong word decreased while the number of morphological attempts increased over time (Tables 5 & 6). The number of morphological spelling errors for EL1 decreased from grade 3 to 5 while the number of morphological spelling errors for ELL remained relatively unchanged. There was also a larger increase in the number of wrong words for the grade 5 ELL participants (Table 6).

Table 5. Descriptives for Grade 3 Morphological Error Types (EL1, ELL)

Grade 3

Morphological Measure	EL1 (n=27)		ELL (n=32)		Total (n=59)	
	M	*SD*	*M*	*SD*	*M*	*SD*
TMEsqrt*	.86	.82	1.16	.83	1.02	.83
Omissions (MO)	.44	1.05	.94	1.22	.71	1.16
Morphological errors (Msp)	.67	1.47	.59	.76	.63	1.13
Attempts (MAt)	.07	.27	.34	.60	.22	.49
Wrong Word (WW)	.78	1.12	.94	1.38	.86	1.26
Wrong Homophone (WH)	.30	.46	.50	1.05	.41	.83

* TME represents the total composite of error types (MO+ Msp, + WW+ WH).

Table 6. Descriptives for Morphological Error Types in Grade 5 (EL1, ELL)

Grade 5

Morphological Measure	EL1 (n=27)		ELL (n=32)		Total (n=59)	
	M	*SD*	*M*	*SD*	*M*	*SD*
TMEsqrt*	.73	.56	1.19	.72	.98	.68
Omissions (MO)	.07	.27	.47	.71	.29	.58
Morphological errors (Msp)	.37	.74	.91	1.28	.66	1.09
Attempts (MAt)	.78	.93	.68	1.09	.73	1.01
Wrong Word (WW)	.63	1.21	1.06	1.76	.86	1.54

Wrong Homophone (WH)	.41	.69	.56	1.10	.49	.93

* TME represents the total composite of errors types (MO+ Msp, + WW+ WH).

A bivariate Pearson correlation analysis was run for grade 3 and grade 5 participants (*n*=59) to examine the association between total morphological error and other linguistic variables. There was a moderate inverse correlation between grade 3 and grade 5 vocabulary (PPVT-4) and grade 3 and grade 5 total morphological error and the grade 5 total morphological error. There was an inverse correlation between grade 3 and grade 5 oral syntax (CASL) and the grade 5 ratio of total morphological errors to word count. There was a moderate inverse correlation between grade 3 and 5 spelling (WRAT 3) and the grade 3 and 5 ratio of total morphological errors. A bivariate Pearson Correlation for ELL participants (n=32) showed a moderate inverse correlation between the grade 3 oral vocabulary and the grade 5 total morphological errors (*r=-.36, p=.006. 006)*, and between the grade 5 oral vocabulary and the grade 5 total morphological errors *(r=-.55, p=.001).* There was a moderate inverse correlation between the grade 3 oral syntax and the grade 5 total morphological errors (*r=-.36, p=.040*), and between the grade 5 oral syntax and the grade 5 total morphological errors (*r=-.60, p=.000*). The grade 3 spelling showed an inverse correlation to the grade 5 ratio of total morphological errors to word count (*r=-.40, p=.028*), and between the grade 5 spelling and the grade 5 total morphological errors to word count (*r=-.37, p=.040*). The grade 3 writing showed a moderate inverse correlation to the grade 5 total morphological errors (r = -.51, p = .003) and the ratio of total morphological errors to word count *(r=-580,p=.000).* The grade 5 writing showed a moderate inverse relationship to total morphological errors *(r=-45, p=.009)* and to total morphological errors by word count *(r=-.47, p=.007).*

As shown above in table 5, the Pearson bivariate correlation between literacy measures for the EL1 participants (n=27) showed an inverse correlation between grade 3 oral syntax and the grade 5 total morphological error *(r=-.40,p=. 041)*, and between grade 5 oral syntax and the grade 5 total morphological error *(r=-.40, p=. 40*). There was an inverse correlation between the grade 3 spelling and the grade 3 ratio of total morphological errors to word count *(r=-.39, p=.* 047*)*. There was an inverse correlation between the grade 3 paragraph writing and the grade 3 ratio of total morphological errors to word count *(r=-.48, p=.*012*)*. The inverse correlation between the total morphological error and other literacy measures means that as total morphological errors decrease, performance in other literacy measures increase and, as the total morphological errors increase, the performance in other literacy measures decrease.

Table 7. Correlations for Literacy Measures and Total Morphological Error

	EL1 (*N*=27)	1	2	3	4	5	6	7	8	9	10
1	Vocabulary 3										
2	Oral Syntax 3	.47*									
3	Spelling 3	.58**	.56**								
4	Writing 3	.42*	.59**	.73**							
5	Vocabulary 5	.86**	.41*	.44*	0.34						
6	Oral Syntax 5	.52**	.57**	.46*	.56**	.61**					
7	Spelling 5	.59**	.46*	.81**	.62**	.56**	.58**				
8	Paragraph 5	.34	.43*	.67**	.59**	.34	.33	.61**			
9	TMEsqrt3	-.20	-.09	-.21	-.22	-.06	.01	-.17	-.07		
10	TMEsqrt5	-.01	-.04	-.12	.12	-.20	-.10	-.03	-.16	-.23	
	ELL (*N*=32)										
1	Vocabulary 3										
2	Oral Syntax 3	.56**									
3	Spelling 3	.29	.06								
4	Writing 3	.2	.11	.53**							
5	Vocabulary 5	.86**	.48**	.34	.43*						
6	Oral Syntax 5	.69**	.65**	.27	.43*	.65**					
7	Spelling 5	.27	-.07	.75**	.57**	.36*	.27				
8	Paragraph 5	.32	-.01	.42*	.55**	.48**	.31	.53**			
9	TMEsqrt3	-.27	-.08	-.26	-.27	-.33*	-.20	-.26	-.19		
10	TMEsqrt5	-.47**	-.36*	-.30	-.51**	-.55**	-.60**	-.32**	-.45**	-.36*	

** Correlation is significant at .01 (2 tailed). * Correlation is significant at .05 (2 tailed).

A 2 X 2 repeated measures ANOVA was conducted to examine the main effect of time (grade 3 and grade 5) and language (ELL, EL1) on the development of morphological awareness in student writing. The ANOVA had one between- subjects variable (language) and two within- subject variables (grade). Results of the ANOVA show a main effect of grade for the ratio of total morphological errors by word count (TMEsqrt/WC) for all participants F (1,57) = 5.02, p = .02 as represented in Figure 1. There was a main effect for the ratio of total morphological omissions by total word count F (1,57) = 8.378, p = .005 and for total morphological attempts by total word count F (1,57) = 4.481, p = .039. There was no main effect for total morphological errors F (1,57)= .142, p= .708. There was a main effect for total morphological omissions F (1,57) = 7.32, p = .009 and for total morphological attempts F (1,57) = 12.23, p =. 001. There were no statistically significant differences for language groups across the morphological measures.

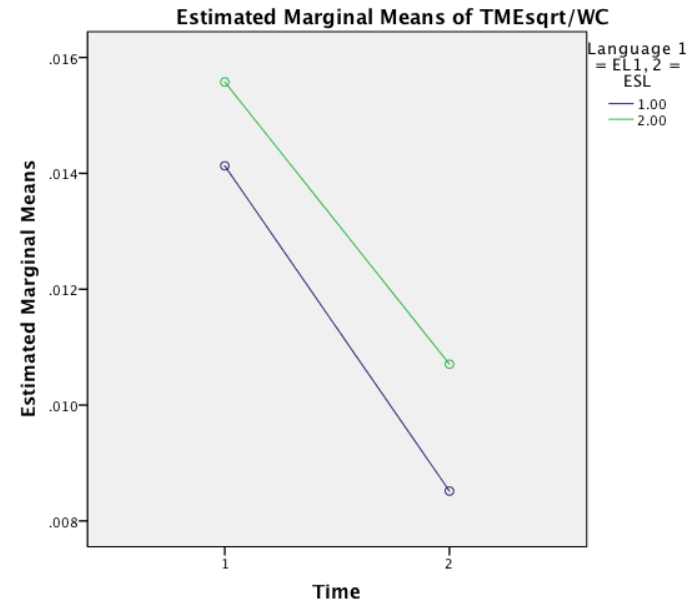

Figure 1. Repeated Measures Grade 3 & 5 (time) Total morphological errors (EL1 and ELL)

Discussion

The current longitudinal study investigated the number and type of morphological errors as a measure of the development of MA evident in children's written paragraphs in a longitudinal cohort of ELL and EL1 children in grades 3 and 5. A researcher designed experimental measure was used to score and code the morphological errors. The results are discussed in relation to each of the research questions.

1) Are there differences in the total morphological errors (TME) for grade 3 and grade 5 writers?

There was a significant main effect of grade on the total morphological errors to word count (TMEsqrt/WC) for all participants (n=57). This finding supports the existing research suggesting that morphological awareness continues to develop between grade 3

and grade 5 as children undergo explicit instruction in word form, grammar and spelling and are exposed to increasingly complex language in reading and discussion (Berninger et al., 2009; Tyler & Nagy, 1989). Analyzing morphological structures in children's paragraph writing may provide further information regarding the development of morphological awareness. Developing writers rely on a variety of skills but are also in the process of struggling with new skills and strategies. For this reason, over time the variations in the growth of morphological awareness may be represented by subtle differences in the total morphological errors, vocabulary, spelling and syntax of young writers. Gains in oral language may contribute to an understanding of morphological awareness development as demonstrated by previous research examining children's spelling and morphological awareness (Kemp (2006). These differences may not impact the final text production in the early grades as children are still in the process of refining their literacy skills and strategies and may naturally compensate by trading one skill for another (Berninger et al, 2009). However, overtime the differences may contribute to noticeable lags across literacy skill development and impact text production.

2) Are there differences in TME between language groups (EL1 and ELL)?

The results from the repeated measures ANOVA showed no significant effect of language on total morphological errors for EL1 and ELL participants. This is supported by previous studies that found that ELL children perform similarly to their EL1 peers in overall writing. However, there were significant differences in the correlations between literacy measures and total morphological errors for language groups (ELL & EL1).

For EL1 participants in grade 3 and grade 5 there was no significant correlation for between the total morphological errors and the other literacy measures. However,

there was a statistically significant correlation between grade 3 total morphological error and grade 5 morphological attempts. This may suggest that for EL1 participants the development of morphological awareness in the early grades may be independent of, or parallel to the development of other literacy skills (e.g. oral syntax, vocabulary, spelling). This was not found to be same for ELL participants whose total morphological errors in grade 5 correlated to lower scores for grade 5 oral vocabulary, oral syntax, spelling and overall writing. If the progression from morphological errors to morphological attempts contributes to an increase in morphological awareness, the above observations may suggest that ELL students are not developing morphological awareness at the same point in time or through the same skills as their EL1 peers. Existing research supports the influence of oral language development on morphological awareness and supports the subsequent influence of morphological awareness on writing. However, further trials would be necessary to verify the accuracy of the experimental measure before pursuing further investigations to explore possible differences in EL1 and ELL morphological awareness using a measure of morphological errors in a writing sample.

3) Are there differences in the pattern of morphological errors for grade 3 and grade 5 writers (morphological omissions (MO), morphological attempts (MAt), morphological spelling errors (Msp), Wrong Word (WW), Wrong homophone(WH)?

As morphology is considered a complex construct it is important to explore more specific patterns in TME in children's writing. The existing research shows an increase in morphological structures (mostly derivational) occurring between grades 4 and 6 (Berninger et al., 2009; Kemp, 2006; McCutcheon & Stull, 2015). The current study found that grade level had a significant effect on the number of morphological omissions

(did not use any morphological structure) and morphological attempts (used the incorrect structure e.g. used s instead of es for a plural form requiring es) made by students in their writing. As previous studies have suggested, students may be omitting morphological forms they are not confident with or have not yet been exposed to. It is expected that as students develop a greater morphological awareness they may begin to make fewer morphological omissions. The corresponding increase in morphological attempts over time supports this observation; what was an omission previously may be an attempt in the future as students continue to build their awareness of more complex morphological structures and experiment with new applications. A second contributing factor may be related to the increasingly complex morphological structures in oral language. As morphological awareness develops in oral language there is an expected development in the use of morphological structures in written language. Morphological omissions may become morphological attempts as children begin trying out new morphological structures in their writing. Further investigations are necessary to determine if a correct usage analysis that included attempts as well as correct usage would be more informative for educators.

4) Are there differences in the category of morphological errors between language groups (EL1 and ELL)?

No statistical significance was found for error types and language for morphological errors by category (e.g. attempts). However, there are some observations in the data that provide further evidence of the small differences in ELL and EL1 writing. EL1s were observed to have fewer morphological omissions in their writing. Frequency of errors for grade 3 shows that 53% of ELLs and 74% of EL1s made zero morphological

omissions. This trend continued in grade 5 but EL1s outperformed ELLs, 65% of ELLs and 92% of EL1s made zero morphological omissions. In grade 5, 46% of ELLs made zero morphological spelling errors while 74% of EL1s made zero morphological spelling errors. Both language groups performed similarly in morphological attempts, wrong words and word homophones. The difference in results for morphological omissions and morphological spelling errors suggest that ELLs may be lagging behind EL1s in specific areas of morphological awareness development. Berninger et al. (2009) suggested that not all areas of morphological awareness are developed at the same time. The greater number of morphological spelling errors and omissions may be related to deficits in semantic and syntactic knowledge. Lower scores in grade 3 may be related to deficits in semantic knowledge while lower scores in grade 5 and up may be related to deficits in semantic and syntactic knowledge. Choosing the correct morphological structure requires an understanding of word formation and vocabulary knowledge, both of which are important to writing (Berninger et al., 2009). In accordance with the triple word form theory, phonological and orthographic awareness may possibly help to bolster overall literacy gains in grade 3, resulting in similar outcomes for both language groups and masking a weaker development of areas of morphological awareness for ELLs. By grade 5 children are expected to be using increasingly complex morphological structures, and small delays in morphological development in lower grades are likely to lead to more significant differences in later years (Nunes et al., 1997; Berninger et al., 2009).

Implications for instructional purposes

The present study found that grade 5 students made less morphological errors than grade 3 students. Grade 3 students had a greater number of morphological omissions and

by grade 5 demonstrated a greater number of morphological attempts. This correlated to increases in oral syntax and oral vocabulary suggesting that the development of morphological awareness in oral language may contribute to some way to the development of morphological awareness in writing. However, no significant effects between language groups were observed. Small differences noted in the results may be due to the limited data but in keeping with existing research, it is more likely that ELLs may have a greater or earlier sensitivity to morphological strategies. This could be a result of targeted instruction at school or the exposure to the differences in the morphology between languages spoken at school and the community. As previously stated, the development of morphological awareness in writing follows the development of morphological awareness in oral language and for this reason, differences in morphological awareness in oral language may provide important information regarding the development of morphological development in writing.

Producing meaningful text requires linguistic knowledge and, in the English language, this requires a combination of phonological (e.g., knowledge of word sounds), orthographic (e.g., knowledge of the visual representation of words), morphological awareness (e.g., knowledge that words contain units of meaning), and syntax (knowledge of how sentences are formed) (Schoonen et al., 2002). Successful writers have linguistic knowledge but are also able to choose appropriate strategies to apply this knowledge to produce meaningful written text (McCutcheon et al., 2013; Schoonen et al., 2002; Bahr et al., 2012). A subtle difference between EL1 and ELL writing suggests that ELLs may rely on a different order of literacy skills and strategies during early text production. Establishing an accurate and teacher friendly measure of morphological awareness in oral

and written expression may help to better inform writing instruction and interventions for diverse learners.

Existing research also suggests that children's morphological knowledge increases with age, shifting from oral to written and receptive to productive. The correct usage of morphological structures in speaking and writing are a result of the increasing development of morphological awareness, first in oral language and then in written language. Morphological awareness increases from grade 3 to grade 5 as students are exposed to more complex structures in oral language (vocabulary, syntax), the explicit instruction in morphological structures, and the increases in word knowledge and usage through exposure in reading and day to day life. Continued investigation into the influence of a second language on morphological awareness development may help educators provide more effective approaches to writing, and better inform targeted writing interventions. Studies show that ELL students are performing overall at a similar level to EL1 peers (Schoonen et al. 2002; Harrison et al., 2015). However, researchers have suggested that small differences in early literacy sub-skill development may contribute to measurable gaps in later learning (Schoonen et al. 2002). This leads to the question of what and when for morphological instruction (Carlisle, 2010). It is suspected but not yet clear if students who employ different strategies at a young age will be limited in later years or if these replacement strategies may be successful in supporting literacy gains. Further investigations into the trajectory of morphological errors in student writing past grade 5 may add to the growing understanding of the role of early morphological awareness on later literacy development and offer insights into alternate strategies. For this reason, providing explicit instruction for morphological awareness may be more

complex than originally assumed. Targeted writing interventions and programs are beginning to recognize the interplay between skills as opposed to more traditional methods that supported developing a single skill in isolation. Writing intervention programs that combine the meaning, structure and usage of words may prove to be more successful in building overall writing achievement for diverse learners. Explicit classroom instruction that recognizes the role of morphology in spelling, vocabulary and syntax would be beneficial for all students, including those dependent upon different strategies and approaches to literacy learning. Providing teachers with a simple but effective means for assessing student writing may also allow them to more confidently prescribe effective, evidence –based writing interventions in the classroom. Being able to accurately analyze morphological errors in student writing may provide classroom teachers with more information and enable them to provide more effective instruction that meets the literacy needs of individual students. The interplay between morphology and other skills provides a unique opportunity for assessment, as it captures information about spelling, vocabulary and syntactical knowledge. For example, *whent* may be an indication of literacy development for one student and yet in another writing sample it may signal a deficit in literacy skills. Bringing evidence-based research into the classroom has been a challenge. However, being able to differentiate student needs and strengths is firmly seated in the accurate identification of developmental pathways determined by existing research. Expanding on the understanding of these pathways will increase the effectiveness of classroom approaches to writing instruction.

Limitations

There are two main limitations in the design of the study: 1) use of single writing task used to measure morphological errors; and 2) the data selected from METS scoring guide, given the number of participants. Research suggests that MA is a difficult construct to measure and this study found that using only a single measure (written production) provided limited for more detailed analyses. It is considered difficult to measure accurate MA in a writing sample as students may hesitate to experiment or explore with new language in their writing (Green et al., 2003; Harrison et al., 2015). It is believed that MA contributes to a variety of literacy skills and for this reason it should be measured by a variety of tasks (such as isolated word; sentence completion; and paragraph production) in order to provide an accurate picture of MA development in writing. For example, including an analysis of the morphological structures in terms of affix familiarity may contribute to the analysis MA awareness. Previous research has demonstrated that younger students may still rely more heavily on phonological and orthographic strategies to decode words, face greater challenges with the physical process of writing, and may have simpler word forms due to a lack of exposure to more complex morphological structures. Existing studies using writing samples suggest that students may not voluntarily demonstrate MA development in more demanding writing tasks, suggesting that using paragraph samples for less experienced writers may limit the results (Deacon, 2010). This may be particularly relevant to the younger participants as grade 3 writing skills vary from grade 5 both in length and scope. Grade 3 writers are less experienced than grade 5 writers in all skill areas and therefore may chose simpler and more familiar words to express their ideas more rapidly, rather than demonstrate their

knowledge of more complex words. The writing process is componential and the use of a paragraph writing sample rather than a single word task, may have limited the demonstration of MA (Deacon, 2010). Using a more detailed analysis of morphological structures in oral language may add to the understanding of MA in young writers, as it would provide a measure of MA in oral language that could then be compared to the MA in a written sample. It would be expected that the oral MA would be more complex than that found in the written sample.

The second limitation was using only error analysis with the METS guide. The METS guide is designed for the collection of detailed correct and incorrect morphological usage and while error analysis is an accepted method there are limitations when using early to mid primary grades. As previously noted, researchers have found increasing morphological awareness in grades 4 to 5 and therefore it may be more beneficial to look at correct or a combination of correct usage and error analysis. This would be in keeping with the statement by Deacon (2008) that the words on the page do not change but the method by which they are scored and analyzed may produce very different results (Deacon, S.H., 2008). Grade 3 participants were not expected to display a large amount of morphological manipulation and therefore a small number of errors were expected. However, combined with the small sample size this limited the amount of morphological data for analysis. The increase in morphological manipulations in grade 5 provided more data for analysis. Previous researchers also suggest that participants may choose to write words that they already know how to spell. The choice of less sophisticated words may be related to age, working memory restraints and language restrictions (Green et al., 2003). This may have also contributed to the low number of

errors and high number of 0 values for errors in the present study. The METS guide provides the means for a more detailed analysis but the limited data available for grade 3 meant that only the larger categories could be statistically analyzed . Using a measure of the correct usage of morphological structures in combination with the morphological attempts and the morphological errors may provide a larger data set allowing for a more precise and comprehensive analysis of morphological development in children's writing.

Future Implications

Morphological awareness is complex and functions on many levels (e.g. semantics, syntax, vocabulary) and each of these may develop at different periods (Berninger et al., 2009). Evidence supporting the development of morphological awareness as non-linear may change how we perceive the use of error analysis for interpreting literacy gains. As previously mentioned, it may be interesting to also look at a correct usage analysis that includes *attempts*. This may provide the opportunity to capture variations in development or strategies as some children may be correctly using more advanced morphological structures to bolster deficits in other literacy skills. Effective instruction relies on having accurate measures to assess and monitor the development of morphological awareness and its support of other literacy skills. The METS guide in combination with a word task may provide the detailed analysis required to identify these components and their development in student writing samples. Previous analyses of morphological awareness focused on specific usages in isolated words with targeted manipulations e.g. the *ed* study (Deacon, 2012). There may be more evidence of morphological development in a student generated writing sample (where students are free to use any words they wish) rather than an isolated word task. As

previously discussed, writing is a complex task requiring children to use a combination of skill and strategies. The conscious manipulation of morphological structures to create meaning through lexical variation suggests a shift to morphological strategies. It is expected that children in the younger grades may only show attempts at specific morphological structures, whereas upper grades will demonstrate a more accurate and wide ranging use of morphological structures. An existing longitudinal study by Tyler and Nagy (1989) investigated the use of derivatives by grade 4, 6 and 8 students using targeted word tasks. The use of neutral (e.g. farmer) derivatives preceded the use of non-neutral derivatives (e.g. quantity). Understanding the developmental order of the full scope of morphological structures (oral and written) may better inform explicit instruction in writing. This shift to morphological strategies suggests that children may begin to consciously choose the appropriate morphological structure in order to convey specific meaning such as time and person (e.g. we went). How successful the children are in their selection may reveal the level of MA. For example, omissions may suggest a lack of knowledge or a lack of attention; an attempt may suggest knowledge not yet fully mastered or a lack of attention; and a spelling error may suggest a reliance on other strategies or a lack of attention (Marinova-Todd et al., 2013). Including the frequency of suffix use or whole word exposure for age groups would also contribute to a more accurate and efficient analysis of MA. The inconsistent spelling of *went* and *whent* in the same passage may indicate a lack of focus on spelling when writing or, a morphological attempt as student continues to learn and practice the irregular past tense. The notion of attempts is perhaps clearer across grades as student writing samples show the attempted *whent* in grade 3 and the correct *went* in grade 5. The incorrect *whent* was scored as an

error as it is an irregular simple past form and not just a root word. The use of *fifinth* for fifteenth demonstrates the correct affix but an incorrect root word. This was scored as a correct derivational suffix error. The morphological manipulation to create the ordinal (noun form) demonstrates a level of MA. Using the natural writing of children may reveal patterns in learning that are related to their oral language development, instructional focus, and overall language(s) exposure.

Developing an accurate measure of morphological awareness and providing a universally accepted definition may help to explain differences in findings across research in the area of morphology and morphological interventions. The connection between oral morphological development and overall writing outcomes also requires further investigations. A child struggling with their pronouns in speech may experience delays in the development of morphological structures in their writing. This may first appear as omissions or incorrect usage, paralleling the oral language development. Research supporting the role of morphology in oral language may provide further insights into the role of morphology in writing. It may be beneficial to examine if targeted oral morphological awareness interventions may support written output in the early school years and perhaps beyond. An analysis of the combined oral and written morphological structures may provide a more information to better inform educators providing intervention programs for writing at all levels.

Piloting the METS guide in higher grades may provide a clearer picture of the scope of development of morphological awareness and highlights related patterns in lexical representations in writing samples across grades and language groups. As recognized by previous researchers, morphology is intimately connected to language

development at all levels. Having a clearer understanding of morphological awareness and how it is best measured may help to address literacy challenges for diverse learners. For this reason, future investigations regarding the development of morphological awareness in first nations cultures as well as ELL may add much to the understanding of literacy gains for diverse learners.

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APPENDIX

Morphological Error Type Scoring (METS) Guide:

NB: punctuation and capitalization are not evaluated (this information is available in data for WIAT II essay evaluation)

Morphological Category (4): Root (R) Compound (D) Inflectional (I) Derivational (D)	Morph Error Type Code: O – omission Sp – spelling A – attempt C- correct + category	Word Descriptor of Code	Example of error for scoring *(target word in brackets)*
General errors: only errors will be coded for this category ***Root/stem/base*** ***Homophone*** ***Word Boundary*** ***Wrong Word***	***R***	**KEY:** Blue – root/general category Brown – compound word category Green – inflectional suffix category Orange – derivational suffix category Yellow – *specific* error type within the category	
Root/stem/base	Rsp	**R**oot/base/stem word is **misspelled** Any spelling error not including the affix or the spelling associated with a rule (eg **aply**ed – root spelling error with correct inflectional verb suffix past tense BUT **apply**ed – not a root word error : correct inflectional suffix for past tense but also spelling error under inflectional suffix for past verb no y to i)	Laet (late) Unhapy (unhappy)
	RNL	**R**oot word is **N**ot **L**egible due to handwriting or letter sequence	
Homophone (spelling error)	Hsp	misspelled homophone	tow cats (two)
Homophone (incorrect form)	HW	Wrong homophone	to cats (two)
Wrong Word	WW	Use of correctly spelled word but meaning is incorrect (context)	bird (frog)
Word boundary	WB	Incorrect spacing *not* related to compound word	abook (a book)
Compounds	D		

Correct Compound	CD	Correct usage and spelling of a compound word	*Boathouse*
spelling	Dsp	Incorrect spelling of one part of compound word including spacing error	*bothouse, boat house*
Inflectional	***I***	***General M Error category***	
Inflectional Suffix	**IS**	**Inflectional suffix**	
Present verb (s)/(es)	ISPr	Inflectional suffix present tense	S/ V agreement with person
correct	CISPr	Correct Inflectional suffix present	He plays
omission	ISPrO	**I**nflectional **S**uffix **Pr**esent Tense **Omission** - suffix is missing (this could also indicate the wrong S/V agreement)	He play (plays)
spelling	ISPrsp	**I**nflectional **S**uffix **Pr**esent tense **sp**elling -suffix is misspelled	He playz (using phonological strategy so sp error)
attempted	ISPrA	Inflectional suffix present tense **attempt** - correct spelling of suffix but wrong application	He plays He playes (using plural but wrong one)
Simple Past verb (ed)	ISPa	Inflectional suffix Past	
Simple Past verb (ed)	CISPa	**Correct** Inflectional suffix Past	jumped
omission	ISPaO	Inflectional suffix Past **omission**	jump (he jumped)

Inflectional	***I***	***General M Error category***	
Inflectional Suffix	**IS**	**Inflectional suffix**	
spelling	ISPasp	Inflectional suffix Past **spelling** use of phonological strategy is considered an error	He jumped /He jumpt, he jumpd
attempted	ISPaA	Inflectional suffix Past **attempt.** The suffix is correctly spelled 'ed' there is an extra d; incorrect letter sequence but not phonological	He jumped/ He jumpded, jumpde
Past participle(ed) (used with auxilliary *to have* and/or *to be* to form various verb tenses eg passive, past perfect/	ISPt	Inflectional suffix Past (Correct form of Verb to be + verb + ed)	have walked was stopped (for this study the auxiliary verb will not be scored separately)
correct	CISPt	**Correct** Inflectional suffix Past	I was scared
omission		Inflectional suffix Past **omission**	I scare *Omission of auxiliary*

			and past tense form
spelling		Inflectional suffix Past **spelling**	I was scart (using phonological strategy)
attempted		Inflectional suffix Past **attempt**	I was scard *Correct auxiliary but incorrect past tense* I scared *Missing auxiliary but has correct past tense*

Past participle (en) Used with auxiliary to have	CISpp	**Correct** Inflectional suffix past participle	I have ridden
omission	ISppO	Inflectional suffix past participle **omission**	(contextual)
spelling	ISppsp	Inflectional suffix past participle **spelling**	
attempted	ISppA	Inflectional suffix past participle **attempt**	I have rided I ridden
Past participle (irregular)	CISppr	Correct inflectional suffix past participle irregular form	spoke
Spelling			He speaked, He goed
attempted			He spoked, He whent

Inflectional	***I***	***General M Error category***	
Inflectional Suffix	**IS**	**Inflectional suffix**	
Present participle (ing) + aux. to be	CISPrp	**Correct** Inflectional suffix present participle	I am walking
omission	ISPrpO	Inflectional suffix present participle **O**mission	I walking I walk (contextual)
spelling	ISprpsp	Inflectional suffix present participle **sp**elling	I walkin
attempted	ISprpA	Inflectional suffix present participle **A**ttempt	I is walking
Plural (s) **(PL) regular**	CISPL	Correct Inflectional Suffix plural (regular)	s, es
omission	ISPLO	Inflectional Suffix plural (regular) **o**mission	boy
spelling	ISPLsp	Inflectional Suffix plural (regular) **spelling**	birdz
attempted	ISPlA	Inflectional suffix plural (regular) **attempted**	penciles
Plural irregular	CISPLr	**Correct** Inflectional Suffix plural (irregular form)	mice
omission	ISPLr	Inflectional Suffix plural (irregular form) No attempt to create	Mice/mouse

		plural form	
spelling	ISPLrsp	Inflectional Suffix plural (irregular form) **spelling** Recognizes plural so the spelling is coded here rather than as a root word error due to phonological attempt	myce
attempted	ISPLrA	Inflectional Suffix plural (irregular form) **attempted**	Mice mouseses (applied correct plural suffix but unaware of irregular)

Inflectional Suffix	**IS**	**Inflectional suffix**	
Possessive ('s)	ISPos	Inflectional suffix possessive omission	
omission	ISPossp	Inflectional suffix possessive omission	
attempted	ISPosA	Inflectional suffix possessive attempted	
spelling			
Plural Possessive (PLPos) (s') correct	ISPLPos	Inflectional suffix plural possessive	
omission	ISPLPos	Inflectional suffix plural possessive omission	
attempted	ISPLPos	Inflectional suffix plural possessive attempted	
spelling			
Comparative (c) with er	ISc	Inflectional suffix comparative	
omission	IScO	Inflectional suffix comparative **omission**	
spelling	IScsp	Inflectional suffix comparative **spelling error**	
attempted (A)	IScA	Inflectional suffix comparative **attempted**	
Comparative (c) irregular (r)	IScr	Inflectional suffix comparative irregular	
Comparative (c) irregular (r) omission (o)	IScrA	Inflectional suffix Comparative irregular suffix omitted	
attempted			
spelling			
Superlative (s)use of est	ISS	Inflectional Suffix Superlative	
omission			
Attempted			
spelling			

Inflectional Suffix	**IS**	**Inflectional suffix**	
Superlataive Irregular (most/least)			

Omission	O		
Attempted	A		
spelling	sp		
Derivational suffix (ful, ize, tion) **see common affixes*	***DS***	***General M Error category***	

Adjective formation (adj)	*CDSadj*	*Correct Derivational suffix adjective*	*Beautiful/beautiful*
omission	*DSadjO*	*Derivational suffix adjective omission*	*Beautiful/ beauty*
attempt	*DSadjA*	*Derivational suffix adjective attempt – there is a correctly spelled suffix but it is not correct in form or meaning*	*Beautiful/beautifully*
Spelling	*DSadjsp*	*Derivational suffix adjective spelling error*	*Beautiful/ beautifull*
Adverb formation (adv)	*CDSadv*	*Correct derivational suffix adverb*	
omission	*DSadvO*	*derivational suffix adverb omission*	
attempt	*DSadvA*	*derivational suffix adverb attempt*	
spelling	*DSadvsp*	*Derivational suffix adverb spelling error*	
Noun formation (N)	*CDSN*	*Correct derivational suffix noun*	
omission	*DSNO*	*derivational suffix noun omission*	
attempt	*DSNA*	*derivational suffix noun attempt*	
spelling	*DSNsp*	*Derivational suffix noun spelling error*	

Derivational prefix (Prf) **see list*	***CDPrf***	***Correct Derivational prefix***	
omission	*DPrfO*	*Derivational prefix omission*	
attempted	*DPrfA*	*Derivational prefix attempt*	
spelling	*DPrfsp*	*Derivational prefix spelling*	