CREATING AND SUSTAINING CLASSROOM KNOWLEDGE THROUGH TEACHER RESEARCH: MORPHOLOGY AS DESIGN INTERVENTION FOR STRUGGLING LEARNERS

A dissertation submitted to the faculty of
San Francisco State University
In partial fulfillment of
The Requirements for
The Degree

Doctor of Education

in

Educational Leadership

by

Eric Blancaflor Claravall

San Francisco, California

May, 2014

CERTIFICATION OF APPROVAL

I certify that I have read *Creating and Sustaining Classroom Knowledge through Teacher Research: Morphology as Design Intervention for Struggling Learners* by Eric Blancaflor Claravall, and that in my opinion this work meets the criteria for approving a dissertation submitted in partial fulfillment of the requirements for the degree: Doctor of Education in Educational Leadership at San Francisco State University.

Barbara Henderson, Ph.D.
Professor
Department of Elementary Education

Susan Courey, Ph.D.
Associate Professor
Department of Special Education

Marco Bravo, Ph.D.
Associate Professor
Department of Elementary Education

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Eric B. Claravall
San Francisco State University
2014

Students who lack metalinguistic skills to identify morphologically complex words face a greater challenge to achieve reading fluency and construct meaning from texts. There is a growing consensus that knowledge and awareness of word structure could provide cognitive tools to improve literacy development of struggling learners in special education. The purpose of this dissertation is to develop a design intervention on morphology emanating from a methodological framework that was an intersection of teacher research and design-based research. This study sought to answer the following research questions: 1) how does teacher research shape my morphology instruction and influence the transfer of classroom knowledge to other special education teachers? 2) how does morphology instruction, delivered by four special education teachers, affect students' morphological knowledge and literacy outcomes? and 3) what evidence is there that teacher research supports teachers to create and apply an instructional design process in special education? Qualitative and quantitative data were collected in three different phases beginning in the fall of 2012 until early winter of 2014. The iterative process of instructional design led to the refinement of new reading curriculum based on morphology. The study addresses equity by outlining a curricular reform that is providing richer and more effective reading instruction to Special Education students. Further, the study addresses leadership issues arising from "leading from the middle" that are inherent in a teacher research study

I certify that the Abstract is a correct representation of the content of this dissertation.

Dr. Barbara Henderson
Chair, Dissertation Committee

March 20, 2014
Date

DEDICATION

Joey, thank you so much for your unselfishness and showing me the full meaning of love, affection, and nourishment.

Mama, Tita Milma, and Ate Move thank you so much for all the support and believing in me.

My best friend Shally Manzanares, the epitome of a hardworking special education teacher, who spends extra hours at home writing goals and objectives for these precious children.

My students – past and present, you are the reason for doing this dissertation and for teaching me how to be an effective teacher of reading and writing.

ACKNOWLEDGEMENTS

This dissertation would have not been completed without recognizing the people and the organizations that contributed to the completion of this research:

Dr. Barbara Henderson, for her care, support, and tireless energy reading my drafts at the wee hours of the morning; her insightful critique, her counter arguments on my claims, her interrogation of my scholarship, and her meticulous weeding out of unnecessary words - all these contributed to the development of my thought and my work as a practitioner-scholar;

Dr. Susan Courey and Dr. Marco Bravo, the members of my committee, for their critical read and recommendations to improve my study;

Dr. Stan Pogrow, for reading Chapters Two and Three, and his incisive comments and questions regarding the logic and structure of my literature review;

Felipe Del Rey School District teachers, for their generosity of time and courage opening their classrooms, exposing the wonders of their teaching craft;

Nancy Johnson, for allowing me to implement my research design at Felipe Del Rey School District;

Dr. Michael A. Gallagher, Dr. Darren Battaglia, Dr. Ana Gutierrez, and Dr. Rebecca Wong, thank you for your friendship and support whenever I needed your expertise;

Betty Holt, for your encouragement and proof reading Chapter Four;

And lastly, The International Reading Association Helen Robinson Research Award provided financial assistance in the early stage of this dissertation, and the Division K of the American Educational Research Association selected my study for the Graduate Student Workshop in 2013.

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The most important pedagogic dharma that should guide the teacher in such a situation is that she should not hastily jump to the conclusion that her learners are unfit, dull, stupid, lacking in motivation, can never be made to learn and so on.
(Angappan, 2006)

Primary grade students who lack the skill to recognize multisyllabic words face a greater challenge to achieve reading fluency and comprehension in later years (Nunes, Bryant, & Barros, 2012). This complicates the trajectory of their literacy development since fluency and accuracy of identifying complex words are important to content area reading in fourth grade and beyond. Biancarosa and Snow (2006) reported that approximately 70% of US students in grades 4-12 struggle to read on grade level. Underdeveloped literacy skills limit students' ability to construct meaning from text and compromise their engagement in learning; thus, the cycle of reading failure continues year after year. As students become disengaged in reading, they experience poverty of vocabulary and poor spelling strategies. Consequently, these students lag further behind by the time they reach intermediate grades or middle school, when adequate reading skills predicate their ability to access knowledge from texts (Alexander & Jetton, 2000).

The National Reading Panel (NRP, 2000), where the rationale for No Child Left Behind (NCLB) was partly based and its adherence to the gold standard of randomized experimental design was valued, recommended phonics and phonemic awareness as the most effective methods to prevent reading failure in the early grades. In addition, it also

highlighted the role of developing students' reading fluency and breadth of vocabulary knowledge on literacy. The NRP adhered to the importance of explicit instruction of blending and segmenting sounds with letters in order to help younger children spell and decode words. When students enter fourth grade, they are expected to have already developed foundational literacy skills necessary to access and communicate information. They are expected to participate successfully, both orally and in writing, in different academic domains like literature, science, social studies, and mathematics. Thus, teachers need to develop all students the capacity to "read text with speed, accuracy, and proper expression" (NRP, 2000, p. 189).

In spite of the effort of the government to improve public education, as demonstrated in the above-mentioned literacy policies, a significant numbers of 4th grade students continue to have inadequate literacy skills. The recent national assessment on reading proved that phonics and phonemic awareness are not enough to prepare students to the rigor and complexity of intermediate grade reading. The National Center for Educational Statistics (2013) reported a third of fourth grade students performed below the basic level on the national reading achievement test since 2007. The results demonstrated that many fourth grade students are unprepared for the challenges of reading informational and narrative texts. An even more troubling pattern is found in special education where the literacy needs of these students are seldom met, due to ineffective reading interventions and instructional issues (Lyon, 2003; Allington, 2011).

The President's Commission on Excellence in Special Education (2002) reported a significant number of students without disabilities received special education services due to instructional problems and not to a presumed inherent difficulty to read. This special education placement error became the rallying ground for scholars in the field of special education to create a multi-level intervention that adheres to the NRP and NCLB's principle of scientifically based core curriculum, which, again, is highly dependent on phonological decoding intervention.

This multi-tiered model known as Response to Intervention, or RTI, involves a layered "process of providing high-quality, research-based instruction and intervention at varying levels of intensity for students who struggle with learning and behavior" (Special Education Division, California Department of Education, 2009, p.1). The RTI model utilizes a preventive and proactive problem –solving, and databased decision-making approach to identify responders and nonresponders to evidence-based interventions (Barnes & Harlacher, 2008). In the beginning of the intervention (Tier 1), prevention of student's academic failure in general education classroom is the utmost objective. The school utilizes universal screening measures to identify students' proficiency level in major academic areas. Students' progress is monitored using formative assessments, such as curriculum-based measures, teacher ratings, word identification, and nonsense fluency word measures (Fuchs, Fuchs, & Compton, 2004). Instruction within the general education classroom is adjusted according to the needs of every child, which creates a big

demand for many general education teachers. If the student continues to lag behind his/her peers or fails to respond to the differentiation of instruction, more intensive intervention is considered (Tier II). The Tier II student receives specific short-term interventions, as decided by the IEP team. If the child succeeds and achieves the target goals set in the beginning of the intervention, the supplemental intervention is discontinued.

Students who did not respond adequately to the instruction in Tier 1 and fail to exhibit meaningful progress in Tier II then receive more intensive interventions in Tier III. Students showing nonresponsiveness to Tier II intervention are assumed to have some form of deficits and qualify for the Specific Learning Disability classification. In this third level of intervention, the team reviews all the data gathered from the previous two tiers. These data include individual performance based on formative measures, curriculum-based measures, teacher observations, and parent reports. These students receive special education services with smaller teacher-student ratio in a self-contained classroom.

Despite the growing support from scholars, policy-makers, and practitioners, the RTI model remains controversial and earns critical scrutiny of its components and implementation process from other researchers (Hauerwas, Brown, & Scott, 2013; Guskey & Jung, 2011; Johnson & Smith, 2011). As I mentioned earlier, nearly all intervention studies within the RTI tradition centered on early reading skills such as

phonemic awareness and phonological decoding (Fuchs, Fuchs, & Compton, 2004; Gartland & Strosnider, 2005; McKenzie, 2009; Vellutino, Scanlon, Small, & Fanuele, 2006). There seems to be a particular need to examine the impact of RTI on higher-level reading skills (Hughes & Dexter, 2011) and non-phonological factors of predicting reading performance (Scarborough, 2005).

Currently, phonology-based curriculum has been the most widely used instructional approach to teaching foundational reading skills to struggling learners within and outside the RTI model (Allington, 2011; Fuchs, Fuchs, & Vaughn, 2008). Yet most of these students continue to experience reading difficulty and fail to achieve reading competency in upper elementary and middle school (Denton, Vaughn, & Fletcher, 2003). Some researchers argue, therefore, that there is an overemphasis on phonological awareness and phonological decoding as reading interventions for struggling learners (Hiebert & Bravo, 2010; Samway & McKeon, 2007). Evidence-based practices related to word formation have received little attention in the national discussion on literacy development in fourth grade and beyond for several years now (Berninger, Abbott, Nagy, & Carlisle, 2010). In the advent of the Common Core implementation, it is timely and relevant to revisit the NRP recommendations and consider the relative importance of non-phonological process in reading and spelling multi-syllabic words.

Description of the Problem

Given the huge challenges confronting students with reading problems, beginning and experienced special education teachers alike need to engage themselves in learning new skills and incorporating best practices in their teaching in order to address equity in special education (Billingsley, 2004). Clearly, teachers play a significant role in influencing students' learning outcomes (Hattie, 2003). If teachers gain wider and deeper knowledge of reading processes and pedagogy, they will be in a better position to positively affect students' reading achievement. Bransford, Darling-Hammond, and LePage (2005) elucidate further that teachers who engage in effective teaching practices consistently construct knowledge in the classroom, critically reflect on students' learning process, and continually evaluate their own practice. When teachers continually evaluate their practice, they recognize the value of data driven instruction to improve their pedagogy and its impact on students' literacy development (Goodman, 2012).

The interrogation of my own instructional practices has engendered a deep sense of interest in teacher inquiry. Starting with the purpose of improving my craft as a special education teacher, it has morphed into a systematic collection of data to create knowledge and inform my literacy instruction. Doing research in the classroom has transformed the way I look at the teaching process and students' ways of learning. Through deliberate and systematic collection of classroom data, I have implemented a literacy curriculum that addresses the unique needs of my students. Through this experience, I wanted to further

explore how my own investigation of instructional practice could generate additional knowledge that would be meaningful to other teachers of struggling learners at my school district.

As a special education teacher for more than ten years now, I have seen the negative consequences of reading failure in many students, and how this leads to a downward academic spiral – the poor-get-poorer in reading achievement (Stanovich, 1986). When struggling readers enter fourth grade, their academic outcomes are further compromised due to their limited skills in navigating complex words present in content area reading; thereby perpetuating the cycle of academic failure. By the time these students reach high school, it is usually too late for teachers to narrow the academic gap or improve their literacy skills comparable with academically low-average students (Lyon, 2003). Thus many students who struggle to read will eventually drop out of high school.

Struggling readers fail to develop adequate word identification strategies and spelling skills with multisyllabic words such *as improbable, submarine,* or *construction* and with subject specific words used in content area reading, like *dehydrate, semicircle, geography* (Reed, 2008). One promising approach to develop students' literacy skills is the use of morphology instruction. Teaching morphology in special education is currently underutilized despite its instructional value on literacy achievement in fourth grade and beyond (Berninger, Abbot, Nagy, & Carlisle, 2010; Carlisle, 2010).

A substantial body of research links the development of morphological awareness and morphological knowledge to word recognition and spelling (see the review of Hiebert & Bravo, 2010). I will further define the concepts of morphological awareness and morphological knowledge in the next chapter. Children rely less on the use of phonological resources as decoding skills mature and texts become more complex (Juel, 1988). Repeated exposure to written words leads older children to automaticity in word reading, and lexical representation (the use of base words, suffixes and prefixes) begins to expand in children's memory, as texts become more complex (Jackson & Coltheart, 2001). In this representation, some of the letter combinations like *–est, -tion, -ing* are processed as consolidated units and as common orthographic patterns that make longer sight words, such as *finest, question*, and *interesting*, easier to learn. Some of these letter patterns have a direct connection between the orthography and the smallest meaningful word unit, or morpheme. These morphemes are the fundamental building blocks of morphological knowledge involved in later acquisition of reading skills (Carlisle, 2010).

Knowledge and awareness of morphological structure provides a new light to understanding reading success and failure in special education; it could be a viable route to achieve instructional equity for students who do not adequately respond to phonologically based literacy instructions. The inclusion of morphological knowledge and awareness as one of the components of literacy instruction in special education could lead to improvement in literacy skills; thus, helping struggling learners better succeed in

reading. To address the needs of this population, we need sufficient, intensive, systematic, and explicit literacy instruction that could improve, not only word recognition and spelling skills, but also vocabulary and reading comprehension. Morphological intervention presents a promise to this quest.

Research Questions

The potential of the Teacher as Researcher (TAR) model to develop design intervention among struggling learners in special education provides a backdrop to a wider landscape of literacy instruction, curriculum development, and instructional leadership. When teachers think like researchers, they develop analytical tools to understand literacy instruction in the classroom and the role students play in their own learning. When teachers deliberately and systematically collect data to drive their instruction, not only do they affect the learning process in the classroom, but they also develop the understanding of the context of reforming curriculum and teaching practice – from the inside out, from bottom to top (Campano, 2007; Cochran-Smith & Lytle, 1999; Lampert, 2000; Meir & Henderson, 2007; Perry, Henderson, & Meier, 2012).

In search for a new common ground in literacy research and instruction, Flippo (2012) highlights the need to empower and support teachers designing, developing, and implementing instructional methodology based on their own classroom context and conditions. To effect change in the school system, teaching practices have to change; the TAR model could potentially change the special education's "core of educational practice

– how teachers understand the nature of knowledge and the student's role in learning, and how these ideas about knowledge and learning are manifested in teaching and classwork" (Elmore, 2008, p. 8).

In this light, the current study aims to explore and examine the relative importance of morphology instruction to improve literacy outcomes of students in special education. This could eventually have policy implications, leading to language arts curricular reform and improvements in literacy instruction within a school district. Through a teacher research model, we make deliberate and informed decisions about classroom issues relevant to students' literacy development, improving instructional quality and academic performance in the long run. As teacher researchers, we follow a systematic procedure to create knowledge based on the teaching process, to understand students' literacy development, and 'to validate, affirm, and improve our practice" (Henderson, Meier, Perry, & Stremmel, 2012).

This dissertation specifically seeks to answer the following questions:

1. How does teacher research shape my morphology instruction and influence the transfer of classroom knowledge to other special education teachers?
2. How does morphology instruction, delivered by four special education teachers, affect students' morphological knowledge and literacy outcomes?
3. What evidence is there that teacher research supports teachers to create and apply an instructional design process in special education?

Purpose of the Study

The overarching goal of this dissertation is to replicate the positive effects of morphological intervention, applied to the vicissitudes of different special education classrooms. Teaching morphology, as an intervention, critically fosters literacy achievement among struggling readers (Berninger, Abbott, Nagy, & Carlisle, 2010; Carlisle, 2010; Goodwin & Ahn, 2010). This study laid down a set of principles and protocols for teaching morphologically complex words to support struggling learners in special education through morphological analysis and synthesis (these terms will be defined further in Chapter Two in the section on conceptual framework). Briefly, morphological analysis and synthesis are metacognitive and linguistic tools students could use to develop their morphological knowledge when reading and spelling multisyllabic words.

The methodological framework for this study involves the use of qualitative and quantitative data imbedded within a design-based research approach. Design-based research is an emerging paradigm for inquiry in response to research-to-practice gap in education. While many believe that carefully controlled experimental design and other scientifically based methods are the gold standard for implementing valid literacy instructions (National Reading Panel Report, 2000; Ong-Dean, Hofstetter, & Strick, 2011), what may have worked in the "laboratory" may not be realistic when applied to the complexity and multi-faceted nature of classroom practice. Design research, also

called formative experiments or design experiments by other researchers (Reinking & Bradley, 2004), aims to test and refine a design intervention through iterative process. Through teacher research, this study created a small-scale version of a "learning ecology – a complex interactive system involving multiple elements of different types and levels" (Cobb, Confrey, diSess, Lehrer, & Schauble, 2003, p. 9) surrounding morphological instruction. These elements include teachers' knowledge, students' diverse disability classification, classroom routines, school culture, teachers' literacy knowledge-based, availability and skills of instructional aides, District mandated-curriculum, and other factors interacting inside and outside the classroom that are resistant to control when applied to a laboratory setting. The knowledge gained from my own research has led me to collaborate with other teachers through an iterative process of refining the protocols and principles of teaching morphology. In this dissertation, I collected multiple forms of data including fieldnotes, interview transcripts, lesson planning materials, e-mail messages, focus group transcripts, pre- and posttest measures, and videos.

Equity Implications

The Pygmalion effect illustrates the power the teachers' expectations have in shaping students' academic path and underscores the moral obligation of every teacher in educating the "unteachables" (Rist, 2000). Most students referred for special education services are seldom provided with accelerated reading instruction to narrow the reading achievement gap (Denton, Vaughn & Fletcher, 2003). Low expectations for children with

special needs can result in students' academic disengagement (Allington, 2011). However, when students are given access to intensive and high quality reading instruction, struggling learners can maximize their literacy potential and develop their reading levels closer to their typically developing peers (Vellutino & Fletcher, 2005).

Children with special needs experience marginalization and receive less effective literacy instruction in American classroom (Vaughn, Linan-Thompson, & Hickman, 2003; McGill-Franzen & Allington, 2006). The Medical Model of disability – the belief that children's disabilities are due to the dysfunction of the central nervous system - further perpetuates and promotes this marginalization, leading to the differential and unequal treatment of students with disabilities (Connor, Gabel, Gallagher, & Morton, 2008). Thus teachers tend to dilute the curriculum and have low expectations for children with special needs.

This issue of equity was addressed in my own teacher research on morphological instruction and the transfer of classroom knowledge to other special education classroom. Students were provided opportunities to think critically and reflect on their knowledge of word structures. Explicit, high quality, and rigorous literacy instruction is necessary to develop students' academic skills. Through the study of inflections, prefixes, and suffixes, students used their knowledge of morphology to improve their vocabulary, to understand specific concepts in reading content area materials, and to develop metacognitive skills (i.e., morphological awareness) necessary for reading and writing

(Hiebert & Bravo, 2010). Overall, students were exposed to complex words and given opportunities to problem solve the meaning of the words using their morphological knowledge.

Special education teachers need to set high level of expectations to optimize and accelerate students' literacy development. Teaching multisyllabic words that contain inflections, prefixes, or suffixes prepares special education students for the rigors of content area reading materials. Students use their knowledge of word structure to improve their vocabulary and develop metacognitive skills necessary for reading and writing. Thus when we raise the bar of expectations for struggling readers – exposing them to morphologically complex words like *maladjusted, semiconductor, midsummer, immodest, overview, empowerment, endanger, hopelessness*, *astonishingly, speculative, saddened* - not only have they learned to read multisyllabic words but they have also expanded their vocabulary knowledge necessary to access content area reading materials.

Leadership Implications

The TAR model undergirds the value of distributive leadership in a school system, and specifically demonstrates how to develop special education teachers as instructional leaders within that system. Creating a cohort of teachers who practice research inquiry in their classrooms could lead to the development of model instructional practices that can be reproduced within the same school district. Principals need to support a culture of "inquiry as a stance" (Cochran-Smith & Lytle, 2009, p. viii) to

address the complexity and challenges of developing literacy skills of struggling learners. Flippo (2012) underscores the significance of giving equal voice to practicing teachers concerning their "beliefs, ideas, and learning based on their classroom research and practice" (p. 22). The TAR Model provides such a framework to empower teachers as experts who can generate theories and knowledge grounded in practice, and as leaders in reforming literacy curriculum for struggling learners.

Furthermore, the TAR model is a viable route to professional development. As "leaders of practice" (Elmore, 2008, p. 69), teachers develop new knowledge and instructional practices that can be shared during professional learning days. As instructional leaders, it is incumbent upon us to go public and initiate collaborative work with colleagues to reinvigorate our desire to improve learning in the classroom and build knowledge based on our classroom inquiry. Indeed, the TAR model disrupts the current silos and isolation that many special education teachers are accustomed to.

The school district and principals need to encourage teachers to work collaboratively and replicate the new knowledge and practices in their classrooms; thereby creating a professional learning community (Lieberman & Miller, 2008). Dufour and Marzano (2011) underscore the important role of school principals in building teachers' capacity to impact students' literacy development through teacher research and engaging in ambitious or promising instructional practices in reading and writing. One way to build this capacity is through teacher inquiry. Teacher research as a professional

development holds a potential for improving the instructional quality in special education and developing teachers' pedagogical knowledge and skills (Elmore, 2007).

Overview of Chapters

This dissertation is organized in six chapters. I began this chapter describing the nature of my research problem, the questions I sought to answer, the purpose of my study, and the implications to equity and leadership in special education. The next chapter reviews the extant literature in morphological intervention studies and describes the conceptual and theoretical framework. Chapter Three situates teacher research within the design-based research, an emerging methodological approach to studying educational intervention. The results of the current study are reported in Chapter Four and Chapter Five. Chapter Four is a narrative account of my experience as a practitioner-scholar working with seven teachers - implementing and refining morphology curriculum. Chapter Five reports the quantitative and the qualitative aspects of design experiment using within subject repeated measures and counter factual measures. These measures are described in Chapter Three. Chapter Six synthesizes the results reported in Chapters Four and Five, and discusses the findings and its implications to special education practice, instructional equity, and instructional leadership. I also discuss the limitations of the study in this final chapter.

Chapter Two
Review of Related Literature

Once children can analyze the internal structure of words, they can make use of stems and affixes as building blocks for new words to convey new meaning (Clark, 2003, p. 273)

The prevailing national policies on teaching reading and the quality of teacher's pre-service training mostly influence teacher's knowledge base on reading development. For instance, the National Reading Panel (NRP, 2000) has supported the value of phonological processing to all students and has influenced policy makers to subscribe to phonologically based instruction as foundational skills in reading (e.g., No Child Left Behind, 2001). Similarly, the members of the National Research Council (NRC) Committee on Preventing Reading Difficulties in Young Children (Snow, Burns, & Griffin, 1998), which laid the foundational work for NRP, have given emphasis on the relative role of phonics and phonemic awareness in early literacy development. The NCLB and NRP have led to teachers' reliance on phonics and phonological processing as key knowledge base in teaching early reading skills. Critics of the NRP have argued that the focus on phonological decoding is narrow and one-sided (Camilli, Wolfe, & Lee Smith, 2006; Hammill & Swanson, 2006; Pressley, Duke, & Boling, 2004). The NRP, the critics explained further, overlooked the complexity of reading process and the multi-dimensional nature of language as the basis for developing literacy skills.

In the last three decades of reading research, educational scholars have reached a consensus that phonological processing is an integral component of reading skills, and that developing phonological awareness could lead to reading success among struggling learners (Bradley & Bryant, 1983; Goswami, 2002; Share, 1995). However, English is morphophonemic language (Chomsky & Halle, 1968; Green, McCutchen, Schwiebert, Quinla, Eva-Wood, & Juelis, 2003). Mapping of letters onto sounds is an incomplete process in teaching the foundational skills of reading and spelling. Berninger, Abbott, Nagy, and Carlisle (2010) suggest that "evidence-based practices related to word formation are also critical for fostering literacy achievement" in elementary students and beyond (p. 156). Four syntheses of extant literature on morphological instruction and intervention in the last five years (Bowers, Kirby, & Deacons, 2010; Carlisle, 2010; Goodwin & Ann, 2010; Reed, 2008) support the importance of morphology in literacy development.

The Purpose of the Review of Literature

In this chapter, I briefly describe the four synthesis studies related to morphological intervention before presenting the analysis of the extant literature. The goal of this literature review is to create a conceptual framework that builds on the existing evidence supporting the relative importance of morphological knowledge in developing literacy skills among struggling learners in special education. Furthermore, the current review of literature addresses the question "What are the pedagogical features

of explicit morphology instruction that could most likely be integrated into the teaching of language arts in special education." Through this query, a qualitative analysis of the extant literature on the effects of morphological instruction on word identification, spelling, vocabulary, and reading comprehension are discussed. Ultimately, the review underscores four important ideas present in the existing literature on morphological intervention: developmental level, instructional setting, learning outcomes, and instructional elements.

Overview of the Literature Review:

Morphology has gained researchers' attention in recent years, and the field of study continues to grow. There has been a significant body of correlational studies linking morphological knowledge to literacy. Although correlational research does not provide evidence of causality, what has transpired at one point in time when students are tested on existing skills and prior knowledge informs researchers' conceptualization of morphological intervention. For that, I synthesize some important findings of these correlational studies before I examined the nature of morphological intervention. The overall focus of this review is the examination of different components and characteristics of existing morphological intervention published between 1980 and 2013.

In the last five years, three meta-analyses (Bowers, Kirby, & Deacons, 2010; Goodwin & Ann, 2010; Reed, 2008) and one integrative review (Carlisle, 2010) have been published in four highly respected scholarly journals (i.e., Annals of Dyslexia,

Learning Disabilities Research & Practice, Reading Research Quarterly, and Review of Educational Research). In addition, Kuo and Anderson (2006) published a synthesis study using cross-linguistic analysis of studies on morphological awareness. This publication, though not directly related to intervention, has advanced the understanding of morphological awareness as a metalinguistic process and clarified the development of morphological knowledge in monolingual and bilingual children.

The next two sections describe the methodological process I used in sifting through the extant literature on morphological intervention, and provide a brief description of how I analyzed the articles. Then, I review the relevant psycholinguistic theories surrounding morphology and its implication to reading skills. Finally, clarification of two complementary constructs - morphological awareness and morphological knowledge – is discussed.

Scope of the Review

An exhaustive search of relevant studies was done in March 2013 through successive use of the following electronic databases: ProQuest Education Journal, EBSCO, Education Full Text, and Educational Research Complete. The key words used in the search for the relevant literature include *morphological processing, morphological awareness, morphological knowledge, intervention, instruction, learning disabilities, dyslexia, specific learning disabilities, struggling readers, struggling learners, English language learners, second language learners, structural analysis, word identification,*

spelling, vocabulary, prefixes, suffixes, inflections, compound words, base word, and root word. The identified abstracts were evaluated on the basis of the following inclusionary criteria:

1. Empirical studies published in a peer-reviewed journal between 1980 and 2013, and articles included in peer-reviewed syntheses.
2. Studies conducted in grades K to 8 public or private schools in the US, Canada, and the UK.
3. Studies that contained a morphological intervention.
4. The main focus of the study is on English morphology (i.e., inflection, base-word, affixes, and Greek/Latin root words)
5. The studies reported experimental, quasi-experimental, or correlational as the methodological design.

To control for publication bias, as pointed in Goodwin and Ahn's (2010) meta-analysis of morphological interventions, unpublished papers including dissertations and studies presented in conferences, were included in the search using ProQuest Dissertation & Theses and Google Scholar databases. In addition, I have contacted two experts in the field of morphology for references on intervention studies that have not been published yet. Michael Kieffer from New York University and Amanda Goodwin from Vanderbilt University (personal communication, March 2013 and May 2013, respectively) were consulted in this matter.

Data Analysis

I examined the methodology and intervention programs of 22 studies that met the inclusionary criteria for this review. Each article contains substantive methodological features that include the following: participants, outcome measures, procedures, description of the intervention, procedure, data analysis, results, discussions, and limitations/recommendations for practice and further research. In the first stage of data analysis, as I read the article, I highlighted important ideas that reflect the following variables: statement of the problem, research questions, assumptions and conceptual framework, subjects, measures, procedures, intervention programs, data analysis, conclusion, and recommendations, and typed down some notes. I printed out 63 pages of notes for cross-referencing later. I also reread the notes and sorted them out based on the reading components (i.e., decoding, spelling, vocabulary, and reading comprehension). These categories are not mutually exclusive. For example, there were some studies that addressed both decoding and spelling or vocabulary and comprehension.

In the second stage of data analysis, the highlighted ideas or concepts in the article were coded using in-vivo coding system (Saldaña, 2013). Words, phrases, and sentences were taken directly from the article to represent each variable and encoded on Microsoft word processing. The following categories emerged after analyzing the codes: developmental level, research into practice, learning outcomes, and instructional

elements. When necessary, I reread a specific page or paragraph to understand the context where the codes were taken.

Key Theories Associated with Morphology

Morphology is the study of word structure and its meaning; each meaningful unit is called a morpheme. The morphophonemic nature of English language attests to the relative importance of morphology in learning to read and write. Imagine a student who does not have the full grasp of English morphological structure. Reading this sentence *ilikegreeneggsandham* would post a challenge and would not make sense at all. The student's ability to conceptualize language within a meaningful context and "reflect upon its structural properties is a critical component in language development and in the development of reading" (Kuo & Anderson, 2006, p. 161). In order to process the above given sentence, the students need to have the knowledge of English orthography and morphology to read the words *I, like, green, egg*, and, *ham*. In the case of the word *liking*, the students' knowledge of multimorphemic words (i.e., morphologically complex words that have inflections) helps them reflect on the grammatical nature of the word. This kind of morphological processing in reading is what Mattingly (1984) and Nagy & Anderson (1999) called fundamentally metalinguistic.

One of the most important components in processing morphologically complex words commonly found in content area reading is the awareness of derivational morphology, that words that have prefixes, suffixes, and Greek/Latin roots. Processing of

derived morphemes involves three different levels of morphological knowledge: relational, syntactic, and distributional (Tyler & Nagy, 1989). Relational knowledge is manifested in students' understanding of the relationship between the base word (e.g., success) and derived words (e.g., successful, unsuccessfully, and successfully). Syntactic knowledge refers to the understanding of grammatical categories of words in a sentence (e.g., the verb becomes a noun when the suffix –ment is added; *acknowledge/ acknowledgement*, *move/movement*). Distributional knowledge is the understanding that the grammatical classification of the base word restricts the use of specific affixes (e.g., suffix –ly is only attached to adjectives, but not to nouns; *silently* is acceptable, but not *silencely*). For more details of these three levels of awareness of derivational morphology, see the discussion of Kuo & Anderson (2006).

The developmental nature of morphological knowledge applied to reading acquisition is still incomplete. Attempts have been made to clarify the developmental progression of morphological awareness in oral language (Anglin, 1993). Carlisle (2003), on one hand, underscores the critical role of morphological processing in the development of morphological awareness and morphological knowledge in young readers. As students gain efficiency and fluency in decoding one-syllable-word patterns and identifying sight words, they encode and decode further complex and multisyllabic words as morphophonemic units, gradually developing their understanding that words

have morphemic structures and can be broken down into smaller meaningful parts (Carlisle, 2010).

Morphological Awareness and Morphological Knowledge

Like any process of scientific discovery, the emergence of "anomalies, or violations of expectation," is crucial to the development of a paradigm and a normal science as a puzzle-solving process (Kuhn, 1962, p. xi). The study of morphology is no exception from this anomaly and puzzle solving. For example, *morphological awareness* and *morphological knowledge* are two complementary constructs that have been used interchangeably in the literature (Hiebert & Bravo, 2010); others view them as distinct constructs (Goodwin & Harris, 2012). Bowers, Kirby, and Deacon (2010) recognize the heterogeneity of defining *morphological knowledge* among literacy scholars. Goodwin, Gilbert, and Cho (2013), on the other hand, think that there is an unclear conceptualization of *morphological awareness* and *morphological knowledge*. Clearly, these two constructs need further clarification in this chapter.

Carlisle (1995) defines morphological awareness as "conscious awareness of the morphemic structure of words and their ability to reflect on and manipulate that structure" (p. 194). The idea of *conscious awareness* reflects the understanding that children have explicit knowledge of morphology in order for them to process the structure and the meaning of words in their mind. Kuo and Anderson (2010) conceptualize this as a metalinguistic process. However, when children are assessed of

morphological awareness, they only need to manifest implicit knowledge of word structure and implicit understanding of the rules governing word formation (Anglin, 1993; Carlisle & Nomanbhoy, 1993; Kieffer & Lesaux, 2012; Singson, Mahony, & Mann, 2000). Students do not need to communicate their knowledge of morphology explicitly in order to show morphological awareness. Morphological awareness then is an implicit understanding of language structure as a result of normal language acquisition.

After learning the specific meaning of each Greek and Latin morpheme, Goodwin and Harris (2012) found that seventh and eighth grade students had lower levels of morphological awareness than their counterparts but gained morphological knowledge. They hypothesized that the intervention supported morphological knowledge as opposed to morphological awareness. This led them to differentiate the concept of morphological awareness and morphological knowledge. Accordingly, "morphological knowledge involves more morpheme specific knowledge such as knowledge of the definition of Greek and Latin morphemes" (p. 24).

Therefore, morphological knowledge is an explicit understanding of base words, affixes, and inflections. This is consistent with Hiebert and Bravo's (2010) definition of morphological knowledge as the "ability to use knowledge of morphemes in giving meaning to unknown words and phrases" (p. 2). Given the over-all tenor of Hiebert and Bravo's article, their definition supports Goodwin and Harris' conceptualization of morphological knowledge. Morphological awareness connotes implicit understanding of

word structure, while morphological knowledge involves the explicit semantic understanding of different morphemes. Morphological awareness, in this case, could be a byproduct of teaching prefixes, suffixes, inflections, and compounding, or a normal process of language development.

Relationship Between Morphological Awareness and Literacy Skills

Morphology matters in language and literacy development from early childhood through young adulthood (Anglin, 1983; Berko, 1958; Carlisle, 2000; Siegel, 2008; Tyler & Nagy, 1989). The relevance of morphology in the current discourse of reading development is shown in the correlational studies implicating morphological awareness to the development of word reading, spelling, vocabulary, and reading comprehension.

Word reading. Knowledge of morphology plays a vital role in later reading acquisition (Carlisle, 2010; Nagy, Berninger, & Abbott, 2006; Singson, Mahony, & Mann, 2000). For example, the presence of multisyllabic words in intermediate grade and middle school texts reflects the importance of sensitivity to morphological structure of printed words in developing word recognition. Singson, Mahony, and Mann (2000) believe that sensitivity to morphemes, which partly represent the English orthography, could play a role in the acquisition of decoding skills. In their study of the relationship between reading ability and morphological skills as evidence from derivational suffixes, the authors concluded that knowledge of derivational suffixes is correlated with reading and vocabulary measures ($r=0.26$ to 0.55). Linear regression model further revealed that

derivational suffix materials made an independent and increasing contribution to decoding ability throughout the higher elementary grades (β_{MR}=0.23, p<0.007). This study not only shows the importance of morphology in later grades but also offers a genuine contribution to reading skills beyond the well-researched and amply documented phonological awareness.

However, when 10- to 12-year old children with learning disabilities are given two morphological tasks: one, where words are phonologically opaque (i.e., change in pronunciation of derived words), and the other one is phonologically and semantically transparent (i.e., no change in pronunciation of derived words), they perform poorly in a task that has phonologically opaque words (Windsor, 2000). Students with learning disabilities would seem to struggle when presented derived words like *signature* (from sign), *healthy* (from heal), or *nationality* (from nation). It is hypothesized that struggling readers developed morphological awareness and build morphographic schema when they are exposed to morphologically complex words, i.e., derived words (Carlisle & Stone, 2004; Goodwin, Gilbert, & Cho, 2013). We can infer from this hypothesis that when providing instruction and intervention, teachers need to challenge struggling readers by exposing them to complex words structure when learning to decompose and compose morphologically riched words, specifically those that change the pronunciation when deriving base words.

Spelling. Some studies have linked morphological awareness to improvement of

spelling of multisyllabic words (Bourassa & Treiman, 2008; Deacon, Kirby, & Casselman-Bell, 2009; Kemp, 2006; Templeton, 1983). The unreliability of using phonemes to spell words (e.g*., break, brake, leak, leech*) makes the meaning of the smallest unit of the word, not sound, the most important feature of spelling (Siegel, 2008). Knowing how vowels change when prefixes and suffixes are added to base words is the first step in spelling words such as *sanity, divinity, serenity,* and *production.* Siegel infers that understanding the morphemic structure of English words could be a factor in correct spelling. This claim has been supported by different studies that recruited students with dyslexia (Silliman, Bahr, & Peters, 2006; Tsesmell & Seymour, 2006), children with and without speech sound disorder (Apel & Lawrence, 2011), second grade native English speakers (Deacon, Kirby, & Casselman-Bell, 2009), and third- to sixth-grade typically developing children (Bourassa & Treiman, 2008).

Limited knowledge of morphology is related to poor spelling of inflected verbs (e.g., *walked, pasted, passed*). Elementary and middle school students with learning disabilities show poor grasp of morphological rules regarding inflection (adding –ed and –ing at the end of the word) when given a dictated spelling task in the context of sentences (Hauerwas & Walker, 2003; Leong, 2009). Younger children with spelling deficits tend to have difficulty doubling the last consonant of a regular past tense verb when spelling words like *dropped, tugging*, and *patted* (Arndt & Foorman, 2010; Egan & Pring, 2004; Hauerwas & Walker, 2003; Silliman, Bahr, & Peters, 2006). However, this

issue gets resolved as students get older, reaffirming the developmental trend in morphological understanding (Leong, 2009).

In addition to inflectional morphology, both young and older children with spelling deficits have difficulty with words that require shifting in sound or orthographic patterns when spelling derived words (e.g., magic-magician; compete-competition; Siliman, Bahr, & Peters, 2006; Templeton, 1983). Tsesmeli & Seymour (2006) argue that dyslexic students' difficulty to spell derived words is attributed to their lack of awareness of morphological structure. In spelling 48 morphologically derived word-pairs, the performance of students in dyslexic group (10 students aged 13 to 15) was inferior to the results for two control groups. Kemp (2006) and Deacon & Bryant (2006) highlight the importance of using the knowledge of base form in order to spell derived words (e.g., correct – incorrectly; cheer – cheerfulness; organize –disorganization). Understanding the role of base words in morphologically complex words, therefore, could improve students' spelling of derived words (e.g., the base word *heal* is related to the following words: *healing, healed, health, healthy, unhealthy, healthily*).

Finally, spelling instruction would be meaningful to students when it is linked to vocabulary instruction. Templeton (1983, 1991) emphasizes the importance of the spelling/meaning interrelationships across prefixes, suffixes, and base words as a

principle and a strategy; rather than rote-memorization. Using morphological analysis as an instructional tool, White, Power, and White (1989) estimate as many as 9,000 prefixed words a year for a fifth grade student to learn beyond direct instruction of words.

Vocabulary. Studies have shown that morphological knowledge could generate growth in general academic vocabulary (Behrend, Harris, & Cartwright, 1995; Flanigan, Templeton, & Hayes, 2012; Pacheco & Goodwin, 2013; White, Power, & White, 1989). Anglin (1993) showed an exponential increase of vocabulary knowledge between grades 3 and 5 due to a significant number of morphologically complex words that students learn between these periods [F (1,93) = 235.99, p, .0001]. During this time, most children have already acquired the foundational reading skills they need, and they read a sheer amount of words in different content-area reading (Adams, 1990). By 5th grade, Anglin estimated that children learn on average 29,596 morphologically riched words, 20 words per day between grade 1 and grade 5. Nagy and Herman (1987) estimated a reading vocabulary growth rate of around 3,000 words per year between grades three and twelve.

Morphological knowledge can positively influence independent vocabulary learning. A student who is trained in morphemic analysis would decipher the meaning of unknown words by looking for its meaningful parts – morphemes (Edwards, Font, Baumann, & Boland, 2004). To understand the meaning of the word "*indescribable,*" students have to disassemble the word into base word and affixes (*indescribable* = *in* + *describe* + *able*), acquire the meaning of the base word and affixes (*describe*: explaining

something, *in-:* not, and *–able:* able to do so), and reassemble the meaningful parts to derive word meaning. When students go through this process every time they encounter unknown words, they substantially increase the breath and depth of their vocabulary learning (Nagy, Berninger, & Abbott, 2006). This generative process triggers a vocabulary growth in content-specific vocabulary and general academic vocabulary, where 70% of words contain Greek or Latin affixes (Flanigan, Templeton, & Hayes, 2012; Nagy & Anderson, 1984).

Awareness of word structure is linked to the ability to decompose and define morphologically complex words (Carlisle, 2010; Nagy, Berninger, & Abbott, 2006). Students with dyslexia have deficit in morphological awareness that puts them at a disadvantage to learn new words (Siegel, 2008). Kieffer and Lesaux (2007) assert that understanding the component parts of a word could be a powerful tool for students faced with the daunting task of acquiring academic vocabulary. Pacheco and Goodwin (2013) emphasize the importance of multiple strategies when teaching students of morphology. Most importantly for middle school, teachers need to develop students' word problem solving using their knowledge of base word, affixes and their awareness of how morphemes are connected within the word. Studying morphology supports students' vocabulary development. Having wider vocabulary leads students to greater chances of understanding what they read, and better opportunity to learn more vocabulary words.

Using morphemic analysis could also influence the understanding of different properties of a word when affixes are added to the base form of a word (Mahony, Singson, & Mann, 2000). For example, the word *parent* (noun), when added a suffix –al, becomes *parental* (this is called syntactic property); malign becomes malignant (phonological property); pronounce as related to pronunciation and pronouncement (relational property).

Reading comprehension is a "process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (Rand Reading Study Group, 2002, p. 11). In this developmental process, fluency and accuracy in word reading, motivation, and rich repertoire of vocabulary knowledge all contribute to students' understanding of written language. But among these three variables, vocabulary has been strongly linked to reading comprehension (August, Carlo, Dressler & Snow, 2005; Baumann & Kame'enui, 2004; Stahl & Fairbanks, 1986). The reciprocal relationship between vocabulary and comprehension is vital to the understanding of morphological awareness. Unfortunately, very limited number of studies has been done in the last 10 years directly implicating morphological awareness or morphological knowledge to reading comprehension. Much of the study relating morphology to reading comprehension is done through the impact of morphological knowledge and awareness on vocabulary growth (Kieffer & Lesaux, 2012; Nagy, Berninger, & Abbott, 2006). Kieffer (unpublished) hypothesizes that the student's ability to extract morphologically

complex words could result in successful word learning and eventually provide them tools to better understand continuous text.

Studies on second language learners have also shown a significant correlation between morphological knowledge and reading comprehension (Jeon, 2011; Kiefer & Lesaux, 2012; Wang, Cheng, & Chen, 2006). After controlling for vocabulary and decoding confounds, Kiefer and Lesaux have established a direct and unique contribution of morphological awareness to English reading comprehension of native English, Spanish, Filipino, and Vietnamese speakers (standardized path coefficient = 0.480; z = 8.443; p, 0.0001). Jeon (2011), likewise, has demonstrated a significant relationship between morphological awareness measures and reading comprehension (r= 0.381for Verbal Suffix Knowledge and Reading Comprehension, and r= 0.481 for Test of Morphological Structure-Revised and Reading Comprehension Test; $p < .01$) among 10^{th} grade English language learners in South Korea, after phonology has been controlled.

Research is needed to fully understand the direct link between morphology and reading comprehension. It is also important to identify which aspects of morphological knowledge are responsible for understanding continuous text. The reciprocity between morphological knowledge and vocabulary is a good start to shed light on the relative weight of morphology to reading comprehension.

To this point, the vast evidence implicating morphological awareness to literacy development is correlational. There is no empirical evidence yet to prove which direction

influences the relationship between morphological knowledge and literacy development. Theoretically, however, the relationship between these two variables could be bidirectional. “It may be that morphological knowledge builds literacy skills or that developing literacy skills build morphological knowledge or that there is some mutually supportive relationship” (Bowers, Kirby, Deacon, 2010, p. 148).

Synthesis Studies

One of the ways to investigate the causality between morphological knowledge and literacy development is through intervention studies. Four synthesis studies on morphological intervention have been published to evaluate the significant effects of morphological knowledge on literacy outcomes. Table 1 shows the list of studies in four previously published syntheses, juxtaposing with the list of studies selected for this review.

Reed (2008) analyzes the effects of morphological intervention on grades K through 12. Her synthesis is limited to seven intervention studies between 1986 and 2006. A total of 101 effect sizes were computed ranging from -.93 to 9.13. Considering the limited studies included in this synthesis and the wide range in effect sizes calculated in relation to outcome measures, conclusive interpretations on the strength of morphological awareness are not warranted.

Table 1.
Research Reviewed in Previously Published Studies

Reed (2008)	Bowers, Kirby, Deacon (2010)	Carlisle (2010)	Goodwin & Ahn (2010)	Current Search (2013)
Abbott & Berninger (1999)	Abbott & Berninger (1999)	Bauman et al. (2002)	Abbott & Berninger (1999)	Abbott & Berninger (1999)
Bauman et al. (2002)	Arnbak & Elbro (2000)	Bauman et al. (2003)	Arnbak & Elbro (2000)	Apel, et al. (2013)*
Bauman et al. (2003)	Bauman et al. (2002)	Berninger et al. (2003)	Berninger, Winn, et al. (2008)	Bauman et al. (2003)
Nunes, Bryant, et al. (2003)	Bauman et al. (2003)	Berninger, Winn, et al. (2008)	Fillipini (2007)	Bauman et al. (2002)
Vadasy et al. (2006)	Berninger et al. (2003)	Birgisdottir, et al. (2006)	Harris (2007)	Berninger et al. (2013)*
Wysocki & Jenkins (1987)	Berninger, et al. (2008)	Carlo, August, et al. (2004)	Henry (1987, 1988); Henry et al. (1989)	Berninger et al. (2008)
	Bowers & Kirby (2006)	Casalis & Cole (2009)	Kirk & Gillon (2009)	Birgisdottir et al. (2006)
	Bowers & Kirby (in press)	Chow, et al. (2008)	Lovett et al. (2009)	Bowers & Kirby (2006)
	Henry (1989)	Elbro & Arnback (1996)	Lovett & Steinback (1997)	Bowers & Kirby (2010)
	Hurry et al. (2005)	Henry (1989)	Roberts (2008)	Bryant et al. (2006)

* Additional studies that are not included in the four synthesis-studies. Five studies were published between 2010 and 2013; four studies were published before 2010

Table 1. (cont'd)
Research Reviewed in Previously Published Studies

Reed (2008)	Bowers, Kirby, Deacon (2010)	Carlisle (2010)	Goodwin & Ahn (2010)	Current Search (2013)
	Kirk & Gillon (2009)	Lyster (2002)	Tomesen & Aarnoutse (1998)	Hesse et al. (1983)*
	Lyster (1998)	Nagy et al. (2002)	Tyler et al. (2002)	Katz & Carlisle (2009)*
	Lyster (2002)	Nunes et al. (2003)	Tyler et al. (2003)	Kieffer & Lesaux (2012)*
	Nunes et al. (2003)	Packard et al. (2006)	Vadasy et al. (2006)	Kirk & Gillon (2009)
	Parel (2006)	Tomeson & Aarnoutse (1998)		Lesaux et al. (2010)*
	Robinson & Hesse (1981)	Wu, Anderson, et al. (2009)		Nunes, Bryant, & Olsson (2003)
	Tomesen & Aarnoutse (1998)			Nunes, Bryant, Pretzlik, et al. (2006)
	Tyler et al. (2003)			Parel (2006)
	Vadasy et al. (2006)			Robinson & Hesse (1981)
				Vadasy et al.(2006)
				Wysocki & Jenkins (1987)*

Bowers, Kirby, and Deacon (2010) provide another systematic review of the literature related to the effects of morphological instruction on literacy development. Morphological instruction is greatest when students were tested using sublexical tasks (effect size of 0.65) such as morphological analogy (e.g., walk: walked:: shake: _____), and when these tasks were given to less able students (0.99) as opposed to undifferentiated groups (0.65). However, the effect sizes tend to weaken beyond the sublexical level. The effect sizes in the lexical level (i.e., vocabulary, word reading accuracy or efficiency, spelling and word-level orthographic processing tasks) and supralexical level (i.e., reading comprehension tasks, syntactic awareness and listening comprehension) range between - 0.08 to 0.41. Bowers and associates hypothesize that untaught morphological knowledge contributed to the relative weakness of the instructional effects beyond sublexical level.

To extend the previously published synthesis studies using variance-weighted estimate, which Reed, Bowers, Kirby and Deacon failed to include in their analysis, Goodwin and Ahn (2010) provide 79 standardized mean-change differences between control and treatment groups from 17 independent studies. An overall significant effect of morphological instruction on literacy outcome (0.33) was observed when compared to control groups. The extent of morphological interventions was more effective when it was part of a comprehensive instruction (0.36) rather than an exclusive focus on morphological instruction (-0.05). Contrary to Bowers and colleagues' findings, Goodwin

and Ahn's analysis of morphological intervention yielded significant improvements on vocabulary knowledge (0.40) and spelling (0.20). However, they concur with Bowers' conclusion that morphological intervention supports literacy achievement of struggling readers (0.46), speech and language disabled (0.77) and English language learners (0.62).

Carlisle's (2010) integrative study highlights three challenges of interpreting results from synthesizing extant literature on morphological intervention. The 16 studies included in her review reflect variability of study designs. Seven used random assignment to different conditions such as schools, classrooms, and students; while the rest of the studies used convenience sampling. In addition, the purpose of the interventions also varied from one study to another. Some studies aimed to test causality and others were exploratory. Another critical area for evaluating the studies is the "detailed presentation of the program of instruction and documentation of implementation" (p. 480). Reporting the types of morphologically complex words was consistent across different studies, but the content of the interventions lacked detailed information. Lastly, the technical characteristics of the measures used in the studies provide little information other than internal consistency.

Owing to different inclusionary criteria, variant research questions, and diverse method of data analysis, comparing the four previously published review of literature to my current review is not ideal. Although intervention studies on the efficacy of explicit instruction of morphology remain limited, an increasing number of scholars investigating

the importance of morphological intervention and instruction on literacy development is observed. This review adds nine studies to the growing extant literature in morphology intervention (Apel, Brimo, Diehm, & Apel, 2013; Berninger, Lee, Abott, Breznitz, 2013; Goodwin & Harris, 2012; Hesse, Robinson, & Rankin, 1983; Katz & Carlisle, 2009; Kieffer & Lesaux, 2012; Lesaux, Kieffer, Faller, & Kelly, 2010; Wysocki & Jenkins, 1987). Overall, three studies were done in Canada, one in New Zealand, four in United Kingdom, and 14 in the USA. The remainder of the literature review reanalyzes individual studies qualitatively according to developmental level, research site, learning outcomes, and instructional elements.

Review of Empirical Literature on the Effects of Morphological Intervention

Developmental level. The current review reflects similarity from previous reviews that morphological awareness and morphological knowledge could be developed early in the child's schooling. Table 2 shows that the bulk of the intervention studies are concentrated in upper elementary level, as shown by the number of studies reported in this paper. This is not uncommon since Adams' (1990) influential book advocated for later teaching of morphology, preferably later elementary grades and middle school. Growing evidence showing the effect of morphological intervention in primary grades is emerging (Bland-Stewart & Fitzgerald, 2004; Kirk & Gillon, 2007; Nunes, Bryant, & Bindman, 1997; Treiman, Cassar, & Zukowski, 1994). This knowledge and awareness of morphological structure continue to develop and reach its peak around the age of 10 or

Table 2.
Morphological Awareness Intervention Based on Grade Level

Primary Level	Intermediate Level	Intermediate Level and Middle School	Middle School
Apel, Brimo, Diehm, Apel (2013)	Abbott & Berninger (1999)	Berninger, Lee, Abbott, et al. (2013)	Goodwin & Harris (2012)
Parel (2006)	Baumann et al. (2003)	Berninger, Winn, Stock, et al. (2008)	Hess, Robinson, & Rankin (1983)
Nunes, Bryant, & Olsson (2003)	Baumann et al. (2002)	Kirk & Gillon (2009)	Kieffer & Lesaux (2012)
Vadasy, Sanders, & Peyton (2006)	Birgisdottir, et al. (2006)	Wysocki & Jenkins (1987)	Lesaux et al. (2010)
	Bowers & Kirby (2010)		Robinson & Hesse (1981)
	Bowers & Kirby (2006)		
	Bryant, et al. (2006)		
	Katz & Carlisle (2009)		
	Nunes et al. (2006		

11, when the child develops sensitivity to derivational morphology (Berninger, Abott, Nagy, & Carlisle, 2010). At present, there are four intervention studies that recruited students from kindergarten to third grade. In this review, primary level is operationalized as students in kindergarten to grade three; intermediate level is grades four and five; and middle school level is from grade six to seven. Table 2 summarizes the twenty-two studies using these three categories. Four studies recruited participants from intermediate and middle school levels. Kirk & Gillon (2009) implemented their intervention study with students from third to six grades. This study was done in New Zealand. Berninger and her colleagues (2008, 2013) drew their samples from fourth to ninth grades. Wysocki & Jenkins (1987) implemented their morphology intervention to 4th, 6th, and 8th grade students. The limited intervention studies done in middle school reflect the current general research and policy issue on marginalized adolescent readers (Franzak, 2006). The limited studies on morphological intervention in middle school represent the microcosm of what has been a long-standing crisis in adolescent literacy research (Deshler, Palincsar, Biancarosa, & Nair, 2007; Vacca and Alvermann, 1998).

Research Setting. Transforming research into practice has been a slow process in education. For example, as early as 1930s, scholars had demonstrated the importance of phonics in teaching young children to read, but only in the 1990s that school had started to embrace the practice (Hurry, 2004). Explicit teaching of morphology is following the same predicament phonics went through. Lesaux et al. (2010) support the idea of

ecological validity in intervention research. They highlight the need for researchers to examine classroom-based intervention that can easily be adopted and implemented by classroom teachers. Bryant, Nunes, Pretzlik et al.'s (2006) research on the use of suffix –ion and –ian tested the hypothesis in a laboratory setting. With three treatment groups (explicit teaching, implicit teaching, and mixed explicit/implicit) and one control group, they found that students in three groups who were taught morphemes *–ion* and *–ian* in spelling words like *confession* and *magician* scored better than students in the control group. Then, they replicated this study outside well-controlled circumstances, having teachers in two Oxford schools teaching morphology to fourth grade students. However, this classroom-based study was not comprehensive enough since they only taught two morphemes among a wide array of suffixes and prefixes to be taught in a year. This condition lacks a multifaceted approach to warrant ecological validity.

Lesaux and colleagues (2010) conducted a text-based academic vocabulary intervention to 476 linguistically diverse sixth-grade students in urban middle schools in southwestern United States. Nineteen teachers taught academic vocabulary lessons that promote deep processing of morphologically complex words in 18 weeks. Using multilevel modeling, the program yielded significant effects on vocabulary knowledge ($d=0.39$; $p<.0001$), morphological awareness ($d=0.20$; $p=.0003$), and word meanings in expository text ($d=0.20$; $p=.0227$). They concluded that "multicomponent curriculum is a

promising approach for mainstream urban classroom with high numbers of language minority learners" (p. 222).

Overall, 58% of the studies (n = 14) reported school setting as the venue for implementing morphology intervention, where teachers taught their own students in their own classroom. Ten of these employed quasi-experiment, two randomized design, and a study with no control group but used a counterfactual measure (i.e., using measures that could influence learning outcomes due to maturation and other variables, but not due to the target intervention; Apel et al., 2013). Table 3 describes the specific studies done in a school or a non-school setting. In a non-school setting, Abbott & Berninger (1999) and Kirk & Gillon (2009) trained graduate students to implement the intervention program. Abbott and Berninger included school psychologists and graduate students from the school psychology and teacher preparation programs; Kirk and Gillon supervised speech pathology students. Meanwhile, Vadasy and colleagues (2006) trained para-educators to teach structural analysis with text reading practice to students who struggle at grade level word reading in the classroom.

Learning outcomes. The 22 studies represent a wide variety of learning outcomes. Research has related morphological intervention to students' academic vocabulary development, spelling skills, word reading, and reading comprehension (e.g., Apel, Brimo, Diehm, Apel, 2013; Bauman, Edwards, Font, et al., 2002; Berninger, Winn,

Table 3
Research Setting

School Setting	Non-School Setting
Quasi-Experiment	***Taught by One of the Researchers***
Birgisdottir, Nunes, Pretzlik, et al. (2006) Bowers & Kirby (2006) Bryant, Nunes, Pretzlik, et al. (2006) Hesse, Robinson & Rankin (1983) Goodwin & Harris (2012) Kieffer & Lesaux (2012) Lesaux, Kieffer, Faller, et al. (2010) Nunez, Bryant, Pretzlik, et al. (2006) Robinson & Hesse (1981)	Berninger, Winn, Stock, et al. (2008) Bauman, Edwards, Font, et al. (2002) Bowers & Kirby (2010) Katz & Carlisle (2009) Nunes, Bryant, & Olsson (2003) Wysocki & Jenkins (1987)
Hierarchical Randomized Group Design	***Trained Graduate Students***
Baumann, Edwards, Boland, et al. (2003)	Abbott & Berninger (1999) Kirk & Gillon (2009)
Randomize Group Design	***Teachers Trained in Clinical Setting***
Parel (2006)	Berninger, Lee, Abbott, et al. (2013)
Within-Group Design using Counterfactual Measure	***Trained Para-educators***
Apel, Brimo, Diehm, et al. (2013)	Vadasy, Sanders, & Peyton (2006)

Stock, et al., 2008; Hesse, Robinson, & Rankin, 1983). Table 4 represents the different components of literacy development and its corresponding measures that have been used in morphological intervention research.

Eight studies evaluated the effect of the intervention on vocabulary, six on spelling, seven on combined word reading and spelling, and three on multiple learning outcomes such as vocabulary, reading comprehension, oral reading, listening, and spelling. Visual examination of table 4 reveals a stark contrast between the first two columns (vocabulary and spelling outcomes) and the last two columns (combined and multiple outcomes). Most of the studies that investigated the effect of morphological intervention on vocabulary or spelling devised their own researcher-made tests (Baumann, et al., 2002, 2003; Bowers & Kirby, 2010; Birgisdottir, et al., 2006; Bryant, et al., 2006; Hesse, et al., 1983; Nunes et al., 2006; Robinson & Hesse, 1981; Wysocki & Jenkins, 1987). While others adapted the measures used in previous studies (Kieffer & Lesaux, 2012; Lesaux, et al., 2010; Parel, 2006). Studies that used multiple learning outcomes administered combined researcher-made and standardized test measures (Apel, et al., 2013; Goodwin & Harris, 2012; Kirks & Gillon (2009).

Nunes and her colleagues (2006) implemented a morphology instruction to upper elementary and middle school students within the context of reading classic stories, analyzing poems, and describing reproduced art posters obtained from the National Art Gallery in London. They devised a 40-item vocabulary test; each item was presented with

Table 4
Learning Outcomes

Vocabulary	Spelling	Combined Spelling and Word Recognition	Multiple Outcomes
Baumann et al., (2003)	***Birgisdottir et al. (2006)***	***Abbott & Berninger (1999)***	***Apel et al. (2013)***
Three types of vocabulary tests administered in different points throughout the lessons: textbook assessment, morphemic assessment, passage vocabulary. Pretest: Degrees of Word Meaning; Content Pretest Posttest: Textbook vocabulary test; Word Part test; Immediate Vocabulary in Context test; Delayed vocabulary in Context test ***Bauman et al., (2002)*** 60 low-frequency target words (30 prefixed words and 30 context words selected from the American Heritage Word Frequency Book)	Used the same spelling measures for pre-and posttests First test contained 26 two- or three-morpheme words, each containing a prefix or a suffix, and words cannot be spelled correctly purely on the basis of sound The second test contains 10 pseudowords with made-up stem and real suffix ***Bryant et al., (2006)*** Sentence completion test and production of pseudowords ***Hesse, Robinson, & Rankin (1983)*** Stanford Achievement Test, Spelling subtest; Morphograph spelling test (50 words)	Three measures of orthographic knowledge; two measures of phonological processing; Qualitative Reading Inventory; Word identification and Word Attack subtests of WRMT-R; Wechsler Individual Achievement Test (WIAT) Spelling subtest ***Berninger et al. (2008)*** Wide Range Achievement Test (WRAT)-3 Spelling subtest; Woodcock-Johnson (WJ) Pseudoword Spelling subtest; Wechsler Individual Achievement Test (WIAT)-II Written Expression; Test of Word Reading Efficiency (TOWRE) Phonemic Decoding Efficiency subtest; Orthographic Process Assessment of the Learner (PAL) Expressive coding; Morphological Signals Test	Morphological awareness task based on Carlisle and Green; combining real affixes and base words into nonsense words; Oral sentence completing using base morpheme; affix identification task; 26 multimorphemic words for spelling; TOWRE Word and Nonword decoding subtests; Test of Silent Reading Efficiency and Comprehension ***Goodwin & Harris (2012)*** Gates-MacGinities Test of Reading Comprehension and Reading Vocabulary; Researcher –created literacy assessments on spelling based on Carlisle and Nunes et al., and knowledge of word definition

Table 4 (cont'd)
Learning Outcomes

Vocabulary	Spelling	Combined Spelling and Word Recognition	Multiple Outcomes
Stanford Achievement Test – 10th ed Reading Vocabulary subtest; Morphological Decomposition Task. ***Nunez, Bryant, Pretzlik, et al. (2006)*** Picture Vocabulary Test; Pseudoword Definition Test ***Parel (2006)*** Reading Vocabulary: did not explicitly describe the components and technical characteristics of the test ***Wysocki & Jenkins (1987)*** Three vocabulary measures (3rd, 6th, 8th grades) each consisted of 12 sentences containing one target word and students were asked to define.		and reading probes representing patterns in morphologically simple and complex words. ***Nunes, Bryant, & Olsson (2003)*** Reading 48 words and 36 pseudowords involving morphological rules; Spelling 31 words and 10 pseudowords ***Vadasy, Sanders, & Peyton (2006)*** PPVT; WRAT reading subtest; (WRMT) –R/NU Word Identification and Word Attack subtests; Phonemic Decoding and Sight Word Efficiency subtests of the TOWRE	

a picture booklet, and the students had to select the correct answer from the four choices. The pre-and posttest results showed that children in the morpheme group did better than their control group counterpart in vocabulary. The authors did not indicate the effect size. However, they did describe the test measures' internal consistency (Cronbach's alpha varied between .75 and .85 with different samples) and correlation with British Picture Vocabulary Scale (5 = .66).

Kieffer and Lesaux (2010) studied the effects of academic language instruction on syntactic aspects of morphological awareness. They defined syntactic knowledge as "the understanding of how a derivational suffix changes the part of speech of a word and thus how derived words function in clauses or sentences" (p. 521). They adapted two measures that were initially created by other researchers from different studies. One of these measures is based on Carlisle's (2000) *Real Word Morphological Decomposition* and *Extract the Base Word*. Results showed that native English speakers have the relational knowledge of morphological awareness (e.g., Does dollar come from doll; Teacher: Mr. Gomez like to ____; p. 521). They also administered a nonword morphological derivation task based on Nagy et al.'s (2006) research. Results revealed treatment effects for language minority learners when both relational and syntactic aspects of morphological awareness were appraised.

The relative ease of examining the effect of morphological intervention on one learning outcome seems to provide researchers the manageability of creating

measurements germane to their research problem and conceptual framework. But studies involving multifactorial measures like that of Abbott & Berninger (1999), Berninger et al. (2009, 2013), and Katz & Carlisle (2009) needed to use standardized test measures. In reality, literacy is a complex summation of different strands of skills – vocabulary, word recognition, reading comprehension, spelling, expressive writing, oral expression to name some – that cannot be measured with one monolithic apparatus. Thus the advantage of using both researcher-made tests and standardized measures could compensate for the inherent technical limitations of each test.

Authenticity of intervention procedure and contextual used of words could result to valid outcome measures. Baumann and colleagues (2002, 2003) emphasize the need to conduct intervention research in authentic school context. Using vocabulary words taken from textbooks (i.e., Unit 2, Chapters Three and Four of the US History 5th grade textbook) strengthens the content and ecological validity of their study. While commercially available assessment materials have gone through rigorous standardization, and established a certain degree of reliability and construct validity, standardized measures of vocabulary and spelling have limited diagnostic capability when applied to morphological intervention studies. Calhoon & Masterson (2011) analyzed six commercially available standardized tests and commonly used instruments in educational research. They found that the Wechsler Individual Achievement Test –III utilizes 43% more multimorphemic words than the rest of the tests (i.e., Kaufman Test of Educational

Achievement (KTEA) Comprehensive, KTEA Brief, Woodcock-Johnson (WJ) III, Wide Range Achievement Test (WRAT) – 4, and the Test of Written Spelling – 4. Building morphological knowledge and developing awareness to word structure from kinder to eight grade could potentially improve the academic achievement of English language learners (Kieffer & Lesaux, 2012; Lesaux, et al., 2010), low SES students (Apel, Brimo, Diehm, & Apel, 2013), children with speech disorder (Kirk & Gillon, 2009), at risk readers (Vadasy, Sanders, & Peyton, 2006), struggling learners (Berninger, Winn, et al., 2008) and typically developing peers (Baumann, Edwards, et al., 2002; Baumann, Edwards, et al., 2003; Bowers & Kirby, 2010; Nunez, et al., 2006). Carlisle (2003) argues that prolonged period of learning morphological awareness could lead to explicit awareness of morphemic structure and analytic attitude toward word parts and its meaning. This experience could eventually impact students' recognition and understanding of morphologically complex words that are ubiquitous in upper elementary and middle school texts. Repeated exposures to these complex words help many students succeed in recognizing, spelling, and understanding new words (Bowers, Kirby, Deacon, 2010; Carlisle, 2010; Goodwin & Ahn, 2010; Reed, 2008).

Instructional elements. After examining the intervention programs described in the 22 studies, I arrived at five themes: instructional components, isolated versus integrated, duration, types of morphemes, and morphological knowledge (see Table 5). In this review, instructional components refer to activities or instructional format relevant to

Table 5
Instructional Elements

Authors	Instructional Components	Isolated versus Integrated	Duration	Types of Morphemes	Morphological Knowledge
Abbott & Berninger (1999)	Phonological and Orthographic skills; alphabetic principle training; phonological decoding	Integrated	16 weeks of one-hour individual tutorial sessions	None specific, but students were taught to check for affixes and roots, then divide the word into syllables	Structural analysis
Apel, Brimo, Diehm, Apel (2013)	Listening; word sort; verbal production; story context; kinesthetic (using blocks and circling the target affix); word writing; review	Integrated	12 lessons in 9 weeks	Inflections (plural -s and third person –s, -ed, -ing); prefixes (un-, re-, dis); suffixes (-er, -ly, -ness, -y, -est)	Receptive; visual and auditory discrimination; word production; analysis, synthesis; memory recall; analogy
Baumann et al. (2003)	Formative assessment; anchor vocabulary based on social studies textbook; chapter reading; contextual and morphemic analysis; review	Integrated of social studies lessons	28 lessons in 28 days; 45 minutes each lesson	Compound words; inflection (-ing, -ed); Prefixes (out-, dis-, mid- un-, en-, in-, re-) Suffixes (-ward, -ship, -ful, -ness, -ment, -or, -ian, -er, -ion, -ish, -ion)	Structural and contextual analysis; remembering vocabulary rule

Table 5 (cont'd)
Instructional Elements

Authors	Instructional Components	Isolated versus Integrated	Duration	Types of Morphemes	Morphological Knowledge
Baumann et al. (2002)	Intro to morphemic analysis; types of prefix family (not, below or part, again and remove, before/after, against, bad); review lessons	Isolated	12 days of 50-minute lessons over a period of 5 weeks	Prefixes (dis-, un/in/im-, mono/bi-, semi/sub-, under-, re-, de-, pre/ post-, anti-, counter-, over-, super-, out-, mis-, mal-)	Structural analysis
Berninger et al. (2013)	Word sorting; orthographic memory training; oral reading and discussion of stories	Integrated in a 4-step intervention	12 lessons over a 5-month period	Inflectional and derivational suffixes (no mention of specific morphemes)	None specific morphological awareness, categorization; working memory
Berninger et al. (2008	10-min warm up; Spelling instruction (word building, word-dissecting, word-contracting, spelling rules); composition instruction	Integrated part of the Writer's Workshop	2-hour sessions, 14 consecutive days over a three-week interval during the summer	Non specific morphemes; base words; suffixes	Synthesis; structural analysis; morphological spelling rules

Table 5 (cont'd)
Instructional Elements

Authors	Instructional Components	Isolated versus Integrated	Duration	Types of Morphemes	Morphological Knowledge
Birgisdottir et al. (2006)	Learning about word classes; breaking words into morphemes; meaning and grammatical status	Isolated (lessons are in the context of word games)	7 sessions lasting 50 minutes	Prefixes (un-) Suffixes –(less, -ful, -ian, -ion, -ness, -y, -ence	Number of morphemes, adding prefixes and suffixes to a stem, analogy; spelling rules
Bowers & Kirby (2006)	Morphological structure; phonological instruction; problem-solving guided discovery	Isolated	20 lessons, 50 minutes each, 3-5 days a week for 5 weeks.	Nonspecific; used Ramsden (2001) lessons	Morphological structure; relationship between letters and sounds; morphological spelling rules; base words carries the core meaning
Bowers & Kirby (2010)	Exploratory problem solving; focused problem-solving; structured practice of newly learned content	Isolated	20 lessons, 50 minutes each, 3-5 days a week for 5 weeks	Nonspecific; used Ramsden (2001) lessons	Word structure; word meaning,; word origin; suffixing patterns; base word carries meaning; morphological family of words
Bryant et al. (2006)	Analogy game with the use of pictures; correction game	Isolated	Two 20-minute sessions	Suffix –ion and –ian	Analogy; spelling words with suffixes –ion and –ian

Table 5 (cont'd)
Instructional Elements

Authors	Instructional Components	Isolated versus Integrated	Duration	Types of Morphemes	Morphological Knowledge
Birgisdottir et al. (2006)	Learning about word classes; breaking words into morphemes; meaning and grammatical status	Isolated (lessons are in the context of word games)	7 sessions lasting 50 minutes	Prefixes (un-) Suffixes –(less, -ful, -ian, -ion, -ness, -y, -ence	Number of morphemes, adding prefixes and suffixes to a stem, analogy; spelling rules
Bryant et al. (2006)	Analogy game with the use of pictures; correction game	Isolated	Two 20-minute sessions	Suffix –ion and –ian	Analogy; spelling words with suffixes –ion and –ian
Goodwin & Harris (2012)	Used Harris (2009) Greek and Latin Morpheme Curriculum	Isolated	12 lessons completed in 15 weeks	Greek and Latin Roots	Greek and Latin meaning
Hesse et al.(1983)	Commercially available spelling program	Isolated	140 lessons, through one academic year	Varied inflections, prefixes and suffixes	Unspecified
Katz & Carlisle (2009)	Speed drills; word sorts; word building; read aloud	Integrated	12-week, twice a week for 30 minutes a session	Unspecified common prefixes and suffixes; base words	Constructing morphologically complex words from prefixes, suffixes, and base words

Table 5 (cont'd)
Instructional Elements

Authors	Instructional Components	Isolated versus Integrated	Duration	Types of Morphemes	Morphological Knowledge
Kieffer & Lesaux (2012)	Organized around a thematic unit; a single expository text; 8 or 9 target words	Integrated	18-week intervention	Derivational suffixes (-tion, -sion, -ify, -er, -or, -ist, -al, -ical, -ous, -ity, -ness, -ful, -ly)	Meaning of suffixes and how these relate to the meanings of their roots; common function; manipulating word parts
Kirk & Gillon (2009)	Word sort; spelling with prompts	Isolated	16-22 individual and group sessions, over 3 months	Suffixes (-er, -est, -y, -ly, -ish, -en, -ened) Inflections (-ed, -ing, -iest, -ier)	Linguistic regularities; spelling of base word when a suffix is added
Lesaux et al. (2010)	Specific target suffixes; whole-class discussion; independent practice with making and recognizing word forms in writing	Integrated	18 weeks, 45 minutes per lesson, 4 times a week.	Unspecified	Extracting meaning using suffixes within meaningful reading of informational text.
Nunes et al. (2003)	Group games (classification, segmenting, blending, analogy; spoonerism)	Isolated	12 weekly intervention sessions	Inflections and affixes (-ion, -ian, -er)	Word stem & grammatical categories (inflectional and derivational affixes)

Table 5 (cont'd)
Instructional Elements

Authors	Instructional Components	Isolated versus Integrated	Duration	Types of Morphemes	Morphological Knowledge
Nunez et al. (2006)	Learning word classes; breaking words into morphemes; meaning and grammatical status	Isolated (lessons are in the context of word games.)	7 sessions lasting 50 minutes	Prefixes (un-) Suffixes –(less, -ful, -ian, -ion, -ness, -y, -ence)	Number of morphemes, adding prefixes and suffixes to a stem, analogy; spelling rules
Parel (2006)	Defining the concept of prefix and suffix; teaching prefixes and suffixes; morphological definition	Isolated	8 consecutive class periods at the beginning of the school year	Prefixes (re-, dis-, un-, in-, im-, en-, over-, mis-); suffixes (-ly, -er/or, -ion, -tion/ation/ition, -ible, -able, -al,-ial, -y, -ness)	Morphological analysis; knowledge of individual word parts, knowledge of structural meaning
Robinson & Hesse (1981)	Commercially available spelling program	Isolated	140 lessons, through one academic year, 20-35 minutes a day	Unspecified	Workable, generalizable set of spelling rules; morphographic analysis; spell 12,000 words

Table 5 (cont'd)
Instructional Elements

Authors	Instructional Components	Isolated versus Integrated	Duration	Types of Morphemes	Morphological Knowledge
Vadasy, Sanders, & Peyton (2006)	Word-level skills and structural analysis instruction; oral reading practice; practice reading and spelling inflected, affixed and multisyllabic words	Integrated	30 minutes, 4 days a week, for 20 weeks	Common affixes (dis-, mis-, re-, pro-, -ly)	Understanding word structure
Wysocki & Jenkins (1987)	Stimulus word training; practice target vocabulary in isolation and in context; written quizzes	Isolated	3 sessions, 15 to 20 minutes	Suffix (-ine, -ance, -ition, -ic, -ment, -ize) Inflection (-ing)	Understanding of morphographic roots, and word analysis

the teaching of morphological awareness. Twelve studies investigated the direct effect of teaching morphology on word reading, spelling, and vocabulary (Birgisdottir et al., 2006; Bowers & Kirby, 2006; Goodwin & Harris, 2012; Hesse et al., 1983; Katz & Carlisle, 2009; Kirk & Gillon, 2009; Nunes et al., 2006; Nunes, Bryant, et al., 2003; Parel, 2006; Robin & Hesse, 1981; Vadasy et al., 2006; Wysocki & Jenkins, 1987). Three studies placed morphology lessons within a multi-faceted literacy intervention program. For instance, Lesaux, Kieffer and colleagues (2010, 2012) imbedded morphology lessons within a text-based academic language program for linguistically diverse middle school students. Berninger and colleagues (2008) included a morphological treatment within a non-school writers' workshop program for children with dyslexia. Other studies involved morphology instruction in a multilayer intervention (Abbott & Berninger, 1999) or multi-step reader-writer's workshop (Berninger et al., 2013). These complex studies highlight the relative role of morphology when other features of literacy instruction are added into the equation. With these studies, I only examined the instructional components pertinent to morphology lessons.

The content analysis of morphology intervention programs yielded five frequently occurring instructional components. Morphemic analysis – or structural analysis – is the most important component of morphology instruction (Baumann, et al., 2002, 2003; Bowers & Kirby, 2010; Valdasy, Sanders, & Peyton, 1987). This involves dissecting morphologically complex words by breaking them down into smaller meaningful units

(i.e., segmenting; Berninger et al., 2006; Birgisdottir et. al., 2006; Nunes et al., 2003) or, the opposite process, by building words using inflectional morphemes and affixes (i.e., blending; Berninger et al., 2006; Nunes et al., 2003). Of the 22 intervention programs, nine studies integrated morphology lessons within a meaningful literacy context activities such as read aloud (Katz & Carlisle, 2009), class discussion (Berninger et al., 2013; Lesaux et al., 2010), expository text reading (Kieffer & Lesaux, 2012), listening (Apel, et al., 2013), chapter reading (Baumann et al., 2003), and composition (Berninger et al., 2008). Word sorting (e.g., categorizing words according to similar inflectional endings or suffixes), problem solving (e.g., using the knowledge of suffixes, base words, inflections, or root words to unravel the meaning of the word), and review lessons are also considered essential components to morphology instruction (Apel et al., 2013; Baumann et al., 2002, 2003; Berninger et al., 2013; Bowers & Kirby, 2006, 2010; Bryant et al., 2006; Katz & Carlisle, 2009; Kirk & Gillon, 2009).

Similar to Bowers, Kirby, & Deacons' (2010) coding analysis, the 22 intervention studies were also analyzed, based on how the investigators implemented the instructional design. Studies that incorporated other non-morphology instruction are coded as integrated (e.g., Abbott & Berninger, 1999); while direct teaching of derivational and inflectional morphemes outside the context of reading or writing continuous text is considered isolated instruction. Fifty-nine percent (n=13) are studies done using isolated instructional design (e.g., Bryant et al., 2006; Goodwin & Harris, 2012; Hesse et al.,

1983; Parel, 2006).

One of the challenges of studying morphology as an intervention is the immensity and the complex characteristics of morphemes (Carlisle, 2003). It is impossible to incorporate all morphemes within a limited period of time. Except for two studies (Hesse et al., 1983; Robinson & Hesse, 1981), the intervention programs were implemented between 2 twenty-minute sessions and 20 weeks. Most of the intervention studies used high frequency affixes such as *re-, un-, dis*, *-ly, -ness*, and inflectional morphemes. Only Goodwin & Harris (2012) employed Greek and Latin roots in their intervention study. The phonological and orthographic aspects of morphological awareness also complicate the design of the intervention and the choices of morphemes. Some suffixes, like *–ation* (e.g., resign/resignation), *-ian* (magic/magician), *-ar* (muscle/muscular), change the pronunciation and the spelling patterns of derived words. Depending on the developmental readiness of the participant, the choices of morphemes vary from one study to another.

Finally, developing morphological awareness depends on students' understanding of morphological concepts (i.e., morphological knowledge). Constructing and deconstructing morphologically complex words through exercises on prefixes, suffixes, base word identification, and inflections help students increase sensitivity to linguistic regularities of English words. These are metacognitive tools that students could use to problem solve complex words found in content area reading, to spell multisyllabic words,

and to extract meaning within the text. Morphological knowledge and morphological awareness are intricately weaved together in all the intervention studies reviewed in this chapter. To my knowledge, there has been no study done on how the levels of morphological knowledge could affect students' development of morphological awareness. This goes back to the issue raised by Goodwin and Harris (2012) on the distinctive nature of morphological awareness and morphological knowledge. Verhoeven & Carlisle (2006) elevate the tenor of this argument by raising the question: "what role morphological knowledge plays in reading development over the school years" (p. 645). This is an important charge that we need to consider as we continue to understand the importance of morphological awareness on students' literacy development.

Conceptual Framework

Despite the evidence that teaching morphology supports literacy development in K-8, teachers know little about the role of morphological knowledge as a metalinguistic tool to develop word identification, spelling, and reading vocabulary (Hurry, Nunes, Bryant, Pretzlik, Parker, Curno & Midgley, 2005). Previous policies about teaching reading have not reflected this research (Moats & Smith, 1992). In this section, I offer a conceptual framework for teachers when designing a morphological instruction. Figure 1 shows the four composite layers: morphological knowledge, cognitive processes involved in morphological instruction, discrete literacy skills, and integrated literacy skills. Each layer has different components that are interdependent with each other.

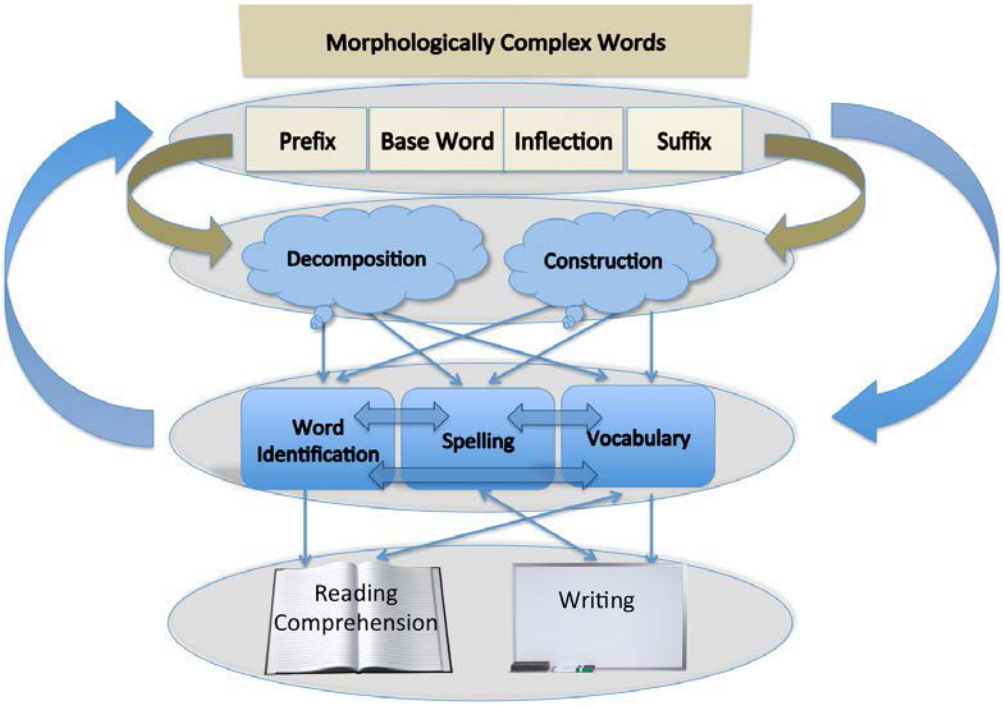


Figure 1. Building Morphological Knowledge through Morphological Intervention

Teachers need to develop students' knowledge of morphology in order for them to understand morphologically complex words within the context of meaningful literacy activities. Morphologically complex words have sublexical structures, e.g., base word, prefix, suffix, inflection, Greek and Latin roots. These sublexical structures, also referred in this framework as morphological knowledge, comprise the first layer of the model. Learning these sublexical features is necessary to perform the required metacognitive processes, the second layer of the model, involved in teaching morphology.

Decomposition and construction are two complementary processes involved when students learn to analyze and problem solve morphologically complex words. In Abbott and Berninger's (1999) study, the students were taught to analyze word structure by checking for affixes and roots before dividing the syllables of a morphologically complex word. Similarly, Baumann, Edwards, Font, et al. (2002) introduce the process of morphemic analysis that involves morphological construction using the different types of prefix family.

Decomposition is an important process when extracting meaning from the text, decoding multi-syllabic words that are common in content area reading, and parsing the sublexical features of words in spelling. Decomposition is a process of breaking down words into smaller and meaningful morphemes (Berninger et al., 2006; Birgisdottir et al., 2006; Carlisle, 2000). Segmenting and counting individual word parts through word games are examples of classroom activities that foster morphological development. When using the knowledge of inflectional and derivational morphology, students are able to relate the meaning of these structures and make a hypothesis within a meaningful reading of informational or narrative text (Kieffer & Lesaux, 2012; Lesaux, Kieffer, Faller, &Kelly, 2010). The student's ability to identify the base or the Greek/Latin roots is an important knowledge needed when decomposing a morphologically complex word (Verhoeven & Carlisle, 2006; Goodwin & Harris, 2012). For example, Carlisle (2000) created a decomposition task that looked like this: *Reduction. The overweight man was*

trying to _____, the student needs to have the knowledge of base word in order to complete the sentence. The use of word analogy is another example of morphological decomposition. When given a pair of words like *hop/hopping*, the student is able to identify the relationship between these two words and relate this to other word pairs like *swim/swimming, tip/tipping.*

Construction is a necessary mental operation when a student tries to identify any sublexical features of the word that could help him understand word meaning or create a new word form. Construction is a process of synthesizing existing knowledge of sublexical structures to produce morphologically complex words - by way of spelling, reading words aloud, or constructing the meaning of a grammatically complex word. For example, in order for the student to spell or to identify multi-syllabic words like *disorganization*, the child has to mentally identify the base word *organize*, recall the recently learned derivational morphemes (i.e., dis- and –ation) and morphological rules (i.e., drop the *e* when adding suffix -*ation*), and blend them together using the structural synthesis schema (e.g., prefix + base word – E + suffix = disorganization). All these happened in milliseconds, in the mind of a mature reader (Moscoso del Prado, Martin, Kostic, Baayen, 2004). Orthographic patterns and the role of phonology are also important when constructing words through spelling. There are some words that change the spelling pattern or word pronunciation when adding suffixes (e.g., muscle-muscular, sign-signature).

The goal of morphological instruction is to develop these two metacognitive processes in order for students to apply the abstraction of morphologically complex words in reading and writing. These two analytic processes could impact word identification, spelling skills, and vocabulary development. These three discrete skills interact with each other, as shown by the arrows on the third layer of the model. Templeton (1983) highlights the necessity of linking spelling with meaning to develop word knowledge in older students. Furthermore, "increased spelling abilities could then help children to read and spell words, leading, in turn, to greater general spelling abilities" (Deacon, Kirby, & Casselman-Bell, 2009, p. 303).

The last layer of the model is the generalizability of morphological knowledge, through discrete skills, when reading stories/content-area materials or writing narrative/informational texts. When students encounter morphologically complex words in a text, explicit morphological knowledge is used to decode and extract meaning within the context of a sentence or a paragraph. For example, a significant number of academic words in English are derivatives of Greek and Latin roots (Rasinski, Padak, Newton & Newton, 2011). Knowledge of Greek and Latin roots provides a metacognitive tool for upper grades and middle school students to infer word meaning, an efficient cognitive process that lessens the demand of reading complex and rigorous passage.

Although, it is still inconclusive as far as the direct effect of morphological knowledge and morphological awareness to reading comprehension and composition,

evidence suggests that students' specific knowledge of word structure and exposure to morphologically complex words could impact their comprehension and writing skills via spelling, word reading, and vocabulary (Apel & Masterson, 2001; Deacon, Campbell, & Tamminga, 2010; Kieffer & Lesaux, 2012; Pacheco & Goodwin, 2013). But what we conclusively know from decades of research is that spelling, vocabulary, and reading fluency directly impact reading comprehension and written expression. Therefore, explicit teaching of morphology builds knowledge and awareness of word structure to support students' literacy development.

Teacher Research: A Framework for Teacher Learning

This section briefly describes the theory and research on teacher learning and situates teacher research as a form of teacher learning. A vast number of studies described and analyzed people's learning process – from language acquisition to socialization, but few research has been published on how teachers learn and engage themselves using evidence-based practices (Bradsford, Darling-Hammond, & LePage, 2005). Teachers acquire their basic pedagogical knowledge from pre-service training, but this knowledge is not enough due to the complexity and contextual nature of education. For most teachers, learning to teach happens in their classroom (Walkington, 2005).

In the last four decades, attempts have been made to conceptualize teacher learning within the purview of professional development. For example, Freire (1970) argues that the act of teaching is transformative – reflecting on their own work and act

upon this reflection to transform their classroom. Vygotsky (1978) suggests that learning takes place through socialization, and overtime, ideas are internalized. That is, teachers no longer do trial and error, but they understand the principles behind the act and know how to perform this act within the context of students' learning. Bruner (1996) further expounds the process of teacher learning within the context of gaining control of your own mental activity (i.e., agency), reflection - "not simply learning in the raw but making what you learn make sense" (p. 65), and collaboration (i.e., sharing resources with other teachers).

The conventional way of teacher learning is through an in-service professional development within a school district. An expert in the field is invited to talk about specific teaching strategy, and it is assumed that teachers learn from this training and transmission of knowledge from the expert is expected (Kennedy, 1998). However, many teachers find this model of teacher learning insignificant and remote from their day-to-day practice (Putnam & Borko, 2000). The well-meaning attempts of the school district and university professors to provide quality professional development have often led to teachers' negative characterizations of the learning experience (Putnam & Borko, 2000). Research shows that conventional professional development is often fragmented, intellectually superficial, and inadequate to respond to the immediate needs of the teachers (Ball & Cohen, 1999; Putnam & Borko, 1997; Sykes, 1996).

At the heart of teacher learning is the promotion of reflexive practice – transforming the act of reflection to the act of teaching. Central to reflexive practice is the suspension of ones own assumptions, biases, and values (Delpit, 1995; Valenzuela, 1999; Wilhelm, 2013). In one study that aimed to develop critical reflexivity among graduate pre-service teachers, Phillips & Carr (2007) used analytic memo as a space to engage them in a dialogue, to support their emerging identity, and to confront their assumptions about teaching and learning. Reflexivity is deeply ingrained in teacher inquiry. As teachers collect artifacts and data from their classroom, they gain insights into students' behavior and learning process. As a result, teacher researchers modify their lessons and respond to the needs of the students.

Context matters in professional development and teacher learning (Borko, 2004; Lieberman & Miller, 2008). Members of the professional learning communities, mostly teachers, have called for autonomy and collaboration among professionals to build capacity and to deal with the local educational issues within the context of their work (Cochran-Smith & Lytle, 1993; Grossman, Wineburg, & Woolworth, 2001; Lieberman & Wood, 2002; Little & Horn, 2007; McLaughlin & Talbert, 2001). Teachers in professional learning communities learn from their practice through engaging discussions among peers and critiquing their instructions (Cziko, 2008; Pointer Mace, 2008). Central to the development of pedagogical content knowledge in this community is scaffolding teacher learning (Shinohara & Daehler, 2008). Teachers gradually build their knowledge,

skills, and confidence through collaboration with veteran colleagues. They are given different opportunities to refine their ideas and improve instruction in their own classroom. Professional learning communities take time to evolve, and commitment is imperative to effect lasting change.

Another form of teacher learning is a collaborative teacher inquiry based on a lesson study model. This model is based on a Japanese educational practice where teachers in the school collaborate to implement a lesson inquiry that addresses students' weaknesses in a particular subject matter (Lewis, 2000). Sisk-Hilton's (2009) shared inquiry model provides a collaborative experience for teachers to integrate the knowledge they have learned through lesson inquiry into their existing repertoire of pedagogical knowledge. To sustain effective implementation of the model and improve teacher learning, Sisk-Hilton laid down five general criteria: acknowledging teachers' assumptions about teaching and learning; fostering a collaborative culture to improve individual and group practice; making individual and group's goals explicit; defining criteria for success; and following a sequence of activity structures. Like any teacher learning models reviewed in this section, learning through inquiry becomes more effective when teachers situate new knowledge within the confines of their practice and their struggle to find ways of improving learning in the classroom.

Conclusion:

Morphological knowledge contributes to the development of morphological

awareness and literacy skills in elementary and middle school. We cannot underestimate its relevance in the current discourse of reading development, literacy instruction, and evidence-based intervention to struggling learners in special education. If normally developing readers benefit from morphology instruction, then teaching morphology, as an alternative intervention to phonics and phonological awareness, provides optimism for teachers to improve the reading and writing skills of struggling learners.

However, a number of significant issues need to be resolved when developing morphology instruction. Goodwin, Gilbert, and Cho (2013) raise an important theoretical issue regarding the unclear conceptualization of these two complimentary constructs. What kind of morphological knowledge do teachers need to know and include when teaching morphology? Understanding the components of morphological intervention is another issue that needs resolution. Lastly, knowledge of principles and protocols for teaching morphology could guide special education teachers in designing their own curriculum and instruction in language arts. This study of morphological intervention in special education provides some key insights into these issues. I now present the methodological design and procedures that were used in this study.

Chapter Three
Methodology

Multiphase designs occur when an individual researcher or team of investigators examines a problem or topic through an iteration of connected quantitative and qualitative studies that are sequentially aligned, with each new approach building on what was learned previously to address a central program objective.
(Cresswell & Clark, 2011, p. 100)

This dissertation is designed as a multiple methods study based on collection and analysis of qualitative and quantitative data. As addressed in Chapter One, the study is framed around three research questions:

1. How does teacher research shape my morphology instruction and influence the transfer of classroom knowledge to other special education teachers?
2. What evidence is there that teacher research supports teachers to create and apply an instructional design process in special education?
3. How does morphology instruction delivered by four special education teachers affect students' morphological knowledge and literacy outcomes?

Pivotal to these research questions is the intersection of teacher research and design-based research as the overarching methodological and philosophical paradigm for this dissertation. As a practitioner-scholar, my methods of research are grounded in naturalistic setting – the school district where I currently work - and are not divorced

from the messy realities of a special education classroom. Implementing an instructional design in education interacts with the unpredictability of the school systems and structures. The unforeseen circumstances and uncontrollable factors emanating from the natural setting could lead to different iterations of instructional design. The heterogeneity of students' profiles in special education, teachers' knowledge of the subject matter, the school district's predilection to use commercially available curriculum program, and parents' involvement in the students' academic life all affect how we design the curriculum.

From a philosophical standpoint, teacher research is a way to emancipate special education teachers from being consumers to creators of knowledge (Kincheloe, 1991). Educational researchers - university professors who are trained in the fields of psychology, linguistics, anthropology, sociology, economics, history or philosophy - traditionally create knowledge (Meier & Henderson, 2007) and influence most educational policies. They create taxonomic and structured knowledge base (Lytle & Cochran-Smith, 1992) for teachers to implement in an ever-volatile classroom environment. The lack of "a truly emic perspective" (Lytle & Cochran-Smith, 1992, p. 448) in traditional educational research makes teacher research valuable to improve classroom teaching and learning.

Integrating Teacher Research in Design-Based Research

Teacher research traces its roots within the tradition of applied qualitative

research for education (Bogdan & Biklen, 2007). This type of inquiry conforms to the epistemology of action or participatory research where practitioners purport to study and to solve issues emanating from their own practice (McNiff, 2002). The design-based research, on the other hand, has a fundamental goal of designing "an instructional intervention that works to achieve a valued pedagogical goal in an authentic classroom environment" while the researchers continuously fine-tuning the intervention through iterative process, or formative experimentation (Reinking & Bradley, 2008, p. 14).

Design-based research and teacher inquiry agree on the common purpose of doing research: to understand learning and the process of teaching in a particular setting. For designed-base research, it is through "discovery, exploration, confirmation, and dissemination" (Kelly, 2003, p. 3). For teacher inquiry, it is through discovery of one's lived experiences and self-criticism of ones own practice (Kincheloe, 1991). These two seemingly divergent pathways are possible to intertwine; thereby creating a methodological framework of teacher inquiry within a design-based research.

Experienced teachers rely on their professional judgment when creating curriculum, writing lesson plans, and choosing instructional activities (Van Velzen, 2013). This judgment is primarily based on their professional knowledge and experience (Cochran-Smith, 2001). Teacher's subject matter knowledge – mostly obtained from teacher prep course work, in the case of novice teacher, or from attending seminars and training – sometimes, is not enough to improve instructional practice and classroom

learning. One needs to have a deeper understanding or knowledge of the subject area in order to affect student learning (Sadler, Sonnert, Coyle, Cook-Smith, & Miller, 2013). This premise provides a compelling reason for doing teacher research within the design-based research because it creates a space for teachers as generators of expert knowledge, rather than relying solely on university-based researchers and professors (Lytle & Cochran-Smith, 1992). The by-product of teacher inquiry is the transformation of teachers as experts in literacy instruction and the development of teacher leadership within a school district.

Overview of the Research Design

In the succeeding sections, I describe in details the nature of the methodological design used in this dissertation. Briefly there were three phases (see Table 6 for the timeline):

1.) Teacher research in my own classroom to create a prototype curriculum intervention for special education students in 3rd, 4th, and 5th grades;
2.) Collaborative exploratory research with six teachers to further improve the design intervention; and
3.) A design experiment where four teachers, myself included, taught a 15-week curriculum intervention to develop students' morphological knowledge.

Teacher research as a systematic inquiry of daily instruction informs and improves one's teaching practice (Meier & Henderson, 2007). During the initial phase that began in August 2012 and lasted until May 2013, I used qualitative research methods

Table 6.
Timeline for different phases of the study

Fall 2012	Winter 2012 and Spring 2013	Summer 2013	Fall 2013 and Winter 2014
Phase One: My Own Teacher Research			
	Phase Two: Exploratory and Collaborative Inquiry		
			Phase Three: Design Experiment

to create a reflective narrative exploring my own critical construction of literacy knowledge surrounding morphological intervention. The narrative of lived experiences in my classroom, "analyzed and reflected upon with reference to the broader" educational context (Bold, 2012, p. 16), mirrored the tradition of narrative inquiry.

This dissertation began in my own classroom in an elementary school, as I studied my day-to-day literacy instruction and students' understanding of morphology. The nature of teacher research, in this case, intertwined with some important aspects of autoethnography. My teacher research generated data based on personal reflection,

collecting classroom artifacts and documenting students' reading and writing behavior. Further, the rich description of my classroom culture and the in-depth understanding of how I structured my lessons lend themselves to the process and the product of autoethnography (Ellis, Adams, & Bochner, 2010).

The second phase of my study began in March 2013, overlapping with Phase One for three months, and ended in early August 2013. The second phase involved two qualitative methods: focus group and individual interviews of teacher participants. In addition, e-mail messages and classroom artifacts were collected for analysis. During this second phase, I developed rapport with seven diverse special education teachers and came to know their personal and professional lives. We met in coffee shops, in the comfort of their homes, and in my house. During these meetings we talked about morphology and I shared articles written for teachers that linked morphological awareness to literacy development. All the meetings and conversation with the teachers were audio-recorded.

The first two phases of my research set the foundation for the final stage of this dissertation – the use of design experiment with the remaining three special education teachers to implement the instructional design that organically developed from my own teacher research. This third and final phase generated both qualitative and quantitative data including fieldnotes, audio recording, classroom artifacts, e-mail correspondences, and pre- and posttest measures. The implementation of the morphological intervention

program for four months included the iteration of the curriculum, taking into consideration the initially unforeseen circumstances and uncontrollable factors emanating from the naturalistic setting of special education classrooms.

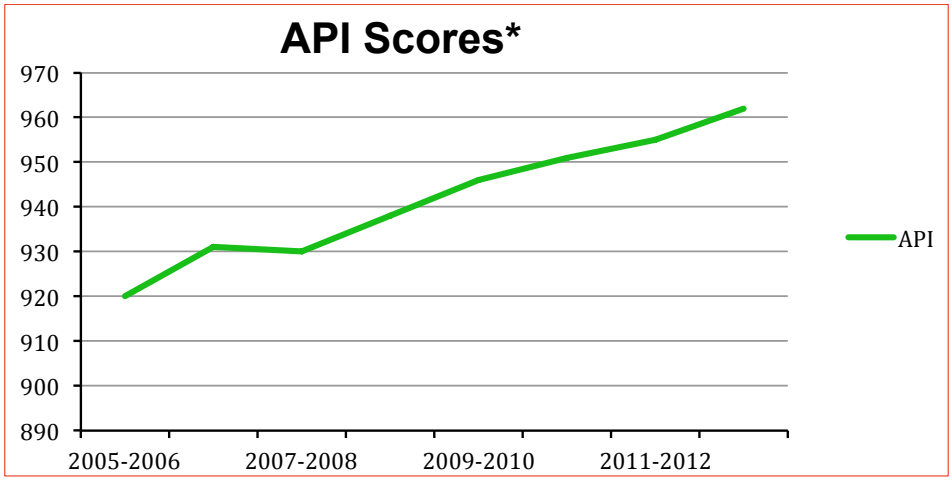
The design-based research aims to address the inherent limitations of experimental design when applied to intervention research. Reinking and Bradley (2004) argue that promotion of educational achievement based on what works best on average is informative but lacks deeper understanding of relevant factors that could contribute to successful implementation of the intervention in a specific context. Hence, "by studying a design in practice with an eye toward progressive refinement, it is possible to develop more robust designs over time" (Collins, Joseph, & Bielaczyc, 2004, p. 19).

Background of the Research Site

Felipe Del Rey School District (FDRSD) is situated 40 miles south of San Francisco, serving approximately 17,500 students in a 26-square mile area that includes the city of San Felipe and portions of five other cities in California's Silicon Valley. FDRSD provides a comprehensive array of instructional services, which include extended learning, behavior intervention for children with autism, special education, and Mandarin immersion program. Felipe Del Rey prides itself in providing an inclusive and caring educational community. The school district's mission includes a commitment to educational equity and development of creative and exemplary learners. The district has

culturally and linguistically diverse population: 70% Asian (includes east Indian descent), 23% White, 5% Hispanic, 1% Black, and 1% Filipino.

FDRSD has been traditionally a high performing school district based on the state sponsored examination. Figure 2 reflects the FDRSD Academic Performance Index (API) growth from 2005 to 2013. In the school year 2012-2013, 89.8% of students scored at



* Source: California Department of Education Data Quest

Figure 2. FDRSD Academic Performance Index

proficient or advanced in the English-Language Arts area, 90.7% in Mathematics, 92% in Science, and 85% in History-Social Science. However, based on the 2013 Accountability Progress Report (APR) released by the California Department of Education in September of 2013, five subgroups have not met the 89.2% target criterion for the Annual Measurable Objectives (AMOs) in English-Language Arts. The district failed to meet the

Adequate Yearly Progress (AYP) target value for White students (86.1%), Hispanic or Latino (56.2%), socioeconomically disadvantaged (60.5%), English Learners (75.5%), and students with disabilities (64.9%).

With the recent leadership reorganization, FDRSD is currently in the midst of instructional and structural change in line with the implementation of the Common Core State Standards. The district is actively training all middle school language arts teachers in the adoption of a text-based reading and writing curriculum created by Inquiry by Design, a private educational corporation. This language arts program uses the method of close reading, analyzing and interpreting a short passage of complex informational and literary texts for the purpose of building reading and writing skills. This district-wide initiative created some challenges in my data gathering and in working with one of the teachers in this study. In terms of structural reorganization to further comply with the 21st century learning environment, the district has created a technology department, manned by a director and four coordinators, who support the school district's goal of infusing current technology into the classroom.

FDRSD has 21 elementary and seven middle schools. As a teacher researcher, I gathered the data for the initial stage of this dissertation in my own classroom at Kimberly Elementary School[1]. This K-5 school had a student population of 547 in the

[1] All school names are pseudonym to preserve anonymity.

school year 2012-2013. This school had two special day class teachers, one part-time resource specialist, and 22 general education teachers. Three teachers, who initially collaborated with me during Phase Two, came from two elementary schools (one from Kimberly and two from Reagan). At the middle school level, three teacher-participants came from the Alameda Middle School and one from Monroe Middle School. I will further describe the demographics of each of these schools later in this chapter.

The Role of Researcher:

I have been a special education teacher for ten years, and over these years, I have learned to hone my craft through trial-and-error. I was able to use the knowledge I gained from my undergraduate and graduate studies in psychology, reading and language development, and counseling. I have always been interested in research and how research can be applied to the specific contexts of my classroom. Sometimes I failed, but this never stopped me from recreating and modifying the curriculum until I have seen success in my students' journey to become lifelong readers and writers. Most students come to my classroom with diminished self-confidence because they lack capacity or skills to navigate the treacherous road to literacy. My instruction seeks to provide a set of tools that would harness confidence in their ability to engage with the written texts. Further, my high expectations and intentional stance as a teacher-researcher have led me to provide students with complex and rigorous materials to challenge their abilities. My students read poetry of *Shakespeare, Hughes, Dickinson*, and *Frost*, to name a few. With

proper scaffolding, my students in elementary learned to appreciate novels like *The Adventures of Huckleberry Finn* (Twain, 1884), *Out of the Dust* (Hesse, 1997), and *Because of Winn Dixie* (DiCamillo, 2000); and in middle school, short stories like *The Tell-Tale Heart* (Poe, 1843)*, The Gift of the Magi* (Henry, 1906), and *A Rose for Emily* (Faulkner, 1930). Overall, innovative persistence has led me to create curricula that accelerate my students' literacy skills and encourage them to love reading.

I have, however, been baffled by many students coming in to my class with a solid knowledge of sounds and letters and awareness of English phonology, yet continuing to struggle to read and write. I first interrogated my assumptions on teaching and learning to read. Then, I searched for other ways to improve my literacy instruction. In 2009, I stumbled upon an article published on the Harvard School of Education website about the value of morphology in teaching reading and writing (Lesaux, 2009). Right in the middle of reading the article, I knew I had found one answer to this persistent problem of practice. The following year, I received a research grant from the International Reading Association for a teacher-research proposal on morphological awareness. I completed that teacher research in 2011 and found that most of my students' word reading skills had improved. My students had also cultivated a cognitive schema grounded in the understanding of the internal structure of multi-syllabic words.

From this experience, I saw the value of classroom inquiry and reflexive teaching. My initial teacher research became the impetus for this dissertation, as I sought to further

understand the nature of morphological knowledge and further develop effective methods of teaching morphology in special education. As a teacher researcher in Phase One, I was a participant-observer in my own classroom, with a complete membership role in the community (Adler & Adler, 1987), and full access to my students' learning six hours a day for 180 days a year. As an insider researcher, I had privileged information about teaching and learning that mainstream researchers coming into classrooms from the outside that can never have (Lytle & Cochran-Smith, 1992). In addition, I acted as my own gatekeeper, having already established rapport with parents, principals, and colleagues who directly or indirectly participated in this study. However, doing research in one's own classroom on one's own teaching practice can also pose some methodological and ethical issues. It is important to recognize the possibility of bridging confidentiality that may arise in the course of gathering the data, observing my colleagues, writing about students' behavior, and interpreting the results. All the participants, including my students and parents, were informed of the goals of this research. Likewise, it is important to have ways to verify my analysis and uncover my assumptions, as teacher research is, by definition, subjective.

My role as a researcher shifted like a pendulum in the next two phases of my study. From having full access to my own classroom as the research site, I stepped back and became an observer and interviewer during the second phase of this dissertation. I moved from the comfort of my own classroom to facilitate a group of teachers in two

focus group discussions. We used classrooms, public libraries, coffee shops, and restaurants as sites for the multiple individual interviews and learning discussions in which I engage with the seven participating teachers. Aside from being a researcher, I also assumed an informal leadership role, guiding these teachers in studying morphology and equipping them with knowledge-based reading instruction around morphological awareness and morphological knowledge. I became a sounding board for some of these teachers, listening to their professional frustrations and coming to know about their personal lives.

Another shift in my role as a teacher-researcher happened as we embarked on the third phase of the study. I wore two hats during this final phase of the study: a teacher-researcher in my classroom and a lead researcher working with three teachers in designing morphological intervention in different school sites within the school district. At this time, three of the original teachers had left the group. Further, my own teaching position had changed as I left my elementary school and began teaching a 7th grade resource class. As the 2013-14 school year began, each of the three remaining collaborating teachers and I adapted and modified the curriculum to fit the needs of our current students

Participants[2]:

Eight teachers participated in the second phase of this study. In January 2013, I sent an e-mail invitation to 27 mild to moderate special education teachers at my school district, recruiting them to join the research project. Diwali, Becky, and Beth responded via email; Jenny, a colleague at my former elementary school, responded in person. They were the first batch of teachers I met for a focus group in March 2013. Through word of mouth, a month later, three additional teachers joined in – Maria, Anna, and Diana. They were the second batch of teachers I met for a focus group in May 2013. Scarlet was the last teacher who joined in the research group.

Unfortunately, five of them could not stay for the duration of the project. Yet, these teachers had contributed to the design of morphological intervention in the exploratory phase of the study. In July, Becky accepted a district office position, while Diwali left the school district. I never heard back from Jenny in the fall, despite several attempts to contact her. In October, two more teachers, Beth and Maria, opted out of the project due to technical difficulties and hardship in implementing the curriculum. Specifically, Beth could not secure the informed consent from the parents, and she was faced with the added complication that her position required her to juggle two school sites. Maria needed to withdraw because she could not fit the morphology instruction

[2] Some teacher participants preferred to use pseudonym for their names, while others preferred that I use real name for this study.

into her language art curriculum due to other competing district-adopted program (i.e., Inquiry by Design Program) that she was required to implement in her classroom.

Only four teachers, myself included, remained throughout the implementation of the design intervention. Table 7 shows the basic information about these three teachers and the composition of their classes. A full narrative of their participation and detailed

Table 7:
Teacher Participants, including myself, and Student Demographics in Phase Three

Teacher-Researchers		**Anna**	***Diana***	***Eric***	***Scarlett***
Ethnicity		Japanese	Caucasian	Filipino	Pacific-Islander
Years of Teaching		13 years	2 years	13 years	Intern
Grade Level		Grades K-1-2	Grades 3-4-5	7th Grade	8th Grade
Number of Students		5 Kindergarten Four 2nd Graders	Two 3rd Graders Five 4th Graders Four 5th Graders	17	5
Students' Eligibility Classification	***Specific Learning Disability***	1	5	15	4
	Other Health Impairment	2	1	2	1
	Autism	3	4	0	0
	Speech/ Language Impairment	2	1	0	0
	Medically Established Disability	1	0	0	0

information about their professional life are discussed in the next chapter. Diana and Anna were part of the second batch of teachers who joined in the second phase of this study. Scarlett came on board in August. Scarlett and I were both new teachers at Alameda Middle School, and, in one of those meetings we attended, I mentioned my research project to her. After hearing the content of my dissertation, she was excited to participate in the study because she was eager to find more effective ways to teach reading to special education middle school students.

Some students in our classrooms were not included in the data analysis. For Anna, five kindergarten students were not included in the morphology intervention due to readiness issues. For Diana, three new students entered her class six weeks after we started the intervention program. These students were not included in the analysis since they had missed the pretesting period. In my case, two students were not included in the final analysis as one missed the pretest period, and the other moved to another school in November.

Measures:

A battery of tests was administered to students before and after the implementation of the curriculum design in Phase Three. These tests consisted of three standardized measures of reading (Gray Silent Reading Test, Gray Oral Reading Test, and WIAT-III Pseudoword Decoding), two researcher-made summative tests (e.g., Word Identification and Pseudoword Spelling), and two counterfactual oral language

development measures (e.g., Oral Expression and Sentence Combining), which will be described further below. I chose these standardized measures because they are commonly administered in K-12. Further, most special education teachers are trained in these tests. None of the current standardized tests in spelling and word identification directly measure morphological knowledge. Thus, I created two measures that reflect morphologically complex words. I will discuss the test construction procedure later in this chapter.

Among the widely used standardized measures of academic achievement, only the WIAT-III contains relatively more morphologically complex words with 43% of the words showing some complexity (Calhoon & Masterson, 2011). I used this standardized test as a criterion measure for validating the two teacher-made summative tests. The two summative tests on word identification and pseudoword spelling were created to reflect the students' use of morphological knowledge. The development of these two researcher-made tests, as well as their reliability and validity are reported in Chapter 5. In the absence of a control group, counterfactual measures were used to estimate how much of a change in students' literacy skills was due to normal maturation. Counterfactual measures provided some evidence the students' expected literacy development from pre- to posttest did not result from the target intervention (Apel, Brimo, Diehm, Apel, 2013; Hofler, 2005; Taylor, Wang, & Thiebaut, 2005).

The battery of tests was administered in August 2013 and again in January 2014.

Teachers were debriefed on the protocols and procedures for administering the tests. Diana and Scarlett needed partial supervision to administer the three standardized measures. Scarlett and I worked at the same school site and so on one occasion she came to my class to observe the administration of the Pseudoword Decoding Test. To lessen the demand on teachers I administered the two counterfactual measures to Diana and Anna's classes. Due to time limitations, I did not administer these measures to Scarlett's students.

Gray Silent Reading Test (GSRT). Form A and Form B were administered as pre- and posttest, respectively, to the middle school students. Each form contains 13 developmentally sequenced reading passages with five multiple-choice reading comprehension questions. This norm-referenced test has a reliability of 0.90 coefficient alpha. Validity is reported using measures of criterion prediction such as age prediction, and group differentiation. However, evidence of content-related validity is absent. The test was administered to groups of students and took about 15 to 30 minutes. The students read a short paragraph and then answered the five questions related to the passage. Raw scores can be converted to age- and grade-equivalent scores, percentile rank, and standard score. Standard Scores are reported in this study.

Gray Oral Reading Test-4 (GORT-4). This is an individually administered, norm-referenced measure of oral reading growth. Only the elementary students in this study took this test. The composite score (i.e., Oral Reading Quotient) is based on four

computed raw scores: rate, accuracy, fluency, and comprehension. The students read aloud 13 increasingly difficult passages, each followed by five comprehension questions. Clinical limits were used for three students, instead of following the standard ceiling procedure for test discontinuity. According to the test's discontinuity rule, a reading comprehension score of less than 3 indicates the student's ceiling point. However, in many instances, a number of students scored 3 or above in succeeding passages beyond the ceiling point. Based on our professional judgment and experience, we felt that exercising this clinical limit would reflect the students' true reading score. The test has a test-retest reliability of 0.85. Test validity was reported via correlation with other reading measures. Student's oral reading quotient is reported in this study.

Pseudoword Decoding Test. One of the subtests of the Wechsler Individual Achievement Test-Third Edition (WIAT-3) is the Pseudoword Decoding Test. The test, consisting of 52 decodable nonsense words, is designed to measure students' speed and accuracy of word reading skills. This test was chosen to avoid rote memory and familiarity effects in reading. All students took this test individually. The test was discontinued after the student received four consecutive scores of 0. A score of 1 means the student is able to read the pseudoword correctly. The standard score, which was converted from the raw score, is reported in this study. The average reliability coefficient for this subtest is 0.96. Evidence of content validity, response process validity, and inter-correlational studies are reported in the technical manual (Breaux, 2009).

Word Identification Test. This teacher-made test has two versions – the primary word identification for second grade students and the advanced word identification for upper elementary and middle school students. Each version consists of two parallel forms (A and B) that were administered individually as pre- and posttest. The words are sequenced in increasing complexity. Each word item on Form A has its corresponding word pair on Form B. The pairs of words are similar in structure (e.g., prefix +base word + suffix), number of syllables and number of letters. Vowels and consonants were matched as close as possible. Using *The American Heritage Word Frequency Book* (Carroll, Davies, & Richman, 1971), frequency of occurring was also used as a criterion for matching. After this process, I derived 20 morphologically complex words for Primary Word Identification and 40 for Advanced Word Identification (see Appendix A). The students read each word aloud, and a score of 1 was awarded for every correct word recognition.

Pseudoword Spelling Test. This group-administered teacher-made test consists of two parallel forms: Form A for pretest and Form B for posttest. The words were sequenced in increasing complexity. Using the ARC Nonword Database (www.cogsci.mq.edu.au), I generated monomorphemic (e.g., seb, fip, and bap) nonsense words. Then, I derived twenty morphologically complex pseudowords using inflections and commonly occurring affixes (e.g., sebs, atly, mibbing, unrip, wokful, misdragmentness). Each word is read twice before and after using it in a sentence (see

Appendix B). Then the students spelled the words on a sheet of paper. The student earned a score for each correct base word, prefix and suffix. The highest possible raw score is 50.

Sentence Combining Test. This counterfactual measure is one of the six subtests of the Test of Language Development: Intermediate-Fourth Edition (TOLD:I-4). This test measures listening, speaking, short-term memory, and organizing abilities that do not have direct links to morphological knowledge. This test was administered individually to intermediate and middle school students. The internal consistency reliability is reported at 0.80, and the criterion-related validity is at 0.61. The test starts with two simple sentences to combine and progressively gets complicated up to item 25. For each item, the teacher read some sentences and the student orally put the sentences together. A score of 1 is awarded for every correct sentence combination.

Oral Expression Test. This counterfactual measure, administered individually to primary grade students, is one of the WIAT-3 subtests. The test consists of Oral Word Fluency and Sentence Repetition. The Word Fluency measures word retrieval flexibility of thought processes, while Sentence Repetition measures oral syntactic knowledge and short-term memory. Both do not have direct link to morphological knowledge. In Oral Word Fluency, the students have to name as many animals they can in one minute, which is then followed by naming colors. The total number of words are counted and converted to standard score. For Sentence Repetition, the teacher says some sentences, and the

students attempt to repeat these sentences exactly what the teacher said. A score of 2 is awarded for no error, 1 for one or two errors, and 0 for more than three errors. The students can earn a maximum raw score of 30, which then is converted to a standard score. This test reported a reliability coefficient of .86 for second grade, and a validity that ranges from 0.30 to 0.61 using intercorrelations with other WIAT-3 subtests.

Procedures:

Phase One. Doing autoethnography provided thick descriptions of my literacy curriculum and instruction. Explicit and implicit systems and structures were uncovered through my lessons on morphology, formative assessment, classroom talk, and students' literacy development. This study proceeded on two levels of inquiry. While I examined broader and holistic themes surrounding my pedagogy as a practitioner scholar and my students' responses to instructions, I also sought to understand how specific literacy skills, in particular, morphological awareness, could contribute to the literacy development of students who struggle to read and write. Videos of my teaching instruction, ethnographic fieldnotes, audio-recorded and transcribed classroom discourse, and student artifacts provided the data for my analysis.

The dual role of being a researcher, and simultaneously, a teacher in the classroom created challenges in interrogating my own instructional practices. On one hand, I had a professional obligation to prepare my lessons, write goals and objectives for the students' individual educational program, create curriculum and daily lessons,

communicate with parents and general education teachers, and attend faculty meetings. On the other hand, I had to write my fieldnotes. As I taught, I carried a small notebook and jotted down some words and phrases whenever I could. I tried to be unobtrusive as much as possible. But in one occasion, a student asked me what I was writing about. That was an excellent opportunity to tell the students that I was also learning to write. I said, "As a writer, we do not want to forget some wonderful ideas that we want to tell the readers, and so I keep this small notebook as my memory tool." I went on to explain the importance of taking notes in creating ideas for writing.

I imposed upon myself a routine of writing fieldnotes every day using my jottings and memory. But this did not materialize. There were days that I had to skip writing to accommodate committee meetings, parent conferences, and lesson planning. Sometimes, I audio-recorded my self in the car on my way home. Then before going to sleep, in the comfort of my bed, I typed my fieldnotes on my laptop using word processing. The time frame of my field note was limited to my language arts period, the first three hours of the day. However, there were times that I had to teach reading on a one-on-one basis in the afternoon, and I included this in my fieldnotes as well. At the end of the school year (elementary classroom, 2012-2013), I wrote 86 single-paged fieldnotes. Written on my fieldnotes are descriptions of what transpired during the day in terms of my teaching and planning of morphology lessons. I also included commentaries and reflections on students' literacy behavior and interaction during the lesson.

A total of 144 minutes and 9 seconds of recorded videos in my elementary classroom were collected for analysis. These are video clips of students working independently or in groups decoding morphologically complex words, reading continuous texts, reciting poems, or in small group discussion. Likewise, I collected purposeful classroom artifact of focal students' writing samples, seatwork, and charts. A total of 65 artifacts were collected from students' individual work, photographs of my white board notes, and poster charts.

Phase Two. Two similar focus group discussions were held in February and April due to snowballing of participants in the study. The main purpose of each focus group was to assess participants' knowledge, comfort level, and understanding of basic research, as well as their familiarity with morphological interventions for reading instruction (see Appendix C for focus group interview protocol). Also during this meeting the participants were introduced to the objectives of this project: to implement the morphology intervention in Phase Three; to build a knowledge base in literacy; and to develop students' reading and writing skills.

Throughout the remainder of the school year 2012-13, I met with individual teachers in their classrooms, in coffee shops, or in the public library to develop rapport and build professional relationship. During these informal meetings, we talked about the challenges in teaching special needs children, told personal stories, and shared professional goals and previous career experiences. We also talked specifically about

morphology. To support this conversation, I shared with the group some professional articles on morphology published in professional journals for teachers (Kieffer & Lesaux, 2007, 2010; Pacheco & Goodwin, 2013; Rasinski, Padak, Newton, & Newton, 2011). I created a web-based repository folder where we could access materials we created while exploring the teaching of morphology in our classrooms. We uploaded pictures of classroom artifacts, journal articles, and lesson plans to Google Drive. E-mail correspondences with the teachers were also collected for analysis.

Towards the end of the school year in June 2013, I learned from Beth that Diwali was leaving the school district because she had accepted a teaching job in a charter school in the South Bay. I met Diwali at Starbucks one weekend in June to personally thank her for participating in the project. On a separate occasion the following week, I met Diana and Beth in a public library and in a coffee shop, respectively, to discuss the plans for the summer. We also looked back the past school year and reflected on morphology instructional practices that we had integrated in our language arts lessons.

The group met in the summer of 2013 to discuss the principles and protocols (Claravall, 2013) I developed in Phase One and to create a curriculum unit map in line with the Common Core Standards (see Appendix D). I met with Jenny and Anna, both K-2 Special Day Class (SDC) teachers, at my home in the early part of July. We devoted the two-hour meeting to curriculum planning. We also brainstormed how the principles and protocols of teaching morphology could be applied to primary grade students with

special needs. We used the Internet search engine as our resource to find lesson materials. On the second week of July, I met Beth at a local coffee shop in Mountain View. In our discussion, Beth was interested in linking morphological instruction in teaching social comprehension, using text to understand characters' feelings and intentions. I shared with her an anthology of children's poetry (Sword & McCarthy, 1995), and we started the discussion of bringing morphological knowledge in understanding text and bringing it to the comprehension level. For two and a half hours, Beth and I had a productive meeting. We decided to finalize the lessons in August, once we would have a clearer picture of her students and their specific disabilities

Finally, Diana and I met in mid-August, a week before the school started. Diana teaches third, fourth, and fifth grade. Because of the similarity of grade level we taught, I shared with her the curriculum I had created for my 3rd through 5th graders the prior school year, and we clarified the principles and protocols for teaching morphology in her classroom context. We emphasized text complexity and the use of technology as the salient aspects of language arts curriculum for upper elementary students.

Phase Three. A total of five special education teachers, including myself, administered the six literacy outcome measures in the first three weeks of implementing the curriculum design. Sixty-four students were assessed across different grade levels. At this point, I had left my previous intermediate grade classroom and moved to middle school, teaching 7th grade core language arts and social studies special education resource

classes. Our special education director offered this class to me late spring. I thought it would be a good opportunity to expand my teaching experience and apply the classroom knowledge I learned from my teacher research in Phase One.

Scarlett, a brand new teacher in the same middle school where I worked, joined the research group. I met with her three times (a total of 6 hours) outside school to provide support and guidance in the implementation of the curriculum. Towards the middle of the design implementation, two teachers needed to drop from the group, and only three teachers, excluding myself, completed the research project in January 2014.

After the assessment period, the next sixteen weeks, from September 9th to January 10th, were devoted to implementing the curriculum design. Due to the frenetic schedules of these special education teachers and the lack of common time to hold a collaborative research group meeting at least once a month, I met with them individually after school or during the weekend twice a month. We revised the curriculum units we had created during the summer and modified most of the lessons I did in Phase One to address the specific needs of the students and the classroom context. Iterations of the morphology lessons were done for each group level (primary grades, intermediate grades, and middle school). A lesson sample can be found in Appendix E. We also discussed issues and challenges that arose in implementing the curriculum. The teachers shared a few modifications for each lesson and resources they found online. During the research process, the three teachers corresponded with me via e-mail, text messages, or conference

calls to address their immediate concerns and questions. Likewise, I visited each classroom and accumulated a combined 11 hours of observations within the sixteen weeks of morphology instruction. In my visits I was particularly looking for teacher fidelity to the design intervention. Immediately after the last week of morphology instruction, we re-administered the six parallel forms of the outcome measures to a total of 29 students. Posttesting lasted for two weeks.

Fidelity of Intervention

The overall rationale for implementing the curriculum design is to test its practicality in the messy reality of special education classrooms and to improve the curriculum through an iterative process. The focus of the fidelity measures is to evaluate how teachers were using the curriculum and re-evaluate the critical components of the instruction plan in response to students' literacy behavior. The fidelity of the design implementation was fulfilled in three ways. First, I observed each classroom an average of one and a half hours once month. I sat at the back of the room and wrote a copious amount of notes while watching the teachers implementing the lessons and the students' interactions with the teacher and peers. In addition, these observations were audio-recorded for cross validation. I also took pictures of classroom artifacts related to morphology lessons. Second, an online survey using a web based host *surveymonkey.com* was shared with teachers toward the end of every month. The teachers responded to six multiple-choice and two open-ended questions (Appendix F) each month from September

through December, 2013. Finally, individual monthly meetings with each teacher served as the third fidelity measure. Through face-to-face interviews, we entered into a dialogue on morphology instruction, principles and protocols of teaching morphology, understanding the uniqueness of each special education classroom and individual students, and the teachers' "aha" moments while teaching morphology.

Reliability and Validity

Reliability and validity were addressed in macro (i.e., observation) and micro (i.e., instrumentation) levels. From a macro level of analysis, the triangulation of data sources weakened the possibility of bias in reporting evidence. The micro level of analysis entailed the use of correlational coefficients to test the reliability of researcher-generated measures. Procedures for estimating reliability included test-retest and alternate forms. Concurrent validity was achieved using two standardized instruments as criterion measures. This micro level of analysis is further discussed in Chapter Five.

Going back to the micro level of analysis, Bogdan and Biklen (2007) view reliability as "a fit between what they record as data and what actually occurs in the setting under study, rather than the literal consistency across different observations" (p. 40). The use of different data sources including fieldnotes, e-mail correspondences, interviews, videotape, audiotape, focus group discussion, and classroom observations present defensible arguments for this study (The Design-Based Research Collective, 2003). The multiple sources created confirmatory or corroborative data. For instance,

throughout the three phases of the study, the veracity of my fieldnotes was crosschecked from the samples of digitally recorded, audio and video, classroom lessons. Teachers' email messages, classroom observations, and individual interviews created data triangulation, as they provided another perspective into the lessons and helped to uncover teacher intention.

The redundancy of data across different conditions in this study provided one layer of evidence from which I had drawn meaningful conclusions. The other layer of evidence that gave credence to my observations rested on the usefulness and efficacy of morphological intervention. The ecological validity of research (Bauman et al., 2003; Lesaux et al., 2010 and Hurry, et al., 2005), as mentioned in Chapter Two, is deeply imbedded in this dissertation. The authenticity of the classroom contexts where this study was conducted, the real teachers who participated in the design of the morphological intervention, and the pragmatic way of teaching morphology in special education classrooms reflect the magnitude of ecological validity across three phases of the study. Furthermore, the use of direct quotes from the teachers and fieldnotes enhanced by audio recordings established the internal validity of this study. Additionally, triangulation of data gathered in three different phases of the study provided meaningful indicators of how the findings were drawn from the results of qualitative and quantitative analysis. Showing all the transcripts to teachers and honoring their ideas and knowledge about literacy instruction established external validity as well.

While generalizability of the findings was not the goal of this dissertation, the scalability of the intervention through "the ease of adoption of a design" (Collins, Joseph, Bielaczyc, 2004, p. 36) into the language arts curriculum in four special education classes became possible. Transferability, on the other hand, could be achieved in this study through clear descriptions of participants, contexts, conditions, activities, and data collection. Further, triangulation of data sources, careful indexing of qualitative data, and the use of counter examples demonstrate that qualitative findings that are transferable (Bogdan & Biklen, 2007). Ultimately, the transferability of the results of this study lies in the connection that readers – other teacher researchers - make to link the results to their own classroom experiences.

Data Analysis

Qualitative and quantitative data were analyzed separately using qualitative and quantitative methods, respectively. Table 8 shows the parallel procedures for analyzing qualitative and quantitative data: "preparing the data for analysis, exploring the data, analyzing the data, and representing the data analysis" (Creswell & Plano, 2011, p. 205).

Qualitative analysis. Focus group discussion and individual interviews were transcribed using online transcription services. Then, I printed out all digital copies of fieldnotes, transcriptions, e-mail correspondences, and lesson plans. These were organized in one three-ring binder for later data coding. Photographs and video recording were catalogued digitally using iPhoto on my iMac computer. For digital recordings that

Table 8.

Qualitative and Quantitative Data Analysis Procedures

Qualitative Data	General Procedures in Data Analysis	Quantitative Data
• Transcribed text. • Organized document and audio/visual data. • Collected e-mail correspondences	Preparing the data for analysis	• Scored the tests. • Converted raw scores to standard scores for Organized numeric values using Microsoft Excel.
• Listened to audio recording. • Watched video recording. • Read through the text. • Wrote analytic data memo for audio/video recording, photographs, and individual interview transcripts.	Exploring the data	• Visually inspected data. • Conducted descriptive analyses using the mean, standard deviation.
• Conducted first and second coding cycle using Saldaña (2013) coding methods.	Analyzing the data	• Used quantitative statistical software program (statcrunch.com) to determine the validity and reliability of the researcher-generated measures, the differences in averages of the learning outcomes, and effect size.
• Code-weaved and themed the data.	Representing the data analysis	• Presented the results in tables and figures

were not transcribed, I listened to three additional audio recordings and watched 60 short videos clips, which I subsequently analyzed through writing analytic data memos

(Bogdan & Biklen, 2007). Likewise, I wrote analytic data memos for photographs, individual interview transcripts, and e-mail correspondences. These analytic memos provided critical data supplement as part of the whole process of "question-raising, puzzle-piecing, connection-making, strategy-building, and problem-solving in qualitative data analysis (Saldaña, 2013, p. 41).

Analysis of qualitative data involved two cycles of coding (Saldaña, 2013). In the first coding cycle, elemental and language and literacy methods were used for preliminary assignments of codes. As texts were read, I highlighted important ideas and frequently occurring concepts that were relevant to my research questions. I applied descriptive coding, in vivo coding, process coding, and narrative coding. Table 9 shows some examples of data coding process I used: Process Coding (the use of gerunds and action words) and In Vivo coding. For more details of these coding processes see Saldaña (2013).

Table 9.
Sample of coding methods used in analyzing data memo

Coding	***Text***	***Coding***
building confidence (in vivo coding)	Today, while I was administering the Rigby to one of my students, he came up and asked me if what he read was correct. He read to me the title of the book "The World We Live In." I think this was a good indicator that he was slowly building his confidence and trying to practice his reading skills.	***asking for validation (process coding)***

The second cycle of coding involved the use of procedural methods. Building on the previous coding cycle, I created codes using protocol coding (includes guidelines, principles, and process) and causation coding (includes beliefs, ideas, behavior, and antecedents). The result of the first and second cycle coding were synthesized and organized into four separate coding manuals: fieldnotes, focus group, individual meetings and interviews, and lesson plans. At this point, patterns began to emerge, and I created broad categories based on the generated codes. From 859 codes I arrived at 44 categories. The data under these categories were not mutually exclusive. Some data will fall into more than one category.

Finally, after weaving similar ideas from the 44 categories, I created extended phrases that represented the repeated themes (Saldaña, 2013) using an iPad application (see Figure 3). Five themes emerged (see Figure 4). These themes were then defined and transformed into theoretical constructs, entered in the codebook, and became part of the thematic index. After further analysis, I collapsed the two themes –developing morphological knowledge in language arts and principles of teaching morphology – into one broad theme, resulting to three general themes:

- Success and struggle in special education classroom
- Teacher research as a platform for professional development
- Developing morphological knowledge in language arts

Figure 3. Samples of Generated Categories

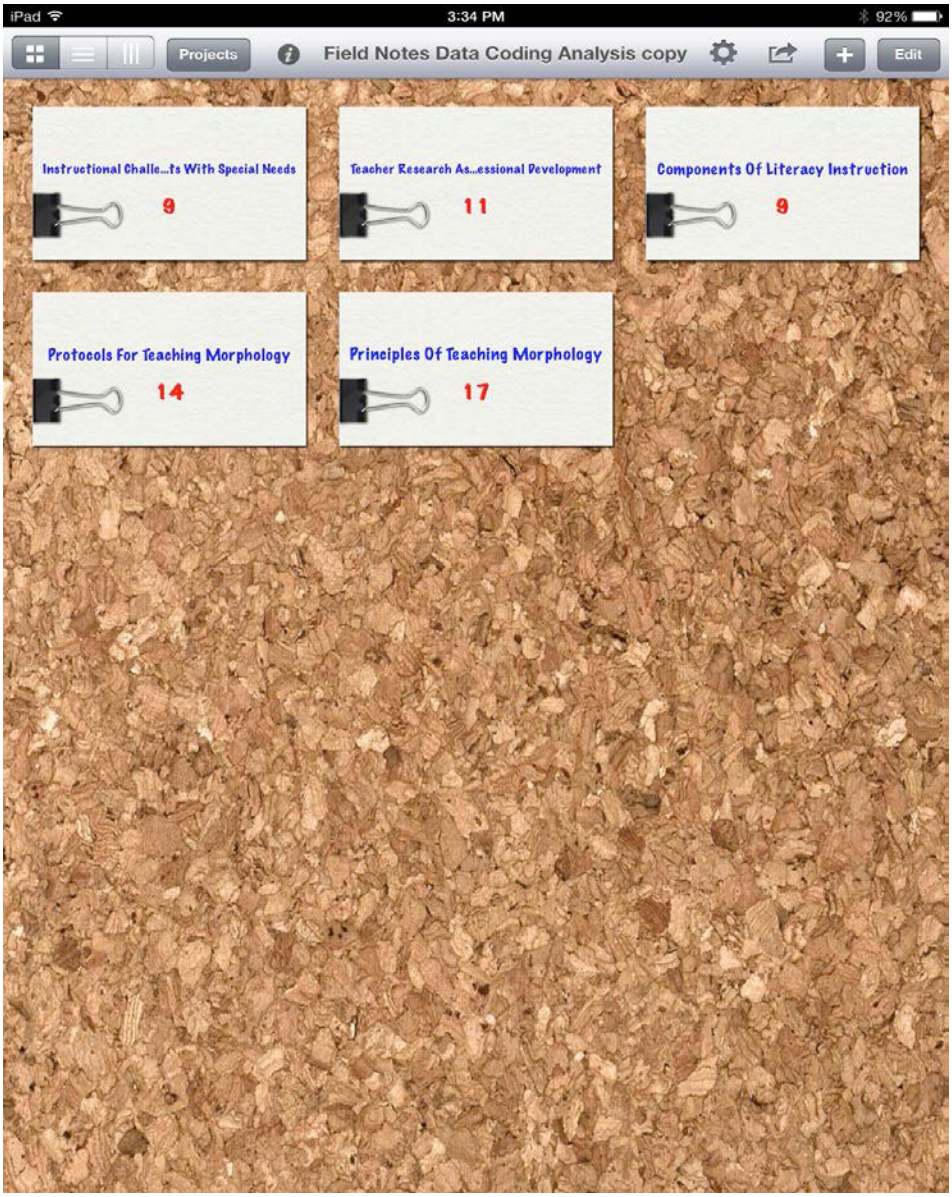


Figure 4. Five Preliminary Themes

Quantitative analysis. After the scores were organized in Excel, descriptive statistics were computed using the pretest data to characterize class variability and average performance in the outcome measures. Then, using the web-based quantitative statistical software (statcrunch.com), I computed for the correlation coefficient using standardized tests to estimate the criterion validity of the researcher-made measures. Similarly, correlation coefficient was employed to estimate the test-retest reliability of the two researcher-generated measures.

Due to lack of randomized-sampling of the participants in the study, as well as the absence of a control group, the quantitative part of phase three was guided by a pragmatic stance within the local context (i.e., teacher researcher) and less formalized laboratory or conventional experiment (Reinking & Bradley, 2008). Counterfactual measure was used to demonstrate certain amount of growth related to language ability (i.e., syntactical awareness and short-term verbal memory ability) "that was not targeted or expected to benefit as a result of the intervention" (Apel, Brimo, Diehm, & Apel, 2013, p. 170).

To determine the differences in averages of the learning outcomes and counterfactual measures before and after the implementation of the curriculum design (Table 10), the data were analyzed using t-test for paired observations. The students' academic progress was analyzed using two statistical procedures - the effect size and the

standard error of measure (SEM) - employed in previous studies with similar small overall sample size (Katz & Carlisle, 2009; Kirk& Gillon, 2009). The effect size index

Table 10.
Within-Subject Single Factor Design

Measures	Pretest	Posttest
Literacy Measures	XX	XX
Counterfactual Measures	YY	YY

was calculated using the formula: sample difference divided by the standard error. The values for sample difference and standard error were taken from the t-test analysis generated by web-based statistical software. The result was compared to Cohen's (1988) descriptive ranking of effect sizes: 0.2 for small effect, 0.5 for moderate effect, and 0.8 for large effect. SEM for each standard measures at pre- and posttest were reported. As Katz and Carlisle (2009) explained:

> SEM provides a statistical estimate of the amount of error that is inherent in a score and so can be used to provide an indication of the degree of confidence that can be placed in an obtained score. We reasoned that non-overlapping pre- and posttest SEMs suggested clinical improvement in the skills measured. (p. 331)

Summary:

I have described in this chapter the context and the methodological design of my study. I have also outlined the process of data collection and data analysis. All throughout

the phases of my study, I have answered the first and third research question I raised in chapter one and restated in the beginning of this chapter:

- How does teacher research shape my morphology instruction and influence the transfer of classroom knowledge to other special education teachers?
- What evidence is there that teacher research can empower educators to become instructional leaders in special education?

Finally, the third phase of the study answered the question "How does morphology instruction, delivered by four special education teachers, affect students' morphological knowledge and literacy outcomes?"

The next two chapters present the findings of this study. Chapter 4 examines the narratives of being a teacher researcher, and discusses the duality of learning in the classroom: the knowledge gained by teachers and the literacy skills acquired by struggling readers. Chapter 5 represents the convergence of qualitative and quantitative data drawn from Phase Three of my study; herein referred to as design experimental phase.

Chapter Four
A Narrative Inquiry

Empiricism, from the base word empiric – meaning someone who exclusively depends on observation or experimentation - and from a suffix forming noun, -ism, meaning a distinctive practice, system, or philosophy.

"To know the meaning of empiricism we need to understand what experience is." (Dewey, 1938, p. 25)

Experience occupies a significant space in the development of teacher's knowledge in the classroom. Using our senses to understand the dynamics of classroom learning and the complexity of instructional practices form the basis for empirical evidence that drives our professional growth as teachers. Evidence from sensory experience, in addition to good intuition, transforms the core of our professional practice – knowledge and learning. This is the experiential narrative that I aspired to explore in doing teacher-research within the implementation of design-based research.

This chapter is narrated in the combined ethnographic genres of confessional and advocacy tales (Van Maanen, 1988). The personalized tone and the intimacy of telling the characters' story "lift the veil of public secrecy" (p. 91) in doing fieldwork in my own classroom and other teachers' classroom. The advocacy tale imbedded within this narrative provides the reader the social justice and equity perspectives in helping struggling readers in special education. The choice is by no means accidental. The methodological design and the "complete membership role" (Adler & Adler, 1987, p. 68)

I assumed in this study naturally blend into the decision of telling my experience in creating classroom knowledge that contributed to improvements in instructional equity and teacher effectiveness. This knowledge empowered me to collaborate in design-based curriculum development with other special education teachers. The confessional/ advocacy tale related here aims to address two of the three research questions stated in Chapters One and Three:

1. How does teacher-research shape my morphology instruction and influence the transfer of classroom knowledge to other special education teachers?
2. What evidence is there that teacher-research supports teachers to create and apply an instructional design process in special education?

Three major themes emerged from the process of analyzing qualitative data - coding, categorization, and data "themeing" (Saldaña, 2013, p. 14). Qualitative analysis showed that developing morphological instruction hinged on three interrelated sources of knowledge: pedagogical, content, and curricular. Foremost, teachers' understanding of students' intrinsic learning experience and its interaction with the overall classroom context formed the basis for pedagogical knowledge. Second, teachers' deep understanding of the relationship between morphology and literacy development led to the deepening of teachers' content knowledge. Third, curricular knowledge involved teachers' understanding and implementation of the literacy components surrounding morphological intervention. The focus of this chapter revolves around the first two

themes, while I reserve the third theme on curricular knowledge for Chapter Five as I will present both qualitative and quantitative evidence to support this concept.

This narrative tale is organized into seven sections:

The Rhythm of Classroom Life, the first section, describes the context of my teacher research when I taught upper elementary grades. The academic success and struggle of my students and the instructional challenges I had as a teacher represents the broader narrative of teaching special education.

Interrogating my Classroom Practice orients the reader to the grand narrative of phonological decoding and phonemic awareness in teaching reading, juxtaposing it with the counter-narrative of morphological knowledge as an important component of literacy skills.

Disrupting the Status Quo tells the story of my classroom research on morphology, the impetus to the instructional design process. This section continues my tale as a teacher researcher in Phase One of the study, which includes the refinement of local knowledge as I continued my day-to-day instruction on morphology.

Success and Challenges of Building a Community of Professional Learners relates the climax of the narrative. Here I describe the collaborative process of design-based curriculum intervention that happened in Phase Two, which involved the exploration of morphology instruction by other teachers recruited in this study.

The Duality of Learning Experiences in the Classroom delineates the parallelism of student and teacher learning surrounding morphology. This section highlights the two layers of instructional equity that benefit teachers and special education students.

Developing Curricular and Content Knowledge provides the evidence gathered in Phase Three, the implementation of the design experiment. This section shows how teacher-research supported teachers to create and apply an instructional design process in special education, looping back to the themes discussed earlier in this chapter.

Reflections summarizes the reflexive component of teacher-research, critiquing my assumptions, the lived experience of teacher researcher, and the findings of my study.

The Rhythm of Life in my Classroom

The first two weeks of autumn, especially in the crisp air of early California morning, life in my classroom was like sitting in the symphony hall - waiting for the lights to dim and hearing the discordant tunes of string, brass, woodwind, and percussion instruments. The cacophony permeated as soon as the 8:30 a.m. bell rang. Three adults were busy manning the flow of traffic through the door, and I, rushing back and forth to my desk, was setting up my Elmo projector and consummating the last chance to organize my lesson for the day. I felt a sense of urgency every day to create routines and

conditions to avoid chaos and lost of learning opportunities for these struggling learners. I felt the need to channel the hyperactive energy in my classroom into an organized rhythm and cadence.

Being a Special Education teacher at the elementary level was a concoction of hard work, patience, and creativity. I considered myself a classroom juggler - a performer who shapes the minds of these children, but also works hard to keep them entertained. Otherwise, I would lose their attention. The chain of inappropriate behaviors would escalate, causing the derailment of instructional momentum. On one warm September morning of 2012, after the students finished recording their poetry recitation, Mariano[3] approached me. "I am going to ask you a question. If I get 20 stickers, can I use the iPad?" After giving him my affirmation, Mariano walked back to his seat contented and ready to learn.

Mariano, a fair skinned Hispanic third grader, is one of my focal students. He was new at Kimberly Elementary. He was in general education class in second grade and had a pullout resource special education program (RSP) from his previous school. His underachievement in the general education classroom led to the Individual Education Program (IEP) team to move him to a special day class (SDC), a self-contained special education program. He was classified under the specific learning disability (SLD) eligibility criteria. In my observation during the first few weeks of school, I had seen

[3] To protect the confidentiality of students in this dissertation, I used pseudonyms.

some academic and cognitive strength. During my grammar lesson on common and proper nouns, Mariano was one of three students who got the idea quickly. He participated in the discussion and shared deep thoughts, a sophistication for a child in special education class. On September 24, 2012, I wrote an observer's comment on my fieldnotes: *I know he is smart. He is just lazy sometimes and lacks motivation to learn. I am not sure if he has SLD. He seems easily distracted and has short attention span.* Misclassification is not an uncommon practice in special education, especially when minority students are involved. In fact, this is one of the reasons for racial inequity in special education (Losen & Orfield, 2002; Valencia, 2010).

The rhythm of life in my classroom continued beyond academic instruction and behavior management. There was constant readjustment of the learning environment that affected the way I conceptualized my curriculum and the scope of my lesson. On August 31, 2012, the second week of school, I wrote in my fieldnotes:

> *The complexity of being a special education teacher does not only reside on how you structure your classroom and how you teach the curriculum to individual student needs; it goes beyond the everyday life in the classroom. I have to write IEPs. I have to attend to mundane issues like students' lunch, parents' email, and school bus concerns. Today, I forgot my yard duty in the morning because I needed to talk to the bus driver, letting her know that some of my kids should be off the bus by 8:15, the time when school opens.*
>
> *I need to modify my curriculum so that I can accommodate the schedule and the needs of the students next door. Mrs. Burkenson is going on a maternity leave in 2 weeks, and the District decided to move them to my class since she has only four students. It does make sense. But I think the*

> *challenge is how am I going to merge two programs with distinct curricular needs.*
>
> *Because of this frenetic schedule, I didn't do my read aloud today. It's new, and everybody is adjusting. Hopefully by Tuesday, Mrs. Burkenson's kids will be on the same page as my students when we get back to the novel – "Out of the Dust."*

In order to enact quality lessons amidst all these non-instructional responsibilities that came with being a special education teacher, time management and organizational skills were my best friends. But the universe sometimes refused to align in my favor. No matter how prepared I was with my teaching, I occasionally overlooked the centrality of students' background in the development of my language arts curriculum. Issues arose when students were in conflict with the theme of the lesson.

It was October and we were studying a poem by John Updike. The poem was about celebrating the month of October. I was reading the poem aloud in a singsong and scary manner and the children were enjoying my act. Except for Mariano. I continued with the lesson, inviting everybody to read the poem aloud with me as I pointed to each word projected on the screen. Mariano's head rested on his desk, both ears covered with his hands. I ignored him, thinking that this was just one of his ploys to catch my attention. One of the students noticed that Mariano had shoved his papers and pencils to the floor and continued to bury his head on his desk. Mariano's eyes were red and wet when he lifted his head. "I don't want Halloween!" he shouted, and then ran from the room. The whole class froze into silence. Miss N and Miss J rushed through the door after him. I had

never seen this behavior from him. The rhythm of the morning was broken and it took me a few minutes to restore a sense of calm.

Although common in special education, these kind of dysfunctional rhythms did not characterize my classroom all the time. Harmonious rhythms happened whenever we celebrated students' learning and success. Student engagement promoted critical thinking and reflection of life experiences. On that same day after Mariano had returned to the class, I showed three video clips from the YouTube channel. The first video clip showed a picture with the sound of a rainforest. After a few minutes of watching the video, John said, *"I get it now; what's next?"* I asked them to tell me the different sounds they heard in the video. *"I heard the sound of the rain"* one student said. Then I switched to the next video clip. The students watched the video and listened to another sound of the rain forest. "*What did you see?"* I asked.

> *Rajiv: I saw a blue jay.*
> *Siddhartha: Where is the rain forest?*
> *Sean: It is in South America.*
> *Siddhartha: I can hear the sound of the bird.*
> *Reyahd: Amazon is so big, six countries could fit it.*
> *Michael: Columbia and Venezuela have the Amazon.*
> *John: I want to hear the thunder.*

> *After this discussion, I showed the third video. It was the complete episode of The Magic School House that deals with the rainforest. The students watched the show intently. They were very engaged, and virtually no off task behavior was observed. After the show, I told them to remember the story of the Magic Tree House when they start reading the book The Rainforest.* (Fieldnotes, October 1, 2012)

Siddhartha, another third grader, is my second focal student. I chose Siddhartha as my second focal student due to his interesting academic profile. He was the lowest performing student in my class, based on my initial assessment on reading and writing. Perseverance and diligence were among his strengths. He moved from a moderate to severe second grade class, a special education program that provides services to students with significant intellectual, communicative, and social deficits. His IEP eligibility classification was autism. The previous IEP team decided that the severe disabilities classroom was no longer a least restrictive environment for him, and so they decided to move him to my class. Siddhartha was a social child and he did not have significant behavior issues that characterize many children with autism. Just as I wondered in Mariano's case, I questioned why Siddhartha had been classified with this disability.

Siddhartha belonged to a group of three students in my class whom I worked with in a small group in the afternoon for remediation. The phonological decoding skills of these three students were not yet fully developed. Although Siddhartha could map out the sounds onto the letters of the words, his reading fluency still needed to mature. His running record showed that he had difficulty blending words with diphthongs (e.g., mouse, coin, enjoy) and initial consonant digraphs (e.g., close, brake, smoke). His writing was sloppy, to a point of illegibility. Aside from the small group instruction, I worked with Siddhartha on a one-on-one intervention twice a week. The purpose of this individual instruction was to review the lessons that I had taught in the morning, during

my language arts class, as well as to provide an occasional review of consonant and vowel digraphs. This intervention lasted for 10 to 15 minutes. The two other children from the small group also participated in the one-on-one intervention in the afternoon.

Interrogating My Classroom Practice

The grand narrative of reading instruction since the first edition of *Dick and Jane* in 1930's centered on the importance of recognizing the shapes of common words and on mapping letters to sounds to phonetically decode new words (Shannon, 2007). Bestselling author Rudolf Flesch (1955) then galvanized the importance of phonics in the teaching of beginning reading in his book *Why Johnny Can't Read, And What You Can Do About It.* In fact, until the early part of this 21st century, the most common literacy practice of effective special education teachers for instructing word-level skills favored a code-based/phonics approach (Rankin-Erickson & Pressley, 2000). Like most special education teachers, I was trained in the tradition of phonological decoding as the main intervention for struggling readers. True to this pattern, among the eight teachers that I initially recruited for this study, none of them had previously taught morphology as a literacy intervention.

I was baffled by the paradox of many students coming into my class with a solid knowledge of sounds and letters and awareness of English phonology, yet they continued to struggle to read and write. The realization of this tension was the start of self-interrogating my assumptions on teaching and learning to read. The Internet provided me

an unlimited resource to find ways to improve and inform my practice, and in 2009, I stumbled upon an article about the value of morphology in teaching reading and writing (Lesaux, 2009). The article stimulated my thinking and provided the basis for evaluating my knowledge of literacy instruction. I searched for further information regarding this topic and explored ways to incorporate this construct in my literacy practice, but continued on with a phonics-heavy approach. Such "meandering through the research process" (Kelsay, 1991, p. 18) is similar to other teacher researchers' initial experience of withholding an instinct to immediately jump into a reformulation of instructional practices (Burnaford, 2001).

Yet my immersion to the field of morphology not only enhanced my understanding of reading processes, it also eventually sharpened my tools for literacy instruction. Countless hours of staying up late at night reading scholarly journals and professional articles clarified my ideas about teaching morphology and shaped my lens as a scholar-practitioner. My sole purpose at that time was to improve my practice, and "creating a rigorous learning environment with high expectations and appropriate support for all students" (California Standards for the Teaching Profession, 2009, p. 7) was my utmost goal. As I became more involved in finding ways to address morphology in my language arts curriculum, my bias toward teacher-research as a tool for educational reform also became more pronounced. I was able to articulate my emerging perspective as I responded to the rejection I received from two teachers I initially recruited for this

dissertation. As I wrote this reflexive fieldnote written on December 12, 2012 (That was 12/12/12. This moment must really have been a turning point!), I realized that teacher-research was not for everybody.

> *Sometimes I don't understand why other teachers find it repelling to do extra work when it would benefit their students' progress or improve their practice. I understand that we have tons of paper work to correct, to grade, and to fill out. I understand that, being a special education teacher, we have three different grades or multi grades to plan our curriculum, and within that level, we still have to differentiate our lessons to meet the needs of our individual student. But isn't it part of our job? Don't we know that from the time we sign up for this profession, there's going to be a lot of challenges that we are going to face? Teaching special needs kids is not an easy job. Here we have to deal with mainstreaming, unwieldy parents, district requirements, state mandated policies, and school wide norms. I totally understand how inundated we are in terms of work, but we only work for 7 hours. I know some of us work at home, but other professions do that as well. My partner works more than 5 days. He brings his work into the weekend; doctors are always on call. Yup, I understand. These people are well compensated for their job – including my partner. But why did we go to teaching as a profession? I came to this profession because I love teaching. I love reading.*

My lens as a teacher conflicted with my other identity as a budding scholar. This was evident in my other reflective fieldnotes. I was on the plane - on my way back home from Atlanta, on the eve of the last day of 2012 – when I wrote:

> *I have been very concerned about getting teachers to participate in my study. Although three teachers have already expressed their interest, I am not quite sure how am I going to organize a focus group. My concern, as their colleague, comes out of respect for their time; their busy schedules. I have been contemplating whether I should just meet them individually and have an in-depth interview to obtain baseline data about their*

> *understanding of teacher-research. I am worried that I won't be able to convene them together.*

As part of identity development, I passed through the stage of self-doubt. I discovered my voice as I continued doing classroom research and gained confidence as I witnessed students' academic improvement. The development of my competence as a researcher was central to self-empowerment as a teacher. At the end, all these self-doubts were dissonant to my growth as a teacher researcher.

Disrupting the Status Quo

Teaching phonics and phonological decoding had been the status quo in my reading instruction. The training that I had in my teacher preparation program and the countless professional development in literacy instruction that I attended over the last 10 years focused on the foundational skills related to phonological processing. This teacher-research guided me to reform my literacy practice and create a curriculum germane to the needs of my student population. Disrupting the status quo shaped my morphology instruction and became the impetus to develop principles and protocols for teaching morphology in special education. This period became the first phase of my design-based research.

My yearlong refinement of my curriculum continued as well as the enthusiasm of my students from learning morphology. I restructured my curriculum and recalibrated my instructional lens. I put phonological decoding into the periphery of my language arts

lessons, and instead situated morphology in the limelight. My predilection toward literature influenced my decision to choose poetry and complex stories as the context for studying morphology. My upper elementary students and I read the poetry of Emily Dickinson, Langston Hughes, Carl Sandburg, and Robert Frost, among others. We studied the novels of Karen Hesse (*Out of the Dust*), George Selden (*Crickets in Time Square*), and Mark Twain (*The Adventures of Huckleberry Finn*). We also read non-fiction books about tsunamis, rain forests, and the life and time of famous artists. Throughout our reading of these rich texts, I carefully extracted multisyllabic words and used them as a staging ground for students to analyze the structure of morphologically complex words.

My class started the day with poetry, which lasted for about 10 to 15 minutes. *As soon as the entire group was seated, I asked the kids to take their binders out. One, two, three, then four students pulled the white three ring binders out of their desk. The rest of the class followed. I projected the poem "The Fall Wind" on the white canvas screen* (Fieldnotes, September 18, 2012). The students read one poem a week, and I structured the lesson in the following manner:

> Monday: Introduce the poet and read the poem aloud, while students listen.
>
> Tuesday: Students and the teacher read the poem aloud; students highlight morphologically complex words; write these words on their whiteboard for spelling practice.

> Wednesday: Discuss some vocabulary words in the poem; students write these words down on their whiteboard for spelling practice.
>
> Thursday: Classroom discussion focused on meaning; independent reading.
>
> Friday: Writing two or three sentences about the poem; students focus on sensory images.

The students read a total of 31 poems in one school year. Poetry became an important part of my mini-lessons in compound words, inflections, and prefixes/suffixes.

> *After reading the poem aloud to the children, I asked them to take their highlighters out. The students first highlighted the word Thanksgiving. John noticed that there is another Thanksgiving word in the last line of the poem. Antonio asked if he could also highlight the title of the poem since it has the word Thanksgiving. "Storehouse" and "without" were the two other words that my students highlighted. From here, I introduced the concept of compound words.* (Fieldnotes, November 14, 2013)

> *We read the poem "The Wind is Calling Me Away" aloud in unison as I pointed the words projected on the screen. Then I asked the student to highlight the words that they have a hard time reading or understanding their meanings. Siddhartha pointed out that there was a compound word (i.e., subtract). I corrected him. I told him that it was rather a prefix. I walked toward the chart resting on the easel by my desk, and pointed out the prefix sub-. Steven suggested to include the word subtract on the list of words that have the prefix sub* (Fieldnotes, March, 4, 2013).

Celebrating success on learning morphology in my classroom was one of the most important rituals that we all practiced throughout the year. On November 13, 2012, after finishing his independent work on inflectional morphology, Siddhartha came up to me with excitement in his voice. He told me that he remembered the rules when adding –ing

and –ed to a base word that ends with short or long vowel sound. In my reflective fieldnotes that day, I wrote:

> *I think the awareness of inflectional morphology was beginning to solidify in them. They just need more practice and prompts to remember the rules when spelling words with inflectional morphemes. In fact, working with Antonio, he did have the idea that there were some words that needed E to be dropped before adding –ing or –ed. This is what I am going to emphasize this week.*

Students acted as bootstraps for others. For example, the higher performing students in the class acted as tutors to other students. One afternoon, I asked Siddhartha, John, and Antonio to practice their poetry. Each student took turns reading each stanza. Antonio read the words harness, lovely, and mistake independently by covering some parts of the word and blending them together. When it was Siddhartha's turn, John and Antonio glued their eyes on him. They occasionally cued Siddhartha with the correct way of pronouncing the words. On a separate occasion, before the students took the spelling quiz on inflectional morphology, Manuel, a child with Asperger, walked to the front and showed his classmates something that they needed to avoid doing when spelling a word with –ing inflection. As Manuel illustrated by writing the word *making* on the whiteboard, John suggested, "You drop the E." Vincent and Antonio agreed. I was on the sidelines, watching and listening as this morphology talk unfolded.

The capacity of humans to represent their thoughts in language enables children to

solve practical tasks and conceptualize their mental world (Bruner, 1996; Vygotsky, 1978). Frontloading of morphological terms like *morphology, derivative, compound words, prefix, suffix, base words, and inflections* was a necessary first step for my students to fully articulate their ideas and use precise vocabulary when engaging in morphology talk and in problem solving unknown multisyllabic words. These terms anchored their knowledge of morphology. My instructional practice of creating word lists and titling them to emphasize the basic structure and explicitly use these terms helped my students to build their schema of morphologically complex words. (See Figure 5 for an example.)

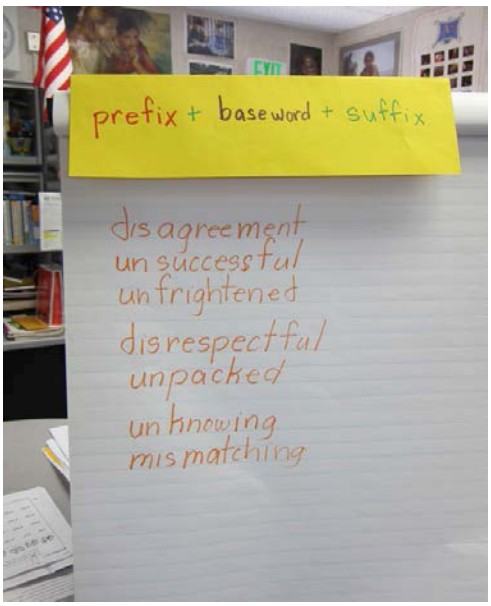


Figure 5. Frontloading morphological terms

Teaching morphology as a whole class instruction every day for about 20 to 30 minutes stimulated students to verbally produce morphologically complex words. During my lesson on prefix re- and under-, after defining the meaning of these prefixes, one student after another volunteered words to write on the poster chart (Figure 6). I became the scribe while complex words floated in the air. "Underground," blurted Mariano. "Underdog," suggested Siddhartha. "Undergarment," yelled John (I believe John remembered this word from the pretest that I had given them earlier that morning).

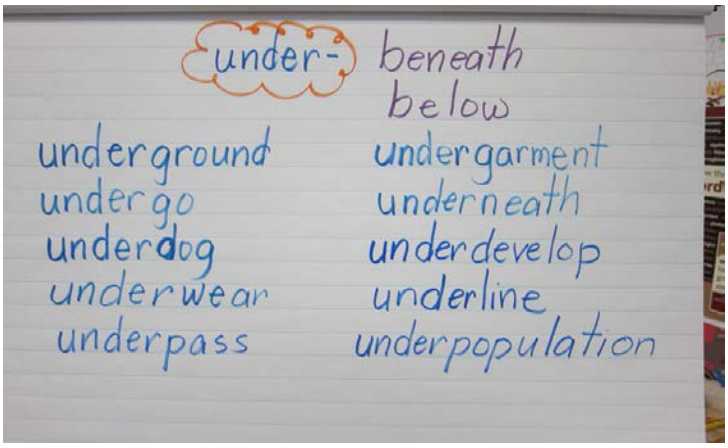


Figure 6. Students' exposure to morphologically complex words

Analyzing a morphologically complex word is not an easy task for many students who do not have a well-developed awareness and knowledge of word structure. My students needed repetition, explicitness, and review to fully learn the process of decomposition (i.e., breaking down words into smaller and meaningful morphemes) and

composition (i.e., synthesizing the newly learned knowledge of sublexical structures). Only through redundancy of teaching were students able to internalize the meaning and structure of multisyllabic words. The students' internalization of morphological schema (e.g., prefix + base word + suffix + suffix = morphologically derived word) formed the basis for their knowledge of morphology and became useful when problem solving complex multisyllabic words.

> *I wrote on the board the prefix un-. Siddhartha commented that they have already done that prefix. I told the class that it was a review. I wrote the meaning next to the prefix un- and followed by an example - unable. Antonio immediately blurted out "not able." Without prodding Antonio, he yelled the word "unallowed"* (Fieldnotes, February 13, 2013).

Teaching morphology elevated my language arts lessons to a different level of rigor and complexity in special education. Reading and writing words such as those shown in Figure 6 exposed the students to morphologically complex words that they needed to access meaning from their texts in content area reading. The multidimensionality of learning morphology – sounds, orthography, and meaning – provided them a more equitable chance to fully understand rigorous and complex texts in literature, science, and history. Moreover, learning the structure of multisyllabic words shaped my students' ability to deconstruct and construct meaning from texts. Most importantly, learning morphology had fostered word consciousness (Nagy & Scott, 2000)

and had imbued fun into the fundamentals of learning to spell and identify words (Blachowicz & Fisher, 2004).

> *The word "unfriendly" is specifically tricky because it has both affixes. I pointed this out to the class. Using a digital graphic organizer, we reviewed some of the previously learned prefixes and suffixes. I used multisyllabic words with two or more affixes. Justine volunteered the word "joyfully." I typed in joy in one box, ful in another box, and ly in the third box. I gave them three words to breakdown - unfriendly, wonderfully, and unfolding. Antonio and Steve jointly asked if there is a double l in the word wonderfully. I showed them that the suffix ful has its own L and the suffix ly has its own L. Then, they copied the words on their morphology journal. I told them that they have to combine all the units to create a new word. I asked the class if they were enjoying the activity. The whole class responded with a resounding "Yes." But Siddhartha added, "It's amazing!" I laughed. "Wow, all I wanted to hear was that you guys are enjoying it, but apparently it's amazing to do this kind of activity* (Fieldnotes, March 7, 2013).

Successes and Challenges of Building a Community of Professional Learners

"We are like an island," Denise responded to my comment about the isolation I felt as an elementary special education teacher in our focus group meeting. But the island needed some bridges to connect to other islands in order to improve the teaching practice and rock the status quo of isolationism in special education. Even though we saw each other every month at the district office for job-alike meetings, the group contrasted these meetings with the way the general education teachers get together to talk about their curriculum.

"We don't really talk about what we are doing. It's more about complaining, right?" Denise remarked. Everybody laughed.

"Well, even when they give us some agenda, and I can see from their point of view that it's like a helpful agenda, it's really not. They could do so much better, I don't know, it could be so much better," Becky added.

Jenny added, *"It would be nice to have like a coherent curriculum that instead of pulling from this book and from that book…"*

"Exactly," Becky agreed*, "Because I was asking when we first started talking is there something that your group follows to help me teach like if I… if Jenny and I work together maybe through the year, we could be okay. This week we're going to start on this type of word or lesson on phonics or sounds, and then build on..." (*Focus Group Transcript, p. 39)

Build on. This idea captured the overall goal for recruiting teachers to work with me in creating and applying an instructional design process emanating from my teacher-research. By sharing my prototype curricular intervention on morphology with the other teachers, we collaborated together to improve the design intervention, which influenced their instructional practices and developed classroom knowledge. I also shared some articles published in "The Reading Teacher," a peer-reviewed journal for classroom teachers. I created a cloud-based file storage to share the curriculum unit map, classroom artifacts, professional articles, and other digital materials related to morphological instruction. This also served as our repository for lesson planning during this exploratory phase of my research.

I characterized the second phase of my study as community building: A community of professional teachers who volunteered to explore the value of morphology in special education language arts. Just like any other kind of community, the community I tried to organize took time to take hold and "for its members to develop effective ways to talk, think, and learn together" (Lieberman & Miller, 2008, p. 12). From a group of four teachers, including myself, we grew to seven. Three more teachers joined in April through the initial members' referral. Due to our hectic schedule and work demands, electronic communication was the best and most efficient way to reach the members of the community.

> ***Diana****: Eric, It would be awesome to collaborate with the group. I have an IEP on 4/10 right after school, but other days (other than Tuesday) would work. School finishes at 3:35 pm, so I could meet at 4:00 p.m. Let me know if you would like me to drive to see you or if you would to come to Hoover (Rm. 13). I don't think I have a Gmail address. My home email is dxxxxxx@yahoo.com. Will that work?* (e-mail correspondence, April 3, 2013)

> ***Maria****: Hi Eric, I'm so sorry for the delayed response. I've had back-to-back Artic meetings since we returned from break. Yes, today works, but we can also arrange for a different day if this isn't enough notice.* (e-mail correspondence, April 23, 2013).

> ***Anna:*** *Hi Eric, Thanks for including me… Sorry for being so tech challenged… but … where did you share all your info?? Am I able to access it? When we're shared things on Google drive at school, we've used our XXXX account… Is there another way to share?* (e-mail correspondence, April 23, 2013)

Of the six participating teachers, I knew Jenny on both personal and professional levels. Jenny and I worked together at the same elementary school. Beth was our itinerant social skills teacher at the same elementary school where I taught in 2012-2013, but she also had middle school special education language arts classes. I had only known the rest of the teachers by name or had met them during one of those district-wide special education meetings. I wanted to get to know them more. I figured that it would be better for me to meet them outside the classroom, somewhere neutral and less formal. I met Diana, Anna, and Denise individually at a local coffee shop to discuss our project and get to know them on a personal level, while Maria and I talked about morphology lessons in the comfort of her kitchen.

Morphology instruction was a new concept for most of the teachers I worked with, except for Maria, who used a commercially available spelling program called "Spelling with Morphographs" for one year, and then abandoned the program the following year. None of the six teachers had tried teaching morphology as an intervention program. The dominant instructional approach they used to address reading problems in their classroom was based on phonological systems. Now, during this second phase of my research, the teachers were all exploring teaching morphology in their language arts lessons. I shared the principles and the protocols of teaching morphology that I had created based on my teacher-research. Diana and Anna requested to see my lesson plans as a model. Then a few weeks later, Beth shared a flip-notebook that she had created for

her students to remember the rules for spelling inflectional morphology (See Figures 7 and 8). Anna sent me an e-mail message on May 31, 2013, sharing what she had done:

> *I did a compound word lesson with my class reading the book "Once Upon a Bull…(frog). They enjoyed it. Then we found all the compound words in the story. We did a few of your compound word worksheets. With my 3rd graders this week we talked about base words and endings. We read one of your poems you shared and looked for all the words with endings… then circled the base word. They actually were getting it! It was interesting how they spotted words like "sing," seeing the ending – ing. Then we talked more about identifying base words. ☺ … it's a start for me!!*

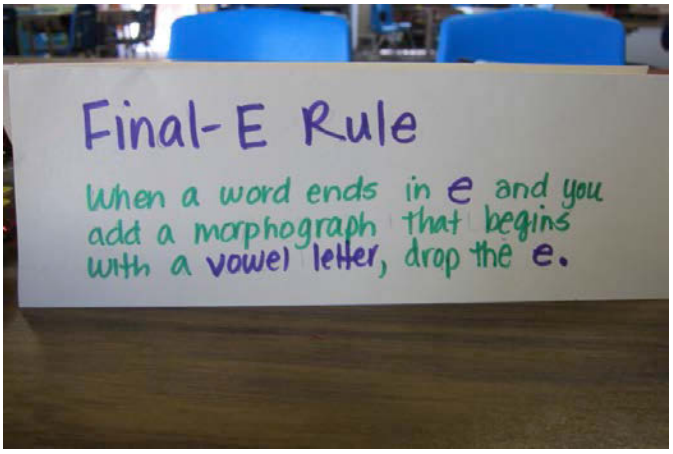


Figure 7. Beth's Flip-notebook showing morphology rule

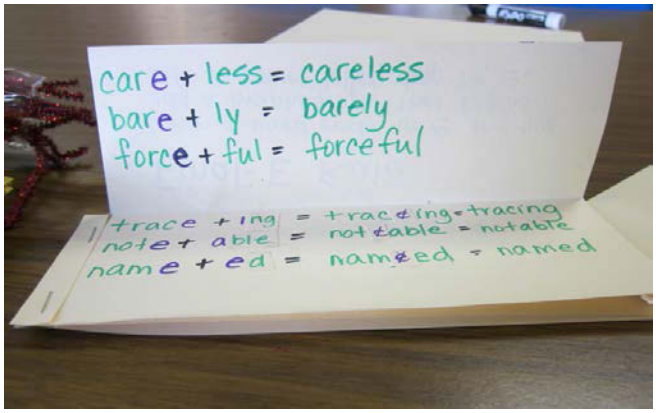


Figure 8. Examples of morphological structure

Unfortunately, I was not able to sustain the group's cohesion through the summer. The original plan of meeting together to finalize the intervention design did not materialize.

> *Anna: Hi Eric! If July 8th week is the only week everyone can meet… I can try to join you guys. I will be on a family vacation from 7/6 – 7/13. We will be at Pajaro Dunes…so, if need be, I can drive back. Would you meet in the afternoon? Let me know the date and I might be able to hitch a ride-back with my sister in law. Where do you live? Whatever you decide…let me know. Thanks.* (e-mail correspondence, June 4, 2013).

Our e-mail exchanges on finding a common date during the summer were futile. Enthusiasm faltered, coming almost to a complete stop. Furthermore, my participants began to make career changes. Denise left the school district; Becky took a district position. I decided, then, to meet Beth and Diana individually, and met with each of them for half a day at the coffee shop. Jenny and Anna were able to meet together with me in

July, and we convened for about three hours at my place. With the demands of the job of special education teacher that includes IEPs, articulation meetings, teacher training, emergency meetings, and faculty meetings -- on top of writing lessons and teaching multi-level classes -- I respected and honored their free time in the summer. I did not want to impose upon much of their summer vacation. I remained flexible and accommodating with their time.

As the summer drew to a close, we prepared to set up our classroom and got ready for the third phase of my research – the design experiment. In August, a newly hired teacher, Scarlett, joined the group. I trained Scarlett and Diana on the administration of the standardized tests. Maria, Beth, and Anna had been teaching for more that five years, and they were quite familiar with the administration of the test measures used in the Phase Three. Then in the fall of 2013, the group further disintegrated. I never heard from Jenny since the last time I saw her in the summer. Also at this time, my job had taken me to middle school for 2013-2014 school year. I accepted the offer of teaching 7th grade language arts and social studies core special education. Then, Beth and Maria opted out in October. Yet Diana, Scarlett, and Anna continued their commitment to the third iteration of morphological intervention design. Although the full complement of participating teachers could not remain with the project through the full four months, they have contributed to further development of the curriculum and provided initial data for the second iteration of the design intervention.

The Duality of Learning Experience in the Classroom

The principles and protocols for teaching morphology provided guidelines for the three teachers as we scaled the design intervention in Phase Three. Anna, Diana, and Scarlett became particularly immersed with me in teaching of morphology as we went through the curriculum week by week, building students' knowledge of morphology. Aside from the monthly classroom observation, I met Anna and Diana individually after school two times a month, and in the case of Scarlett, we met during the weekend at a local café. During these individual meetings, we evaluated the lessons taught, discussed the students' responses to morphology instruction, and planned the succeeding lessons.

Anna, Diana, and Scarlett recognized the depth of my knowledge and experience teaching morphology in elementary and middle school, and so I became an instructional facilitator for Anna, and an instructional coach for the newer teachers, Diana and Scarlett. Anna was a veteran special education teacher of 13 years. She had never included morphology as a component of her language arts instruction. Instead, her language arts instruction at the primary level revolved around the teaching of phonics and phonological decoding. In one of our conversations, Anna realized the value of morphological knowledge in early literacy. Anna's realization proved that morphology could be taught to younger students (Arndt & Foorman, 2012; Apel & Lawrence, 2011). While her students were learning to develop morphological knowledge and awareness, she, too, was learning about teaching morphology.

> ***Anna:*** *And I think the type of language will help them, maybe not this year because they are not going to have Star Tests, but next year when they start doing those language tests and, needing to know the prefix meaning. I don't think a lot kids understand or know that, unless it is being taught to them. And I don't think a lot of teachers teach a lesson about that. You know what I mean? It isn't incorporated in their language arts curriculum*
>
> ***Eric****: Sometimes you think implicitly that the kids will get it, right?*
>
> ***Anna****: Yeah. I think having you making me… not making me... but having me more aware of these made my teaching better. I think as far as... Oh you know what? I need to take a time to introduce these concepts.*
> (Interview Transcript, November 23, 2013)

Anna went on with her reflection on teaching morphology, touching broadly the idea of instructional inequity in special education. Her assessment of the curriculum echoed Bruner's (1996) idea that as a teacher, we "do not wait for readiness to happen" (p. 120) in order to develop morphological knowledge. Through scaffolding, children deepen their understanding of word structure.

> ***Anna:*** *Yeah and make the time to do it. As you were saying, you know eventually they will get it or it will come in our lessons once in awhile. But I think you are making me more aware that it is important. They do need to learn this, especially with special ed kids, they are not catching things like the regular kids that typically would.*
>
> ***Eric****: Yeah, think about now that the second graders are getting it, how much more next year. They're already exposed to this kind of concept. So hopefully it's going to click. There's a study that shows when you are doing phonics and at the same time you're doing parallel lesson with morphological awareness, kids get better because they actually complement each other.*

> ***Anna**: Oh. OK. That's the current study that they have not been exposed to. The teachers are not aware of it -- that we always focus on phonemic awareness and phonological processing and this part of the language is overlooked.* (Interview Transcript, November 23, 2013)

But the biggest challenge for her was how to teach morphology for her four diverse second-grade English language learners with speech and learning issues. Two of them were the focal students for this study. Zhineng was the only girl in the group. Her speech intonation was nasalized, and sometimes I could hear the Chinese articulation when she talked to me. Yet, this never stopped Zhineng from expressing her ideas and asking questions during small group instruction. She was gregarious and never shied away from adults. She was hard working and eager to learn. One day, I was sitting at the back table. She walked in from her mainstream class and looked at me. Eagerly she asked if I was going to work with her.

Similar to Zhineng, Ricardo spoke a language other than English. One morning in December 2013, I heard him speaking Spanish to himself as he colored pictures on his worksheet. Ricardo had a good command of oral communication in English, yet when I spoke to him in Spanish, his eyes sparkled. He responded to me in Spanish, then shifted back to English. Anna mentioned that Ricardo was aware of inflectional morphology when the material was given to him orally. He could point out words that end with –ed and –ing in a text, but he was unable to read the word. Anna was puzzled about this.

> *I think it was harder for Ricardo. He couldn't read them. But when we do worksheets and stuff, you know he was able to identify the prefix and he*

> *knew what to look for. But if it is reading, it was hard for him. So it's like any type of phonics work he gets it just because he is smart enough to know the rules. He knows whatever words we are talking about he picks it up. He doesn't know what it says but he could go all the words*
> (Interview Transcript, November 23, 2013)

The preponderance of morphologically complex words on the whiteboard and on the anchor chart in Anna's classroom provided a print-rich environment for her young students, and in this way, she demonstrated high expectations for these struggling learners. On October 9th when I visited Anna's classroom, I saw some charts posted on the whiteboard (see Figure 9). The charts showed Anna's previous lesson on compound

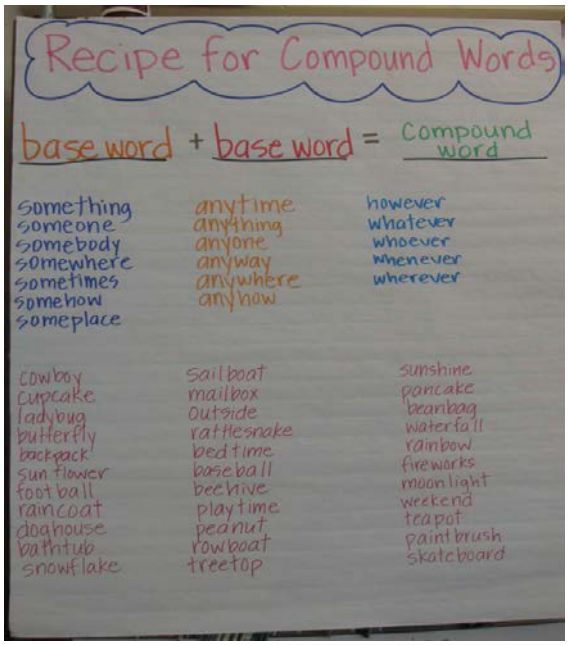


Figure 9. Morphologically complex words taught in Anna's classroom

words. In fact, the whole prior month had been devoted to compound words and the concept of base word. The use of different colors made this poster appealing to primary grade students. I like the way she included the word "recipe" in her title, very catchy. The way Anna organized the words according to common family words (e.g., something, someone, somebody, sometimes, somewhere) provided an explicit pattern for her students to see. This poster served as an anchor chart for students when they were writing sentences and became a visual resource throughout the day. The words written on the post-its reflected Anna's idea of contextualizing this lesson through building sentences using compound words.

On the right side of this poster, I saw six compound words written in one column (see Figure 10). There were two post-its on the left side of these compound words. The first post-it has the word "I" written on it, while the second one has the word "see." These post-its could create a sentence frame using the compound words and helped

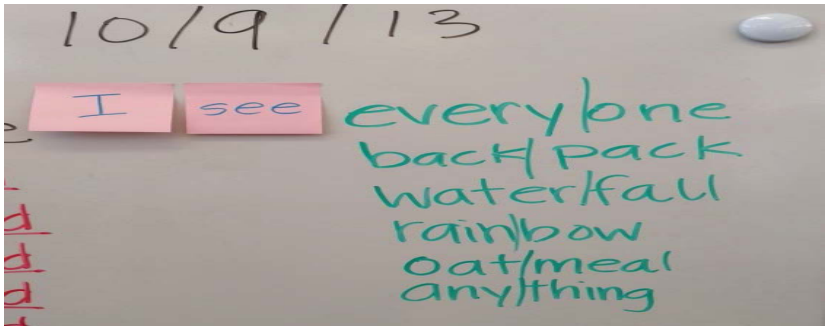


Figure 10. Imbedding morphology instruction within meaningful sentence

contextualizing the lesson content. Students manipulated the post-its to create different sentences

Directly below this, Anna wrote another group of words on the whiteboard with the heading "–ed: past tense". Beneath the title, she wrote words that end with –ed such as *loved, wagged, wanted, shivered, giggled, drooled, groaned, looked, parked, walked, climbed, smelled, laughed, unpacked, picked, needed*, and *snuggled*. Anna would then spend the whole month of October teaching inflectional morphology. In her e-mail correspondence to me before I visited her classroom, she shared her students' excitement in learning the concept of inflectional morphology.

> *I reread The Dragon with my kids and they were able to find the –ed words. We also started our story today, Henry and Mudge… and that story had tons of –ed words! And compound words…the kids made a list of both. They were excited about finding the words*! (E-mail correspondence, October 7, 2013).

Direct instruction is an explicit teaching method that is relevant to teaching morphology. Just like teaching phonics, students in Anna's class needed to understand explicitly the mechanics and principles of morphological rules. This approach helped them see the patterns and nuances of word structure. Anna's lessons did not end there. She integrated morphology in her read aloud, spelling, writing sentences, and guided reading. At times, she pointed out inflectional and derived words outside her language arts lesson.

Anna also incorporated the morphology lessons in writing meaningful and continuous texts. She provided scaffold to her students in order to lessen the cognitive demands in writing. She pushed her children to be brave in spelling words and encouraged them to use their morphological knowledge in writing in their journals. The children wrote words like *cooking, played, jumping*, and *Thanksgiving.*

As Anna learned new ways of teaching reading and spelling, she discovered how her students develop knowledge of morphology. Zhineng was the highest performing student in Anna's group. She had shown a steep learning curve and continued to absorb morphological knowledge like a sponge. Zhineng was good at finding morphologically complex words when reading, and she would call Anna's attention to point out these words on the text. Zhineng's recent writing sample reflected a good grasp of inflectional morphology: "*My Thanksgiving Break; I bought the brown books. I went to a big mall. I also played in a jumping house, I saw santa there. I say hi to santa* (Classroom Artifact, December 9, 2013)*."* On the other hand, Ricardo continued to struggle in mapping sounds onto the letters of the monosyllabic words. Yet, Anna did not stop him from learning morphological concepts, and Ricardo showed his awareness of word structure through his verbal skills. Even with underdeveloped decoding skills, he could grasp the morphological patterns in the text by pointing out the inflectional endings. This was a learning experience for Anna.

Developing Curricular and Content Knowledge

Diana and Scarlett were relatively new to the profession. During the implementation of the design experiment, Diana had one-year experience as a credentialed special education teacher, while Scarlett had years of experience as an assistant teacher in California and Hawaii. Their curricular and content knowledge were, therefore, limited to what they had learned in their pre-service teacher education. In Scarlett's case, she was concurrently doing her internship at a local state university and undertaking her first professional teaching assignment with an emergency credential. Though they were familiar with the concept of prefixes and suffixes and knew, from their own experience as readers and writers, the value of these ideas in developing literacy skills, neither had taught morphology as an integral part of language arts. To further develop their content and curricular knowledge, Diana and Scarlett looked up to me as an instructional coach and mentor.

Before we implemented the morphology curriculum, I trained Diana and Scarlett on how to administer standardized tests such as the Gray Oral Reading Test (GORT) and the WIAT-III Pseudoword subtest. On the 17th of August 2013, Diana and I met in the morning, around 10 o'clock, at the same café by the community library to discuss the test materials. I explained the protocols and showed how to individually administer the test. We planned to administer the pretest during the first two weeks of the school year. We met again two weeks later in her classroom to score the tests.

> *She grabbed the pile of GORT forms from the rear counter and showed me the test protocols. She was not sure if she was scoring it properly, and thus, she asked for my assistance. I looked at one sample. Her scoring process was accurate. We just needed to convert these raw scores into standard scores. Diana grabbed another paper, and we scored the paper together. She took another one; this time she scored the paper by herself. In the interest of time, I helped her score the other papers.* (Fieldnotes, August 30, 2013)

Scarlett and I taught in the same middle school. We had one overlapping prep period, and oftentimes we utilized this time to work together on our project. Scarlett had not experienced administering any of the standardized or non-standardized tests used in this study. She expressed her desire to observe how I would administer these tests to my students. Her first prep period was after brunch, the fourth period. She came in to my room ahead of my students. We chatted for a while until the children came in; I introduced her to my students. I read chapter three of the novel The *Watsons Go to Birmingham* aloud, as the children followed along with their own copies. Scarlett walked around and sat next to a student. I stopped every once in a while to stimulate classroom discussion about the story. I noticed Scarlett nodded her head, showing approval to the students' ideas. After reading the chapter, I pulled out one student at a time to administer the tests.

> *I gave the students seatwork, while I individually administered the tests. Scarlett joined us in the round table. I modeled to her how to administer the pseudoword decoding and the word identification test. I let Scarlett administer the tests to the third student. She was deliberately careful about marking the record form. I also noticed that her hand quivered as she marked the students' responses on the form. After a few suggestions*

> *to improve her test administration skills, she tried another student. I finished the administration for the rest of my students, while Scarlett sat across, observing*. (Fieldnotes, September 3 2013*)*

Scarlett gave the non-standardized tests to her students the following day, and I administered the standardized tests to her four students on September 5th.

When I visited Diana's classroom in August and September her classroom walls were festooned with commercially made posters and some artwork done by her students. For example, on the left side of her classroom facing the whiteboard, the wall was partially covered with yellow butcher paper bordered with colorful owls. On this bulletin board, I saw some commercially made posters about parts of speech, a checklist for student work, punctuation rules, writing process, and classroom norms. At the back of the room, I saw some student work in science and social studies. The left side of the whiteboard showed academic icons with schedules starting from 9:10 to the end of the day, and the agenda for each block of time. Written on the board were the following:

9^{10} – 9^{35} Word of the day/ phonemic awareness/sentence structure
9^{35} – 10^{15} Houghton Mifflin/ Deborah Reading Program
10^{15} - 10^{35} Step Up to Writing
(Periodicals)
Computer-based
10^{35} - 10^{55} Recess
11^{00} - $12:^{25}$ Social Studies/ Science (Tue & Fri)
1^{15} - 3^{15} Wed
12^{25} - 1^{10} Lunch

When I came back to observe her classroom on October 17, 2013, I noticed that Diana was using this chart more and more for her morphology lessons (see sample chart

on Figure 11). I like the way she added the question "How is the first column different from the second column?" to provide cognitive prompts for students to analyze the morphological structure of the words. The poster revealed Diana's attempt to incorporate morphology lessons with spelling and grammar. This was evident in the three groups of

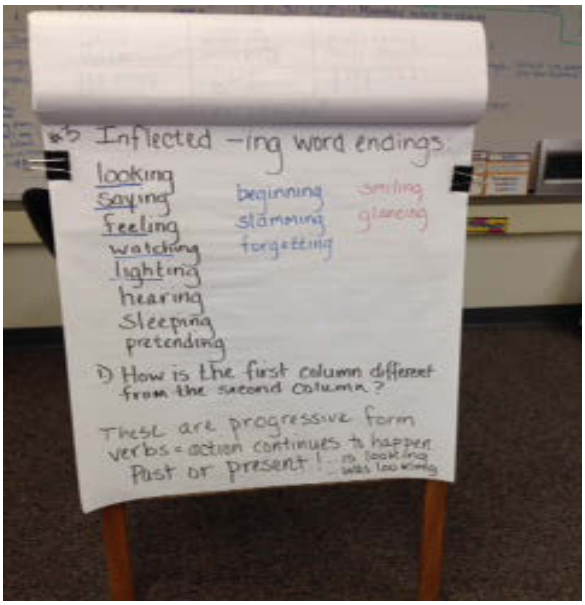


Figure 11. Diana's fidelity of instruction

inflectional words on the chart. The color-coding also worked well as visual signal that each group of words was different. I suggested that these charts should be posted on the wall. She needed help to organize and maximize the use of space on her walls; especially as she accumulated more anchor charts from her morphology lesson. We found a corner

on the left side of her whiteboard to hang them on the wall for students to use as resources. She designated this area as her morphology wall.

I also noticed the preponderance of digital literacy in Diana's class. Diana loved to integrate technology in her language arts lessons. Her interest in technology stemmed from her previous job in a tech company here in the Silicon Valley. Last summer I was supposed to go to Providence, Rhode Island to attend a digital literacy workshop, and I invited Diana. She ended up going, and I did not. She used the on-line educational programs and technological tools she learned there to enrich her students' literacy experience. The preponderance of technology in her lessons was consistent across all my classroom observations. Even when we planned our lessons together, she shared some interesting on-line tools and sites she had discovered along the way. When we had our conference call in November 17, 2013, we spent part of our planning on finding ways to infuse technology and on-line educational programs in her lessons

> ***Diana:*** *OK. That is good. I just checked the answers… OK.. Another thing, just so you know. Remember when we talk about doubling the last letter with –ing. Or maybe we were just adding –ed. I actually needed a video and we came up with images.*
>
> ***Eric****: Oh really. How nice. Can you send me that video?*
>
> ***Diana:*** *The kids absolutely loved it. So I think that might be one way to draw them in. Hold on. Let me go to Animoto. (searching the video on Animoto and sending the link to me). I love the Quizlet and I am so excited about the Quizlet. OK… so.. file.. (still searching for the Animoto). I am curious to see if you need my password for the Animoto.*

> ***Eric:*** *I do have an Animoto account.*
>
> ***Diana****: Let me just send you the link. OK. Happy ending with an –ed. So I'll just email this to you……. I hope it gets there. OK here it comes (sending the link through email). They would do anything for Animoto. It doesn't matter what the subject matter is, but they will work on Animoto.*
>
> ***Eric****: Maybe sometime in December we can make something on Animoto. They can write a poem using morphologically complex words, and then they can create a video of that poem. Would that be too much for them?*
>
> ***Diana****: No. If we do it all together. They can create a poem and make a video of the poem.*

While incorporating digital literacy and technology into her morphology lessons seemed second nature for Diana, classroom management was an area where she needed more help. This topic emerged twice in the conversation after a classroom observation. I followed Diana to playground where she had her yard duty. These fieldnotes capture the gist of our post observation debriefing.

> *As we walked on the hallway, she asked, "How did I do? Did I do right?" I shared with her some classroom management tips, and how she can do a small group activity using the rainbow table. She talked about her new student, Joey, being so distracted and distracting to other kids as well in the middle of her lesson. Diana share with me a bit of personal information about the boy and his two mothers. We also talked about the substitute principal whom she thought was awesome. Then I managed to get back the conversation to our project. She apologized for being delayed in her lesson. She just had to finish doing the CELDT (California English Language Development Test). The end of the recess bell rang, and we walked back to her room* (Fieldnotes, October 17, 2013).

Despite all the challenges of being a brand new teacher, Scarlett managed to integrate morphology into her language arts curriculum. I shared my lessons with

Scarlett, and she tweaked them accordingly to fit the needs of her students. As a brand new teacher, and an intern teacher on top of that, it was not surprising that September and October were rough for her. She juggled her IEP schedules, prepared lessons, attended BTSA meetings, and learned to navigate the content of her language arts curriculum. All these responsibilities created stress. Although, she never confessed her anxiety, I could see from her eyes and body language; I was once a first year teacher, too.

> *I gave Scarlett the poster chart I made. I told her that I could make another poster charts in my second period. Previously, I would just reuse the poster from my first-period class. Now, I created another poster in my second period language arts class and gave it to Scarlett. I wanted to lessen the demanding load for a first year teacher, let alone being an intern. I know she had been overwhelmed with the IEPs and parent meetings lately. She was out yesterday due to illness and now felt better. We talked about increasing the dosage for morphology lesson in her class. In her comment, she just realized the importance of morphological knowledge as foundational skills for her students. Just this morning, she incorporated morphology in her lesson on "The Legend of Sleepy Hollow."* (Fieldnotes, November 5, 2013*)*

Scarlett's eighth grade students highlighted the words that end with suffix –ly and inflection –ed on the text. "The kids are getting analytical with how they spell words and how they spot the correct spelling. I asked the kids to write these words on the whiteboard and some students spotted the error, and they corrected each other and pointed out the rules on the board."

When I visited Scarlett's classroom on December 1, 2013, I noticed that she had been using poster charts to document her morphology lessons. We had a conversation on

the importance of having a print-rich environment even for middle school students. By posting these charts on the wall, we were exposing our students to morphologically complex words, providing them visual cues and anchors for learning. Similar to Diana, Scarlett designated a morphology area to the rear wall of her classroom (see Figure 12).

In our last planning session in December, Scarlett and I talked about text complexity and rigor in designing morphology intervention. We set up the cloud-based file-sharing tool on her computer and browsed through some of the short stories I had shared with her. We looked at the stories of Chekov, Nabokov, O. Henry, and Poe. I

Figure 12. Scarlett's fidelity of instruction

explained to her the value of close reading and the importance of exposing her 8th grade students to challenging texts. The purpose of using these texts was not for them to fully grasp the details of the story, but to contextualize the lessons in morphology. Then, we went over the previous lesson:

> *I asked her which activities had she implemented in her class. She gave them the spelling test and used the Francis Bacon essay, Of Study. She described the experience as "the hit ice in bowl." I did not understand her metaphor, and so I further inquired. It was very challenging for her class yet students were interested. She read the essay aloud and highlighted the topic sentence, and asked them why it is important. She did follow the lesson step by step. She concluded, "But the reading was tough. It was like swimming through murky water. It was challenging because it was unfamiliar. They don't have roots to lay on this."*
> (Fieldnotes, December 1, 2013)

Part of designing this curriculum intervention for special education students was our intention to adhere to the Common Core State Standards' principle of text complexity. Scarlett and I entered into this discussion with the same question that Williamson, Fitzgerald, and Stenner (2013) raised: "how much complexity is 'enough' for different grades if students are to attain the college and career readiness" (p. 59). While we did not have the immediate answer when we talked about context in morphology lessons, we both knew that many morphologically complex words are imbedded in every literary piece. In the end, using complex texts facilitated the increased instructional equity by allowing special education students greater access to general education curriculum.

Reflections

This narrative tale presented the evolutionary process of creating a morphology curriculum by using the design-based research tradition. By interrogating my own teaching practice and reflecting on the status quo of my literacy instruction, I had created a knowledge base from a deliberate and systematic collection of classroom data. To scale up the rigor and validity of my curriculum, I recruited teachers from my school district and collaborated with them to improve the instructional design. The transfer of classroom knowledge to other special education teachers led to the improvement of our teaching practice and enrichment of our understanding of literacy development and instruction. My teacher-research became the staging ground for collaborative process in designing intervention for struggling readers and writers.

Designing instructional intervention for students in special education yielded three important sources of knowledge that helped us improve our practice and supported learning in the classroom. The three participating teachers, Anna, Diana and Scarlett, had deepened their understanding of morphological processing in literacy development through our collaborative research. Their teaching of morphology had enriched their content knowledge of reading and writing. The didactic nature of Phase Three as evidenced by my coaching of the two new teachers had increased Diana and Scarlett's curricular knowledge in language arts. Using technology, understanding the role of digital literacy, and situating morphology lessons through literature and meaningful texts

all added to the teachers' entire repertoire of curricular knowledge. Finally, classroom context and students' learning profile were vital to the development of instructional design in morphology intervention, and each teacher modified and added to the curriculum to respond to her students. We had advanced our pedagogical knowledge through learning from our students while teaching morphology.

The collaborative nature of my research led to the replication of knowledge and instructional practices in different classroom contexts and conditions. Anna taught at the primary level, Diana taught the intermediate grades, and Scarlett taught middle school. In my case, I applied the knowledge and skills I had gained from teaching morphology in the elementary grades to my middle school students. What I hoped in the beginning of this study was to establish a cohesive group of professional learners. Instead, the collaboration materialized as a didactic method where I facilitated the process of teaching morphology. Furthermore, the nature and structure of our jobs prevented us from full collaboration. We all taught from different schools within the district, and each school has different dismissal times. The demands of our job and the personal life that we need to live prevented us from finding the right time to meet and collaborate. Lastly, while we shared common issues in teaching and classroom learning, the group had diverse classroom contexts, delimiting the relevance of fully collaborative planning.

In this chapter I have introduced the three sources of knowledge through a narrative format. The chapter provides evidence that teacher-research supports teachers in

creating and applying an instructional design process in special education. In the next chapter, I will present the details of morphological intervention by describing the components of literacy instruction, principles of teaching morphology, and protocols for morphological instructions. I will also present the quantitative data supporting students' development of morphological knowledge and literacy skills.

Chapter Five
Morphology Intervention and Design Experiment

"An understanding of fundamental principles and ideas
appears to be the main road to adequate transfer of learning."
(Bruner, 1977, p.25)

The general goal of this chapter is to present the convergence of qualitative and quantitative data drawn from a design experiment. I start with the components of the morphology intervention and then the data resulting from the pre- and posttest measures. As mentioned in the previous chapter, the qualitative analysis of this dissertation resulted in three themes. The first two have already been described and interpreted in Chapter Four. The third theme - teachers' understanding and implementation of the literacy components surrounding the design intervention on morphology (curricular knowledge) - captured the general aspect of curriculum design through the iterative process of design-based research. Within this theme emerged the following four constructs relevant to morphological intervention: 1) components of morphological intervention; 2) assessment; 3) principles of teaching morphology; and 4) protocols for teaching morphology. The first two constructs are addressed in this chapter, and the last two are found in Appendices E and G, which provide guidelines and framework for developing morphology lessons.

In the succeeding sections, I first describe the components of morphological

intervention. Then, a qualitative data analysis of teacher's fidelity of intervention is reported based on classroom observation, bi-monthly meeting with the teachers, and monthly on-line surveys. Evidence of teacher fidelity has been visually presented in the previous chapter through teachers' use of poster charts. Next, the development and post-hoc validation of the two measures created for this study are reported. Then, a statistical analysis of pre- and posttest results follows. Finally, the chapter concludes with a summary and a brief transition to the next chapter.

Components of Morphological Intervention

The development of morphological intervention in this study was grounded on three iterative processes of design-based research. Briefly, I describe the first two iterations of the curriculum. Then the final iteration, which formed the basis for this design experiment, is described in detail. Based on the findings of my own classroom research (first iteration), I designed a prototype curriculum on morphological instruction for intermediate grade students (third to fifth graders) in special education. This curriculum involved explicit and direct instruction of morphemes using poetry, short stories, and novels as the primary context for language arts instruction. Corollary to the curriculum development during this phase was the conception of principles of and protocols for teaching morphology (Claravall, 2013). These principles and protocols guided the other teachers and prompted them to provide further refinements - the second iteration - of the curriculum during Phase Two, the exploratory stage of the study. Before

I expanded the curriculum to primary level (second graders) and middle school (7th and 8th graders), I created a unit map on morphology using the Common Core State Standards for Foundational Skills (Appendix D). The teachers I worked with in Phase Two adapted and revised the lessons according to their students' level of readiness to learn morphology. Two teachers at the primary level explored the teaching of morphology using compound words and inflections. Two teachers at the intermediate elementary level adapted my lessons on prefixes and suffixes for four weeks in their classroom. Two middle school teachers implemented a four-week series of lessons on morphology using inflectional and derivational morphology in middle school. Incorporating the teachers' recommendations for further iteration of the curriculum resulted in a preliminary curriculum structure involving seven unit lessons. The third and final iteration of the curriculum happened during phase three of the study. For 15 weeks, from September 16, 2013 to January 10, 2014, Anna taught 9 unit lessons, Diana taught 10 unit lessons, Scarlett and I taught 15 unit lessons. See Appendix E for samples of unit lessons.

The morphological instruction in special education language arts has four literacy components (see Table 11). Morphemic analysis involves the use of decomposition and construction, the two processes introduced in Chapter Two. To recap, decomposition is a process of breaking down words into smaller and meaningful morphemes, while construction is a process of synthesizing existing knowledge of sublexical structures to produce morphologically complex words. Using these two analytic processes provide the

Table 11.
Components of Morphological Intervention

Literacy Components	***Descriptions and Characteristics of each Component***		
Morphemic Analysis	Levels of Analysis		Compounding
			Inflectional
			Derivational
Vocabulary	Tier-Two		Tier-Three
	Words across content area reading		Words highly specific to content area reading
Contextual Reading Application	Text Complexity	Fiction Texts	Non-Fiction Texts
Written Expression	Levels of Writing		Word level (spelling)
			Sentence level (contextual)
			Paragraph (compositional)

foundational skills in learning to identify, spell, and understand morphologically complex words. Using morphemic analysis, the teachers in this study guided their students to apply morphological knowledge at three different levels. The basic level was compounding, where students used their knowledge of the base words. The inflectional level involved the use of inflectional endings such as –ing, -ed, -es or –s. The derivational level was the most complicated level of morphemic analysis. It entailed the use of prefixes, suffixes, and Latin or Greek roots to construct or decompose morphologically complex words. Teaching compounding and inflectional analysis began in the primary grades and continued through intermediate and middle grades. Analysis of derivational morphemes, however, was reserved for intermediate and middle school,

although the simple use of phonetically transparent affixes such as un-, re, -ful, -ment, and –less was taught in 2nd grade to help students decode common, but complex words with these affixes.

Morphemic analysis was also implicated in vocabulary study. Although vocabulary was not part of the learning outcome measured in this study, we linked our spelling instruction to teaching vocabulary. The spelling/meaning connection (Dale, O'Rourke, & Bamman, 1971; Templeton, 1983) is an important piece of morphological knowledge when teaching prefixes, suffixes, derivations, and Greek/Latin roots. The teachers found many derived words containing affixes and Greek or Latin roots used in science, mathematics, social studies, and literature.

Overall, we found that many of our students lacked the strategy to analyze the meaningful parts of a complex word. Using the tiered approach to develop word knowledge (Beck & McKeon, 1985), we also situated morphological instruction within *tier-two* and *tier-three vocabulary*. Accordingly to Beck and McKeon, *tier-one vocabulary* corresponds to the most basic words, mostly concrete words such as *paper, mother, drink*, and so on – that do not require further vocabulary instruction in school (McKeon & Beck, 2004). *Tier-two* consists of words that have high utility across content area reading. Words like *plantation, destruction,* and *evolution* were examples of high frequency words we found in our students' science, social studies, and literature texts. *Tier-three vocabulary* contains words that are highly specific to content area reading. For

example, words like *condensation, constitution*, and *parabolic* were highly specific to science, social studies, and mathematics, respectively. Owing to the complexity of word problem solving as a strategy to define tier-two and tier-three words, most vocabulary lessons happened at the intermediate and middle school levels.

Contextual application of morphology was necessary for students to generalize morphological knowledge in reading complex fiction and non-fiction texts. The overall argument of this dissertation is that one of the major issues related to instructional inequity in special education is an over-reliance on phonological decoding as the dominant intervention for struggling readers. English language is morphophonemic. The use of morphological intervention in conjunction with the use of phonics and phonemic awareness could open a whole new world of reading experience to students with special needs. As we enter the Common Core era, we are being pushed to provide students with rigorous reading materials and text complexity. Students with deeper knowledge of morphology may access more complex texts. Thus, using morphology instruction in our language arts curriculum sets high expectations in students' learning and provides the joy of reading authentic materials loaded with morphologically complex words.

Written expression was the fourth component of our morphological intervention. The basic level of written expression involved understanding the rules of spelling morphologically complex words. Specifically, the students in primary and intermediate levels were drilled with rules governing the omission or substitution of letters when

spelling inflectional words (e.g., doubling the last consonant when adding –ed or –ing to a base word that contains a short vowel sound). Our students learned that some derivational morphemes, when added to a base word, changed the overall structure of words. For example, when the suffix –ion was added to the base word *communicate*, the students learned to drop the "e" to spell the word *communication.*

We methodically taught how morphologically complex words interacted on a sentence level. Our goal was to contextualize word spelling in sentence writing. At the primary level, Anna played an active role in supplying sentences through cloze writing (Taylor, 1953). Her students filled in sentence frames using newly learned morphologically complex words. Students at the intermediate level were expected to use these morphologically complex words in a self-generated sentence. For example, students were encouraged, but not expected, to use multisyllabic words with affixes when writing a paragraph. At the middle school level, students were expected to use morphologically complex words when composing narratives or expository texts. Therefore, the students' uses of morphological knowledge in written expression reflected our overall commitment to a high level of expectation in special education. High expectation within a supportive classroom climate is, at its heart, an instructional equity stance.

Fidelity of Intervention

As visually presented in the previous chapter, the poster charts that Scarlett, Diana, and Anna created during their morphology lessons reflected some level of teacher

fidelity to the intervention. Three other converging sources of fidelity measures are discussed in this chapter. First, during the bi-monthly meeting, we discussed what worked and did not work in the lessons. For example,

> *Anna pulled out a printed copy of the lesson plan. Then she showed me a copy of a poem different from the one I recommended in the lesson plan. The recommended poem was too difficult for her students. She looked on-line and found a poem that has compound words. I asked her how often she teaches morphology during the week – everyday. She thought that her students were able to grasp the idea of base word, even her lowest performing student was able to identify a multisyllabic or compound word in the text after reading the poem aloud*. (Fieldnotes, September 18, 2013)

While Anna and Diana showed consistency in teaching of morphology, Scarlett taught morphology in desultory fashion during the first few weeks of implementation, due to IEP preparation. After I shared my concern about the limited "dosage" of the morphology lessons in her language arts, Scarlett responded positively. In October, she was in full swing teaching inflectional morphology in her 8th grade class.

During my classroom visits, the teachers implemented the critical components of morphological intervention. I observed each teacher for about 6 hours in the 15 weeks of implementing the program. In October 2013, Diana and Anna devoted their morphology lessons on inflectional morphology. In one of my observations of Diana's class, she was introducing the inflectional ending –ing.

> *"Do you guys remember what a base word is?" Diana asked the kids. She pointed on the chart to the word "looking," and Johnny asked, "What is a base word?" Jonathan responded, "Look." Diana underlined the word look. Kathy read the next word and identified the correct base word. Then*

> *Diana explained the inflected words in the context of grammar lesson. "I am looking. I was looking." The kids followed Diana in unison, reading the list of words. "I was looking. I was saying. I was feeling, I was hearing, I was sleeping, I was pretending, I was beginning. I was forgetting," the kids recited*. (Fieldnotes, October 17, 2013)

For the last fidelity measure, I created an online questionnaire using a free web-based survey tool. At the end of each month, for three months, I sent an email to each teacher with the link to the survey questionnaire. The teachers answered the same set of questions every month beginning in October and until December 2013 (see Appendix F). On average, all three teachers reported incorporating morphology instruction in their language arts lessons three to four times a week. In a single session, Diana and Scarlett would teach morphology for about 30 to 45 minutes, while Anna taught her morphology lessons that last between 15 and 30 minutes. In terms of the amount of time they needed to prepare morphology lessons, Diana and Scarlett spent an average of 30 to 45 minutes a week, while Anna spent an average of 15 – 30 minutes a week. Aside from the materials and lesson plans I shared with them, all three teachers used online resources to find information or spark ideas when they needed to modify the lesson. Interpreting the four sources of fidelity measures, I can say that Anna, Diana, and Scarlett stayed faithfully with the implementation of the design intervention throughout the third phase of this study. Only on a few occasions did these teachers fail to teach morphology, due the other demands of being a special education teacher.

Estimating the Reliability of the Test Measures

As discussed in Chapter Three, two teacher-made tests were constructed to measure spelling and word decoding. The students needed to apply their knowledge of morphology to achieve success in each item. The Pseudoword Spelling Test has 40 items. The Word Identification Test, on the other hand, has two different levels: the Primary Word ID (20 items) and the Advanced Word ID (40 items), and each has two forms. Using convenience sampling, students from mainstream classes in grades two, three, five, and six were recruited to validate the measures, and their teachers administered the tests twice, one week apart. Six veteran teachers – years of teaching ranging from five to 15 years - participated in this test validation. All the teachers were briefed on how to administer the test. The data gathered from the administration of these tests were used to estimate the reliability of the two measures. What follows reports the data for reliability estimate.

Table 12 presents the descriptive statistics from the reliability measurement for Pseudoword Spelling Test (PWS), Primary Word ID (PWID), and Advance Word ID (AWID). Overall, the mean scores across grade level on both tests show an increasing trend. This is consistent with the developmental shifts in morphological awareness that previous studies demonstrate (Bryant, Nunes, & Bindman, 2000; Carlisle, 2000, 2010; Mahony, Singson, & Mann, 2000).

Table 12.
Descriptive Statistics for Testing the Reliability of the Test Measures

Grade Level	PWS ($Test_1$)			PWS ($Test_2$)		
	N	Mean	SD	N	Mean	SD
2nd Grade	37	5.84	2.65	37	6.81	3.13
3rd Grade	19	7.63	2.87	19	9.05	2.34
5th Grade	49	8.73	3.22	49	9.43	3.39
6th Grade	55	11.24	2.86	55	11.83	2.62
All levels	160	9.39	5.99	160	10.18	5.87

	PWID (Form A)			PWID (Form B)		
Grade Level	N	Mean	SD	N	Mean	SD
2nd Grade	39	18.67	2.02	39	18.59	1.42
	AWID (Form A)			AWID (Form B)		
3rd Grade	22	29.41	6.00	22	28.41	6.97
5th Grade	54	33.74	4.62	54	32.5	4.95
6th Grade	35	37.43	2.82	35	36.77	3.11
Combined 3rd, 5th, 6th	111	34.05	5.25	111	33.04	5.73

Pseudoword Spelling Test. I combined all the grade levels together to estimate the reliability of this test. As hypothesized, there was a significant correlation between test and retest, $r(159) = 0.84$, $p < 0.0001$, indicating an 84% consistency of students responding to the Pseudoword Spelling Test at different times. Calculating the coefficient of determination produced an $r^2 = .73$, which reveals how the observed scores fit with the

statistical model shown on Figure 13. Table 13 shows the corresponding analysis of variance for the Pseudoword Spelling Test regression model.

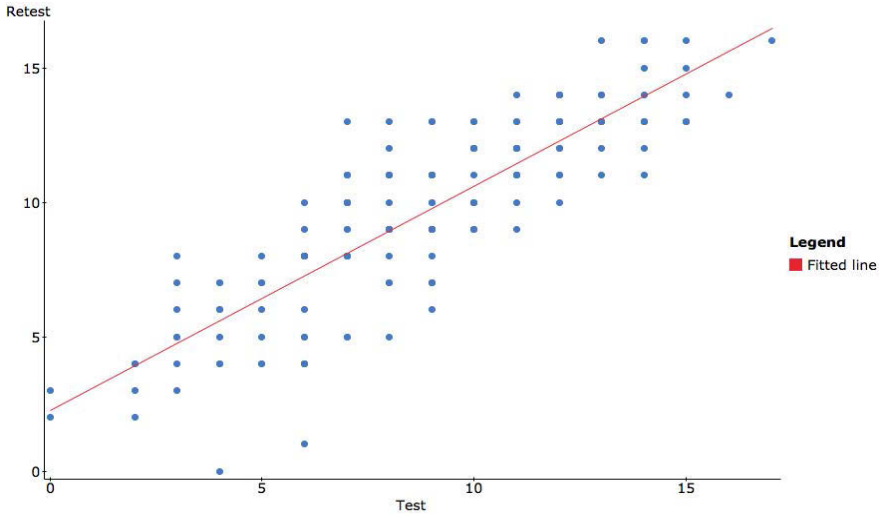


Figure 13. Linear Regression Model for Pseudoword Spelling

Table 13.
ANOVA for Regression Model

Analysis of variance table for regression model:

Source	DF	SS	MS	F-stat	P-value
Model	1	1413.5125	1413.5125	420.84581	<0.0001
Error	158	530.68124	3.358742		
Total	159	1944.1938			

Word Identification Test. Similarly, I used linear regression to test for the reliability of this measure. The alternate form method (i.e., Test Form A and Test Form B) for estimating reliability yielded a significant correlation, r (38) = 0.39, p<. 0001 for the Primary Word Identification, and r (110) = 0.88, p<.0001 for the Advanced Word Identification. Initially, the Primary Word Identification assessment produced a moderate correlational strength. Further analysis of the data revealed a weak $r^2 = 0.15$. This prompted me to reconsider the use of this measure for my later analysis of second grade students' performance in Anna's class. Figure 14 shows the dispersion of scores around the fitted line for Primary Word ID and Advance Word ID Test. Table 14 shows the corresponding analysis of variance for the Intermediate Word ID regression model.

Overall, the Pseudoword Spelling was found to be a reliable measure of spelling test due to a high correlation coefficient of r=0.84. On the other hand, between the two measures of word reading, the Advance Word Identification (r=0.88) was more reliable than the Primary Word Identification (r=0.39).

Estimating the Validity of the Test Measures

A separate procedure was done to estimate the validity of the test measures. Validity of the tests was conceptualized as "the relationship between test scores and criterion measurements made at the time the test was given" (Crocker & Algina, 1986, p. 224). A post hoc analysis was done using the data gathered from our special education

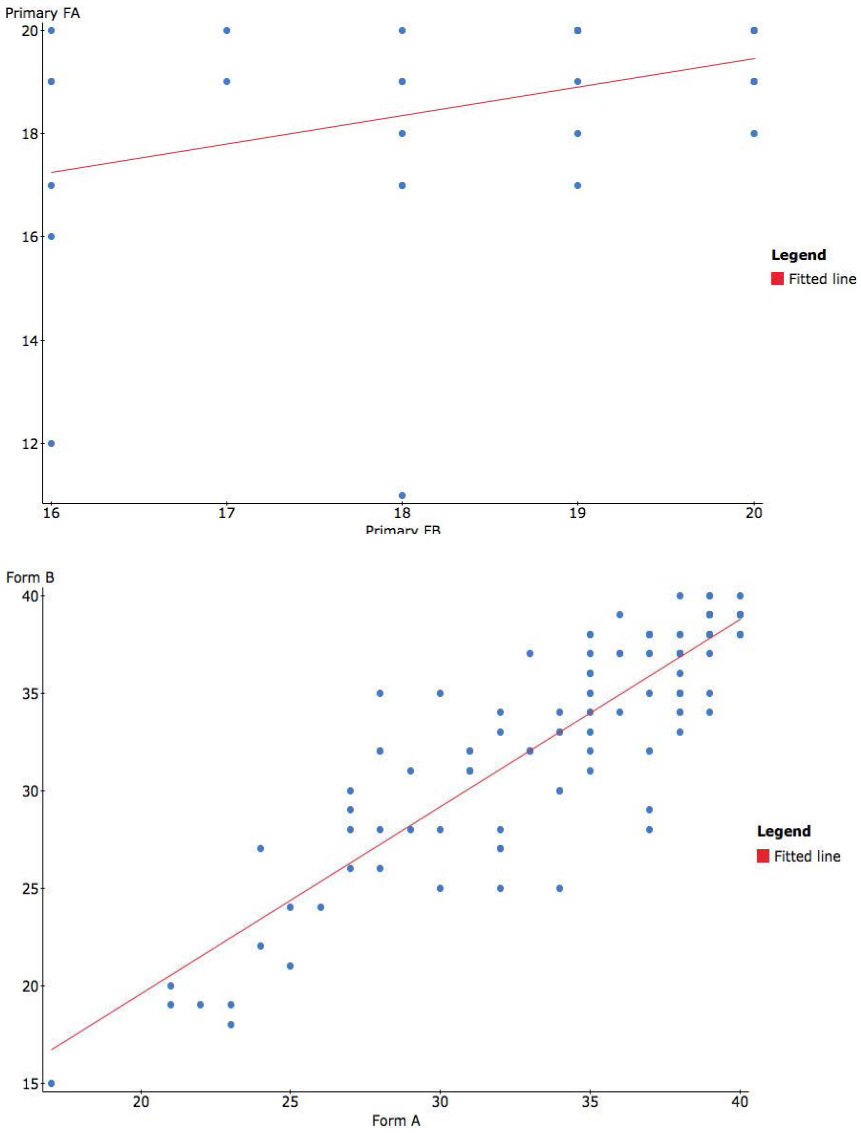


Figure 14. Linear Regression Model for Primary (top) and Advanced (bottom) Word ID Test

Table 14.
ANOVA for Regression Model for Advanced Word ID Test

Analysis of variance table for regression model:

Source	DF	SS	MS	F-stat	P-value
Model	1	2795.7657	2795.7657	368.00157	<0.0001
Error	109	828.09013	7.5971572		
Total	110	3623.8559			

students' pre- and posttest performance. Tables 15 and 16 show the descriptive statistics. I used the pretest data for validating the Pseudoword Spelling Test and Advanced Word ID Form A. Posttest data were used for validating Advanced Word ID Form B. The WIAT-3 Pseudoword Decoding subtest was used as the criterion measure for the three test measures mentioned earlier. The sample size for PWS and WIAT Pseudoword decoding in middle school is bigger than the sample for PWID due to the inclusion of the data that Maria and Beth – teachers who dropped out of the study -- gathered during the early part of the third phase. The discrepancy between the sample size in Comp-A and Comp B within the intermediate level is due to an absent student.

Pseudoword Spelling. Studies have shown that spelling and decoding involve similar cognitive and orthographic processing (Ehri, 1992; Moats, 2000). For this reason, the validity of pseudoword spelling measure was tested using the WIAT-3 Pseudoword Decoding as a criterion measure. When Pseudoword Spelling Test is correlated with the

Table 15.

Descriptive Statistics for Validating Test and Criterion Measures

Grade Level	PWS (Pretest Data)			WIAT Pseudoword Decoding (Pretest Data)		
	N	Mean	SD	N	Mean	SD
Primary Grades	4	2.25	2.06	4	13.75	10.31
Upper Grades	8	1.25	1.28	8	14.13	9.14
Middle School	61	7.95	4.06	61	32.46	12.01
All levels	73	6.91	4.44	73	29.44	13.43

	PWID-A (Pretest Data)			PWID-B (Posttest Data)			IWID-A (Pretest Data)			IWID-B (Posttest Data)		
Grade Level	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Primary	4	8.75	6.75	4	12.25	8.52						
Intermediate							8	20	7.91	8	18.56	6.72
Middle School							21	26.17	9.89	21	30.38	7.22

Table 16.
Descriptive Statistics for Gray Reading Comprehension

	Comp-A (Pretest Data)			Comp-B (Posttest Data)		
Grade Level	N	Mean	SD	N	Mean	SD
Primary	4	4	5.41	4	7.75	7.5
Intermediate	9	15.8	7.16	8	19.13	5.96
Middle School	21	22.86	8.94	21	24.06	9.2

WIAT-3 Pseudoword Decoding Test, simple linear regression analysis yielded a significant correlation coefficient, $r(72)= 0.71$, $p<0.0001$. Figure 15 shows the dispersion of scores around the fitted line.

Advance Word Identification Test. Since the Primary Word Identification Test has a weak reliability index, and given that n=4, validation procedure for this measure was suspended. The validity measures for Advance Word ID Form A and Advance Word ID Form B were tested using the pretest and posttest data, respectively. Advance Word ID Form A was significantly correlated with WIAT-3 Pseudoword Decoding Test, $r(27) = 0.84$, $p<0.0001$, and Gray Reading Comprehension Form A, $r(27) = 0.61$, $p<0.0005$. Advance Word ID Form B was significantly correlated with WIAT-3 Pseudoword

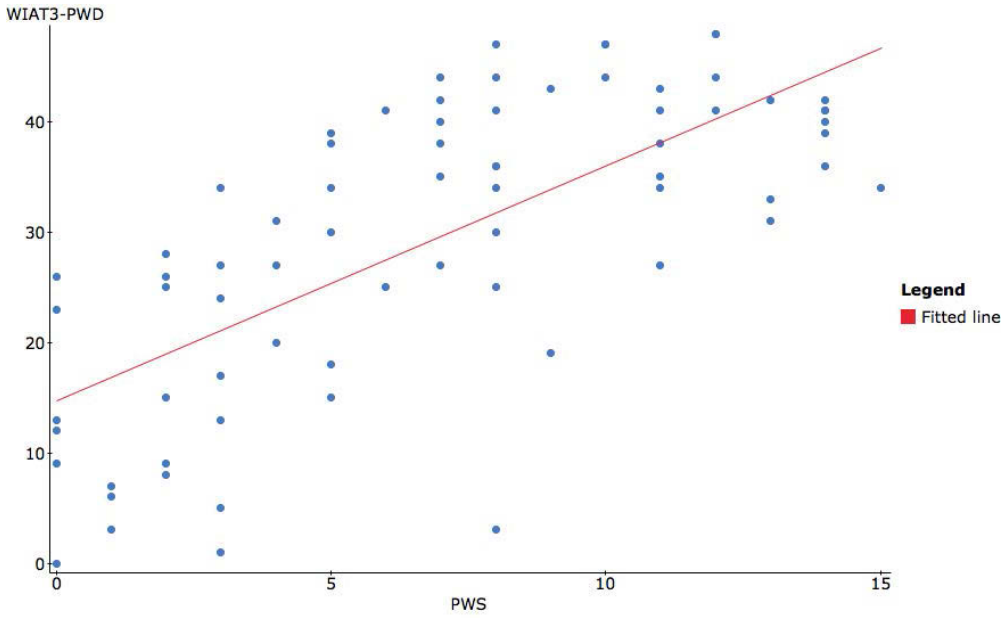


Figure 15. Pseudoword Spelling Regression Model

Decoding Test, $r(27) = 0.90$, $p<0.0001$. On the other hand, Advance Word ID Form B and Gray Reading Comprehension Form B were not significantly correlated, $r(27) = 0.30$, $p = 0.123$. Figure 16 shows the linear regression models. In this procedure, both forms of the Advance Word Identification Test were highly related to the WIAT-3 Pseudoword Decoding Test. However, the relationship between the Advance Word Identification Test and Gray Reading Comprehension is inconsistent. Form A has a moderate relationship with Gray Reading Comprehension Form A; while Form B has no relationship with Gray Reading Comprehension Form B. Based on the validity estimates of the test measures,

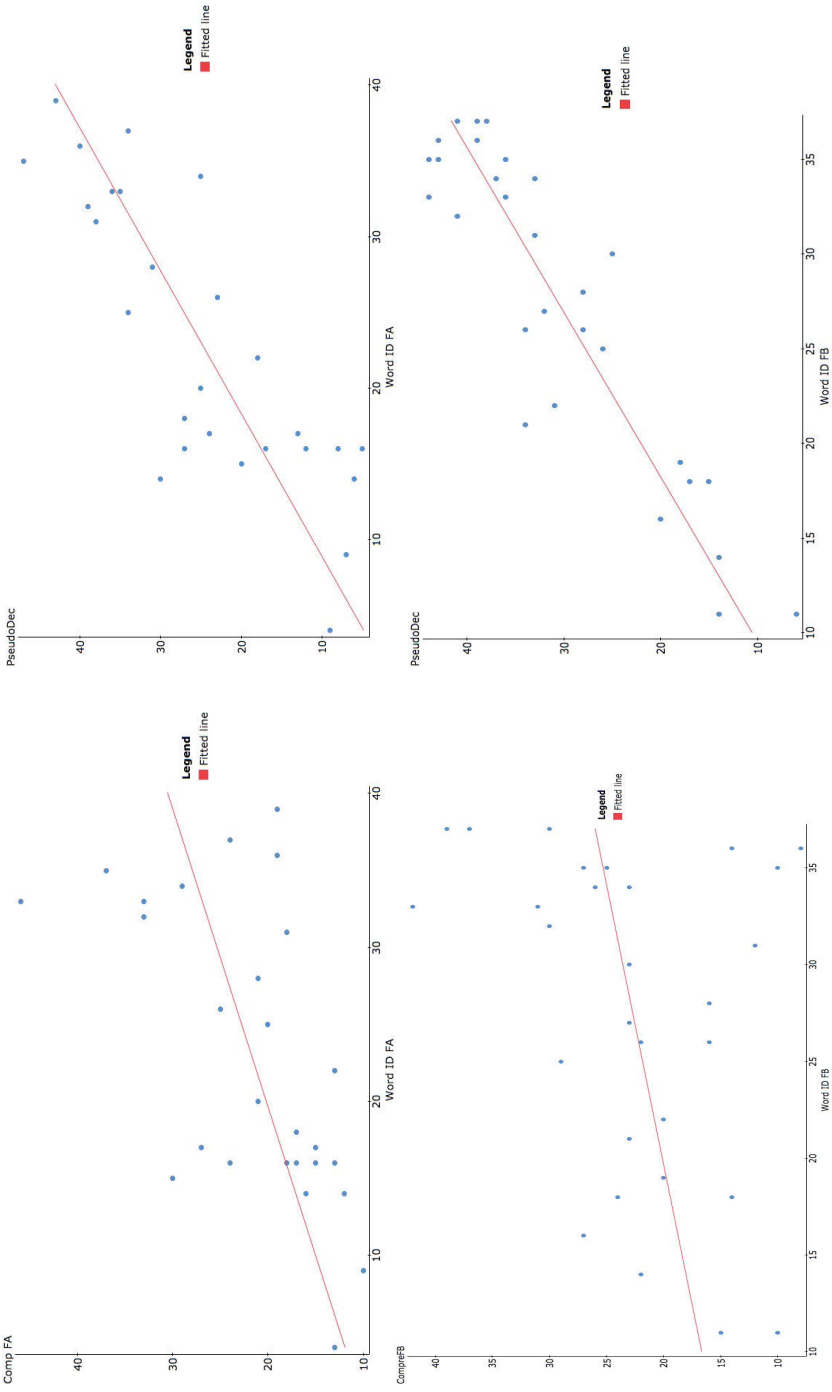


Figure 16. Best fitted lines for Advanced Word ID Form A (above) and Form B (below)

the Pseudoword Spelling is a valid measure of spelling skills. Similarly, because of a significant correlation with a standardized criterion measure (WIAT-3 Pseudoword Decoding), the Advance Word ID is a valid measure of word decoding.

Students' Literacy Development

I have examined how morphology instruction affected students' literacy development using four literacy measures: pseudoword spelling, word identification, pseudoword decoding, and reading comprehension. First, I report on the results of the t-test for paired observations (i.e., pretest and posttest data) using the four literacy measures and a counterfactual measure. Since t-test only indicates a significant difference between pre- and posttest scores, it is important to include the effectiveness of morphological intervention. I report the effect size using Cohen's d to evaluate the magnitude of students' academic progress. Lastly, to determine the clinical and statistical usefulness of individual student's difference score, I present the standard error of measurement (SEM) for the WIAT-3 Pseudoword Decoding Test and intra-test discrepancy analysis used in TOLD-I4 (Hammill & Newcomer, 2007) and the Gray Reading Tests (Wiederholt & Blalock, 2001; Wiederholt & Bryant, 2001).

Based on the mounting evidence that morphological knowledge contributes to students' literacy development (Bowers, Kirby, & Deacon, 2010; Carlisle, 2010; Reed, 2008), particularly to struggling readers (Goodwin & Ahn, 2010), I hypothesized that our students' word reading and spelling skills would improve after implementing the design

intervention on morphology. I also predicted that, given the improvement in word identification and the role of morphological knowledge on vocabulary development (Baumann, Edwards, Boland, et al., 2003), our students' reading comprehension would improve as well. The results of this study confirmed the first hypothesis on word identification and spelling. Students' pseudoword spelling, word identification, and pseudoword decoding have improved after four months of morphology intervention. On the other hand, the data did not provide support to the second hypothesis. Baumann et al. (2003) found similar insignificant result when morphemic analysis was implicated to reading comprehension.

Pre- and posttest data were compared to evaluate the observed change in students' literacy skills, which include pseudoword spelling, word identification, pseudoword decoding, and reading comprehension. Students' raw scores were used for statistical analysis. Table 17 shows the descriptive statistics for each grade level. Results suggested a significant level of difference between pre- and posttest when literacy skills were measured on a lexical level such as pseudoword spelling, word identification, and pseudoword decoding, and not on a continuous contextual level like reading comprehension. Table 18 presents the summary of the four analyses.

Incomplete student data for pseudoword spelling and pseudoword decoding were not included in the analysis. Recall that the Primary Word Identification Test did not achieve a significant level of reliability coefficient and there was a difference in the

number of items between the Primary and the Advanced Word Identification. For this reason Anna's four second-grade students were not included in the analysis for word identification t-test. However, qualitative analysis of her students' word reading behavior revealed some remarkable changes after four months of implementing the design

Table 17.
Descriptive Statistics for Each Grade Level

Tests	Word Identification			Pseudoword Spelling			WIAT-3 Pseudoword Decoding			Gray Reading Tests		
Grade Levels*	PG	IG	MS	PG	IG	MS	PG	IG	MS	PG	IG	MS
N	4	8	19	4	9	20	4	8	21	4	9	21
Mean**	8.75	16.75	25.84	2.25	1.11	6.76	13.75	14.13	29.67	4	16.56	23.24
	12.25	**20**	**29.63**	**4**	**2.33**	**9.71**	**20.75**	**18.25**	**33.95**	**7.75**	**17.56**	**24.05**
SD**	6.75	7.91	9.20	2.06	1.27	3.17	10.31	9.14	11.82	5.42	7.16	8.89
	8.42	**6.14**	**7.55**	**3.16**	**3.39**	**3.24**	**14.53**	**10.65**	**8.90**	**7.5**	**7.30**	**9.20**

* PG (primary grades), IG (intermediate grades), MS (middle school)
**Bold numbers represent posttest scores

Table 18.
Summary of Pairwise T-test Analysis

Literacy Skills	Sample Diff.	Std. Err.	DF	T-Stat	P-value
Pseudoword Spelling	2.4242	0.4827	32	5.0221	<0.0001*
Word Identification	3.6296	0.9931	26	3.6550	0.0011*
Pseudoword Decoding	4.5758	0.9644	32	4.7449	0.0003*
Reading Comprehension	1.2059	1.6701	33	0.7220	0.4754

* Achieved the level of significance at 0.05 p value

intervention. For example, Zhineng, as second language learner with speech and language impairment, read more words in the posttest (19 out of 20) compared to her pretest word reading (13 out of 20). Similar results were observed with Raj, another second language learner with speech and language impairment. He initially read 7 words, and this was doubled when I administered the posttest. Sebastian, the lowest performing student in the class, did not show any improvement. However, during the posttest administration, he tried sounding out the words, when four months ago his strategy was saying the letters found in each word. His sounding out of words could be the result of his developing phonological awareness.

To evaluate students' progress in three word-level literacy skills, the effect size was calculated using Cohen's d (Katz & Carlisle, 2009; Vadasy, Sanders, & Peyton, 2006). The effect size is the change in the mean score from pretest to posttest divided by the pooled standard deviation. Using Cohen's descriptive ranking of effect sizes - small effect (0.2 to 0.3), medium effect (around 0.5), and large effect (0.8 to infinity), the three literacy skills demonstrated moderate gains in terms of effect size. Table 19 depicts the summary of the three effect sizes. The Cohen's d for Word Identification is 0.4020, Pseudoword Spelling is 0.6035 and Pseudoword Decoding is 0.3615. These indicate that students in our special education classes moderately benefitted from the four-month morphology instruction that targeted word reading and spelling skills.

Table 19.
Effect Sizes for Three Literacy Skills

	N	Mean		Standard Deviation		Cohen's d
Literacy Skills		Pre	Post	Pre	Post	
Word Identification	26	23.15	26.78	9.66	8.35	0.4020
Pseudoword Spelling	33	4.27	6.70	3.49	4.50	0.6035
Pseudoword Decoding	33	23.97	28.55	13.19	12.13	0.3615

Because of the absence of a control group in this study, it would be hard to justify that the significant differences between the pretest and posttest measures are due to the teaching of morphology in language arts alone. A myriad of threats to internal validity of results could confound the overall findings of this study (Campbell & Stanley, 1963). However, the design of this study focuses on the ecological validity and the iteration of the design intervention to adequately address the messiness and unpredictability of special education classroom. However, to establish that general maturation factor did not interfere with the estimate changes in students' literacy skills due to morphology intervention (Apel, Brimo, Diehm, Apel, 2013), I administered a counterfactual measure to students in Diana and my class. Scarlett's five students were excluded in this analysis due to the limited time administering the counterfactual measures to her class. Data gathered from Anna's class were not included due to the low number of n=4, which was deemed limited for statistical analysis.

The Sentence Combining subtest of the TOLD:I4 was administered to upper grade and middle school students. These counterfactual measures could determine whether maturation and other effects that are not directly relevant to morphology could result to change or develop specific skills. In this case, the counterfactual measures target short-term auditory verbal memory recall, syntactic awareness, and conceptual development. Non-significant results in a counterfactual measure could provide evidence that the improvement in literacy skills after the implementation of the morphology intervention was not due to maturation.

Using the data gathered from the administration of the Sentence Combining Test and the WIAT-3 Sentence Repetition Test, the mean differences between pre- and posttests were analyzed. Table 20 provides the descriptive statistics for these measures. The pairwise comparison t-test revealed a non-significant effect, $t(1,23) = 1.6291$, $p>.05$ (p- value = 0.1169). The assumption underlying the use of counterfactual measure is that without any intervention, the skills measured by Sentence Combining Test would improve across time due to maturational effect. In the current analysis, there is no significant difference between the pre- and posttest measures. This suggests a counterfactual assumption that the significant effects in students' word reading and spelling skills are due to morphology instruction. This interpretation, however, should be taken with cautious optimism. A randomized experiment with control groups is still the best way to determine the causality of morphology intervention.

Table 20.
Descriptive Statistics for Counterfactual Measure

		Counter Factual Measure	
Grade Level	N	Mean*	Standard Deviation*
Intermediate	9	4.56	2.11
Grades		**4.44**	**2.81**
Middle School	15	5.8	1.74
		6.67	**2.06**
Total Students	24	5.33	1.78
		5.92	**2.45**

* Bold numbers represent posttest scores

Another way of evaluating academic progress in the current study is through the analysis of standard error of measurement (SEM). This procedure provides the "estimate of the amount of error that is inherent in a score" (Katz & Carlisle, 2009, p. 331) and, therefore, provides an indication of the students' clinical progress over time using the WIAT-3 Pseudoword Decoding Test and the Gray Reading Tests. Among the three standardized measures used in this study, the WIAT-3 is the only test measure that provides an SEM. The Gray Reading Tests used Anastasi and Urbina's (1997) formula to determine the statistical and clinical significance of the difference score. The student must achieve a minimum difference standard score of 9 between Form A and B (Wiederholt & Blalock, 2001; Wiederholt & Bryant, 2001). Table 21 shows the number of students who achieved non-overlapping SEMs in WIAT-3 Pseudoword Decoding and the number of students who obtained the minimum score difference in Gray Reading

Tests. Non-overlapping pre-posttest SEMs indicates academic progress (Katz & Carlisle, 2009). 15% of 33 students achieved clinical progress in pseudoword decoding and 39% of 33 students achieved clinical progress in Gray Reading Tests.

Table 21.
Number of Students who Achieved Clinical Progress

Grade Level	N	Non-overlapping SEMs	Minimum Difference Score of 9
Primary	4	1 (25%)	3 (75%)
Intermediate	8	1 (13%)	3 (38%)
Middle School	21	3 (15%)	7 (33%)
Total	33	5(15%)	13 (39%)

*WIAT-3 Pseudoword Decoding
** Gray Reading Tests

Summary

The results of the design experiment were organized into qualitative and quantitative data analysis. At some points, qualitative and quantitative data converged in the analysis. The development of morphological intervention from my own teacher research to the design experiment resulted in the development of four components of morphology instruction in language arts curriculum(morphemic analysis, vocabulary, contextual reading application, and written expression). These components guided us in creating and applying an instructional design process in special education. Also, the iterative process of developing principles and protocols for teaching morphology

provided us three sources of knowledge: content knowledge, curricular knowledge and pedagogical knowledge.

Morphology instruction delivered by four special education teachers, myself included, affected our students' morphological knowledge and literacy outcomes, as shown in the quantitative analysis using pairwise t-test. Among the four literacy skills measured in the study, pseudoword spelling, word identification, and pseudoword decoding showed a significant improvement after fifteen weeks of implementing the morphological intervention. The lack of a control group in the study was tempered by the non-significant effect of the counterfactual measure.

In the next chapter, I synthesize and discuss the qualitative and quantitative results of this study in relation to the three research questions I raised in Chapter 1 and in light of the current research on morphological instruction discussed in Chapter 2. I also discuss the three knowledge sources in detail as they relate to teacher learning, morphology intervention, and instructional improvements in special education. Implications, limitations, and recommendations are also discussed.

Chapter Six
Discussion

Many, many years ago there was an emperor who was so terribly fond of beautiful new clothes that he spent all his money to his attire. He did not care about his soldiers, or attending the theatre, or even going for a drive in the park, unless it was to show off his new clothes. (Andersen, 1949, p. 1)

For several decades we have witnessed the tide of literacy practices and policy reforms in American education ebb and flow (Flippo, 2012; Ravitch, 2010). The governments' lofty purpose of democratizing the teaching of reading and writing have sparked great debates among scholars, educators, and policy makers on the best methods of teaching reading and writing to American children. The phonics versus whole language debate polarized many scholars and practitioners, and became the most divisive moment in the history of reading education. Then, the authorization of NCLB marginalized many communities, particularly poor and minority children, and led to the mushrooming of yet another tide of literacy intervention that turned out to be not successful after all (Goodman, 2013; Shannon, 2007). Once more, the "emperor's new clothes" is the lingering narrative in education research and practice.

What is missing in this narrative is the empowerment of teachers as creators rather than simply consumers of knowledge. One of the arguments that I foreshadowed in Chapter One is the power and the promise of teacher research in reforming literacy instruction in special education classrooms. The knowledge I gained in my own

classroom research had led to the development of curricular intervention on morphology that targeted the foundational literacy skills of struggling learners in special education. Through the iterative process of design-based research, I had further refined the curriculum with the help of other teachers at my school district. The experience of co-construction in teaching morphology in different classroom conditions and context had strengthened the ecological validity of the morphology curriculum I had created.

In this chapter I synthesize and discuss the findings presented in Chapters Four and Five within the purview of the three research questions raised in Chapter One. The discussions of the results, likewise, are anchored in the current literature reviewed in Chapter Two. Next, in line with the current findings of this study on creating sources of knowledge to develop instructional design in special education, I extend the conceptual framework that I proposed in Chapter Two. This section highlights the contribution of this study to the field of curriculum development and teacher effectiveness in special education. A discussion on the limitations of the study follows next. To amplify the findings of this dissertation, I discuss the implications of my study in three different layers: the multi-level instruction of morphology in a self-contained special education, educational leadership, and equity in special education. Finally, this chapter concludes with my own call to action related to morphological intervention and classroom knowledge.

Creating and Sustaining Knowledge Through Teacher Research

While the nature of teacher research lies within the reflective practice of teaching and the understanding of students' learning process (Cochran-Smith & Lytle, 1993; 1999), my investigation of morphological intervention has also responded to Meier and Henderson's (2007) call "to join the ranks of educational researchers and to contribute to broad-scale changes in educational research" (p. 9). The overall goal of this dissertation resonates with Goodman, Calfee, and Goodman's (2013) book *Whose Knowledge Counts in Government Literacy Policies? Why Expertise Matters.* Contextualizing the tenor of their argument, I raised the similar questions: "Why does classroom knowledge counts in literacy instruction?" and "Why do teachers matter?" to synthesize the results of this study. The findings in this dissertation are layered with the theoretical knowledge on morphology, the pragmatic use of morphological design intervention in special education, and the methodological framework of teacher research and design-based research.

Research Question 1: How does teacher research shape my morphology instruction and influence the transfer of classroom knowledge to other special education teachers? Critical reflections and reflexivity formed the foundation of my local knowledge about morphology instruction. While reflective and reflexive processes of teacher inquiry have been used interchangeably in the literature (Convery, 1998; Henderson, Meier, Perry, & Stremmel, 2012; Phillips & Carr, 2007), I view these two constructs separately in light of the transformative nature of my classroom inquiry.

Through reflective practice, I was able to employ critical examination of my own teaching practices and incisive analysis of students' literacy behavior. My prior knowledge of literacy development, personal values, cultural upbringing, and professional experience undergirded my understanding of teaching morphology in special education. However, when I went public with my teacher research and scaled up the curriculum, reflexivity played a significant role in my practice as a teacher researcher. This led to the design of an approach to morphological instruction for special education students in grades two to eight, with seven other teacher taking part of the study. Wilhelm (2013) differentiates reflexivity from reflectivity. He defines reflexivity as "the privileging of the perspective, history and values of others" (p. 57). He further argues that reflexive practice suspends ones own assumptions in order to understand other people's ways of framing knowledge about teaching and learning. Reflectivity and reflexivity are complementary process of understanding issues of practice and building local knowledge. Through this combination, I created and sustained a local knowledge that went beyond my classroom and engaged other teachers to improve their instruction and students' learning.

This dissertation demonstrates teacher research as an alternative pathway to developing curriculum and intervention within a school district. The narrative of teacher research does not stop with reflection and improving ones own practice. Transfer of local knowledge to other classrooms is a prerequisite condition to achieve teacher

empowerment and emancipation from the educational status quo. Elmore's (2000) notion of "loose-coupling" (p.8) characterizes the instructional core of education (i.e., teaching and learning) as an isolated structure that seldom influences the entire system when instructional innovations happen in different classrooms. The collective efforts of teachers in this study, through iterative process of designing an intervention program, built a structure that influences teachers' instructional practices and understanding of students' literacy development. By sharing the local knowledge I created from my own teacher research, I have tested the rigor of this knowledge as it was applied to a diverse group of students in different contexts and conditions.

My narrative as a teacher researcher reached its consummation when I went public with my own classroom knowledge. The transformative nature of my research – changing teachers' perspective on literacy instruction and developing students' literacy skills through morphology – led to the refinement of local knowledge as my initial findings and the curriculum I designed became useful to other special education teachers. Based on the classroom observation and individual interviews with teachers, I further revised and improved the core instructional knowledge (e.g., principles and protocols of teaching morphology, components of morphological intervention, and multi-level instruction in a self-contained special education classroom), which I will explain later in this chapter.

My experience as a teacher researcher brought me to a new level of understanding

of what classroom knowledge was all about and how this could impact literacy instruction for other classrooms in my school district. The intuitive process of solving instructional dilemmas in my own practice had evolved into a systematic and analytical process of collecting evidence to change my literacy instruction. This is similar to Cochran-Smith & Lytle's (1999) argument that a data driven instruction improves teacher's pedagogical knowledge and affects students' learning process. Teacher research provided me the opportunity to interrogate my classroom practices and transformed my reflective thoughts into a formalized knowledge that became the building blocks for developing a prototype in design intervention, yielding the reflexive process of teacher research. My classroom became the laboratory for creating local knowledge and the staging ground for transforming the language arts curriculum in four special education classrooms, including the middle school class that I taught in phase three.

One of the most important narratives that emerged from the teachers involved in this dissertation is the long-standing issue of isolation in education. Special education teachers are vulnerable to the structural and functional silos built around their practice. Structurally, it is hard to collaborate with other special educations teachers when colleagues are situated across different school sites. While we did plan to use technology to mitigate this issue of proximity, the demands of our non-instructional jobs (e.g., committee meetings, individual meetings with parents, consultations with mainstreamed teachers) and seemingly never-ending IEP meetings prevented us from physically

working together as a team. Functionally, our collaboration was interrupted, as special education teachers do not use a homogenous curriculum intended to target the average majority. Instead, the very nature of special education lies within the individualization of educational programs to address the unique needs of every student, as stipulated in their IEPs.

Therefore, what I had planned as a collaborative teacher research project turned much more didactic as I worked with the three teachers to implement the design intervention and maintain fidelity to the curriculum. Part of the challenge was that morphology instruction had never been included in the teachers' literacy intervention. With hindsight, they showed explicit knowledge of morphology, but this knowledge base had never been translated into their teaching practices until they participated in the study. They were stuck in the idea that phonological decoding is the only foundational skills that they could employ to address the reading failure that is common in special education.

During the focus group discussion, all participating teachers recognized the value of morphology in children's literacy development. Yet not one of them had the pedagogical knowledge and experience to teach morphology as an alternative literacy intervention. As a result, I explicitly guided them on using the protocols and principles for teaching morphology in their classrooms. My lesson plans served as exemplars when constructing their own lessons. Participating teachers were motivated to teach morphology because of the success of morphology instruction in my own classroom and

the positive reading outcomes of my students. Hurry and colleagues (2005) reported similar experience regarding teachers' motivation to adopt morphology instruction into their curriculum. In their study, the teachers needed external motivation to include morphology instruction. Their explicit knowledge was not sufficient; they needed to understand how morphological instruction made sense in their practice and how it worked in their own classroom, in a sense the motivation needed to be internal.

The power and the promise of teacher research in reforming curriculum and instruction in special education hinges on teachers coming to the understanding of where the knowledge sources come from to improve learning in the classroom. Content, curriculum, and pedagogy are the sources of knowledge that help us frame our understanding of morphological instruction and students' learning experience. The goal of teacher research is not to test and to consume educational products but to develop, assess, and revise theories that inform what teachers do in their own classrooms everyday (Lytle & Cochran-Smith, 1992). Teacher research empowered us to develop morphological design intervention and drove our instruction based on evidence arising from the data we had collected and analyzed ourselves. A concrete example of this empowerment and instructional success is further discussed in the next research question.

Research Question 2: How does morphology instruction, delivered by four special education teachers, affect students' morphological knowledge and literacy outcomes? Based on the mounting evidence that morphological knowledge contributes to students'

literacy development (Bowers, Kirby, & Deacon, 2010; Carlisle, 2010; Reed, 2008), particularly to struggling readers (Goodwin & Ahn, 2010), we hypothesized that our students' word reading and spelling skills would improve after implementing the design intervention on morphology. We also predicted that, given the improvement in word identification and the role of morphological knowledge on vocabulary development (Baumann, Edwards, Boland, et al., 2003), our students' reading comprehension would improve as well.

The results of this study confirmed the first hypothesis on word identification and spelling. Students' pseudoword spelling, word identification, and pseudoword decoding had improved after four months of morphology instruction. The use of pseudowords as measures of spelling and word decoding guaranteed that students used their morphological knowledge, including base words, when identifying or spelling words. We can assume further that, due to the unfamiliarity of the words, their performance in Pseudoword Decoding and Pseudoword Spelling Tests was not a result of automaticity (i.e., sight word reading) or practice effect (Katz, Lee, Tabor, et al., 2005). When students were tested using real words, via Word Identification Test, they performed better in Form B (posttest) than in Form A (pretest). The morphologically complex words used in this test were low frequency words, that is, words that do not occur frequently in many books students read during the implementation of the intervention. These findings are consistent with previous intervention studies designed for struggling learners (Berninger, et al.,

2013; Kirk & Gillon, 2009; Vadasy, Sanders, & Peyton, 2006). What distinguishes these findings is that highly motivated special education teachers have implemented the design intervention within the dynamic natural settings of their own special education classroom. Furthermore, the continuous refinement of the intervention sets this dissertation apart from the previously mentioned studies.

The statistical analysis of effect size revealed a moderate improvement in word reading and spelling. This is a welcome finding given the design intervention was implemented for less than 5 months. The effect size may have been stronger if the instruction had been implemented through the entire school year, resulting in more students benefiting from the program. I could infer from the analysis of effect sizes that when students are given longer time to practice morphemic analysis their ability to decompose and construct word structures is solidified. The longer they are exposed to morphologically complex words, the high probability that these struggling learners can improve their word identification and spelling skills.

Additionally, the analysis of non-overlapping SEMs showed, one out of four second graders (25%), one out of eight intermediate grade students (13%), and three out of twenty-one middle school students (15%) had improved their ability to decode multisyllabic pseudowords. The complexity of teaching morphology could influence the results of the non-overlapping SEMs. However, the limited number of N in the study could possibly limit the conclusiveness of this result.

Beyond lexical level, morphological intervention did not yield a significant difference on the reading comprehension measure. Baumann et al. (2003) found similar results where students' reading comprehension did not improve after learning to use morphemic analysis. In the current study, in spite of the intervention's significant emphasis on meaning and word problem solving, there are three possible reasons why the transfer of foundational skills did not occur in the reading of continuous text. For one, the Gray Reading Tests, which were the comprehension measures used in this study, do not have a preponderance of morphologically complex words in the stories our students read. Thus the transfer of learning is impossible to assess. Furthermore, in order to perform successfully in reading measures like Gray Reading Tests, students use top-down processing -- semantic and syntactic competencies -- to fully understand the texts (Wiederholt & Blalock, 2000). Secondly, the variability of reading comprehension profiles in special education classes. Such variability, which only increases as children age, is supported by the descriptive statistics, showing an increase of standard deviation in the posttest across the three grade levels. Finally, a closer examination of students' performance reveals that several students dropped two standard deviations between pretest and posttest, which suggests a third confounding issue - students' dispositional change. It is likely that some students guessed their answers in the test or had difficulty concentrating when reading the selections.

The role of morphological knowledge on reading comprehension is still unsettled.

A link between morphological knowledge and reading comprehension has been studied through its influence on vocabulary growth (Nagy, Berninger, & Abbott, 2006). Yet very few studies have linked morphology directly to reading comprehension in children with reading problems (Siegel, 2008). Mostly, researchers have studied the effect of morphology on reading comprehension with second language learners, typically developing readers, or students from low socio-economic status (Apel, Wilson-Fowler, Brimo, & Perrin, 2012; Carlisle, 2000; Jeon, 2011; Kieffer & Lesaux, 2012).

Due to lack of randomized controlled experiment in this study, a cautionary interpretation is warranted. However, the counterfactual measure corroborated with the significant results of the pairwise comparison and tempered the inherent confounding variables that may affect changes in students' word reading and spelling development. While this study neither intends to generalize its conclusion, nor suggests that morphology is the silver bullet to improve reading and writing skills among struggling learners, the design experiment was able to demonstrate the ecological validity of the morphology intervention when applied to the natural setting, and across four different classroom contexts. As with any design-based research, the iteration of the instructional model based on the qualitative and quantitative evidence could lead to further refinement of the design intervention (Collins, Joseph, & Bielaczyc, 2004).

Research Question 3: What evidence is there that teacher research supported teachers to create and apply an instructional design process in special education? The

narrative interpretation that I presented in Chapter Four provided the storied context of how teacher research supported myself as a practitioner-scholar, as well as the rest of the seven teachers I worked with in this dissertation. By extracting the interweaving narrative of my study, three important constructs emerged from this dissertation: knowledge creation, duality of learning in the classroom, and curriculum design. These constructs informed the design of morphological intervention in special education and advanced the conceptual framework I proposed in Chapter Two.

Knowledge in education has been traditionally generated through university research, which capitalizes on the assumption that it is supported by rigorous scientific evidence. What has been classified as rigorous scientific evidence has excluded other forms of knowledge created outside the parameters of randomized controlled experiments. This definition of what counts as quality research became a polemical issue in shaping educational policies and practices (Calfee, 2013). Lacking in this research narrative are the voices of the insiders who are in the trenches trying to narrow the achievement gap and make a difference in the lives of many marginalized students. In contrast to other teacher research (Campano, 2007; Megowan-Romanowics, 2010; Zeichner & Nofke, 2001) my study exemplifies the power and the promise of teacher research within the design-based research to develop instructional design in special education. Teachers as creators of knowledge situate learning and thinking within the context of their classroom and utilize whatever available resources they have in that

particular setting (Bruner, 1996). Interrogating my own practice, and building a knowledge base in morphology and literacy, has led to the development of teaching principles and protocols that are useful to other special education teachers. As a result, I designed an intervention program that is germane to the needs of our students and flexible enough to accommodate the intricacies and the unpredictabilities of teaching in special education.

As the seven teachers learned about morphology and began to develop morphological knowledge among their students, they also learned how previous research was integral to the development of their local knowledge. The participating teachers' exposure to teacher research and to the enactment of research in my classroom provided them the basis for the development of curriculum and intervention. They came to realize that the classroom is not just a place for teachers to teach, but also a space for them to learn and develop new knowledge (Darling-Hammond, 2000; Darling-Hammond & Loewenberg Ball, 1997). This duality of learning in the classroom was evident in my collaboration with the remaining three teachers who took part in the final phase of this study. As Anna, Diana, and Scarlett learned to incorporate morphology in their language arts lessons, they further deepened their understanding of English morphology and saw how this knowledge could impact students' literacy development. They became intellectual apprentices as they helped me refine the curriculum I had designed.

One of the important outcomes of this study is the development of morphology intervention designed to improve the foundational skills of struggling readers in special education. As described in Chapter Five, the design intervention went through a series of iterations, starting from my own classroom research and moving to other teachers' exploration of the curriculum in their classroom. By the time I reached the final phase of my study, I had incorporated the feedback I received from these teachers and modified the curriculum according to the classroom context and conditions. The refinement of teaching principles and protocols was essential to the process of design experiment to ensure transferability of the curriculum across grade levels. This process started from a modest guide to inform my own instruction on morphology. Then, it morphed and scaled-up to a level where the curriculum addressed the developmental nature of morphological awareness and morphological knowledge. For example, Anna focused her morphology instruction on the development of inflectional morphology and compounding in her second graders. Although she introduced some basic affixes toward the latter part of her instructions, the goal was to expose students to morphologically complex words (e.g., unhappy, disagree, repay, overcooked) when reading continuous texts. Inflectional morphology and compounding were present in Diana's curriculum as her third, fourth and fifth grade students reviewed spelling rules around inflection and the structure of compound words. The major focus of her intervention was the teaching of derivational morphology and building students' awareness of morphology structure. At the middle

school level where Scarlett and I taught, we still included inflectional morphology and compounding as part of the review. We also dug deeper on the importance of derivational morphemes and morphological structure as mental tools for spelling, word identification, and word problem solving. Toward the end of the intervention program, we taught Greek/Latin roots.

Creating Knowledge Sources through Teacher-Research

The challenge of teaching literacy in special education, or teaching for that matter, is the amount of knowledge that teachers need to possess to become effective literacy instructors. Teacher training has been historically compared to other professions – quite often with medical preparation; however, teaching preparation has often been described as falling short in terms of the amount of preparation and the depth of knowledge teachers gained (Sadler, et al., 2013; Snow, Griffin, & Burns, 2005). Studies on teacher effectiveness have mostly relied on teachers' test scores based on state exams, college major, courses taken in pre-service programs, and other teacher certification requirements (D'Agostino & Powers, 2009; Wilson, Floden, Fertini-Mundy, 2002). Yet these measures have proven to be poor predictors of students' academic success (Sadler, Sonnert, Coyle, et al., 2013).

Thus, how can special education teachers help struggling students learn to read and write when they themselves have limited understanding of their students' learning process and knowledge behind teaching reading and writing? Declarative knowledge, that

is, knowledge learned from books and lectures about children development, instructional approaches, and text analysis (Snow, Griffin, & Burns, 2005), is not enough for beginning teachers to depend upon as they seek a foundational knowledge for their instructional practices. I have seen this in Scarlett and Diana's experiences. In my individual interviews with them and their participation in the focus group discussion, they acknowledged their basic understandings of the role of morphology in literacy development, but translating this basic knowledge to their teaching practice was a challenge. Scarlett and Diana, and to some extent Anna, as well, needed my assistance to structure their lessons around morphology. The current literature on the limits of subject matter knowledge supports this observation (Lederman, Gess-Newsome, & Latz, 1994; Sadler, Sonnert, & Coyle, 2013).

The findings on knowledge sources in this study have fully supported and extended Bransford, Darling-Hammond, and LePage's (2005) framework of professional practice to prepare teachers for a changing world. They envisioned three areas of knowledge, skills, and dispositions that teachers need to acquire in order for them to be relevant, effective, and transformative. Teachers need to have:

- Knowledge of learners and how they learn and develop within social contexts,
- Conceptions of curriculum content and goals: an understanding of the subject matter and skills to be taught in light of the social purposes of education, and
- An understanding of teaching in light of the content and learners to be taught, as informed by assessment and supported by classroom environment. (p. 10)

Surface knowledge of reading development and student learning is not sufficient to achieve competency in teaching struggling learners in special education. Capitalizing on Bransford, Darling-Hammond, and LePage's conceptualization of teaching practice, the findings of this dissertation led me to propose that the conceptual framework I presented in Chapter Two should be guided by three different knowledge sources to improve literacy instruction in special education. These knowledge sources, visualized in Figure 17, are similar to Shulman's (1986, 1987) conceptualization of professional knowledge.

Figure 17. Knowledge Sources

The three sources of knowledge guided the development of morphology curriculum as a design intervention in this dissertation. The pedagogical knowledge reflects the interplay between the classroom context and the conditions of individual students through reflexive teaching process. Contexts include class size, school culture, school district's approaches to curriculum, and opportunities for collaboration (Ellinger, 2008; Lieberman & Miler, 2008; Van Velzen, 2013). As was evident in the present study, this pedagogical knowledge takes time to develop and is highly dependent on teachers' experience. Anna and I have been teaching for more that 10 years, and we have mastered this pedagogical knowledge to create innovative intervention based on previous research knowledge. Lacking of teaching experience, a novice teacher can acquire a certain degree of pedagogical knowledge with the help of veteran teachers like myself. The zone of proximal development is highly applicable in this process (Vygotsky, 1978). With my assistance, Scarlett and Diana learned as they followed the exemplar lessons and the prototype curriculum. Hopefully, they will continue to acquire knowledge and improve their practice in the future on their own or in collaboration with other teachers. At the conclusion of this study, the three teachers who participated in Phase Three expressed their desire to continue implementing morphology in their language arts lessons.

Deep content knowledge is essential to achieve teaching competence and to impact students' learning (Saddler, Sonnert, Coyle, et al., 2013). Special education teachers need to understand that morphology is an integral component of literacy

development. Mounting evidence suggests that morphological awareness and morphological knowledge affect literacy achievement of students with literacy difficulties (Bowers, Kirby, & Deacon, 2010; Carlisle, 2010; Goodwin & Ahn, 2010; Reed, 2008). In this dissertation, I brought a deeper understanding of morphology through my own teacher research to the teachers I worked with. Now the teachers have a different dimension of literacy knowledge they can apply when dealing with struggling learners. The exploratory phase of the study brought new knowledge to the seven teachers; the implementation of the design intervention deepened Anna, Diana, and Scarlett's conceptualization of language and reading development. Comments like, "Oh, I have never thought about that," "I learned something new from you," and "You have inspired me to work on this," are the testaments of their growing knowledge of the subject matter.

Curricular knowledge is highly dependent on content knowledge and pedagogical knowledge. However, I conceptualized this form of knowledge based on careful planning of the lessons and the execution of morphology intervention. Reflexivity plays an important role in shaping this knowledge. As we implemented and refined the design intervention, we considered how students responded to the different activities and how learning took place within our classroom. Curricular knowledge links the relevance of research knowledge to practical knowledge. Professional judgment is valued and teachers are empowered to decide what aspects of the lessons would work within their students'

capabilities. Just like pedagogical knowledge, curricular knowledge is contingent upon teachers' experience. Based on reflective and reflexive teaching practices, the guidance and didactic collaboration with Diana and Scarlett provided them the experience to build on their curricular knowledge.

At the outset, these knowledge sources were not apparent to me. However, as I interpreted the autoethnographic narrative presented in Chapter Four, and analyzed the qualitative and quantitative data discussed in Chapter Five, I have come to the understanding that these three sources of knowledge shaped and strengthened the ecological validity of my intervention across different grade levels. The formation of knowledge, based on professional practices and systematic inclusion of data from our classroom, changed how we perceive teaching and learning. This dissertation has demonstrated that teachers are not just consumers of knowledge provided by the "experts in the field" or technicians of bureaucratic government. Teachers have the capacity to create knowledge that is even more organic and relevant to their own professional practice. This dissertation empowers teachers to enact the sources of knowledge and transforms their instructional practices and decision making into equitable teaching practice. For novice teachers like Diana and Scarlett, as well as those teachers who left the study, the mere exposure effect from their colleague doing teacher research and their participation in a didactic instruction of the curriculum development provided an alternative model for teacher learning.

The three sources of knowledge are interconnected, forming the foundation of literacy instruction and student learning (see Figure 18). At the foundation of this hierarchy is the teachers' knowledge base, which is the consolidation of knowledge from three sources discussed above, the declarative knowledge they learned from pre-service training, and the practical knowledge during their student teaching.

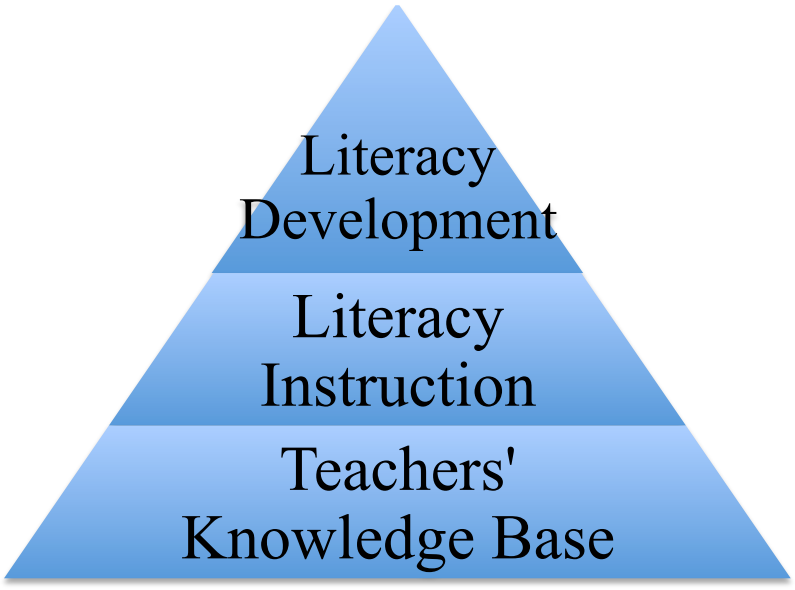


Figure 18. The Hierarchy of a Competent Special Education Teacher

As we continue to reflect on our knowledge and integrate it into our classroom practice (i.e., reflexive), we become more efficient and competent instructors of literacy. When knowledge improves, our literacy instruction improves as well. Teachers' depth of

knowledge on language and reading could affect students' literacy development. Needless to say, when all of these foundations are firmly laid down, we reach the apex of our teaching - the highest good of education.

Limitations

This dissertation has certainly informed and improved teachers' literacy practice - myself included - surrounding morphology instruction. Moreover, the ecological validity of the findings has impacted the transferability and the credibility of the design intervention to other special education classes. Five potential confounding factors need to be considered when interpreting the findings of the study. These are the following: competing literacy skills, lack of randomized sampling and control group, limited transferability due to small number of classes involved, variability of students' disabilities within a class, and measures of learning outcomes. These factors are important to strengthen the internal and external validity in the next iteration of the study.

Teaching literacy entails acquisition of complex knowledge and skills. Although the main focus of this dissertation is the teaching and learning morphology within the iterative process of design intervention, other aspects of learning and development are equally important and could play out to improve literacy among struggling learners. Learning to read and write is a gestalt; morphology is just one part of the summation. Therefore, we cannot fully predict the extensiveness of an understanding of morphology and its impact on literacy development. Research on morphological awareness and

morphological knowledge continues to attract many scholars as the field seeks to fully understand how these constructs interact with literacy development among struggling readers (Bowers, Kirby, & Deacon, 2010; Goodwin & Ahn, 2010; Kieffer & Lesaux, 2012). The studies published within the last 10 years point to the conclusion that teaching morphology could improve struggling learners' literacy development. The unanswered question remains: how much morphology instruction do these students need to improve reading and writing?

The lack of control group and randomization during Phase Three of this dissertation limit the inductive inferences made in the study, even with the use of counterfactual measure. Although the t-test results show a significant change in students' word reading and spelling performances, and the effect sizes yield a moderate strength, other instructional methods that were not accounted for in the study could have played a potential role on the students' literacy performance. Likewise, uncontrolled conditions such as the presence of instructional aides and the extent to which parents helped these students work on their homework could also have produced confounding effects. Cautious optimism is imperative when interpreting a significant result using one-group pretest-posttest design.

Owing to the methodological design and the limited number of students who participated in the study, generalizability of the results is not the main goal of this dissertation; transferability is. However, the degree to which the results of the design

intervention can be transferred to other classrooms is limited to self-contained special education classrooms with similar student profiles. Careful interpretation and implementation of the design intervention are indispensible, especially when applied to struggling learners with special education services in the general education classroom or in an elementary resource program. These settings could be included in the next iteration of the instructional design.

It is inherently challenging to control the context and conditions of students' performance, and the selection of respondents when using natural experiment in a design-based approach. Students in special education are not a homogenous group, and it is hard to control the variability of their academic skills without random assignment and a much larger N. This could certainly bias the results of the study.

Finally, the conditions of students when taking the tests could have affected the observed scores. Because we want to implement the intervention in a more realistic manner, students took the test in the classroom, and the teachers, at some point, had to pull out one child at a time when the rest of the students were doing independent work or working in groups. The environment could be chaotic at times, which could affect the overall disposition of the students.

Despite these limitations, the triangulation of the data and the establishment of ecological validity made this dissertation believable and defensible. In a real world, classrooms are not petri dishes, and the design-based research is an appropriate choice for

this kind of intervention study. In the next iteration of the design intervention, the above-mentioned limitations will be addressed to further refine the instructions and strengthen the effect of morphological intervention to struggling learners in special education.

Implications to Special Education Practice

Teaching in context. More than three decades ago, Bronfenbrenner (1979) advocated for ecological principles that govern child rearing and development. That is, situation-specific conditions play a significant role in human development rather than the "transcontextual properties" of observed behavior generalized across a variety of settings (p. 844). This issue of context in child development is germane to the problems and prospects of promoting research evidence to improve education. The complexity of human behavior as studied in one classroom cannot be fully applied to another classroom, as no two classrooms are exactly alike. The role of context in learning has been widely acknowledged in the history of education (Bruner, 1996; Dewey, 1938, Moll, 2013; Vygotsky, 1978). This dissertation capitalizes on the importance of classroom context in designing morphology instruction in special education.

While the main intention of this dissertation is to study the ecological validity of design intervention on morphology across different grade levels through iterative process, I veer away from a prescriptive form of intervention program where teachers follow cookie-cutter lessons with strong fidelity. As the present study illustrated, enduring understandings were possible when the instructional goals were set and developed by

teachers within the context of their practice and students' needs. The principles and protocols for teaching morphology in special education serve as a framework to guide special education teachers when incorporating morphology in their language arts curriculum. In addition, these principles and protocols could also be used as guidelines for planning Tier 2 (specific short-term intervention) and Tier 3 (intensive intervention in a self-contained special education classroom) interventions.

Morphology in the RTI Model. Morphology instruction provides a promising instructional agenda to the RTI model. Using the four literacy components (morphemic analysis, vocabulary, contextual reading application, and written expression) for teaching morphology could provide different entry points for special education teachers to target literacy needs of students qualified for Tier 2 and Tier 3 interventions. For example, teaching students morphemic analysis develops their awareness of word structure and deepens their knowledge of words across content area reading.

Currently, morphology has never been used as an evidence-based practice in the implementation of RTI (Hughes & Dexter, 2011; Jones, Yssel, & Grant, 2012). Given its instructional versatility, morphology could be an auxiliary intervention to phonological decoding and whole language approach to reading. Morphology instruction also builds reading fluency (Carlisle & Stone, 2005; Goodwin, Gilbert, & Cho, 2013), provides efficient cognitive tools to develop vocabulary (Flanigan, Templeton, & Hayes, 2012; White, Power, & White, 1989), and enhances students' understanding of texts (Jeon,

2011; Kieffer & Lesaux, 2012). Using a multi-level instruction, morphology can be taught in an inclusion setting, a small group, and an individualized context. Borrowing from Bronfenbrenner's (1979) proposition for primary developmental context:

> A primary developmental context is one in which the child can observe and engage in ongoing patterns of progressively more complex activity jointly with or under the direct guidance of person who posses knowledge and skill not yet acquired by the child and with whom the child has developed a positive emotional relationship. (p. 845)

Scaffolding (Wood, Bruner, & Ross, 1976) is an important metaphorical concept that functions as a building block for the development morphological knowledge and morphological awareness. For instance, Anna guided her students to understand the structure of morphologically complex words by extracting the prefix un- in the word unread. In the middle school level Scarlett and I used different word schema structures (e.g., prefix + base word + suffix + suffix) to assist students in deconstructing words like *unpredictability, disorganization*, and unsuccessfully. Bronfenbrenner's proposition clearly applies, as does Vygotsky's (1979) zone of proximal development, in Tier 2 and Tier 3 morphological interventions. The teacher acts as a mediator of the child's underdeveloped word identification and spelling skills. As the child learns to mentally manipulate morphological structure, he gets closer to full acquisition of morphological knowledge that he can use independently when confronted with unknown complex words in the text.

The goal at each RTI tier is to develop independence. Again, Bronfenbrenner

proposes a secondary context in which the student can further develop his or her morphological knowledge:

> A secondary developmental context is one in which the child is given opportunity, resources, and encouragement to engage in the activities he or she has learned in primary developmental contexts, but now without the active involvement or direct guidance of another person possessing knowledge and skill beyond the levels required by the child (p. 845).

Achieving independence in each tier signifies the attainment of the IEP goals and objective and the child's readiness for a different level of literacy instruction. Independence in Tier 1 means the child is now ready to come back in the mainstream group to fully access the general education curriculum. Independence in Tier 2 means moving the child to Tier 1 intervention. Independence in Tier 3 provides the IEP team to reevaluate the child's goals and objectives; the possibility of moving the child to Tier 2 intervention is imminent. Figure 19 further illustrates the proposed multi-level model imbedding morphology instruction in RTI.

Most of the elementary students participated in this study could qualify for a Tier 3 intervention. The self-contained special education classrooms of Anna and Diana afforded them to provide small group and individualized instructions in morphology. Explicit and direct instruction of morphological knowledge afforded students a cognitive tool to identify morphologically complex words in the context of reading fiction and non-fiction. In addition, Diana, Scarlett and I employed digital media as a dyadic instruction in vocabulary and spelling to address the individual needs of our students.

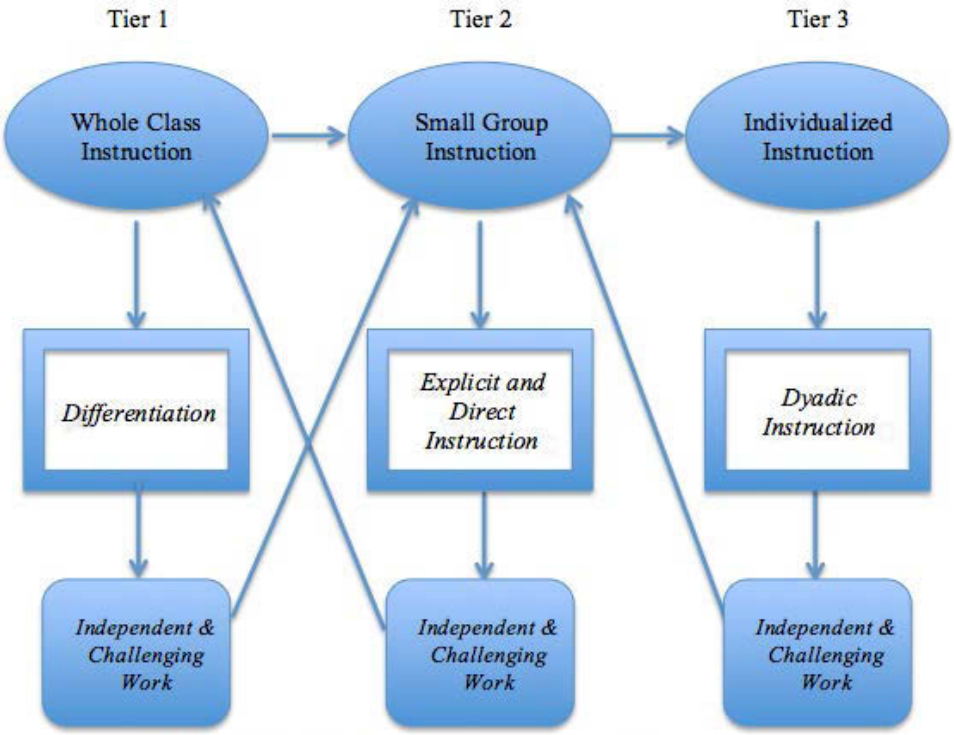


Figure 19. Imbedding Morphology Instruction to RTI

Supporting students' literacy development in special education involves different levels of instruction. General and special education teachers can work together in Tier1 and Tier 2 to implement morphological intervention to struggling readers. Studies have shown that morphology intervention benefits students when integrated with other literacy instruction (Bowers, Kirby, Deacon, 2010; Carlisle, 2008; Goodwin & Ahn, 2010; Reed, 2008). In Tier 1, morphology intervention is implemented as part of the differentiation of

the lesson, and the general education teacher consults with the special education teacher as far as crafting lesson activities and criteria for improvement.

If the instructional modification and differentiation have shown to be unsuccessful, the second tier of intervention is recommended. The context of this instruction is within a small group of students needing the same kind of intervention in morphology. The special education teacher delivers the instruction with the goal of using their morphological knowledge in reading continuous texts, or writing expository and narrative texts. In this small group instruction, the special education teacher provides explicit and direct instruction, applying the components of morphology instruction mentioned earlier. The use of digital technology like the ones that Diana, Scarlett and I used (*Quizlet, Spelling City*, and *Educreation*) as well as developing digital literacy could enrich the lessons in morphology and motivate students to be word conscious.

Finally, if Tier 2 proves insufficient to develop students' word reading, spelling, and vocabulary knowledge, a more intense and dyadic intervention is recommended – Tier 3. The student works in a self-contained classroom, and the special education teacher modifies the instruction to suit the individualized needs of the student. An instructional aide who is trained in morphological instruction (Vadasy, Sanders, & Peyton, 2006) could also take part in this level of intervention when the teacher needs to work individually with other students in the classroom.

Implications to Equity in Special Education

Access to the general education curriculum has been historically fought as an important advocacy call for students in special education (Pugach, Blanton, & Correa, 2011). In recent reauthorization of the Individuals With Disabilities Act of 2004, the law requires general and special education teachers to create a "Universal design for learning" (UDL), and to provide a curriculum that accommodates students' diverse learning needs and develops knowledge and skills. Cochran-Smith and Dudley-Marling (2012) emphasize the UDL's underlying significance of multiple and flexible methods of instruction to provide high-level instruction and to support academic achievement commensurate to typically developing peers. This context foregrounds the discussion on instructional equity issue in this section.

This dissertation addresses equity twofold: teacher research and morphology instruction. Teacher research situates the discourse of social justice in special education within the students' success and failure in reading. The deficit thinking framework and the medical model of disability have influenced special education such that educators provide a low level of structure in communicating curriculum content and designing instruction (Cochran-Smith & Dudley-Marling, 2013; Valencia, 2011). The disengagement of many struggling students to read is partly attributed to a scarcity of curriculum that challenges their capacity to learn (Hettleman, 2003). Because of the low expectations of many teachers, general and special education alike, students are given

less rigorous materials that further marginalize their education experience (McGill-Franzen & Allington, 1991; Vaughn, Linan-Thompson, & Hickman, 2003). This further actualizes the Matthew effect (Stanovich, 1986) – the poor get poorer - that plagues many contemporary classrooms.

In their critical analysis of the diversity of teacher education in special education, Cochran-Smith & Dudley-Marling (2012) acknowledge that variants of practitioner inquiry – including teacher research – empower teachers to create local knowledge. They further argue that this kind of inquiry would be most likely to veer away from the idea of "universally appropriate best practice" (p. 242), and, instead, practice inclusive teaching. Because of the independence given to special education teachers in our school district, the teachers I worked with in this dissertation had the freedom to use any existing evidence-based literacy practices or commercially available reading program. Diwali, one of the seven teachers participated in Phase Two, lamented this state of affair in our focus group: "The district doesn't have a curriculum in place for these kids. The curriculum I use is something I made or I've scavenged or somebody has graciously shared it with me." Unfortunately, this kind of practice is unsustainable and an example of inefficient use of public money. In most cases they abandoned the program after a few months of trial and error, and were on to the next round of curriculum hunt.

On a district level, curriculum leaders continue to practice cookie-cutter mentality within the pretext that an adopted curriculum can be modified in the classroom. This

practice perpetuates inequitable expectations that any program fits all sizes by tweaking and modifying the instruction for students with special needs (McGrew & Evans, 2009). Most of these literacy programs were created and validated for general education classroom purposes. In most cases, the idea of classroom differentiation has been overused in the field of special education without deep regards to special education teachers' complex day-to day teaching. Sometimes the artificiality of many commercially available reading curricula sets in when generic reading activities are recommended for English Language Development (ELD) and special education students as a group – as if these students have monolithic academic needs. A case in point, Maria, one of the teachers who left toward the middle of Phase Three, used a commercially available program in the previous year for her spelling and vocabulary lessons. As she realized that the program was highly dependent on student worksheet, she decided to abandon these materials due to incompatibility with her pedagogical principles.

The underlying motive for teacher research is to develop reflective and reflexive practice, driven by classroom data, in order to continue revising one's knowledge of teaching and learning. It does not only inform teachers' local understanding of students' learning but also deepens their content, curricular, and pedagogical knowledge through critical interrogation of their instructional practices. Studies have shown that situated learning experience (i.e., learning through context) develops competence and skills (Resnick, 1991). As teachers gain deeper knowledge of teaching within the context of

everyday experience, they improve their practice, and it benefits students' learning (Evans, Lomax, & Morgan, 2000). When Anna and I studied students' artifacts (e.g., student journal, worksheet, and running records), Anna realized the value of teaching morphology to improve students' literacy development. Zhineng, for example, benefitted the most as shown in the non-overlapping SEM in WIAT-3 Pseudoword Decoding and the achievement of a minimum difference score of 9 in Gray Reading Test

My teacher research and the scaling-up of morphology curriculum as a design intervention for struggling learners aimed to address the long standing issue of academic low expectations for students receiving special education services (Jussim & Harber, 2005; Madon, Jussim, & Eccles, 1997). One of the principles that emerged from this study is the importance of situating morphology lessons through literature and meaningful texts. These texts expose the students to an abundance of morphologically complex words that help them develop rich vocabulary. In addition, when reading complex materials that have well developed plot and interesting storyline, students are engaged in reading and have the chance to apply their morphological knowledge and skills. For example, by scaffolding middle school students in reading short stories like *The Gift of the Magi* (Henry, 1905), *In a Grove* (Akutagawa, 1922), and *A Rose for Emily* (Faulkner, 1930), we have exposed them to morphologically complex words like *conception, longitudinal, ornamentation, wonderfully, inconsequential, adornment,* and

unconscious. Such sophisticated words are not present when teachers use only basal reading texts or texts written to teach phonetic approaches to decoding.

Text complexity and academic rigor in morphology intervention do not only reside on the sophistication of words our students read. For example, the deep overlaying of themes surrounding the lessons on Japanese culture in my social studies class afforded the continuity of this topic to language arts. Blurring the line between language arts and social studies resulted to students reading *In a Grove*, a classic Japanese short story that used Rashomon effect – a story narrated from different perspectives according to different characters. At the end of the lesson, the students composed their own testimony as if they were also witnesses of the crime. Many students had the opportunity to use morphologically complex words in crafting their story. Students used morphologically rich words like *competition, immediately, horrified,* and *coldblooded* to provide details to their composition. This lesson as well as the overall teaching principles generated from this dissertation reflect our commitment to set high expectations for students in special education.

Implications to Educational Leadership

Creating and sustaining classroom knowledge through teacher research and iterative process of design-based research undergirds the relevance of educational leadership in this dissertation. Educational leaders confront challenges to transforming instructional practices and changing the culture of consumerism in education. Textbook

adoption or purchasing commercially available curricula tends to be costly, and the sustainable use of these materials in the classroom is no guarantee. Many district leaders undervalue the role of local knowledge in developing curriculum and instruction to serve the needs of students in special education. Oftentimes, the school district hires an outside expert to provide staff development for teachers with the assumption that this will transform their thinking and practice. Putnam and Borko (2000) further galvanize this issue by stating

> Teachers, both experienced and novice, often complain that learning experiences outside the classroom are too removed from the day-to-day work of teaching to have a meaningful impact. At first glance, the idea that teachers' knowledge is situated in classroom practice lends support to this complaint, seeming to imply that most or all learning experiences for teachers should take place in actual classrooms (p. 6).

This dissertation positions teachers' knowledge at the heart of transforming instructional leadership in special education. First, I explore the role of leadership from the middle to develop curriculum and instruction. Next I argue for the inclusion of morphology intervention as an educational policy within the school district. Finally, this dissertation addresses Ball's (2012) challenge to close the "knowing-doing gap in education – research that is designed to inform others, influence others' thinking, and inspire others to action" (p. 283).

Teacher research is a viable route to develop curriculum and instruction organic to the population of students we serve. As instructional leaders, teacher researchers develop local knowledge and instructional practices that can be shared during professional

learning days. Bringing teachers' classroom experience to professional development is a powerful learning process that could transfer from one classroom to another (Putnam & Borko, 2000). District leaders and school leaders need to encourage such replication of local knowledge and practices through collaborative work (Spillane, Healey, & Parise, 2009). Dufour and Marzano (2011) underscore the important role of school principals in building teachers' capacity (e.g., teacher research) to impact students' literacy development and in undertaking ambitious or promising instructional practices in reading and writing. Teacher research as a professional development holds a potential for improving the instructional quality in special education and developing teachers' pedagogical knowledge and skills.

Teacher researchers, like myself, can lead other teachers to interrogate their instructional practice and challenge the status quo of routine teaching practice. When using certain methods of teaching reading or writing over the years, teachers are susceptible to patterns of thinking and acting that could easily become automatic and resistant to reflection or change (Putnam & Borko, 2000). However, as illustrated in Anna' s experience, teacher involvement in collaborative teacher research facilitates professional growth and benefits the school leaders in curriculum and instruction development.

In this dissertation, we did not hold positions of leadership in our respective schools. Teachers voluntarily joined the research project and, by default, we created a

professional platform that helped us grow as educators and forward our thinking to improve classroom instruction. This newly formed professional learning community through teacher research echoes the theoretical and empirical underpinnings of Spillane, Healey, and Parise's (2009) perspective on distributive leadership. Our group expressed commitment to deepen our understanding of student thinking, challenge our common held beliefs about teaching and learning, build pedagogical skills, and renew our commitment to the teaching profession.

The transformation from classroom teachers to leaders of instruction began with the acknowledgement that classroom knowledge is essential to the development of teaching skills. Understanding what it means to do research in the classroom was the first task that we clarified during our collaborative meeting. As a teacher leader, it is important that I have to clarity the ideas of my research and the problems of practice when I go out in public to share my work with colleagues. In our collaborative work, we explicitly discussed ideas that needed to be understood. As a result, we were able to articulate concepts like morphological awareness, inflectional morphemes, base word, and derived words using "teacher language" (e.g., prefixes, suffixes, past tense markers). This is an essential tool to become effective teachers and teacher leaders. We hoped that through critical interrogation of our instructional practice, we could share this knowledge and skills with other special education teachers in our school district when we formalize our

leadership role as instructional coaches, BTSA mentors, or teachers on special assignment.

As teacher leaders, we can advocate for the inclusion of morphology as a form of intervention for students with special education services. The theoretical underpinnings behind morphological knowledge and the data we collected from our classrooms serve as a compelling reason for this instructional reform process. The knowledge that we developed in this study could be a staging ground for district-wide training of special education teachers to incorporate morphology lessons in their language arts. The principles for teaching morphology, teaching protocols, and sample lessons could offer coherent guidelines to support the use of complex reading materials and rigorous academic expectations for students with special needs.

The district adoption of morphological intervention could further scale-up and improve the instructional design. With district leadership support, randomized control experimental design, case studies, and video recording of exemplary teaching could be used to replicate the findings in this dissertation – the final iteration of design-based research. This kind of educational policy recognizes teachers' innovation and creativity, and legitimizes them as intellectuals and knowledge creators. It behooves the school district to channel public money to something meaningful to teachers and relevant to the population they serve.

The process of designing curriculum and instruction through design-based research and teacher inquiry as a district policy is not always simple and linear. It takes multiple years of commitment and resource allocation for this policy to succeed. The district recognizes that the demands of special education teachers are unwieldy sometimes. Therefore, the district could initially tap local universities to provide professional development for teachers interested in classroom research. Experienced teachers who are interested in doing research can be freed from their teaching obligations during the days when they are being trained as teacher researchers. This training could take months. While in training, the teachers integrate the methodological concepts into their classroom practices and continue developing their own local knowledge. As teachers become more adept at the process of doing research, they become the cadre of teacher researchers, ripe for reforming special education curriculum and instruction.

In a wider perspective, teacher research and design-based research respond to the knowledge and practice gap that Ball (2012) charged to the members of the American Educational Researchers Association (AERA) in her presidential address. AERA's mission is to *promote the use of research to improve education and serve the public good* (Ball, 2012, p. 282). According to Ball, one of the reasons why research-practice gap exists is because of "educational practitioners and policy makers very rarely carry out research" (p. 285). To close this gap, she advocates for more cooperation among

researchers, policy makers, and practitioners. This, I think, is where teacher educators initiate the lion's share in order to narrow this gap.

Currently, the quality of teacher education in special education is now being questioned (Pugach, Blanton, & Florian, 2012). Cochran-Smith and Dudley-Marling (2012) cite the Secretary of Education's depiction of traditional teacher education as a "broken system." Currently, the field of special education faces a shortage of qualified teachers to provide services for struggling learners (Billingsley, 2004). Incorporating teacher research or design-based research in the teacher preparation program could help mediate the translation of research into practice. Some schools of education in the country (e.g., California State University Fullerton, Boston University, University of Wisconsin, University of Pennsylvania, and University of Tennessee) have successfully integrated teacher inquiry in their teacher-training program. This shows that research methodological framework can be included in every course in special education, and student teachers could perform a full-blown research project during the final year of their credentialing process. I can only hope to see this in fruition in the near future.

Conclusion

Morphology is an important component of language and literacy development. The growing evidence linking morphological knowledge and morphological awareness to word reading, spelling skills, and vocabulary development is unequivocal. Yet, limited studies have been undertaken to incorporate morphology as an instructional intervention

in special education. The overarching goal of this study has been to develop morphological intervention within the design-based approach. From my own teacher-research to the implementation of design experiment, I have refined and scaled-up the curriculum in four different classrooms in my school district. Based on the qualitative and quantitative results, we have developed local knowledge that informed and improved our practice in teaching morphology to struggling learners. The promising findings in this dissertation bear significant implications to special education literacy practices, instructional equity, and instructional leadership. Specifically the findings suggest morphology intervention could be included in the RTI Model as part of the growing evidence-based practices in literacy instruction. Moreover, knowledge and awareness of morphological structure is a cognitive tool for students with special needs to navigate text complexity. As for instructional leadership, teacher research has the potential to promote leadership from the middle in reforming special education curriculum.

It is high time to revisit the policies surrounding the teaching of reading and writing. As we move forward to the next iteration of literacy policies, scholars and practitioners need to rally around the inclusion of morphology as one key component of reading instruction. I do not intend to argue that morphological intervention is a silver bullet to improve the literacy skills of many struggling readers. In fact, studies have shown that morphological instruction is most effective when paired with other scientifically proven instructional methodology. Despite the study's limitations, the

findings are consistent with the extant literature that morphological knowledge improves students' word reading, spelling skills, and vocabulary.

Finally, this dissertation emboldens teachers' participation to advance knowledge about education through scholarly inquiry. The reflective and reflexive processes of teacher research within the design-based research have led to the creation and the sustainability of local knowledge about morphological intervention in special education. Many researchers have recognized the value of teacher's professional knowledge and their contribution to mediate the gap between research and practice (Ball, 2012; Cochran-Smith & Lytle, 2009; Flippo, 2012; Goodman, 2012). In order to fulfill the utmost goal of improving public education and serving marginalized students, policy makers need to recognize the legitimacy of teacher research, as it possesses the generative power of promoting research knowledge and solving educational problems. This dissertation advocates for and supports teachers as generators and producers of knowledge. Teacher research is a viable road to mitigate educational inequities and problems of practice.

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Appendix A

Word Identification Test - Advanced

Form A

baked	lucky	lover
billed	kinder	racing
decode	patter	winner
unhappy	painful	medical
location	cultural	division
gestured	maturity	majority
finality	vapidity	severity
precooked	bucketful	narrative
radiation	confession	gracefully
attendance	hopelessly	difference
confidence	biannually	probability
transfigure	mismanagement	misinterpreted
unsuccessfully	disorganization	insubordination
unconstitutionally		

Form B

raked	rocky	mover
filled	harder	casing
debone	robber	beggar
unlucky	fateful	musical
emotion	postural	decision
pastured	security	minority
locality	tepidity	serenity
prebooked	wonderful	primitive
situation	confusion	gratefully
ascendance	carelessly	recurrence
preference	bimanually	possibility
transdermal	misgovernment	misrepresented
disrespectfully	miscommunication	unexceptionable
unconventionality		

Appendix B
Pseudoword Spelling Test

Instruction for administration: Provide a lined sheet of paper to the students. You can administer this spelling test individually or as a group. As you read the items, pronounce the pseudowords clearly and at a conversational tone. In each item, you will say the target pseudoword first, read the sentence, and then reread the pseudoword. Do not read the target spelling words slowly or in parts. Stop when the student committed ***5 consecutive mistakes.*** The word inside the parenthesis reflects the possible part of speech that the word functions in the sentence. You do not say these words.

Read this Direction to the student: In this test you will write some words on a sheet of paper that I just gave you. These words are non-sense words. They do not carry any meaning at all. But just like when you spell a new word, sometimes we do not know the meaning of it, and thus, it does not make sense to us.

I will say the nonsense word first and use it in a sentence. I will say it again the second time after using it in a sentence, and I want you to write the correct spelling. Some words will be hard and some words will be easy. I want you to spell the words as best as you can. Do you have any question?

1. The first word is **sebs**. The boy *sebs* in the playground. **Sebs**. (present form of the verb)
2. Spell **atly**. Maria put the glass *atly* on the table. **Atly** (adverb)
3. Spell **unfip**. Johnny helped Mark to *unfip* the gift. **Unrip**. (verb)
4. Spell **rebap**. The students *rebab* the tests for the third time. **Rebap**. (verb)
5. Spell **wokful**. Visitors admired the *wokful* vase. **Wokfu**l. (adjective)
6. Spell **lurted**. My mother *lurted* when she heard the phone rang. **Lurted**. (past form of the verb)
7. Spelling **mibbing.** She was mibbing when her cousin came. **Mibbing**. (progressive form of the verb)
8. Spell **torbing**. I like what we are *torbing* after school. **Torbing**. (present progressive form of the verb)
9. Spell **sorbtion**. The *sorbtion* of the library is in front of the school. **Sorbtion** (noun)
10. Spell **dreepless**. The *dreepless* child left school disappointed. **Dreepless**. (adjective)
11. Spell **creepment**. We are waiting for the *creepmen*t of the news on TV. **Creepment**. (noun)
12. Spell **undervoom**. The class walked by the *undervoom* in the forest. **Undervoom.** (noun)
13. Spell **bicafting**. We like *bicafting* in the summer. **Bicafting**. (verb)
14. Spell **uncaftfu**l. The *uncaftful* girl ignored her friends. Uncaftful. (adjective)
15. Spell i**ntraction**. The *intraction* with other students help me understand the lesson. **Intraction**. (noun)
16. Spell **tarmliness**. His *tarmliness* contributed to the group's success. **Tarmliness**. (noun)
17. Spell **plossingly**. My sister accepted the apology *plossingly*. **Plossingly**. (adverb)
18. Spell **prosnayfully**. She made a *prosnayfully* intricate design for her art project. **Prosnayfully.** (adverb)
19. Spell **unfrodfulness**. The *unfrodfulness* of the boy made the teacher sad. **Unfrodfulness.** (adjective).
20. Spell **misdragmentness**. The teacher's desk shows the *misdragmentness* of her books. **Misdragmentness**. (adjective)

Appendix C
Focus Group Protocol

Thank you very much for coming to this focus group meeting. I know some of you might have seen each other in one of those district meetings, but it might also be the first time for you to meet one of us. For this I would like to start this meeting by introducing yourself to the group, tell us who you are, what grade level you teach, and what your expectations in this focus group (Members introduce themselves).

Before we begin our discussion, I would like to emphasize that whatever we talked about in this meeting, it will be treated with strict confidentiality. I am audio recording this conversation for documentation purposes and for later data analysis. I will also have the transcript available to everybody if you are interested. Additionally, I am video taping this conversation because I am also interested in our nonverbal behaviors, which will help me when I write the narrative for this focus group. If you feel uncomfortable with this, please let me know and I will discontinue the use of any digital recording. (Give the participants a minute to reflect on this)

I would like everybody to feel comfortable and consider the discussion more of a conversation rather than group interview. If you have doubts, questions, or you need to ask some questions for clarifications, please feel free to address that to the person who is sharing. I encourage everybody to participate in the conversation. Also, please turn off your cell phone so we avoid interruption of the flow of the conversation. I have three broad questions to guide our conversations. Everybody will have the time to share his or her thoughts about these questions.

Is there any question or clarification?

1. What is the most important aspect of literacy instruction in your classroom?

   Probing questions:

   a. How do you assess student learning in your classroom?

   b. How do you use assessment to understand your students' literacy development? How do you use assessment to understand your teaching practice?

   c. Have you heard of the term morphological awareness? If yes, when and where?

2. What are some of the instructional challenges you have in teaching children with special needs?

3. What is your idea of classroom research? What does it mean to do research in your classroom?

Appendix D
Curriculum Unit Map

Unit Map for Foundational Skills
Special Day Classes K-8

Unit: Understanding Word Structure (Morphological Awareness)	**Duration: August – June 2014**

Reading Standards: Foundational Skills (K-5)

This unit focuses on the progression of word recognition and spelling skills. Research shows that there is a high correlation between word reading and spelling (cite evidence). While the standards' main objective is to develop phonics and word recognition, developing morphological awareness (i.e., understanding that words have different structures) supports the students' word reading development from 1st grade to 5th grade (or middle school if a child has learning issues). The highlighted words are concepts that directly refer to morphology and morphological awareness.

RS 1.3.f Read words with inflectional endings
RS. 1.4 Read with sufficient accuracy and fluency to support comprehension
RS. 2.3.d Decode words with common prefixes and suffixes
RS. 2.4.b Read on-level text orally with accuracy, appropriate rate, and expression on successive readings.
RS. 2.4.c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.
RS. 3.3.a. Identify and know the meaning of the most common prefixes and derivational suffixes.
RS. 3.3.b. Decode words with common Latin suffixes.
RS. 3.3.c. Decode multisyllabic words.
RS. 3.4 Read with sufficient accuracy and fluency to support comprehension.
RS. 4.3.a Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g. roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.
RS. 4.4 Read with sufficient accuracy and fluency to support comprehension.
RS. 5.3.a Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g. , roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.
RS. 5.4 Read with sufficient accuracy and fluency to support comprehension.

Big Ideas:	**Essential Questions**
Understanding the structure of multisyllabic words (i.e., morphological awareness) helps students develop word identification and spelling unknown/new words. Developing morphological awareness improves vocabulary across content area.	How are words formed? (through compounding and using inflections) How does the meaning of a word change when you add or combine two words (i.e., compounding) ?

Developing morphological awareness promotes tier two and tier three vocabulary (academic language) that are common in the content area knowledge (e.g., constitution, nutrition, radioactive, representative) Developing word recognition and vocabulary builds confidence in reading.	How does the meaning of a word change when you add –es, -s, -ing or –ly? (i.e., inflections) What is the importance of prefixes/suffixes/ Greek/Latin roots in understanding the meaning of unknown or new words? What sources of knowledge do you use to identify multisyllabic words and understand the meaning of unknown words?
Content: Base words Syllabication Compounding Inflections Prefixes/ suffixes Greek/ Latin roots	**Skills:** Identify base words Count syllables Derive words using prefixes, suffixes, and inflections Understand the meaning of unknown words using the knowledge of morphology
Key Terms/Vocabulary: Morphological awareness; Morphology; Inflections; Base words; Prefixes/suffixes; Greek/Latin root words; Compound words; Syllables/syllabication	
Assessments: Formative Assessments: 1. Running records 2. High Frequency words 3. Classroom observations (e.g., informal conversation, classroom talk) 4. Anecdotal/classroom notes 5. Writing sentences/paragraph Summative Assessments: 1. Vocabulary and spelling Pretest and posttest (multiple choice) 2. Morphological awareness Test 3. Structural Analysis Test	
Learning Activities: (Communication, collaboration, creativity & critical thinking) **K-2** Introduce and define the concepts of morphology such as compounding, syllables, base words, and inflections. Underline or highlight compound words on the texts	**Learning Outcomes:** Developing word identification, decoding, spelling, and vocabulary skills. Problem solving using morphological knowledge and information when students

(e.g., stories, poems, sentences strips, and other reading resources). Explicitly teach syllabication by counting the syllables through clapping, using hyphen or slash, and tapping. Use of pictures to develop morphological awareness, by combining different pictures to orally form new words (e.g., thunderstorm, backpack, classmates, classroom, bowtie) Combining words, aided with visual materials, to form compounds (e.g., rainbow, everywhere, anything). **3-5** Review syllables and compound words. Introduce and define the concepts: morphology, prefixes, suffixes, base word. Using foldables, students create compound words. Sort words that have similar inflectional patters (e.g., walked, walking, walks) Highlighting words with inflections, compound words, and affixes on the text. From the list of multisyllabic words, students identify the base words. Explicitly teach meaning of different prefixes and suffixes and how these change the pronunciation and the meaning of multisyllabic words. Deriving words using affixes and inflections (e.g. agree, agrees, agreed, agreeable, agreement, disagreeable, disagreement)	encounter complex words or multisyllabic words. Develop academic language skills through the use of prefixes and suffixes in 3rd to 5th grades. Developing awareness of inflections such as –ly, -es, -ing, -ed to improve word identification and spelling among 1st and 2nd grade SDC students
Resources: Use of technology such as Kidspix and PowerPoint Poetry and literature Use of flip notes	

Appendix E
Sample of Unit Lesson

Unit Lesson: Developing spelling and identification of multisyllabic words using Morphological structures

Rationale: After five months of explicit instructions on breaking word down using their knowledge of prefixes, suffixes, base words, and inflections, the students are ready to expand their ability to recognize complex words using the following morphological structures:

Base word + suffix (e.g., careful, careless, caring, cared, cares)
Prefix + base word + suffix (e.g., disagreement, unsuccessful, disrespectful)
Base word + suffix + suffix (e.g., carelessness, luckily, beautifully, loveliness)
Prefix +base word + suffix +suffix (e.g., uncaringly, unluckily, unwillingness)

Activities: These activities are done successively in different days.

1. The teacher says the words *careful* and *cheerful*. Writes these words on a poster chart. Then call students for examples of words they could think of that use the structure *base word + suffix*. Add these words to the list. (This can also be done using the other morphological structures)

2. Using magazines like Spider, Cricket and Highlights, students read an article and search for words using any of the four morphological structures. Students write these words on a piece of paper or on a foldable they created (see the pictures for details).

3. Show the students the morphological structure: *base word + suffix + suffix* (This can also be done using the other structures). Remind them on the lessons they had on suffixes. Ask students to recall the different suffixes they learned in the last few weeks. Write these suffixes on the whiteboard or on poster chart. The students copy the structure on the front of their two-fold burrito paper. Students and teacher negotiate which words could go with this structure. Write words on the poster chart. Once you have collected sufficient amount of words, students copy these words on a half sheet of paper or on a white board for practice.

4. Assign a student leader to review the words. Student leader points each word and students read them (see the video).

Assessment: A pre- and posttest can be used for word identification or word spelling. Word ID can be administered individually and word spelling can be administered in groups.

Homework: Activity sheets can be sent home to reinforce learning and independent practice.

Appendix F
On-line Survey for Teacher Fidelity of Instruction

1. Within the last four weeks, what kind of morphology instruction have you used in your language arts lessons? (You can choose more than one)

Identifying base words	Prefixes	Suffixes
Compound words	Inflections	Greek/Latin roots

2. How often do you incorporate morphology instruction in your Language Arts Lessons?

Everyday	Three to four times a week
Twice a week	Once a week

3. Approximately how much preparation time do you spend for your morphology lesson per week?

30 minutes	Between 30 minutes and 1 hour
Between 1 hour and 2 hours	Between 2 hours and 3 hours
More than 3 hours	

4. Aside for the materials and lesson plans I share with you, where do you get information and ideas to modify your morphology instruction?

5. On average, how long do you teach morphology in a single session?

Less than 15 minutes	45 minutes to 60 minutes
15 to 30 minutes	More than one hour

6. What component/s of your language arts lesson do you integrate your morphology instruction?

Spelling	Academic vocabulary
Word identification	Reading Comprehension

7. Do you teach morphology incidentally outside your formal language arts instruction? If yes, please describe.

8. What are some of the challenges you encounter in teaching morphology?

Appendix G
Principles of Teaching Morphology

1. Situating morphology lessons through literature and meaningful texts

    - Reading continuous texts and writing are the heart of morphology intervention
    - Use of complex reading materials
    - providing activities that develop morphological knowledge through reading complex texts, word problem solving, selecting words that encourage children's use of morphological structure in their thinking process

2. Direct instruction and explicit teaching of morphological knowledge

3. Morphology Talk: building cognitive structure and schema

4. Meaning and spelling connection

5. Selecting study words using tier-2 and tier3 vocabulary

    - Word problem solving

6. Understanding of grammatical structure through morphology

7. Imbedding digital media and technology to develop morphological awareness