DISSERTATION

DEVELOPMENT AND VALIDATION OF THE TEACHER WRITING TO LEARN SCALE

Submitted by

Mark Perkins

School of Education

In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Summer 2014

Doctoral Committee:

Advisor: Gene Gloeckner

Michael de Miranda
Louann Reid
Alyssa Gibbons

ABSTRACT

DEVELOPMENT AND VALIDATION OF THE

TEACHER WRITING TO LEARN SCALE

Despite numerous efforts by educators and U.S. government agencies to improve the public education system, students continue to struggle with writing, mathematics, science and reading. Researchers and educators have employed a wide range of interventions, but proficiencies are still not at desired levels. One intervention that lacks empirical research is writing to learn (WTL). Social constructivist learning theory and cognitive learning theory of information processing provide an explanation as to why WTL promises to be an effective tool for improving content knowledge and writing skills. Further, the theoretical literature on WTL and the research on general writing mirror such theories of learning. However, despite over thirty years of theoretical and inductive research, little research examines the generalizability of WTL's effectiveness on writing and other content areas.

Before measuring the effects of WTL on students, it is necessary to address teacher knowledge and efficacy of WTL. Therefore, the purpose of this proposed study is to develop an instrument to measure teacher knowledge and efficacy of WTL in the content areas of mathematics, science, social studies and language arts (which includes reading). Using the theories of self-efficacy (Bandura, 1977) and using the literature on effective teaching of writing, WTL and theories of learning.

This study began with item development using the literature and teacher input. Next, experts were used to test content validity and appropriate item response. The result was a six

factor model to be tested empirically. Internal consistency measures using alpha and omega, exploratory factor analysis and confirmatory factor analysis were used to check the response processes of the measure. The scale was correlated with other measures and differences tests were used to examine attributes of respondents.

Results indicated problems with the first, second and last factors. The remaining two factors, perceived relevance of writing to the content and efficacy of teaching with writing showed the best fit indices, though future research is needed to refine them. The final two factors negatively correlated with writing apprehension, positively with teacher efficacy (with little explained variance) and positively correlated with number of years teaching. Difference tests indicate a strong difference between content areas of teachers on both factors and a small difference in efficacy to teach writing given gender. No differences were found between urban, rural and suburban teachers and none were found between middle school and high school teachers.

This research adds to the body of work by developing a measure of teacher readiness to use WTL. However, future research is needed to refine the instrument to a usable state so that intervention research and staff development can use it.

ACKNOWLEDGEMENTS

Dr. Louann Reid provided expertise in the content and asked the tough questions that needed to be asked, questions that often lead me towards veins of gold. Dr. Alyssa Gibbons shared her expertise in measurement, opening my eyes to a whole new way to look at things. Dr. Michael De Miranda has pushed me beyond my comfort zone and right when I finally "got it," his approval meant the world every time. Dr. Gene Gloeckner has my infinite appreciation, admiration and respect.

Dr. Nancy Leech is acknowledged for being my instructor and my mentor and for helping me when I hit roadblocks. Dr. Alan Davis, my advisor during my MA piqued my interested and supported me. Dr. John Cumming is acknowledged for the endless phone conversations. Dr. Michael Marquardt has seen me through many phases of my adult development. His friendship has been a pillar in my life. Burt (Bones) Baldwin, my greatest mentor, is the foundation of this project. He taught what it means to be a teacher and an academic. Judy Walker is thanked for her input and philosophical discussions. Finally, Dawn Hillman is acknowledged for her expertise.

Thanks to the educators who helped with content validation. I keep your names in confidentiality, but you know how you are. I thank Richard Argys for his expertise in writing as well as Dr. Cindy O'Donnell-Allen for hers.

I owe much to Amanda Miller who saw the roots of this journey as they began to take hold and encouraged my curiosity and dreams. She was a pillar of support through those difficult early years of teaching when this dream began. My parents deserve endless acknowledgements.

DEDICATION

To Cora Malinda Perkins and Sarah Elizabeth Perkins:

Your tolerance of my endless rants regarding this project deserves sainthood, ignoring all of your other qualities, which probably merit divinity.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Writing is essential for academic success ("Workforce Investment Act", 1998). Unfortunately, the need for remedial college writing courses is increasing (Sommers & Saltz, 2004). In addition, recent data illustrate that students also struggle in mathematics and science (NAEP, 2011). According to the National Assessment of Educational Progress (NAEP), in 2011, 43% of 8th grade students were proficient in mathematics (NAEP, 2011, p. 2) and 34% of 8th grade students were proficient in science (p. 5). Despite the fact that the 2011 data show improvement in reading since 2009 (NAEP, 2011), the majority of students are still not proficient in mathematics, science, or writing.

One potential way to improve student academic proficiency in multiple content areas is to use writing to learn (WTL) across all academic content areas (Adamson et al., 2006; Grisham & Wolsey, 2005; Maxwell, 1996; Mendelman, 2007; Monroe & Troia, 2006; "New Tools for Teaching Writing," 2008; Richardson, 2008). WTL is when teachers of all content areas (mathematics, science, social studies, English language arts, etc.) use writing in social and cognitive contexts to improve content area learning, challenging a conventionality that content areas are exclusive only to themselves (Fuhler, Farris, & Nelson, 2006; Maxwell, 1996; Rudell, 2001). Limited research suggests correlations between science, social studies and mathematics. A limited amount of research also suggests that deficits in writing may inhibit student abilities in mathematics, science, studies and English language arts (Fuhler, Farris, & Nelson, 2006; Maxwell, 1996). However, the research on this is lacking; therefore, further research is needed to better understand the relationship between writing and other content areas.

However, before implementing WTL in the classroom, teachers must be ready to apply it and this readiness may entail, among other things, a strong knowledge of using WTL in the classroom. In addition, while researchers find support that a willingness to write requires a strong positive efficacy towards writing (Pajaras, 2000; Daly & Miller, 1975), more is needed to test the relationship between teaching writing and confidence in teaching it. Finally, there is a gap in how useful teachers of mathematics, science and social studies feel WTL is in their classrooms. Much research suggests that mathematics, science and social studies teachers have students write less in their classrooms than language arts and English teachers have students write (National Commission on Writing in America's Schools, 2003). Little empirical research exists on teacher knowledge, efficacy and perceived usefulness of using WTL in the classroom. Therefore, the purpose of this study was to develop an instrument to measure teacher readiness to teach with writing in any content classroom. For this instrument, readiness is defined as knowledge of WTL, efficacy of teaching with writing and perceived usefulness of writing. In addition, this instrument asks teachers to report on the extent to which they already use writing. The data gained from this instrument promises to help future researchers and leaders to develop interventions to improve the volume and quality of writing activities in all content area classrooms. Once teachers are better prepared to use writing, future research will be able to test its effects on student content performance, something that is greatly lacking in the literature.

Context of the Problem

United States writing scores indicate room for improvement. Despite over thirty years of literature on WTL, many schools and teachers do not utilize writing in content areas outside of English/Language Arts and many who do utilize writing, lack the training to utilize it correctly

(Ulusoy, 2011, pp. 13-14). Many teachers decrease the rigor of their writing assignments due to student deficits in reading and writing (Zigmond, 2006, p. 265).

In 2011, the National Assessment of Educational Progress (NAEP) assessed students' writing performances. With a sample of 24,100, NAEP (2011) reports 27% of the sampled 8th grade students scored at or above proficient, with only 3% scoring in the advanced range. NAEP 12th grade writing scores mirror those of 8th grade students with only 24% of 12th graders writing at the proficient level with 3% at the advanced level (p. 10).

Even though some of the gaps in gender and ethnicity are slowly closing in writing, these gaps remain statistically significant (p. 13). Boys score lower than girls do and whites and Asians score higher than other groups. Even though boys and many groups have shown growth since 2002, the gap is still wide. For example, in 8th grade, Hispanic and black students scored more than twenty points lower than white students (p. 10) and boys score 20 points below girls (p. 12).

The deficits are not just with writing. Students across the United States also struggle in mathematics and Science (NAEP, 2011). In 2013, 53% of Colorado's 8th graders scored proficient or advanced on the mathematics Transitional Colorado Assessment Program (TCAP) and 34% scored at that level in 10th grade. Further, both grade levels showed gaps in gender and ethnicity with 10th grade girls outscoring boys and 8th and 10th grade white and Asian students outscoring others (Colorado Department of Education (CDE), 2013). Science scores in Colorado are lower than mathematics scores. In 2013, 52% of eighth grade students scored proficient or higher while 51% of 10th graders scored at that level. The difference between genders is one point in eighth grade and two points in tenth, but a larger ethnicity gap is present with Asian and White students surpassing other groups (CDE, 2014). The Common Core Standards (CCS) for

English Language Arts (ELA), which were adopted in 2010, encourage all content areas to support and facilitate school wide literacy programs. This includes writing (p. 6).

Further, students continue to struggle with reading. Although NAEP (2012) reports an increase in reading since their 2009 report, only 37% of students scored at or above proficient in reading (p.3). In 2013, 67% of 8th grade students scored at or above proficient in reading and 70% of 10th grade students scored at that level (CDE, 2013). However, large gaps in gender and ethnicity were present with girls outscoring boys and with Asian and white students scoring much higher than students of other ethnicities (CDE, 2012).

In 2003, the National Commission on Writing in America's Schools and Colleges (NCWASC) published *The Neglected R* which reports that very few teachers receive training to include writing in their classrooms and that very few secondary teachers of non-English/Language Arts content directly teach writing. Many of these teachers want to teach writing, they simply lack the knowledge of how to teach it (p. 23). Therefore, their current practice does little to help their students improve. As a result, the National Commission on Writing recommends that students spend more time writing in all classes along with more writing instruction in all classrooms (pp. 28-29) and more staff development to improve writing pedagogy of teachers of all content areas (p. 32). Further, the commission believes that writing instruction is the responsibility of all teachers (p. 32). .

Statement of the Problem

One potential way to improve the academic areas of mathematics, science, social science and reading is to use WTL in all content areas. Much literature offers theories and some research on the effectiveness of WTL in content areas. Albert (2000); Baxter, Woodward and Olson (2005); Burton (2000); Maxwell (1996) and many other researchers offer strategies to improve

mathematics with WTL. Further, Baker, Barstack, Clark, Hully, Goodman, Kook, et al. (2008); Balgopal and Wallace (2009); Ellis, Teaylor and Drury (2007); Maxwell (1996) and others offer ways to implement WTL in secondary science classes. Bagley (2007), Beery, Heitzmann (2000), Maxwell (2006) and Turner and Kearns (1996), among others, offer ways to implement writing in social studies classes. Finally, the connection between reading and writing is well established as they are both use similar cognitive process and share common base knowledge (Shanahan, 2008).

Even though much research supports the idea of using writing in multiple content areas (NCWASC, 2003), many teachers of content areas outside of English/Language Arts may not feel comfortable introducing writing in their classrooms due to their own self-efficacies of teaching with writing (Bandura & Locke, 2003; Lavelle & Guerra, 2006), their perceived relevance of writing given their content areas and their general knowledge of WTL. Much of the literature on WTL is theoretical, but little empirically tests its effects on student performance in other content areas. In order to study these effects, teachers must implement writing in their content areas. Since many secondary teachers are trained to specialize in one content area (e.g. mathematics) (NCLB, 2001), teachers who do not teach language arts or English may not use in their classrooms.

Research Purpose

A way to measure teacher knowledge and efficacy of WTL across the content areas is needed to help teachers use it in the classrooms. The Teacher Writing to Learn Scale (TWTLS), which is what this research begins to develop, can be used to self-efficacy of teaching with WTL, teacher knowledge of WTL and teachers' perceived relevance of WTL to their content areas. These three constructs of the latent variable of teacher TWTLS have the potential to better

inform teacher training programs, administrators and teachers on educators' abilities and efficacies to teach writing in their classrooms. This tool can thus inform and test interventions and diagnose educators. In addition, it can help to evaluate teachers and programs.

Therefore, the purpose of this dissertation was to develop the TWTLS using classical test theory methods, starting with the development of items, followed by the establishment of content validity and ending with quantitative validity tests using the multitrait-multimethod matrix (DeVellis, 2012). This scale may then be used to impact or recommend intervention.

Research Questions/Focus of Inquiry

The research questions focuses on the development of the instrument and testing its psychometric properties. Chapter 3 goes into more detail on the proposed method of approaching these questions. Appendix A gives a logic model of the research questions, showing the latent variable and its six constructs which include: (a) writing to learn continuum, (b) writing to communicate continuum, (c) perceived usefulness of writing, (d) self-efficacy of teaching with writing, (d) knowledge of writing to learn and (e) use of writing. The first two factors include items that ask teachers to rank specific writing tasks on a continuum between WTL and writing to communicate (WTC). The third construct asks teachers to rank their perceived relevance of writing to their content areas. The fourth asks them to rank their efficacies in teaching writing. The fifth asks teachers to show what they know about WTL. Finally, the last factor asks teachers to report how often they use certain writing tasks. The research questions are the following:

1) Does the TWTLS show evidence of appropriate content?
    a. Do the items represent the theory and literature?
    b. Do the experts find the measure to consist of appropriate content?

2) Does the TWTLS show evidence of response processes?
    a. Do the experts who reviewed the measure respond appropriately?
3) Does the TWTLS show evidence of internal structure?
    a. Does the theoretical structure of the TWTLS match the empirical structure?
4) What are the relationships of the TWTLS with other variables?
    a. Does the TWTLs show evidence of convergent validity with other measures?
    b. Does the TWTLS show evidence of discriminant validity with other measures?
    c. Does the TWTLS show evidence of known-groups' validity?
5) What are the consequences of the TWTLS?

In general, the initial development of the items included an extensive review of the literature on WTL, self-efficacy and each content area of language arts, mathematics, science and social studies followed by consultations with teachers of those content areas. Content validity was established by consulting with experts in WTL as well as educators and administrators. After distributing the survey, item response processes were tested with exploratory and confirmatory factor analyses, reliability was tested with internal consistency tests. The data were then tested for convergent, divergent and known-groups validity using Pearson's Moment Product *r* and parametric and nonparametric difference tests.

Delimitations and Limitations

The instrument development phase of this study is delimited to a sample obtained by accessing public school web sites in a mountain state and emailing teachers listed on those sites. The sample of this study is delimited to teachers of grades six through twelve who work in the state including urban, suburban and rural school districts. Since one main objective of this

research project is to address WTL at these grade levels in the core content areas, the delimitations are thus defined.

In addition, there are several limitations to this study. First, in psychometrics, researchers often attempt to measure latent variables, or variables of which one can conceive, but not necessarily see (DeVellis, 2012). The results of quantitative instruments measuring latent variables in the social sciences should be considered estimates of true score. The instrument that attempts to measure the latent variable is only able to give an estimate of the true value that is thought to exist (DeVellis, 2012; Raykov & Marcoulides, 2011). Therefore, one major limitation of this study is the fact that, regardless of fit statistics and estimates of reliability, there is error. In addition, this instrument is relatively new. Therefore, not much is known about the latent variable. This study attempts to develop items to devise a way to measure that latent variable. This is the first time such has been attempted. It is the first time research has attempted to estimate its value. Because of this, the results should be approached with caution.

There are also threats to internal and external validity as well. External validity is the extent to which we can generalize our research to the theoretical population and internal validity is the extent to which we can be sure an observed effect is related to the dependent variable. (Gliner, Morgan, & Leech, 2008). To strengthen external validity, it is generally desirable to sample randomly and to strengthen internal validity, random assignment of treatment is desirable (Creswell, 2012). Although a large list of teacher emails was used as the sample, this should be considered a non-probabilistic convenience sample (Creswell, 2011) since it was not randomly pulled from the theoretical population. The results of the convergent, discriminant and known-groups' validity tests should also be approached with caution given threats to external validity. The internal validity of these tests are also threatened because these results were not obtained

from any intervention study, no variables were controlled in a laboratory setting and no random assignment. The correlations and difference should be viewed with caution and it is important to consider that these only tested correlations and differences, not causation.

Researcher's Perspective

Developing a new instrument is a difficult process. The most challenging part of the process is, perhaps, item development, especially if the latent variable has previously never been measured. Typically, item development is inspired by theory (Beaden & Sharma, 2003; DeVellis, 2012; Raykov & Marcoulides, 2011). A strong theory informs a strong instrument. However, the process of using theory to develop items is often obscure, particularly if no previous items exist. Fortunately, in the case of this instrument, previously established instruments measure related latent variables. Specifically, there are established instruments that measure self-efficacy of teaching and self-efficacy of writing that were used to develop the efficacy portion of the instrument. Further, established theories inform knowledge of WTL. However, no instrument combines all three constructs of knowledge of WTL, efficacy of teaching WTL and relevance of WTL to a teacher's content area, which is what this research purports to do.

It was necessary to go through a laborious process of item development, beginning with a rigorous item development and construct validity phase. This includes consulting with teachers and other experts related to the instrument to develop and validate the items. After developing the items, I tested the reliability and validity of the scale by deductively testing the factor structure in relationship to theory and by testing the consistency of the scale.

Finally, it should be noted that this research comes after experience teaching writing at the middle school level. I anecdotally found the activity of teaching writing to be immensely

challenging and found that many of my colleagues struggled to use WTL it in their classrooms, regardless of their content areas. Further, my interest is not just writing in language arts and English classrooms (which is the content area that I taught). My interest is to use writing in all core content areas to improve not only writing, but also other content areas. After reviewing the literature and teaching not only middle school language arts students, but also graduate level research methods students, I believe that writing is a tool that can be used to enhance any content area. I also believe (as the literature will support) that this tool is not often utilized. Therefore, as a researcher, I am generally interested in ways to help teachers use this tool in their classrooms to enhance their own content areas. Unfortunately, much research is lacking on how to do this. For me, the first way to meet this need is to develop a tool to help evaluate the effectiveness of staff development. In the future, I would like to research ways to bring writing to other content areas and empirically test such intervention's impacts on teachers and students. Therefore, this dissertation is a small step towards a greater research agenda.

Significance of the Study

There is much literature on WTL, but little of this literature is quantitatively empirical. The latter portion of the twentieth century approached writing as a discipline through a constructivist (Guba, 1990) lens and many writing processes are subjective.

Writing is often used to express logical thinking and/or as a way to transfer information from the writer to the reader. The academic tradition uses writing as a vehicle of conversation between academics and thinkers (Applebee, 1984). Writing is a tool that, in theory, all disciplines can use, like mathematics is a tool used by disciplines such as science and linguistics.

Over forty years of theoretical scholarship have discoursed upon writing as a tool to assist with learning. Since the late 1970s, numerous papers and books have been published, all

dedicated to WTL, which, simply put, theorizes that writing is also a tool for learning, that writing can be used to enhance the content knowledge of students of all ages (see chapter 2). The qualitative literature suggests the potential effectiveness of WTL and even provides strategies to incorporate WTL in all traditional content areas (science, mathematics, social studies and language arts). To be more generalizable, these theories derived from the qualitative research should be tested deductively and very little empirical quantitative literature tests them. In short, most of the literature is theoretical, constructivist and/or inductive.

The research process provides ways to test theory using deductive means. However, before this can be done, there must be a way to measure some aspect of teaching WTL, hence, the need for a scale to measure teacher readiness to use WTL.

This study attempts to make one little step in a different direction for research on WTL. Since public education systems have been held accountable with quantitative data (NCLB, 2001) and since little quantitative evidence of WTL's effectiveness exists, schools and their districts may be neglecting a very powerful tool, this research attempts to take the theory and work that has been done thus far and create a system of measuring teachers. This tool will not measure student outcomes. It will only measure teachers' perceptions of writing tasks on a continuum, their perceived relevance of writing to their content areas, their efficacies of teaching with writing, their knowledge of WTL and how much they use writing. However, if this instrument shows promise, it may lead to further quantitative research that examines WTL and thus help to progress our systems of learning in all content areas.

CHAPTER 2: LITERATURE REVIEW

Overview of the Chapter

This review begins with a historical background of teaching content areas at the secondary level and an overview of theories of learning and thinking and how they relate to WTL followed by an overview of the theories that inform the constructs of the latent variable. As shown in Appendix A, the theoretical structure of the instrument consists of six constructs: (a) WTL continuum, (b) WTC continuum, (c) perceived relevance of writing in the classroom, (d) self-efficacy of using writing in the classroom, (e) knowledge of WTL and (f) use of writing in the classroom. The first two constructs consist of items that ask teachers to rank writing tasks on a continuum between WTL and WTC. The first construct consists of writing tasks that come from the literature on WTL and the second construct consist of WTC tasks. The third construct asks teachers to report how relevant they feel writing are to their content areas. The fourth construct asks teachers to share how confident they are with teaching using writing. The next asks teachers to show what they know about using WTL, and the final construct asks teachers to report how often they use specific writing tasks.

This review first provides an overview of WAC then focus on WTL and its sibling, WTC. Next, it addresses research on WTL, specifically; its use in mathematics, science, social studies and language arts and it addresses common ways writing in assessed in these areas. Next, it provides a review of the literature on the effectiveness of WTL in the content areas. Next, it reviews the literature on self-efficacy narrowing towards self-efficacy of teaching, self-efficacy of writing and writing apprehension.

Figure 2.1 gives a visual of the structure of the review of literature and the theoretical framework. Appendix A gives the theoretical structure of the instrument, which shapes the framework of this section.

Dozens of books and hundreds of peer-reviewed journal articles were read to inform the theoretical structure of the instrument. Most of the books were available at the Colorado State University Library, some through Interlibrary Loan. The journal articles were accessed through Eric, Ebsco, Web of Science and PsychInfo. In addition, several sources were located through the National Council of Teachers of English (NCTE) and the National Writing Project (NWP). The latter provided titles to peer-reviewed publications and books, most of which were relevant to post-secondary education, but some of which were still informative to secondary education. Several government and professional documents including The Nation's Report Card (2007 and 2011) and the Common Core Standards (National Governor's Association, 2010) were located and read.

This review only utilizes literature that was published in a scholarly peer reviewed journal, published in an academic book or a book aimed at teachers, or published by a credible organization such as the National Writing Project (2012). Second, this dissertation only reviews sources that provide the reader logical and feasible strategies to incorporate WTL and/or that include rigorous qualitative or quantitative methods as defined by books by Creswell (2007), Willis (2007), Tabachnick and Fidell (2007) and Morgan, Leech, Gloeckner and Barrett (2013). Finally, the reviewed literature utilizes the strategies of the meta-analysis by Graham and Perin (2007), which is discussed later.

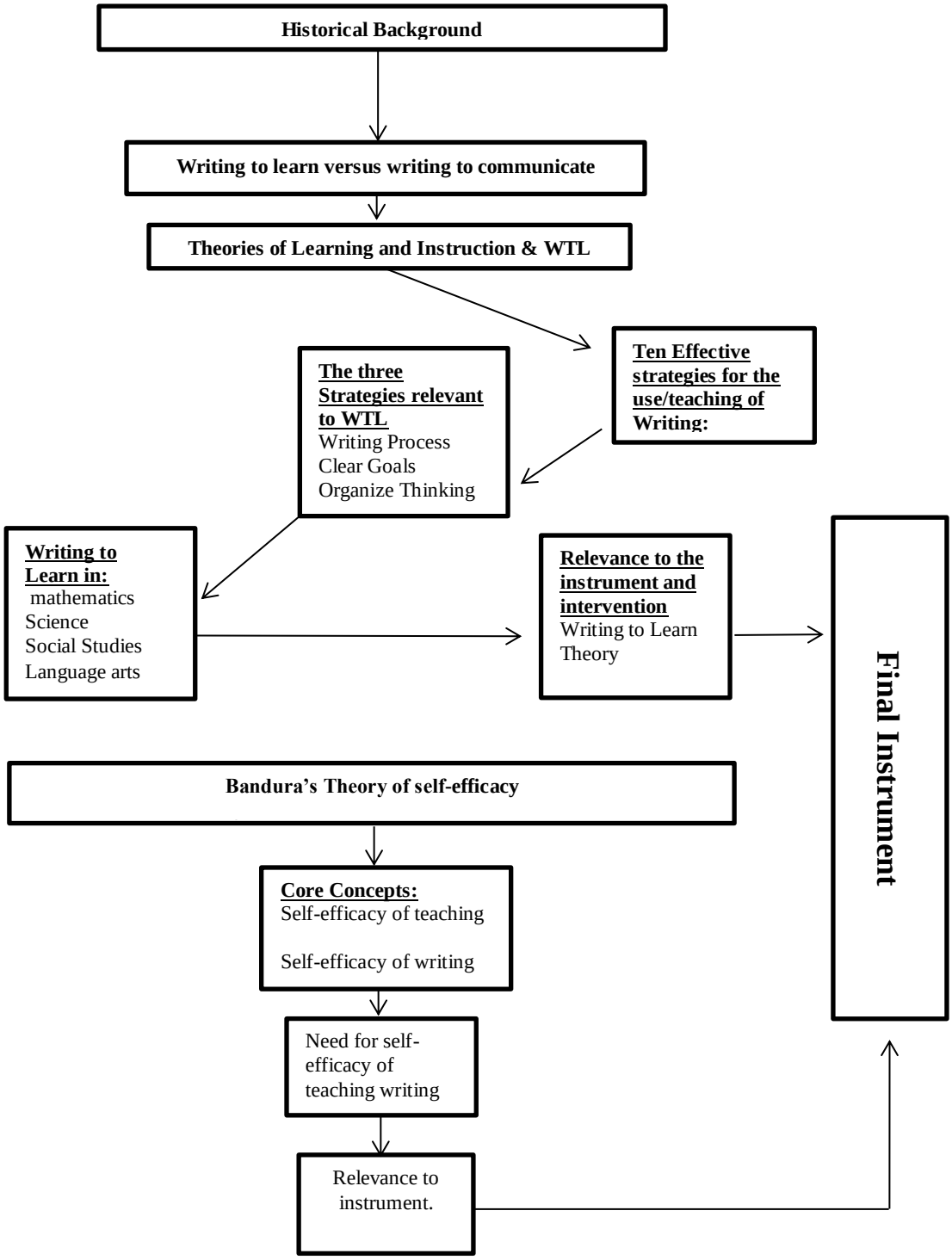


Figure 2.1 A logic model of the literature review and theoretical framework beginning with the historical background and moving to WTL, WTC, theories of learning and then self-efficacy. All of the literature informs the first model of the instrument.

Historical Background

Like many things in the Western tradition, we can trace educational philosophy to the Greeks. Plato, wrote extensively about the content students should learn, specifically stressing the balance between physical fitness, knowledge of music, mathematics and oratory ("Republic," 1998, pp. 112-132). His counterpart, Aristotle, believed in a balance of the arts, politics, mathematics and oratory, writing, "Every art and every investigation, every occupation and pursuit, is believed to aim at some good" ("Ethics", 1913, p. 13).

After the long period of intellectual stagnation of the Medieval period, The Greco-Roman idea that individuals should be strong in multiple areas carried into Enlightenment. For example, John Locke (1779) wrote of the importance of calculation ability, proper grammar and good rhetorical skills (pp. 275-280). John Dewey (1897), who is often classified as a pragmatic philosopher, wrote of the need for a well-balanced and practical education. To Dewey, all content areas were interrelated and strengthening all subjects in pupils promised to benefit the future of such pupils (pp.78-79).

It is therefore arguable that for much of Western history, a desire for pupils to obtain well-balanced educations and the mutually beneficial nature of content areas were widely accepted among scholars and philosophers. This idea, philosophically, probably persists today. However, during the early 20th Century, the U.S. educational system compartmentalized as - schools organized themselves like factories (Boers, 2007, pp. 48-49). Many people in power wanted an education system that reflected the industrial model, which consists of specialized individuals to improve productivity (Boers, 2007). As a result, time was standardized, as were curriculums. Academic subjects and grade levels were compartmentalized, which was a shift from the old schoolhouse model (O'Brien, Stewart, & Moje, 1995, pp. 447-448).

Presently, standardized tests mandated by NCLB (2001) test students in four separate subjects: (a) science, (b) mathematics, (c) reading and (d) writing. These subjects are assessed and scores are given separately by content areas. Students are taught these content areas separately. In elementary school, these are taught at different times of the day, but by the same teacher. In most middle schools and high schools in the U.S., not only are these subjects taught separately, but also by separate teachers who specialize in their content areas. In fact, according to NCLB, content-area teachers are required to have a degree in their content areas, carry enough college credits in that content area, or pass a test in that content area (NCLB, 2001). The idea is that content experts are best at teaching their content areas.

Much theory suggests that certain content areas may be more than just isolated topics. These so-called content areas may actually be tools that are applicable to other content areas. One such content area is writing.

Connecting Writing to Other Content Areas

In the early 1970's a group of researchers began to look for ways to emphasize reading and writing across the curriculum (WAC) (O'Brian et al., 1995, p. 447; Ackerman, 1993). Some researchers and educators were concerned with reading within content areas (Boothby, 1982) and content literacy, which is defined as the ability to engage in reading and writing within the scope of a specific subject (O'Brian et al., 1995; Alverman, O'Brien, & Dillon, 1990; Rudell, 2001). Yet others were interested in how to incorporate writing within content areas (Ackerman, 1993).

In late 1970s and early 1980s, research examined the use of writing within curricular areas other than English/language arts (O'Brian et al., 1995). Authors such as Martin (1976) and Filwiler (1982) gave specific strategies to use writing in content classrooms. Authors such as Freisinger (1982) began to discuss the purpose of writing, expanding from just a tool to inform to

a tool to instigate learning (p. 13). Britton, Burgess, Martin, McLeod and Rosen (1975) mostly inspired these ideas. Specifically, the Britton et al. (1975) theory that writing is a tool for learning inspired much interest in the use of WAC. The idea that writing could be used as an instructional tool as well as a method of communication instigated much thinking about writing's place in all academic content areas (Freisinger, 1982, p. 10). This conversation related to the idea of writing to learn (WTL), which is discussed later in this proposal.

By the mid-1980s and into the 1990s, much research went into WAC and WTL (Fulwiler, 1982; Young & Fulwiler, 1986) as many educators and researchers began to explore writing within core content areas. The areas most explored were social studies, science and mathematics. However, a small body of literature exists on writing in the fine arts and music and a limited amount of literature discusses other content areas.

Currently, key entities in writing and literacy continue to voice the benefits of WAC and WTL. First, the National Writing Project (NWP) has been publishing literature and instigating professional development to improve writing since 1974. Two areas of interest for NWP are WAC and WTL, as the Project has published thousands of reports, books and articles on those topics ("History of NWP", 2012). Many of which are used in this review. In addition, the National Council of Teachers of English (NCTE) is also interested in WAC and WTL and explicitly states that they both help students to master concepts in their content areas (NCTE, 2011, p. 16).

Much of the literature on WAC and WTL is written for the practitioner and therefore is more theoretical than inductively or deductively empirical. Some research does exist on the effectiveness of WTL on student writing and content performance, but very little of it is

generalizable beyond the research sample as it comes from a constructivist paradigm (Lincoln, 1990) and utilizes inductive qualitative methods.

Writing to Learn Versus Writing to Communicate

Unlike writing to communicate (WTC), which is the process of using writing to relay information, WTL employs compositional techniques to explore intellectual content, theory and processes at personal cognitive levels as well as in social spheres and it is less concerned with the precision of the writing product as it is concerned with the process of learning (Applebee, 1984; Bazerman, Little, Bethe, Chavkin & Garufis, 2005). WTC is concerned with the final product, as the main objective is to communicate (Tyninjala et al., 2001). The process of WTL is both social and cognitive. It is social in that students learn content and writing from their peers and teachers. It is cognitive in that students explore content through writing within their brains' own processes. Therefore, proponents of WTL theorize that the process of writing helps students to learn about content (Applebee, 1984, p. 590). Students can use writing as an instructional tool to improve writing and their content areas simultaneously. The primary objective of WTL is to strengthen content areas more than or equally to the strengthening of writing (Applebee, 1984). Writing to learn owes its theoretical framework to social constructivism theory and cognitive theory. Both will be examined respectively.

Social constructivism. According to social constructivists like Vygotsky (1962, 1978) and Bruner (1960), human beings learn in social contexts, that humans shape reality in group contexts and the nature of the environment and the group thus shapes the nature of knowledge. Students learn in social environments that encourage peer interaction towards learning but that also provide age-appropriate learning goals (Vygotsky, 1962; Vygotsky, 1978). In addition, a

student's culture, according to social constructivism, shapes that student's cognition and the collection of individuals' cognitions shape the culture (Woolfolk, 2005, p. 316).

This foundational belief of social constructivism shapes the foundation of WTL, which purports that writing can be used as a tool to instigate learning. Since writing is a social activity, or an activity of conversation and discourse, social factors strongly influence WTL and many WTL activities employ methods of social learning (Applebee, 1984). In short, the processes of using WTL often involve group work and social contexts wherein the student uses his/her writing as a way to explore the shared meanings and knowledge of content areas.

Cognitive theory of learning. Cognitive theorists see writing as an activity of self-exploration in which students consider problems and ideas given the thinking required while writing (Tynijala, Mason, & Lonka, 2001, p. 9). Stemming from Gestault psychology, cognitive learning theory views learning as an internal process of the brain, in which the student employs cognitive tools like working memory and processing to learn (Woolfolk, 2005). Vygostsky and Piaget, both social constructivists, also built upon cognitive theory with their work in cognitive development (Woolfolk, 2005, p. 316). However, cognitive theory later expanded from developmental theory to theories of learning. One major premise of cognitive theory is that knowledge is learned and learning changes behavior (Woolfolk, 2005, p. 228). However, before changing behavior, students must take information, process it, store it and retrieve it when it is needed. This process depends on sensory memory, working memory and long-term memory. Sensory memory transforms stimuli into information. Working memory temporarily stores that information so it can be processed. Long-term memory is information that is stored over long periods of time for frequent access (Woolfolk, 2005, pp. 233-236).

Figure 2.2 gives an overview of the information-processing model of cognitive learning theory. As shown in the figure, once stimuli enter the executive control (which guides thought and actions), working memory acts as a mediator between sensory memory and long-term memory. In addition, long-term memory is affected by implicit memories when they interact with knowledge and knowledge changes one's perception during the sensory memory phase. In other words, memories affect the way in which we store information over the long-term and new knowledge affects the way in which we perceive new stimuli (Woolfolk, 2005, p. 231).

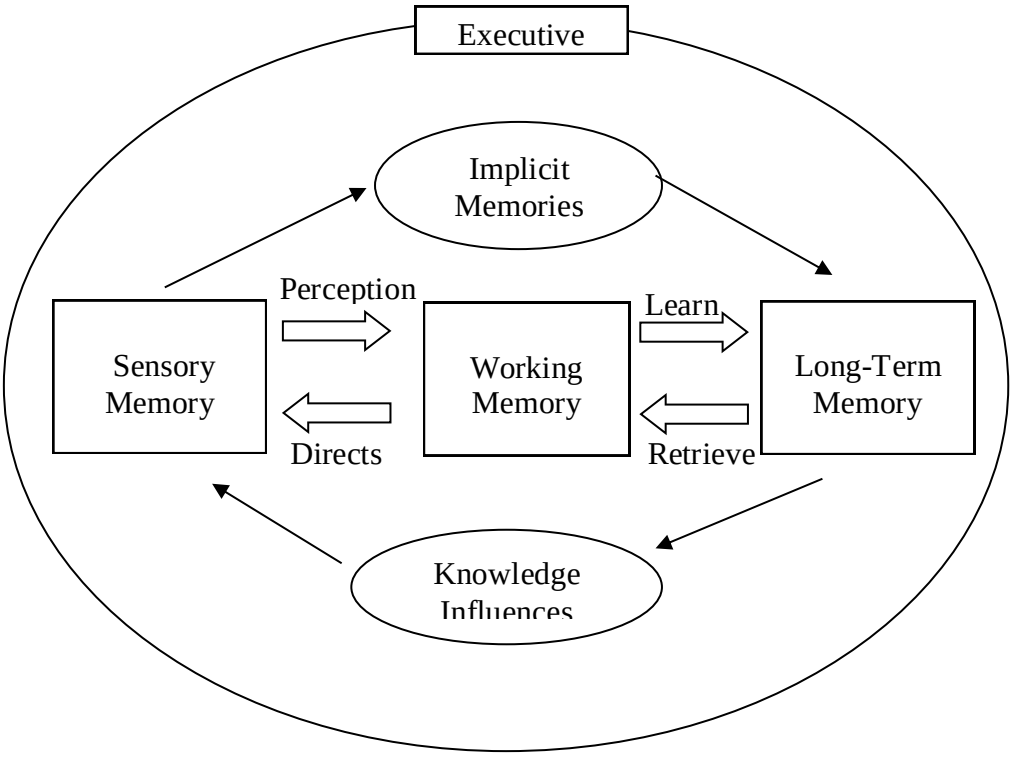


Figure 2.2. The Information Processing Model, which illustrates that stimuli may undergo a variety of processes before being stored as long term memory, and that cognitive processing is not linear (Woolfolk, 2005, p. 234).

According to theorists such as Moshman (1982), knowledge is constructed by both internal and external sources where external sources represent social constructivism and internal sources represent cognitive theories. As shown on figure 2.3, external sources include things such as teacher feedback and social influence whereas internal sources include activities such as

transforming information and accessing previous knowledge. Many believe that both the internal and external sources interact to construct knowledge (Woolfolk, 2005, p. 316). Such ideas lead to social cognitive theory, which is interested in the way social interactions influence cognitive processes (Bandura, 1977; Woolfolk, 2005).

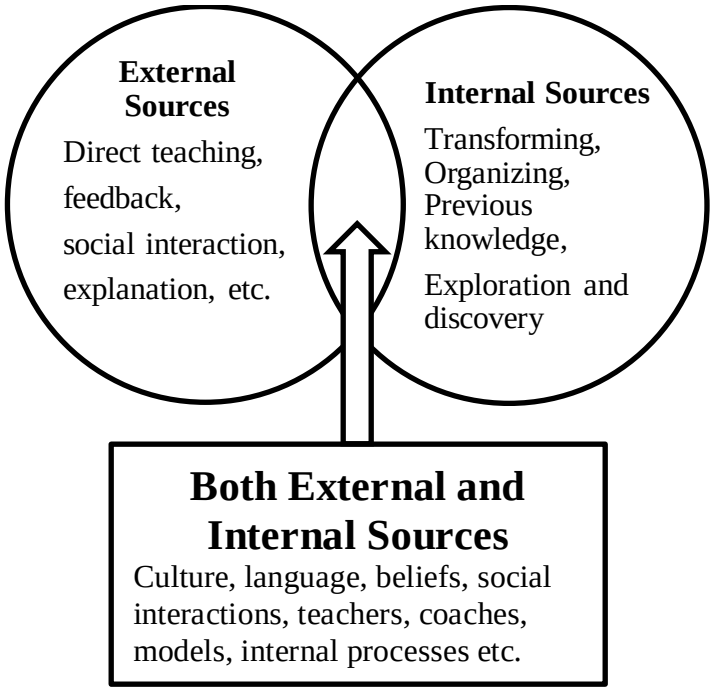


Figure 2.3. Model of learning including external sources (social theory), internal sources (cognitive theory) and the interaction of the two.

Bloom's taxonomy of thinking. Not only is WTL an instrument to learn content or knowledge, but it is also a tool that can be used to tap into different levels of thinking (Applebee, 1984). Educators have long known that academic tasks require different levels of thinking; some tasks require "higher" levels of thinking than others do. One of the first psychologists to categorize thinking skills was Benjamin Bloom (Bloom, 1956). Bloom categorized the levels of thinking in a pyramid. Figure 2.4 shows the different thinking skills according to Bloom's first model. According to Bloom, students first acquire knowledge through repetition, memorization, listing and other learning tasks. Next, they comprehend information through discussion,

description, or explanation. Students apply that information by demonstrating and interpreting what they have learned. Finally, at the three highest levels, students break apart, connect and judge information.

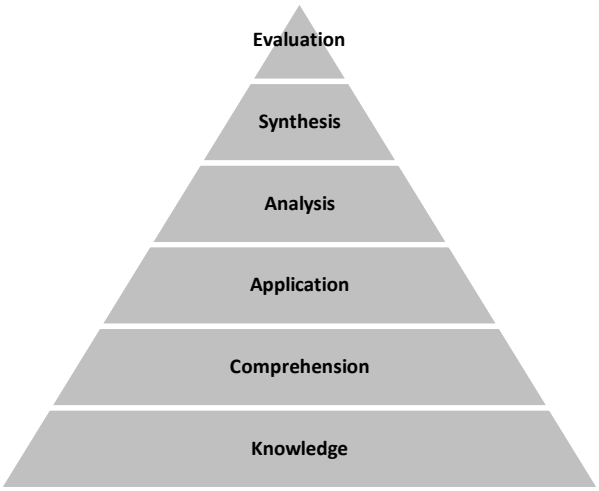


Figure 2.4. Blooms original taxonomy of thinking skills, which includes evaluation as the highest skill (Bloom, 1956).

This interpretation of thinking continued until the 1990's until Bloom and one of his students Anderson, revised the model (Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths, & Wittroc, 2001). Figure 2.5 gives the new cognitive taxonomy, which replaces "knowledge" with "remembering", "comprehension" with "understanding" and "application" with "applying". In addition, the new taxonomy no longer includes "synthesis"(Coffey, 2010). Examination of the new taxonomy illustrates that thinking skills vary in type and difficulty. The simplest skills are at the bottom and increase in difficulty as one moves up the pyramid. In addition, these skills are directly applicable to state standards (Krathwohl, 2002). According to Bloom and Anderson, students think at different levels and these levels vary with difficulty (Krathwohl, 2002). Educators often want their students think at the higher levels of Bloom's model, but, this is often very difficult until students are able to fist think at more basic levels (Bloom, 1956; Krathwohl, 2002; Coffey, 2010) .

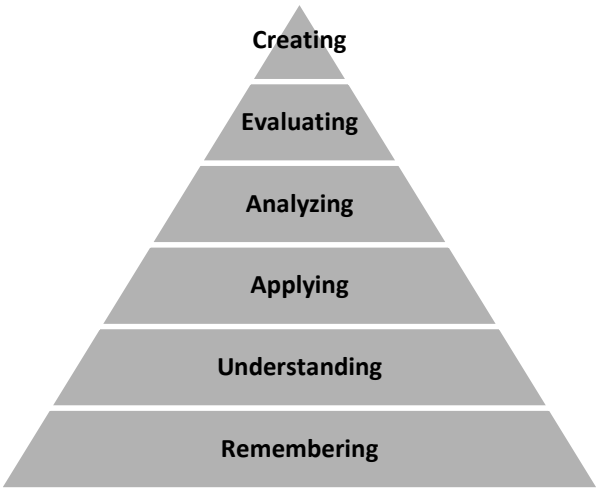


Figure 2.5. The new cognitive taxonomy according to Bloom and Anderson which includes creating as the highest skill (Coffey, 2010).

Time and learning. Whether learning occurs socially, cognitively, or a combination of both, the individual student needs enough time to learn the content material (Berliner, 1990). One of the first researchers to examine the relationship between time and learning task was Carroll (1963). Carroll purports that an individual students' success in a learning task requires that student to spend the correct amount of time learning that task (p. 725). In other words, for any learning task, there is a specific amount of time needed for each student to master that task. However, Carroll quantifies this with five variables. These are: (a) aptitude, or the amount of time an individual needs to learn a task under ideal conditions minus prior learning, (b) a student's ability to understand instructions, (c) the quality of instruction a student receives, (d) the amount of time a student spends learning and (e) a student's level of perseverance, or the amount of time a student is willing to spend learning the task (pp. 727-728).

Because of these factors, Carroll (1986) represents time as a function of learning, this $\textit{Degree of learning} = f\left(\frac{time\ actually\ spent}{time\ needed}\right)$ (p. 730). If the amount of time a student actually spends learning under ideal conditions equals the amount of time that student needs, the resulting ratio

of learning is 1.0. Since time needed never changes, the only way to alter the results is to provide students with enough time to learn under ideal conditions (Carroll, 1963, p. 730).

Berliner (1990) further analyzes the idea of instructional time into nine parts. These are shown on Table 2.1. As shown on the table, a variety of classroom elements impact learning time and these elements may interact with each other. For example, learning time may decrease with an increase of transitional time.

Berliner expanded upon Carroll's formula in equation 2.1 (Berliner, 1990, p. 16). Berliner better describes factors of actual time spent in the numerator of his formula and he changes the denominator from Carroll's 'time needed' to a more complex model of an interaction between aptitude, quality of instruction and ability to understand. He thus proposes that mastery learning occurs when students are provided with sufficient time to learn and when the quality of instruction is high.

Table 2.1

Berliner's (1990) Analysis of Instructional Time, Elements and Definitions

Element	Definition
Allocated Time	The time provided for student instruction and learning (p. 4).
Engaged Time	Time students appear to be paying attention (p. 5).
Time-on-task	The time students spend on a particular task (p. 5).
Academic learning time	Time in a specific subject matter (p. 5).
Transition time	Time switching to other tasks (p. 5).
Waiting time	Time that student spends waiting to receive help or instruction (p. 6).
Aptitude	Amount of time a student needs (p. 6.)
Perseverance	Time student is willing to take (p. 6).
Pace	Amount covered in a certain amount of time (p. 7).

$$\textit{Degree of learning} = f\left(\frac{\left(\begin{array}{c}\textit{opportunity}\\ \textit{to learn}\\ \textit{or}\\ \textit{Time allocated}\\ \textit{for learning}\end{array}\right) X \left(\begin{array}{c}\textit{Perserverence}\\ \textit{or}\\ \textit{Percentage of time}\\ \textit{actually}\\ \textit{spent engaged}\end{array}\right)}{\left(\begin{array}{c}\textit{Aptitude}\\ \textit{or Time actually}\\ \textit{needed to Learn}\end{array}\right) X \left(\begin{array}{c}\textit{Quality of}\\ \textit{Instruction}\end{array}\right) X \left(\begin{array}{c}\textit{Ability to}\\ \textit{understand}\\ \textit{instruction}\end{array}\right)}\right) \quad [2.1]$$

Finally, Berliner identifies four variables of academic learning time (ALT). These include: (a) allocated time, (b) engaged time, (c) success rate and (d) alignment of curriculum with measures (p. 18). Figure 2.6 gives an overview of the interaction of factors of time and their relationship to learning as given by Berliner (1990, p. 19). As shown in the figure, high success most likely occurs when students are provided with plenty of time to engage with materials related to outcomes (Berliner, 1990, p. 19). Therefore, allocated time is an important factor, but that time is only useful if students are also using that time while interacting with appropriate materials, instruction and foci.

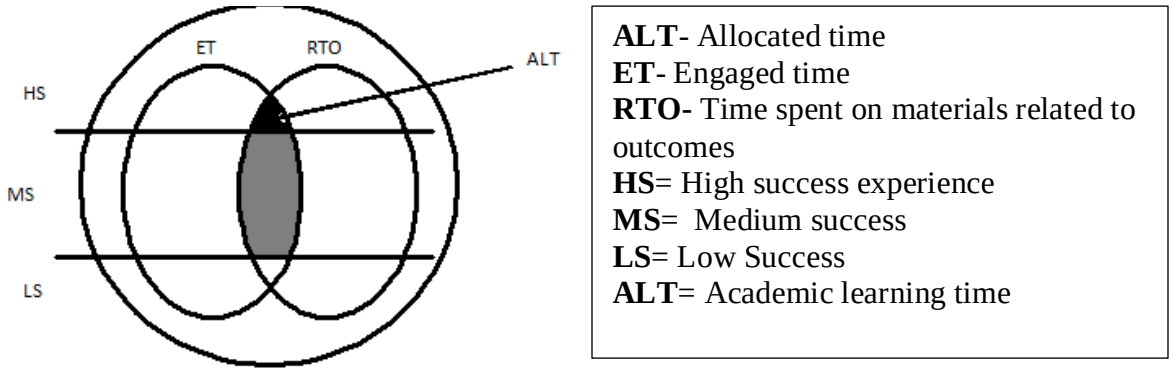


Figure 2.6. Relationship between learning success, time and activities (Berliner, 1990, p. 19). As shown, the highest success of learning occurs with maximum time spent on related materials, and with maximum engagement time.

Since the publication of Carroll's paper, much research has examined the relationship between time and classroom instruction and it all overwhelming supports the idea that quality time is essential in improving student learning. Gettinger (1985) found that students who had less learning time performed lower than students who received optimal amounts ($p.<.05$). Anderson

(1976) found that time needed to learn could be altered by also altering effective teaching and that student qualities also influence time needed. This finding relates to the Berliner model. A meta-analysis by Tobin (1987) found that increasing wait time also increases student learning. Researchers like Zuriff (1999) and Ofiesh, Hughes and Scott (2004) stress the importance of learning time and testing time for students with special needs.

The influence of time in student learning is an intuitive, yet well-researched area. Given the framework of Carroll (1963) and Berliner (1990), it is logical to conclude that correctly implementing WTL will not only increase student writing time, but may also increase the quality of student learning time in the content areas. However, as the work of Berliner suggests, this time should be well spent and students should benefit from quality instruction. The following sections will give an overview of using WTL in the content areas. Finally, even though this research does not purport to study students, it is important to understand the theories behind WTL and why it is effective at teaching students content and writing skills

The Effectiveness of Writing to Learn on Core Content Areas

Many authors acknowledge the lack of empirical evidence on the effectiveness of implementing writing to learn, specifically on its ability to improve content area knowledge when content areas are defined as mathematics, science, social studies and language arts. For example, Ackerman (1993) discusses that much research reports on the effects of WTL, but there is a lack of congruence and consistency. This study also observed that most empirical research on WTL was conducted on college students (p. 353). A meta-analysis by Bagert-Downs, Hurley and Wilkinson (2004) explored 48 empirical articles attempting to measure the effectiveness of writing to learn by calculating pooled effect sizes. Their results indicate that writing to learn

produced small positive effects on school achievement ($d \leq .04$) and that giving students more time to write resulted in cumulative positive effects in content areas and in writing.

Most of the articles reviewed by this meta-analysis used college students as participants and thus their content courses. The second most common article reviewed by the meta-analysis included elementary student participants. Therefore, to examine the research on the effectiveness of WTL on secondary students, the studies in the meta-analysis were located and examined separately. This resulted in three dissertations. Two of these (Johnson, 1991; Kasparek, 1993) examined the effects of writing on algebra and one (Willey, 1988) examined the effects of WTL on student attitudes. All of these studies examined high school.

Johnson (1991) used staff development to inform teachers on how to have students write essays on mathematical development. Using analysis of covariance (ANCOVA), he found a statistically significant difference between the pretest and the postest ($p.<.0001$) of the treatment group and a statistically significant different between the posttest score of the treatment group and the comparison group. Bangert-Downs, Hurley and Wilkenson (2004) calculated an effect size d=.55. This study may be problematic because it does not use random sampling and it does not use a third wave of data on the dependent variable of algebra. Therefore, threats to internal and external validity are strong.

Kasparek (1993) tested the effects of writing to learn on algebra performance. Specifically, students were asked to write about the concepts they were studying. Results indicated mixed results. However, Bangert-Downs, Hurley and Wilkenson (2004) calculated an average effect size of d=.37 for statistically significant results, which mostly consisted of differences between chapter tests for the treatment group in contrast to the comparison group. This study's mixed effects and the general simplicity of the methods and sampling, lend many

avenues to problems with internal and external validity. The mixed results demonstrate an inconsistency on treatment effects that are not well explained by the dissertation.

Finally, Willey (1988) studied the effects of WTL on high school students' attitudes and achievement and found statistically significant differences in science abilities and attitudes towards science between students who use WTL in science and students who do not. Bangert-Downs, Hurley and Wilkenson (2004) calculate a large effect size of $d=1.48$. Willey (1988) also studied social studies in the same dissertation and found statistical significance, but the effect size was low (.04).

The lack of literature on the effectiveness of WTL provides researchers with a gap to explore. Further, much this research is outdated and often fails to implement WTL ideas. For example, a part of Willey's intervention was to implement the entire part of the writing process, including feedback. This is contrary to the theoretical suggestions of Applebee (1986).

Effective Teaching of Writing

As will be shown, much literature examines the effective strategies to improve writing and another body of other literature offers ways to bring WTL into content areas outside of English and Language Arts. The literature of combing general writing strategies and content areas to improve both writing and content areas lacks quantitative empirical evidence, which leaves even less empirical evidence of the effectiveness of WTL. Further, there is a gap in the literature about teacher knowledge of WTL, perceived relevance of writing and efficacy of using writing across the content. Therefore, this section presents the evidence on effective teaching of writing and the literature on using WTL in the content areas. Finally, it narrows the focus to WTL in the content, which informs the theoretical structure of one of the proposed instrument's constructs, as illustrated in Appendix A.

A meta-analysis on effective writing by Graham and Perin (2007) examined 123 quantitative empirical research articles, ranging from the 1980s to 2006, on effective writing strategies. After calculating average weighted Cohen's *d* effect sizes, they found ten interventions that help with writing. The literature on WAC and WTL consistently mentions three of these strategies, thus providing an area of overlap for the development of my instrument. These effective strategies are shown in Table 2.2, which also emboldens the strategies that are found in the WAC literature.

Table 2.2

The ten most effective strategies to teach writing, their pooled effect sizes, connectedness to WTL literature (Graham & Perin, 2007, pp. 466-467)

Strategy	Pooled Effect Size Range	Found in WTL Literature?
Teach students the writing process, which includes planning, drafting, editing and rewriting.	.5 to 1.3	**Yes**
Have students summarize their reading materials.	.70	**Yes**
Allow students to collaborate.	.75	No
Give students clear goals and purposes for their writing.	.70	**Yes**
Allow students to word process when writing.	.55	No
Have students practice writing complex sentences.	.50	No
Provide professional development to teachers specifically about the writing process.	.46	No
Sharpen students' skills of inquiry.	.32	No
Allow students to gather information to organize their thinking.	.32	**Yes**
Provide students with Good Models of writing.	.25	No

Given the meta-analysis of Graham and Perin (2007) as well as the literature on writing in specific content area writing, effective teaching of writing converges with WTL in three ways: (a) the writing process, (b) clear goals and purposes and (c) gathering information. These strategies, given the literature on WTL, are applicable to the core content areas at the secondary level, which includes mathematics, science, language arts and social studies.

Using Writing to Learn in Content Areas

Three of the ten suggestions made by Graham and Perin (2008) to improve writing are found to be applicable in the WAC and WTL literature. Therefore, the purpose of this section of the framework is to examine specific pedagogical tools that are found in the literature to implement WTL. These tools not only inform the instrument, but these tools will also be relevant to the intervention that is pilot tested.

Langer and Applebee's early work (1986) offered three general suggestions when utilizing writing to learn. First, teachers should facilitate writing, but not evaluate it (p. 185). Second, students must have ownership of their writing (p. 186). Finally, teachers must provide students with opportunities for collaboration (p. 187). Klein (1999) offers similar suggestions in his review of literature, adding that students should be provided with opportunities to express themselves in journals regarding their learning journeys (p. 214), students should be provided with opportunities to rewrite (p. 235) and students should use goals to guide their thinking about content and writing while writing (p. 251).

The suggestions of both Klein and Applebee synthesize with the literature on effective teaching of writing and stem from a wide body of research and authors on writing to learn. However, he expressively mentions that all of the given strategies lack adequate empirical evidence (p. 204). The lack of quantitative research on the effectiveness of these strategies

provides opportunity to fill gaps in the literature. Nevertheless, the following section will give an overview of how to implement WAC and it will distinguish the elements that are specific to WTL since not all WAC strategies conform to the theories of WTL.

Each of the writing strategies that overlap with the WAC literature as well as the literature that merges that content area with the strategies to effectively use WTL given the overlap with Graham and Perin (2007) are addressed respectively. Under each section that addresses a writing strategy, I will give general pedagogical methods and tools that use WTL.

The writing process. Gram and Perin (2007) found that one of the most important interventions to improve writing is to give students more opportunities to plan, revise and edit their work. This is known as the writing process. Table 2.3 gives an overview of the writing process. The writing process includes eight stages: (a) Outlining and/or preplanning, (b) first draft, (c) self-edit, (d) second draft, (e) peer edit, (f) third draft, (h) teacher edit and (I) final draft. Any or all of these steps may be used given the context of the writing assignment (Maxwell, 1996). In addition, these steps are not necessarily linear. Flower and Hayes (1981) introduced a cognitive process model, that includes all of those steps as well and the cognitive processes discussed later in this dissertation. In this model, writers may move between the planning, drafting and writing stages in non-linear ways (pp. 375-377). Several texts on writing iterate the process of writing and its effectiveness in improving student writing is well-established and validated by Gram and Perin (2007) whose meta-analysis showed this strategy to have a medium to high effect ranging from .5 to 1.3 (p. 466).

Language arts classes utilize all elements of the writing process when students write to communicate (Hillocks, 2006). In addition, it is possible to implement two of these elements in other content areas when students write to learn (Applebee, 1984). Table 2.3 shows all the steps

of the writing process. As shown on the table, all of these steps are relevant when students write to communicate. However, the first two are the most relevant when students write to learn (Applebee, 1984).

Table 2.3

*The steps, descriptions of the steps and tools of the process of drafting and editing**

Step	Description	Tools	
Outlining/ Pre-planning	Students begin to think about their initial ideas. They begin to think of the foundation and skeleton of their writing pieces.	• Webbing/Mapping • Brainstorming • Outlining • Any graphic organizer	---Relevant to WTL---
Rough Draft	Students compose first drafts.	• Their outline or graphic organizer • A comfortable place to write • Appropriate writing tools	
Self-edit	Students edit their own work using the traits the teacher will use to assess their final drafts.	• A copy of the traits to be used to evaluate the student • Their draft	---Relevant to WTC---
Second Draft	Students write second drafts after using their self-editing suggestions.	• See rough draft's tools	
Peer Edit	Students have their drafts edited by a fellow student. It is important that the editors know the system and honor the work they are editing.	• A rubric on how to assess the traits • A copy of the students' work	
Draft	Students write their next drafts using their peers' suggestions.	• See other draft's tools	
Teacher edit	The teacher edits the students' drafts. The teacher should not grade beyond the pre-established expectations.	• Rubrics • Established expectations	
Final Draft(s)	Students write final drafts given the teacher's editing input.	• See other drafts	

Using planning platforms in conjunction to writing has been shown to improve student writing and content knowledge by using the first steps of the writing process as shown on table 2.3. Such things may include graphic organizers or other guided organizational structures to help students plan what they are going to write (Maxwell, 1996; Flowers & Hayes, 1981). Pugalee (2004) found that students who were required to plan and reread mathematics writing assignments were more successful at mathematics content and at writing than students who did not go through these processes. McCarthy (2008) used a four-square planning technique with pre-service teachers to introduce the writing process to elementary students. Science teachers can use templates and other means to have students write about the several steps of the scientific process (Penrose & Katz, 2006, pp. 76-77; Yalvac, Smith, Hirsch, & Birol, 2006). Planning platforms in science can also be improve communication of science ideas (Syh-Jong, 2007), science concepts (Rigano & Duane, 2008) and to improve science writing content accuracy (Rijlaarsdam, Couzijn, Braaksma, & Kieft, 2006). Social studies teachers can use planning platforms to help students better understand concepts in history, geography, psychology and other social studies areas (Ediger, 2000; Maxwell, 1996; Giroux, 1978) and in Language Arts class (Graham & Perin, 2007; Marzano, 2009; Maxwell, 1996).

Clear goals and purposes. One of the most important aspects to any assignment or lesson is clear goals and purposes (Marzano, 2009). Clear goals include specific points to which students strive to learn and writing may assist with these. These points are aspects of the writing piece that will be evaluated (Grisham & Wolsey, 2005). Purpose of writing includes elements such as the intended audience and/or the general topic. The advantages to writing for clear purposes and with clear goals is supported by Graham and Perin (2007) who found a medium-high average weighted effect size of (d=.70) from studies that examined the effects of when

students write with goals and purposes for student writing (p. 467). Content areas provide students with contexts and these contexts often have clearer goals and purposes than the goals that come from writing literature or in language arts/English class (Maxwell, 2006).

Graham and Perin (2007) strongly suggest that teachers, "Set clear and specific goals for what adolescents are to accomplish with their writing product, this includes identifying the purpose of the assignment as well as identifying the characteristic of the final product" (p. 467). Core content areas each offer unique opportunities for students to approach writing in different contexts given the nature of the specific class. The literature provides several strategies that address the recommendations of Graham and Perin core content areas. However, like the previous goal of the writing process, this literature is thin, lacks empirical evidence and is more extensive for social studies and science than it is for mathematics. The limited amount of literature for mathematics is inductive and qualitative. All the ideas from all of the content, inductive or not, offer suggestions which can be used to develop an intervention which can then be tested deductively and inductively.

Implementing clear goals and purposes, although not a clear and specific strategy, likely requires the teacher to be thoughtful about for what the teacher wants the student to use WTL. A clear goal or purpose may pertain to a mathematics content knowledge goal. For example Baxter, Woodward and Olson (2005) asked students to explain the concept of "ratio" in writing (p. 125). Pugalee combines goals with journals and emphases that teachers should use journals to communicate specific content goals as writing prompts and Maloy, Edwards and Anderson (2010) asked students to transform mathematics formulas to story problems.

Science classes give students opportunities to write for clear goals and purposes. This is because like social studies, science provides studies with various contexts for their writing. As

Grant and Fisher (2010) state, writing for science is different than writing for other disciplines and these differences present novel goals and purposes to which students can practice the skill (p. 62). The Colorado Model Content Standards for Science (2010) require students to master the following: (a) Critical thinking and reasoning, (b) information literacy, (c) collaboration, (d) self-direction, (e) invention (p. 23). Critical thinking requires students to justify their findings based on evidence given the goals and purposes of their inquiries. Further, collaboration requires students to participate in the scientific conversation as consumers and producers of science. Finally, invention requires students to draw upon their experiences to create new ideas and scientific products. Writing within the context of these requires students to consider the goals and purposes of their scientific inquiries and investigations.

Yalvac et al. (2006) found that when engineering students wrote their inquiries after they established a method of clear goals and purposes, those students had better engineering products and better writingv($p<.05$) than group of students that had no system of goal setting (p. 72). Ritchie, Rigano and Duane (2008) articulated clear goals and purposes to much younger student writers. These students produced stories about scientific phenomena and the practitioner found their understandings of science and their writings to be satisfactory (pp.149, 164). Novak, McNeil and Krajcik (2009), Butler and Nesbit (2008) and Rijaarsdam (2006) all found that articulation of goals and purposes to assist students with science writing projects such as manuals and science notebooks improved their science and writing performance. Finally, Gunel (2009) suggests that science teachers should be aware of state writing standards and articulate goals and purposes before assigning science writing.

Practitioners and researchers support the use of writing in social studies when the teacher uses clear goals and purposes. Boyer (2006) and Ediger (2000) discuss how teachers can design

lessons to implement writing in social studies classrooms. Fry (2009) discusses the importance of giving clear goals on specific topics of writing, especially when using multicultural sources. Tancock (2002) writes about the extensive use of technology to research and plan writing after giving the students clear goals and purposes. Finally, Maxwell (1996) provides teachers with several resources for goal and purpose setting for writing in social studies.

Opportunities gather information to organize thinking. It is important for students to learn to organize their thinking before, during and after writing. Graham and Perin (2007) found this intervention to yield a low to medium average weighted effect (*d*=.32) on student writing (p. 467). Although this effect is not as strong as the previous two strategies, it is still statistically significant in helping students improve their writing and many content areas provide opportunities for it. Generally speaking, it is helpful for students to organize their thinking prior to writing. This phase of the writing process is often called preplanning or outlining (Alber-Morgan, Hessler, & Moira, 2007). Therefore, this strategy to improve writing is also a part of the writing process, which was mentioned first. Nevertheless, given the meta-analysis, as well as other texts on teaching writing, this specific strategy is important to consider separately (Maxell, 1996).

Mathematics often includes processes of step-by-step calculation and procedural understanding of concepts (Maxwell, 1996, p. 86). Baxter, Woodward and Olson (2005, pp. 121-122), Hamdan (2005, p. 606) and Koirala (2002, pp. 7-8) had students use mathematics journals to organize their thinking about complex mathematics concepts. Pugalee (2004) found that giving students opportunities to organize their thinking in writing prior to writing about the mathematics process benefits their mathematics and their writing. McCarthy's (2008) study of the use of a graphic organizer to teach elementary students how to write mathematics and Burns

and Silbey (2001) suggestion that mathematics teachers use planning organizers to help students write about problem solving both illustrate that mathematics gives students a process of thinking that is applicable to writing.

Writing science often requires students to generate questions and hypotheses, articulate their procedures, report results and draw conclusions from the results (Penrose & Katz, 2004, pp. 40-83). Scientific write-up is not the only form of writing in science and the literature points to several instances, including experiment writing, when science can support the organization of thinking in writing. Grant and Fisher (2010) give several examples of handouts and activities that help students put their thoughts in structured settings to begin the writing process for science. Rijlaarsdam et al. (2006) required students to organize their thinking before writing in their experiment manuals to help students in their science compositions. Hand, Wallace and Yang (2004) used a heuristic with 7^{th} grade students to articulate laboratory findings. Prain (2006) finds that writing helps students organize their science thoughts and vice versa. Finally, Maxwell (1996) provides educators with numerous graphic organizers to help with science writing.

The social studies classroom offers several opportunities for students to engage in the pre-planning process. Many books give strategies for graphic organizers, outlines and other visual aids to help students plan (Maxwell, 1996) and practitioners and researchers have written about their strategies and successes. Boyer (2006) requires her students to engage in a pre-planning thought organization process before writing for a variety of assignments. Cantrel, Fusaro and Dougherty (2000) used a graphic organizer known as a KWL (which stands for Know, Want–to-Know, Learned) before and after engaging in a major writing project. They found that the organizer helped students to write better about what they learned and the process of learning. Marlow (2000) encourages the use of outlines and pre-planning guides when

students write for social studies. Finally, Tancock (2002) provided thought organizes when students used library research to write. It is important to distinguish portions of these ideas as either WTC or WTL. While some steps may encourage students to learn content material, some may encourage students to write to share information.

Connecting WTL strategies to learning and thinking. When implementing the writing process, writing for clear goals and purposes and organizing their thinking and materials, students learn in ways that connect with social constructivist theory and in ways that connect with cognitive learning theory. When students engage in activities that ask them to plan, ponder goals and objectives and organizing information and thinking, they are engaged in solitary activities that require them to take the information used for writing, transfer it to their working memory and communicating their content knowledge through WTL. This may help students with long-term memory and with working memory (Applebee, 1984; Woolfolk, 2005).

In addition, these strategies are relevant to social constructivist theory. For example, students can preplan writing activities as a class (Maxwell, 1986). Students can also construct learning goals as a community and assist each other in information gathering and organization.

Finally, the these strategies promise to help students exercise all levels of thinking (Bloom, 1956; Coffey, 2001), but this depends on the desired information the instructor wants the students to output. In other words, while some WTL activities may require students to simply explore foundational information; other activities may require students to be creative, evaluative and analytical (Maxwell, 1986).

Types of writing activities across the content. The literature on WTL, WTC and on writing in general give several different types of writing used at the secondary and even the post-secondary level. Appendix B gives a table of these types of writing, their descriptions and

whether each strategy relates to WTL, WTC, or both. As shown in the appendix, most writing strategies include either WTL, or both WTL and WTC. This is because, even when the end goal of a piece of writing is to communicate to the reader, the process of writing may also result in social or cognitive learning (Langer & Applebee, 1987). These strategies include: (a) reading logs and learning logs (the word "log" is often replaced with "journal"), (b) freewriting activities, (c) writing for discussions, (d) note-taking, summary writing, (e) annotation writing, (f) writing to synthesize, (g) expository writing and (h) creative writing.

In general, journals, freewriting activities, discussion writing and notes are considered to be mostly WTL. This is because these activities are often only used by the student and if evaluated by the instructor, not by their writing qualities, but by the thinking and processes (Anderson, et al, 2001).

Reading logs are used specifically for helping students improve in their content area reading (Bazerman, Little, Bethe, Chavkin, & Garufis; 2005). Other are used to learn the content of a class and are often called "learning logs," "learning journals," or just "logs" or "journals" (Maxwell, 1996). The mathematics journal (learning log, log, etc.) is mentioned in most of the cited mathematics articles in this dissertation and has the potential to address the three goals of focus as informed by Graham and Perin (2007). Baxter, Woodward and Olson (2005) discuss the use of mathematics journals as a platform to teach mathematics content and to practice the writing process. This study found that when a mathematics teacher gave students writing prompts on mathematics content and topics, that teacher also often required students to plan, draft and revise. This helped the students with their writing and their mathematics progress. In addition, Maxwell (1996, p. 90) states that journals are an effective tool to use in language arts, social studies, science to improve writing, increase reading ability and help with writing.

Journals can be used to help students use the process of planning and drafting to understand scientific concepts and the scientific process (Shickore, 2008, p. 324). In short, journal writing is useful across all content areas (Fulwiler, 2006).

Freewriting is when students are asked to write openly about some question or content matter. The results of these are not evaluated for grammar, style, conventions, etc., but are instead used to help students process information and gain greater understanding of the content, or to solve problems (Tynjala, Mason, & Lonka, 2001, p. 12). Very little literature examines the effects of freewriting on content knowledge. Hinkle and Hinkle (1990) examined its effects on college students' understanding of a lecture and find them to be small. Moxley and Lutz (1995) found that elementary students were better able to understand word counts when they utilized freewriting. Finally, Munday and Cartwright (1990) found that the use of freewriting with preservice teachers helped them to think more critically about their own teaching. Nevertheless, even though much literature discusses how to encourage freewriting (Maxwell, 1996), the research on freewriting is lacking. No literature was found the effects of freewriting on core content areas at the secondary level.

Many classes utilize discussion as a part of the learning process. Discussions consist of students and teachers interacting. Discussions can be used to explore a topic, expand thinking, or to simply gain a deeper understanding of the subject (Maxwell, 1996). Discussions themselves are verbal. Students share their thinking out loud. However, students can write before, during, or after a discussion to plan, refine, or reflect upon their thinking (Writing to Learn Clearinghouse, 2013). Many times, these are used as free writing activities and are mostly WTL activities (Writing to Learn Clearinghouse, 2013).

Note taking is the process of taking information from another person (e.g. the teacher), a text, or another source and recording it to help one learn it. Limited research addresses how to use note taking in content areas as WTL. However, some research examines its effectiveness. For example, Backman (1994) collaborated with her students to create a note taking strategy to learn Geometry Boyle (2013) found that strategically structuring note taking activities for student learning helped them learn science. Though little research examines note taking as writing, note taking does theoretically fit into the idea the WTL helps students process information and thus learn it (Applebee, 1984).

Writing summaries, annotations and synthesizing things with writing all implement WTL as well as WTC. Whereas a student may write a summary to better understand a complex text, that summary may also be evaluated for how well the student communicates the ideas (Langer & Applebee, 1987). While a student may annotate a text or texts, annotations may also be used to communicate information about sources (Langer & Applebee, 1987). Finally, a student may access his or her ability to synthesize ideas or texts through writing, but the resulting piece may also be used to communicate these things and evaluated as such (Maxwell, 1996; Young, 2006). In addition, summaries, annotations and synthesis writing all require different levels of thinking skills as presented by Bloom and Anderson (Coffey, 2010). For example, a summary requires students to apply their knowledge, an annotation requires skills of analysis and synthesis writings require synthesis (Coffey, 2010).

Expository writing includes such activities as essays, theses, research papers, lab write-ups or reports, general reports and several other tasks (Stanford University, 2014). Many of these tasks are used to communicate information or ideas and are thus considered to be WTC (Applebee, 1984). Nevertheless, literature on WAC does suggest that these tasks can be used in

content area teaching and may help students to learn the content (Maxwell, 1996). For example if a student is asked to write a persuasive essay in a history class, that student may go through the cognitive process of learning about the content while simultaneously creating a product that could be used to communicate the learned information. When one writes, one may come to learn while writing, even if the main objective is to communicate knowledge. The act of writing instigates knowledge due to cognitive processes required to write. As the writer writes, she learns. When the writer is finished, she also has a product that can be used to communicate. The process instigates learning and the product communicates (Applebee, 1984). Thus, writing expository pieces may serve both to help learn and to communicate.

Another form of writing is creative writing. This may include such genres as poetry, drama, creative non-fiction, fiction and others (Purdue, 2014). Very limited research examines creative writing across the curriculum. Maxwell (1996) suggests some forms of creative writing in content classes. Avery (1999) suggests the connection between poetry, music and mathematics. Most of the literature on creative writing in the classroom focuses on language arts and English classes (Young, 2007; Jocson, 2010; Avery, 1999). Whether creative writing activities instigate WTL or WTC probably depends on how they are used. Like expository writing, these activities may help students learn content while also creating something to be communicated due to the cognitive processes required to write (Applebee, 1984).

This research examined aspects of WTL that were the most present in the literature, which included reading logs, learning logs (journals), free-writing activities, discussion writing activities, note taking, summary writing, annotation writing and synthesis writing. Future research should examine the effects of expository writing and creative writing on student content

learning. This research measures the before mentioned categories due to their presence in the literature.

Ways to improve mathematics with WTL. In Colorado, secondary mathematics (6^{th}, 7^{th} & 8^{th} grade) includes courses that teach subjects ranging from basic computation in 6^{th} grade to Algebra 1 in 8^{th} grade. In high school, courses typically range from pre-algebra to advanced Calculus (Colorado Department of Education, 2012). Like any other discipline, mathematics comes with its own language and vocabulary. Different types of mathematics have different types of vocabulary. Therefore, one of the first ways mathematics teachers can implement writing is to require students to explore mathematics vocabulary in journals (Maxwell, 1996, p. 88). A useful tool is to require journals about the process of learning mathematics. Students can periodically write about their mathematics learning experiences as process as they grow and learn (Maxwell, 1996, p. 85). Teachers can also require students to write about the process of solving multiple step problems (Maxwell, 1996, p. 86). When students do this, they analyze their thinking and problem solving strategies. This will help the mathematics teacher to understand each student's thinking when approaching a problem, thus aiding instruction. Another strategy is to have students explain mathematical concepts (Maxwell, 1996, p. 86). This can be included when students write about the process of solving problems, or it can be done separately. For example, a teacher may have students compare and contrast factors and multiples. A teacher may also have students compose a paragraph that explains the process of squaring or cubing a number. Finally, while many students are used to reading and solving story problems, one clever way to challenge them is the reverse the process. In other words, teachers can start with a pure numeric equation and have the students create a story problem. Once they create it, teachers can then require them to solve it and write about the processes of solving it.

Ways to improve science with WTL. The hard sciences use a process of writing often referred to as the scientific method (Schickore, 2008, p. 324). Successful science writing requires proficient writing abilities and several strategies may help science teachers achieve their goals. Students can use journals to learn science vocabulary and teachers can utilize journals for students to write about their experiences and thought processes. In addition students can write poetry about scientific concepts of phenomena (Maxwell, 1996, p. 90). Students may also write descriptions of scientific content as they learn them. For example, a student may describe the process of photosynthesis in writing, or students may write a story about visiting a planet and then describe what they see using what they are learning in science (Maxwell, 1996, p. 96).

Ways to improve social science with WTL. Given that it is often nested in the Humanities, social science naturally uses writing activites and many of them are WTC as well as WTL. In terms of WTC, general, Maxwell (1996) suggests that social studies teachers consider the content they teach and then consider how they want their students to communicate their knowledge of that content (pp. 101-115). All of the social studies middle school subjects areas lend room for many creative ideas including: (a) Theme responses, (b) Travel brochures, (c) Writing as a character from history, (d) Propaganda posters, (e) Reports, (f) Scripts/plays, (g) Biographies and (h) Historical fiction or poetry. In addition, students can use logs and journals to help them with tasks in the social studies classroom (Cantrell, Fusaro, & Dougherty (2000)). All of these specific ideas will require certain levels of planning, editing and re-writing. The intervention will provide social studies teachers with time to create ideas given the literature to bring back to their classroom. In addition. Social studies teachers can use WTL strategies such as logs/journals about their difficult reading, learning logs about their thinking and teachers can

have student write before, during and discussions to plan, reflect, or refine their thinking (Maxwell, 1996).

Ways to improve language arts with WTL. Much of the above given literature on WAC and WTL in this proposal excludes much on language arts. This is because language arts is the content area that typically uses writing the most, thus the use of writing is implied. However, this study is interested in the readiness of language arts teachers to teach writing and it is important to understand how writing to learn is applicable to language arts.

Since it is typically given the responsibility to teach students both reading and writing (CDE, 2012), the language arts classroom provides a variety of opportunities for students to implement the writing process (Glenn & Goldthwaite, 2008). Sometimes this process benefits WTL and sometimes it benefits WTL and WTC. Effective language arts teachers typically provide students with a variety of graphic organizers to help them plan and map their thinking for writing, ask students to engage in all of the stages of the writing process and employ a whole host of strategies, use a variety of materials and engage students with a wide range of media to

Gaps in the Literature

Despite over four decades of literature on the potential positive effects of using writing to help students learn, little is known about the extent to which content teachers use writing in their classrooms, particularly at the secondary level. In addition, there is much literature that informs "best practices," and many of these best practices include integrated curriculum and WTL (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010), but little has examined the extent to which teachers integrate curriculum, let alone implement WTL strategies correctly in their content areas.

The next major gap in the literature is the scarcity of empirical research on WTL. According to Brewster and Klump (2004) of the Northwest Regional Educational Laboratory, "Few high-quality quantitative studies of writing across the curriculum currently exist" (2004, p. 10). Since then, a NWP published a mixed-methods report that utilizes analysis of variance for the quantitative portion. Peach and Campos (2008) report on the effects of a staff development program on teacher use of writing and its effects on student writing success. The found that teachers exposed to a writing staff development program were more likely to use writing in their content area classrooms that teachers not exposed (p. 19). They also found that students who had teachers that implemented WAC scored better on writing scores than students who did not (pp. 20-22). Many of their strategies may have implemented WTC, not WTL. In addition, this study failed to provide validity evidence for their measures of writing and it failed to reference other WAC research. In fact, its entire reference list mostly consists of literature on staff development and no other WAC studies. In fact, it references nothing on WAC or WTL.

It would be of great benefit to the body of literature on WTL to fill these two gaps. By implementing a survey of writing strategies used in the classroom, we can better understand the practices of teachers. This study used such a survey as a convergent variable. In addition, the lack of empirical research on WTL/WAC effectiveness weakens the ability to understand the benefits of these strategies on student writing performance, any benefits to mathematics, science and social studies.

The literature presented, which was selected based on the meta-analysis of Graham and Perin (2007), offer strategies of content writing implementation that match research on writing effectiveness. Even though their meta-analysis examines research on writing within English and language arts classrooms, applying the three strategies to similar practices in other content areas

promises to improve writing. In short, the literature does not provide generalizable evidence of improving writing, but it does use strategies that are supported by the literature on improving writing within specific content areas.

In addition, both NAEP (2007) and The Neglected "R" (2003) strongly suggest that students increase the amount they write. One way to increase student writing ability is to implement it within content areas in ways that are suggested by the research. The purpose of this study was to build the foundation to increase the use of WTL in the core content areas by developing the TWTLS. Such a tool promises to help bring generalizability to the literature on WTL.

Theoretical Framework

In order to better inform the use of WTL in all content areas, it is necessary to create ways to help teachers with their preparedness to do so. Therefore, the purpose of this dissertation was to develop the Teacher Writing to Learn Scale. The development of an instrument requires a thorough understanding of the theory that informs its structure (DeVellis, 2012). The structure of this instrument is informed by the theoretical literature on use of WTL in content areas and Alfred Bandura's theory of self-efficacy. First given is an overview of Bandura's theory of self-efficacy also including the background of the theory and the application of the theory to writing and teaching including the background and development of the theory, the general application of the theory to the field of education and the general application of the theory to the content area of writing.

Self-Efficacy

One significant element of the theory driving this instrument is self-efficacy. Self-efficacy is the extent to which an individual feels that he or she can successfully perform an act (Bandura, 1977, p. 193). This proposed research applies Bandura's theory of self-efficacy to the instrument to measure teachers' self-efficacies of using teaching with writing.

It is important to create a framework of social cognitive theory as it relates to self-efficacy, which the broader theory that is most applicable to Bandura's theory of self-efficacy. According to Bandura (1977), cognitive processes pay a role in behavior change (p. 192). Once cannot change behavior, without first processing the need and ways to change that behavior. Further, an individual's behavior is related to outcomes as they sequence (p. 192). As one processes and comprehends outcomes of behaviors, they make inferences that similar outcomes will occur. Finally, once one creates anticipated outcomes, that person will repeat his or her behavior until the learned outcome occurs, regardless of the outcomes that occur before the desired outcome (p. 193). According to Bandura (2012), three main determinants influence outcomes. First, personal determinants, which relate to one's own social world, shape outcomes. Many times, personal determinants are under the influence of proxies. For example, one may be limited in her social influence and choice to a power structure. Therefore, that person depends on actions of a person or people within that structure (p. 12). Second, the nature of the environment influences outcomes and perceived outcomes. Environmental determinants are imposed upon individuals, selected by individuals, or constructed by individuals (pp. 12-13). Finally, the behaviors of individuals influence their functioning or courses of events. Naturally, behaviors result in consequences and perceptions of consequences influence behavior (p. 120).

These aspects of social cognitive theory are important to this research because much of self-efficacy is concerned with perceived outcomes and related actions and behaviors. Bandura (1977) defines self-efficacy: "An efficacy expectation is the conviction that one can successfully execute the behavior required to produce the outcomes" (p. 193). In paraphrase, self-efficacy is the individual belief that one can complete a task with acceptable results. The databases are filled with literature that tests and utilizes this theory in a pogrom of fields. This proposal attempts to provide a brief, but rigorous overview of the theory as it relates to the construct of self-efficacy of teaching writing.

Sources of self-efficacy expectations. Bandura (1977, 2012) identifies four sources of efficacy expectations. These are: (a) mastery experience, (b) social modeling, (c) social persuasion and (d) physical/emotional arousal (Bandura, 1977, pp. 195-198; Bandura, 2012, p. 14). These are shown in figure 2.7. As shown in figure 2.7, the process from stimulus to efficacy to behavior to outcome is cyclical. However, Bandura proposes that the place to treat efficacy is at the efficacy expectation level. An efficacy expectation is the extent to which one expects to do well on a specific task; this can vary in magnitude, generality and strength (Bandura, 1977). It is important to note that according to Bandura (1980), self-efficacy and other efficacy beliefs are nested in contexts. For example, one may have high self-efficacy for swimming, but low self-efficacy for running. The four sources of efficacy expectation therefore apply within such contexts.

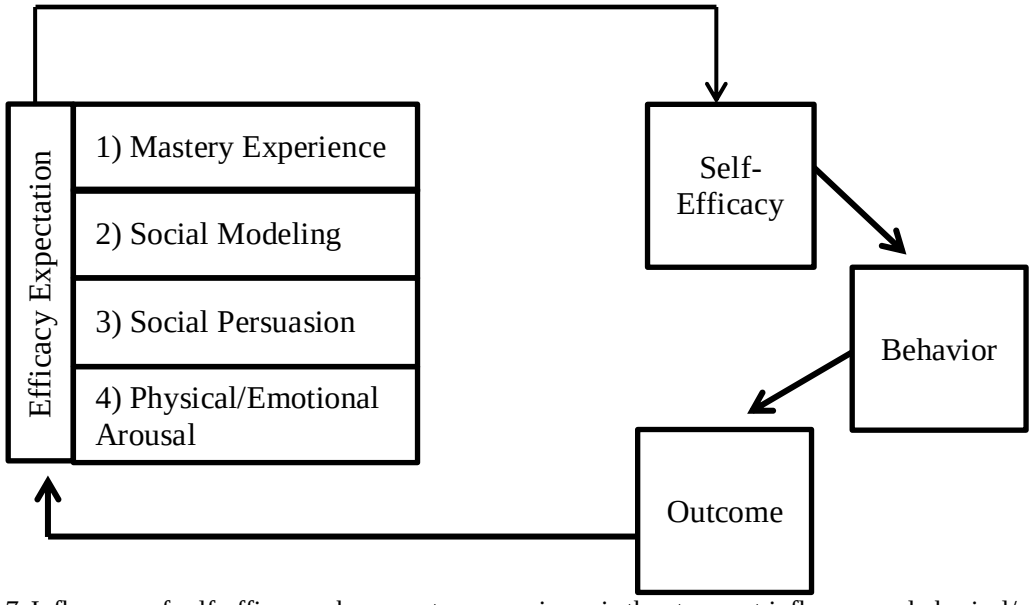


Figure 2.7. Influences of self-efficacy where mastery experience is the strongest influence and physical/emotional arousal is the least strong influence (Bandura, 1977, pp. 195-198; Bandura, 2012, p. 14).

Mastery experience is the extent to which one achieves a specific task after the related behavior. According to Bandura (1977, 2012) the perception of success or failure is positively correlated with future efficacy expectations. Whereas a performance attainment strengthens efficacy expectations, the opposite weakens them (Bandura, 1977, p. 195). This sort of performance expectation is self-directed in that it is related to the individual who holds the latent efficacy expectation. It also holds the most influence over efficacy expectations and performance attainments (or lacks thereof) may generalize the individual's efficacy expectations to similar tasks (p. 195).

The second strongest influence on efficacy expectation is what Bandura (1977) classified as social modeling, which relates to his work in vicarious reinforcement (p. 197). Observing the mastery or lack of mastery of other people has been found to vicariously shape the efficacy expectations of observers (Bandura, 1977, p. 197; Bandura, 2012, p. 14).

The third strongest influencer on efficacy expectations, according to Bandura (1977) is social persuasion, which occurs when other people or the person who holds the efficacy belief, use communication to encourage or discourage perceptions of successful performance tasks. This is done through suggestion (casual statements of encouragement), exhortation (more empathetic and involved coaching, discouragement, or coaxing), self-instruction, or interpretive treatments (when the holder of the efficacy belief interprets situations and self-talks ways to either achieve or fail) (Bandura, 1977, p. 195; Bandura, 2012, p. 15). Research finds that cooperative persuasion is more effective than individual persuasion when it comes to verbal persuasion (Bandura, 1977).

The fourth and least predicable source of influence over efficacy expectation is emotional or physical arousal. Emotional arousal occurs when emotions such as anger, anxiety and depression are present. Heightened negative emotions adversely correlate with efficacy expectations. Therefore, people are more likely to be efficacious when they are more at ease (Bandura, 1977). Naturally, fear is a very powerful negative emotion and Bandura and Adams (1977) and Bandura, Adams, Hardy and Howles (1982) found that efficacy expectations increased with snake phobia participants when their fears were directly treated. Locke and Bandura (2006) found that self-doubt prevents a person from using his or her skills to the full potential (p. 97). Bandura (2012) recently emphasized the role of physical arousal since emotions such as anxiety have physical consequences (p. 15).

These sources of self-efficacy expectation come from the very earliest work of Bandura, but still hold strong in the literature that subsequently emerged in the many contexts in which scholars conduct efficacy research. This proposed research purports to use these early, yet reliable to frame questions for my participants for the research (see chapter 3).

Correlates of self-efficacy. It is important to consider Bandura's (1977) capitulation that there is a difference between the environment (or external world) and the mind (or internal world). Bandura purports that what occurs in the mind may or may not reflect the actual physical world. This epistemology, suggests that, if efficacy expectations exist in the mind, they may or may not match the environment. Therefore, the individual who holds an efficacy expectation may not hold one that is logical or supported by the external world. Further, the extent to which an efficacy expectation matches the external environment is only determined through objective research (Guba, 1990).

As a result, the most important factor of an efficacy belief is the perception of the individual, regardless of the source (see above) of the efficacy expectation (Bandura, 1977; Bandura & Adams, 1977). Therefore, although self-efficacy correlates with behavior outcomes, one should not assume that this correlation is perfect. Many efficacy beliefs contradict with actual outcomes. That is why some people may expect a strong outcome (or hold high efficacy), but perform at an inferior level. The reverse is also possible (Bandura, 1977). Therefore, it is important, especially for the purposes of this research, to distinguish self-efficacy of a given task from the action and results of such a task. The two are related, but there is no direct causal relationship.

The most common correlate of efficacy is performance outcomes. When people are more efficacious, they tend to perform better on relevant tasks and the reverse is true when their efficacy is low. Bandura, Adams, Hardy and Howells (1980) found that participants were more likely to act toward phobia related behavior if there was an increase in efficacy, which is similar to the findings of Bandura and Adams (1977). In addition, efficacy has been shown to exhibit a negative correlation with fear arousal (Bandura et al., 1982; Bandura, 1982), addiction relapse

(Bandura, 1982) and positive correlations with persistence to complete tasks and positive self-judgment (Bandura, 1982).

Bandura's more recent collaborative work, as well as the works of other efficacy researchers, produces evidence of other correlates with self-efficacy. For example, high self-efficacy positively correlates with people's goals and motivations (Bandura, 1989; Bandura & Locke, 2003). People tend to set more ambitious goals and pursue them more fervently when their self-efficacies for the relevant task are high. Bandura and Locke (2003) also found links between efficacy and stress management and "going the extra." People who are highly efficacious tend to manage their stress better and they tend to do more than the minimum on relevant tasks. In addition, research finds a negative relationship between efficacy and anxiety (Goodman, 2009; Smith, 2011; Czernaik, 1989; Akin, 2011) and job satisfaction (Caprara & Barbaranelli; Scwarzer, 2008; Canrinus, Helms-Lorenz, Beijaard, Buitink, & Hoffman, 2012; Johnson, 2010).

Self-Efficacy of teaching. Bandura (1977, 1986, 2012) strongly emphasizes that efficacy is only relevant within contexts. In other words, one does not have an efficacy expectation that is applicable to all circumstances. Instead, efficacy depends on the task at hand. Therefore, self-efficacy of teaching is the extent to which a teacher feels confident at successfully running a classroom. This includes such things as classroom management, implementing and designing curriculum, transferring skills and knowledge to students and managing time teaching (Caprara, Barbaranelli, Steca, & Malone, 2006, pp. 473-474).

The scales to measure teacher efficacy have resulted in a body of research with similar findings as Bandura's given other efficacy expectations. For example, while Bandura and Adams (1977) found positive correlations between efficacy and job satisfaction, Ashton (1984)

measured teacher self-efficacy and found it to predict teacher expectations of teaching consequences and thus teacher performance. In other words, teachers with low efficacy expectations had lower expectations of themselves and their students and thus lower outcomes. This was due, in large part, to their teaching behaviors (pp. 246-247). Caprara et al. (2006) found correlations between teacher efficacy, satisfaction and student achievement (p. 488). Scwarzer and Hallum (2008) found a strong correlation between low self-efficacy and teacher burnout. Freidman (2003) found a link between self-efficacy and classroom instruction. As teacher self-efficacy decreases, so does effective classroom instruction (p.196). Freidman also found efficacy to be a predictor of teacher-burn out due to the downward spiral of effective classroom instruction.

The literature clearly provides a link between efficacy and effective teaching. This is because several instruments have been developed over the years to measure the construct of teacher efficacy. The first of which was developed by Armor, Conroy-Osegurar, Cox, King, McDonnel, Pascal, Pauly and Zellman (1976) under the Research and Development (RAND) organization. This assessment asks teachers to rank, using a Likert type system, levels of agreement with two items. Several instruments spawned from Armor et al. These instruments added constructs such as *teacher locus of contro*l (Rose & Medway, 1981) and *responsibility for student achievement* (Guskey, 1982). Other instruments approached the latent variable with different items all together (Dembo & Gibson, 1985), norm referenced items (Ashton, 1984), while other instruments focused on efficacy in individual content areas. For example, Riggs and Enochs (1990) created a science teaching belief efficacy scale. Finally, Bandura (1997) decided to create his own teacher efficacy scale in attempt to keep the measurement of efficacy true to his theory. Despite their differences, all efficacy scales strongly correlate with student outcomes,

teacher stress and professional commitment, exhibiting Pearson's Product coefficients between .4 and .6 (Tschannen-Moran, Woolfolk & Hoy, 1998). Finally, Woolfolk and Hoy (1991) developed the teaching efficacy scale, which is used to test convergent validity of the TWTLS later in this dissertation.

Although several efficacy scales have been created, few focus on specific teaching tasks. For example, while Riggs and Enochs (1990) created a specific self-efficacy scale for teaching science, there is not such scale for teaching with WTL strategies. Therefore, one major purpose of this proposed research is to examine the previous effective efficacy scales and use their successes to develop the self-efficacy of teaching with WTL portion of the TWTLS. Before this is possible, it is necessary to gain a strong understanding of self-efficacy of writing. Such is the topic of the next section.

Self-Efficacy of writing. Since Bandura (1977, 2012) emphasizes the need to frame efficacy within a context, much research has been done regarding efficacy in individual school content areas. For example, an abundance of research exists on science efficacy (Sayers, 1988; Czerniak, 1989; Smist, 1996; Britner, 2002; Desouza, Boone, & Yilmaz, 2004; Meluso, Zheng, Spires, & Lester, 2012), mathematics efficacy (Adeyemi, 2012; Champion, 2010; Clutts, 2011; Hackett, 1985; Hamilton, 2012; Johnson, 2009; Sakiz, 2007; Sexton, 1987) and social studies (Bercu, 2010; Fitchett, Starker, & Salyers, 2012; Gehlbach et al., 2008; Holt, 2010; Lyons-Wagner, 2011). All of this research finds links between efficacy and academic performance and much of it examines variables such as gender and ethnicity. Nevertheless, the purpose of this research is to examine writing.

Self-efficacy of writing is a person's belief that he or she can adequately complete a writing task (Pajares & Johnson, 1994). The literature on self-efficacy of writing is not as

extensive as the literature on other forms of self-efficacy as researchers published the first papers on self-efficacy of writing in the mid-1980s and found that like other contexts, self-efficacy of writing was crucial to general performance.

The process of writing begins in the mind. A series of tasks may or may not follow depending on the writing objective. The writing process itself, therefore, acts as a catalyst of self-efficacy of writing. In other words, the extent to which an individual experiences mastery, social support, etc. (see Figure 2.7) very much determines his/her level of writing efficacy in the future (Bruning, Dempsey, Kauffman, McKim, & Zumbrunn, 2012). Flower and Hayes (1981) found writing to be a goal-directed activity and that writing goals often change as the individual goes through a writing task (pp. 377- 381). Further, the authors theorize that writing first begins in the mind, then, depending on the environmental context in which the writer works, the writer goes through a process of planning, translating and reviewing. This process is not necessarily chronological (p. 375).

These processes of writing support levels of writing efficacy. As individuals go through different levels of the writing process, they experience different levels of mastery, social modeling and persuasion and anxiety relating (in the mind of the individual) to those specific areas of the writing process. These experiences thus shape the individual's efficacy for writing and for that step in the writing process. For example, Zimmerman and Kitsantas (2002) found that 72 undergraduate students self-efficacies were increased with social feedback ($p<.01$, $f=.55$) and with modeling ($p<.05$, $f=.25$) (pp. 664-665). (Incidentally, $f=\sqrt{\frac{R^2}{1-R^2}}$ therefore providing the square root of the ratio of the percentage of variance explained divided by the percentage of variance unexplained (Cohen, 1988). Like most effect sizes, the closer the number is to zero, the higher the effect.) Zimmerman and Kitsantas also found that people acquire new writing skills

through observation, emulation, self-control and self-regulation. The extent to which individuals are able to advance given these very much depends on self-efficacy (p. 660). In other words, high self-efficacy promotes growth in writing and modeling and social feedback are effective ways to improve self-efficacy of writing and self-efficacy of different steps in the writing process.

Other literature explores the influence of self-efficacy on different types of writing. Bruning et al. (2012) state that writing is a cognitively complex task that advances slowly and that writers use their experiences to form categories that inform self-efficacy of writing. For example, one may have a category of writing poetry and another category related to expository writing. Each of these groups will have different self-efficacy levels (pp. 3-4). Similar findings are reported by Schunk and Swartz (1993) who found from a sample of 60 fifth grade girls that process goals (or several goals to achieve a large objective) increased writing efficacy and performance as compared to students who just considered the larger goal ($p<.05$). Self-efficacy of writing correlated highly with writing outcomes (r=.83). Pajares, Britner and Valiante (2000) found that high achievement goals predict writing self-efficacy in science. Zimmerman and Bandura (1994) used path analysis to predict writing performance. They found that perceived academic self-efficacy and personal goal setting to account for 35% of the variance of writing achievement. Zimmerman and Kitsantas (1999) found that goals setting and regulation resulted in higher efficacy and writing outcomes on girls in grades 9 through 11 than setting no goals or regulation ($p<.05$). Finally, Prat-Sala and Redford (2012) found strong relationships between the self-efficacies of reading and writing and found those two outcome variables to increase as efficacy increases.

The bridge between self-efficacy of writing and teaching writing has not been explored widely. Lavelle (2006) measured the self-efficacy of writing of teachers, but did not connect it to teaching writing. Bowie (1996) found that content teachers (other than language arts or English) may lack confidence in their writing depending on the nature of the task and its evaluation and that many of these teachers were less willing to teach writing. Therefore, the lack of literature on self-efficacy of teaching using WTL represents a small but noteworthy gap.

Relevance of Literature and Theory to Proposed Study

This dissertation develops an instrument to measure teacher knowledge and efficacy of WTL. Therefore, the focus of this literature review was to provide background information on WTL and WAC and to introduce the theories that shape the way in which WTL helps students improve in their learning and the theories that represent the structure of the instrument. The instrument development used in this research draws from the literature on WTL and self-efficacy, to inform items and constructs. As shown in Appendix A, the proposed instrument includes six constructs. The literature shapes these construct. The continuums (construct 1 and 2) come from a perceived gap in the literature. It is interesting to note how teachers perceive these tasks in terms of WTL versus WTC. The relevance questions come from the literature, which suggests that there is a difference in perceived relevance of writing given content area, but this perceived relevance is yet to be measured, which this research attempts. The efficacy items also come from a gap in knowledge of how confident teachers feel about using writing in the classroom.

CHAPTER 3: METHODS

General Approach

The Teacher writing to learn scale (TWTLS) purports to measure secondary educators (grades 6 through 12) of core content areas in the United States. Core content areas include language arts (or English), mathematics, science and social studies (or social sciences) (CDE, 2012). Therefore, the purpose of this study was to measure the scale's psychometric properties by addressing the following research questions, which mirror the Standards for educational and psychological testing (AERA, APA & NCME; 1999):

1) Does the TWTLS show evidence of appropriate content?
    a. Do the items represent the theory and literature?
    b. Do the experts find the measure to consist of appropriate content?
2) Does the TWTLS show evidence of response processes?
    a. Do the experts who reviewed the measure respond appropriately?
3) Does the TWTLS show evidence of internal structure?
    a. Does the theoretical structure of the TWTLS match the empirical structure?
4) What are the relationships of the TWTLS with other variables?
    a. Does the TWTLs show evidence of convergent validity with other measures?
    b. Does the TWTLS show evidence of discriminant validity with other measures?
    c. Does the TWTLS show evidence of known-groups' validity?
5) What are the consequences of the TWTLS?

As shown in figure 3.1, this research consisted of three phases. First, I consulted the literature and I sought the input of secondary core content teachers to help me create items.

Given their feedback, I created an initial set of items, consisting for factors. Second, I sought the feedback of more experts, made adjustments according to their feedback and verified the acceptability of my adjustments. Finally, when my experts were satisfied with the instrument, I sampled secondary teachers from a database that I built which included over six thousand teachers in a Mountain West state and was obtained through public internet sites. I first employed analyses of internal consistency using Cronbach's *alpha*. I then conducted factor analyses and internal consistency analyses with McDonald' *omega,* followed by multitrait mutimethod tests. Parameters and indices informed any further changes needed to make the instrument's data more valid. I knew that any changes to the instrument would be best done prior to a new sample. The rest of this chapter will discuss the processes of item development and it will provide an overview of the other validity and reliability tests. Chapter four will give the results of the reliability tests, the factor analyses and convergent/discriminant tests.

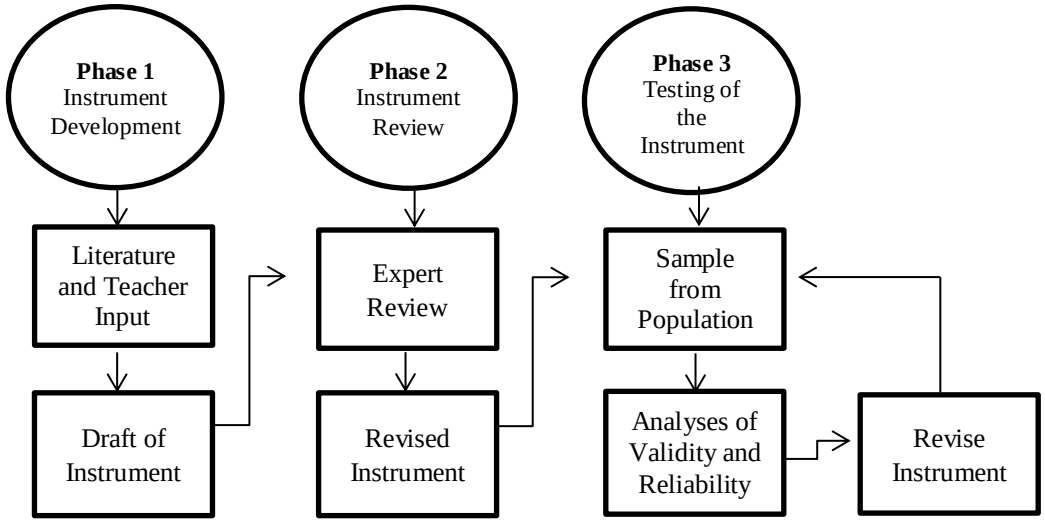


Figure 3.1. The three phases of the study are shown in sequence. The circles above include the main steps which are instrument development, instrument review and tests of validity and reliability. The squares include the sub-steps. As shown, the process may repeat at phase three.

Item Development

The most important phase of instrument development occurs in the review of literature and in the strong articulation of the elements of the latent variable (Netemeyer et al., 2003; DeVellis, 2011). Subsequently, the researcher is to develop items given the strong theoretical foundation. Additionally, much research utilizes additional resources in the item development phase. Specifically, many researchers choose to seek the input of experts (Netemeyer et al, 2003, p. 92). According to Haynes, Richard and Kubany (1995), content validity (which is currently categorized as response processes and appropriate content by the 1999 standards) is important because it increases the clinical (or in the case of this study, the practical) use of the results of the instrument because the scores on the instrument represent all aspects of what it purports to measure. In addition, content validity ensures that the measure represents the latent variable in a way that is proportionate correct and relevant to the field and its magnitude and duration (p. 240). The appropriate content of the instrument was thus considered prior to, during and after the initial instrument development phase. The response processes were considered during the initial item development phase. Both of these were assessed using expert feedback.

During the item development phase, I was most interested with the content of the items and the way in which I worded them. I wanted to develop a scale that assessed three basic constructs: (a) Teachers perceptions of WTL on a continuum, (b) their perceptions of WTC on a continuum, (c) knowledge of WTL, (d) perceived relevance of writing to the classroom (e) self-efficacy of using WTL, and (f) use of WTL. It was my objective to make an instrument whose target population consisted of any teacher in the United States who teachers grades seven through twelve and teaches either mathematics, science, social studies, or language arts (English,

literature, etc.). Therefore, the most difficult items to develop were the items that asked teachers to demonstrate their knowledge of WTL and the items for the first two constructs of the TWTLS.

To develop the items on the knowledge construct, I made an appointment at a suburban/rural middle school and asked any teacher interested to help me develop items for my scale. Seven teachers volunteered. These teachers represented all core content areas of my interest. I began the workshop by introducing my research goals for this dissertation. I then told them I needed their help in developing items around teacher knowledge. I handed out the protocol for the workshop. Appendices C and D give this protocol. As shown in the appendices, I asked the teachers to write down specific teaching strategies that used specific thinking skills and specific WTL strategies. I provided them with big sheets of paper and markers. The teachers chose to get into four groups and then wrote down several strategies. I then went home and typed these into items Appendix E gives the first set of knowledge items that I created from this workshop. These items would later be reduced with expert review. As shown, these items consisted of scenarios and for which there is one correct answer and three distractors. These items are therefore binary. The items for construct two were developed below each knowledge item. The items for the third construct, self-efficacy of using writing in the classroom, were developed using the literature on self-efficacy. Well known efficacy scales were used to model the structure of these items, which ask the respondent to rank his/her level of confidence in using writing in the classroom. In addition, the classification of writing tasks as WTL or WTC as well as the items ranking perceived relevance of writing to the respondent's content area were composed using the literature on WTL an WTC. All the items on the scale are given in appendices F-H. After consulting with my experts, the number of items was reduced to five.

Future work may adjust and test the other items. However, the experts felt those were the best items to test.

To test to see if the content of my scale was appropriate and to see if response processes were as I expected them to be, I asked experts to review my items. According to Develiis (2012) Ntemeyer (2007) and Haynes et al. (1995), these are best examined and supported through the thoughts of experts. I sought the feedback of five experts, stemming from different fields. The first expert was a university instructor of English and writing and a member of the National Writing Project and an academic expert on writing to learn. The other experts included a secondary science teacher, a secondary language arts teacher, a secondary mathematics teacher, a secondary social studies teacher and a secondary principal. The experts reviewed my items and communicated whether they seemed to measure what they purported to measure and whether they seemed to fit in the factors that were assigned to them. The experts did complete a form. The university writing expert was given one form (Appendix I) and the teachers were given another form (Appendix J).

I made several changes to the instrument given expert review. The first expert who reviewed the instrument was the writing expert. This person's review resulted in me changing the names of the constructs of my instrument, which made the items seem more appropriately housed in those constructs. This feedback helped me to classify a construct as "knowledge of WTL." I also eliminated an item that read, "which of the following best describes writing annotations." Finally, I changed an item that read, "Writing adds things to my content area" to "writing helps students to learn the content of my class."

The teacher content experts gave similar feedback, reinforcing the feedback of the writing expert. Given the feedback of one educator, I changed the item reading, "when I really

think hard, I am able to find ways to integrate writing in my class" to "I am able to find ways to integrate writing in my class." The educator was concerned that the original way it was written might offend the respondent. The other educators helped me to further clarify the items on my instrument. Given the science teacher's feedback, I added the item, "Using writing activities in my class is too demanding" under the efficacy construct. The educators also expressed concerns about the potential of teachers not knowing what certain writing strategies are, or lacking the knowledge to adequately address the questions. This, however, was of less concern to me because the main point of this instrument is to assess just that. If there is variability among knowledge, that will help me establish construct validity in my factor analyses. As will be illustrated in chapter 4, their concerns had merit.

In general, all the content experts supported the Likert scales and they supported the distractors and correct answers on the multiple choice scales. Appendix K shows the TWTLS as well as all validation scales in the order they were given to the respondents as well as how it was coded.

Sampling

In general, the literature suggests a minimum of 200 participants for a scale of 20 items to conduct a factor analysis (DeVellis, 2012; Talbachnick & Fidell, 2007). However, other researchers argue that statistical power for factor analyses is more of a function of items and participants per factor that the rule of thumb of 200 that is generally given (Bandalos & Boehm-Kauffman, 2008).The internet was used to laboriously compile a list of 6,080 email addresses of secondary content teachers from publicly accessible school web sites. Each school's web site was accessed and teacher emails were compiled one school at a time. All email addresses were used. Caution should be used when generalizing the results to the theoretical population of

secondary content teachers in the United States. The sample consists of secondary (6-12) teachers of one of the four core content areas (language arts, mathematics, science, or social studies) and some teachers outside of those content areas as well as educators who do not each. Chapter 4 gives the demographic results from the sample.

Multitrait-Multimethod Matrix

The multitrait-multimethod matrix by Campbell and Fiske (1959) is a way to test for construct validity. Campbell and Fiske originally proposed that a good way to test for validity was to test several measures using several different methods (p. 82). For example, a researcher might test for depression (D), mania (M) and anxiety (A) using a paper and pencil (P&P) survey, a test the person's spouse or partner (S/P) completes and an observational (O) test. Table 3.1 gives an example of the multitrait-multimethod matrix for this study. As shown in the table, the main diagonals consists of reliability coefficients for the test (in this case alphas), placed where the test would correlate with itself. The rest of the parameters consist of correlations (*r*).

Several correlations are given by this matrix. First, there is the reliability diagonal (shown as *alpha*), which represents how the measure correlates with itself these values should be higher than all others (Netemeyer et al., 2003, p. 73). Second, there are the monotrait-heteromethod correlations, which show how the same trait correlates with different methods. For example, in the table, a correlation between depression paper and pencil and the other depression measurement would be correlated. Likewise, there is the heterotrait-monomethod, which correlates different traits measured with the same methods. Finally, there are monomethod and heteromethod blocks, the former correlated the same methods of measurement and the representing correlations that do not share the same methods (Campbell & Fiske, 1959, pp. 85-92).

Table 3.1

An example of a multitrait-multimethod matrix examining construct validity of measures of depression (D), mania (M) and anxiety (A) over three tests (pencil and paper (P&P), spouse or partner (S/P) and observation (O).

		P&P			S/P			O		
	Trait	D_1	M_1	A_1	D_2	M_2	A_2	D_3	M_3	A_3
P & P	D_1	α								
	M_1	*r*	α							
	A_1	*r*	*r*	α						
S/P	D_2	*r*	*r*	*r*	α					
	M_2	*r*	*r*	*r*	*r*	α				
	A_2	*r*	*r*	*r*	*r*	*r*	α			
O	D_3	*r*	*r*	*r*	*r*	*r*	*r*	α		
	M_3	*r*	*r*	*r*	*r*	*r*	*r*	*r*	α	
	A_3	*r*	*r*	*r*	*r*	*r*	*r*	*r*	*r*	α

A challenge to using the multitrait-multimethod matrix is the need to find multiple methods of measuring the same construct (Drummund & Jones, 2010, p. 113). This was the case in this study. Only one method of measuring teacher readiness to use WTL was developed for this study and the TWTLS used an online format. Therefore, this study modified the multitrait-multimethod matrix by examining multiple traits, but this study did not use multiple methods. In other works, this study calculated the reliability of the TWTLS and correlated the scale with other scales that were hypothesized to either show medium to strong correlations with it, or were hypothesized not to show medium to strong correlations with it. The given research questions were thus addressed using several traits and different instruments, but not several methods.

Procedure

After the item development phase and after the database of teacher emails was built, surveys were electronically distributed through Campus Labs software through Colorado State University. These were distributed in waves. A random number was assigned to each email. These numbers were sorted and selected 500 at a time. All participants were kept anonymous as the survey software keeps track of surveys by assigning random numbers to participants, but does not provide a link to the respondents' email addresses, or any other identifying information. Different iterations were tried to improve response rate, but none proved to make any difference as rates remained between 4-6%. Some surveys were sent with the entire TWTLS and only one validity instrument. Other surveys were sent with all validity scales with the TWTLS. Despite all random samples, the entire 6,080 emails were eventually used, meaning the final sample was non-random.

Data were exported from Campus Labs to an MS Excel file. I screened and clean the data. Cases with numerous missing values were deleted. Statistical Software package for the Social Sciences (SPSS) was used to recode variables that needed to be reversed (DeVellis, 2012; Netemeyer et al., 2003).

Data Analyses

Since the TWTLS is new and attempts to measure a difficult concept, several methods were used to test the validity and reliability of the data. The first research question regarding content validity was addressed using the item development procedure before mentioned. However, content validity is not enough to show convincing evidence that the data produced by a scale measure what they purport to measure (DeVellis, 2012). Therefore, several other methods were required.

Item Discrimination

To begin answering research question 2, first, I checked for item difficulty and item discrimination. Item difficulty is the mean given all the scores on that one item in the sample (Raykov & Marcoulides, 2007, p. 15). Items with lower means (absolute value) are more difficult. In addition, standard deviations of each item were calculated. Items with large stand deviations (>1 absolute) tend show more volatility in responses for those items. In sum, items with unusual means and/or high standard deviations may not be desired and may be thus excluded from the final scale.

Next, I tested the ambiguity of each item by calculating their discrimination scores. R statistical software (Revelle, 2014) was used to calculate Pearson's moment product *r* to correlate each item with the entire scale minus that item (Raykov & Marcoulides, 2011). A Spearman correlation was used for the dichotomous items (Morgan et al., 2011). This told me how highly each item related to the rest of the scale. The less an item correlated with the entire scale, the more discriminant the item. In general, items with low correlations are less than desirable because they are more ambiguous (DeVellis, 2012).

Reliability. To calculate estimates of reliability, I used Cronbach's alpha for the Likert items, Kuder-Richardson 21 for the dichotomous items and McDonald's (1999) omega for the factor loadings. Cronbach's alpha is the better-known form of reliability. It purports to measure the degree to which the items on the scale have a relationship with each other to share a common "cause," or latent variable (DeVellis, 2012, p. 34). However, coefficient alpha is not an index of unidimensionality, but, as shown in equation 3.1, only used to measure inter-item covariance for each unit of composite variance. CFA and EFA best address the unidimensionality question (Raykov & Marcoulides, 2011).

$$\propto = \frac{p}{p-1}\left[1 - \left(\frac{\sum_{i \neq j} Cov(X_i, X_j)}{S^2}\right)\right] \quad (3.1)$$

To calculate alpha I used the Statistical Software for the Social Sciences' alpha function to divide the total sample by the sample minus one and multiply that by the sum of the covariance of each item and divide it by the composite variance, the results give average inter-item covariance. Higher average inter-item covariance indicates higher internal consistency because such results indicate the extent to which each item covaries with all other items (Raykov & Marcoulides, 2011).

KR21 (*r*) was calculated by first finding the proportion of the examinees who got the items correct and incorrect. I then summed those items, divided them by the total variance of the factor that included them, subtracted that by one and the multiplied that by the total number of items minus one. Equation 3.2 gives the formula (Drummond & Jones, 2010, pp. 90-91). Microsoft Excel was used to calculate the formula by following order of operations and Excel code.

$$r = \frac{N}{N-1}\left[1 - \left(\frac{\Sigma pq}{S^2}\right)\right] \quad (3.2)$$

McDonald's omega (McDonald, 1999) is a less common measure of reliability that uses the construct loadings to estimate the ratio of true variance to observed variance for each construct in a factor model, as shown in equation 3.3 (Raykov & Marcoulides, 2011, p. 161) .

$$\omega = \frac{(\Sigma \hat{b}_{ik})^2}{(\Sigma \hat{b}_{ik})^2 + \Sigma \hat{\theta}_{ik}} \quad (3.3)$$

Mplus was used to calculate omega for each factor of the theoretical model by dividing the square of sum of the factor loadings in the given factor by the sum of the factors plus the error terms. Omega typically yields a different parameter values than Cronbach's alpha because it examines the reliability of each individual factor instead of examining the internal structure of

the entire instrument (McDonald, 1999; Raykov & Marcoulides, 2011, p. 161). However, both alpha and omega are useful because of this difference in information. For example, different factors may yield noticeably different omega results, thus providing more information about the reliability of the instrument given its theoretical structure. Alpha may also be calculated for each factor, but may also produce different results due to the difference in calculation with omega. However, it is important to keep in mind that all methods of calculating reliability are estimates of true reliability. Therefore, different ways of calculating it will yield different parameters (DeVellis, 2012).

There is much debate about acceptable reliability parameters. Since each reliability parameter yields a different estimate of true reliability, there is no magic number for minimum "acceptable" reliability. Some authors give specific numbers. Gliner, Morgan and Leech (2009), for example recommend alphas above .8, as does Netemeyer (2003). Other researchers are fickle about appropriate levels and differentiate between newly developed scales and more established scales (DeVellis, 2012). Further, it is important that all measures of reliability represent an estimate of the ratio error variance to total variance (Netemeyer, 2003). Therefore, for this study, alpha is thus considered acceptable if it is $\geq$.75 and omega if it is $\geq$80.

Exploratory Factor Analysis. Mplus software was be used to conduct an EFA with an oblique rotation prior to the CFA (Bandalos & Boehm-Kaufman, 2008; Raykov & Marcoulides, 2011; DeVellis, 2012; Netemeyer et al., 2003). An oblique rotation allows factors to be correlated instead of forcing orthogonal factors (Talbachnick & Fidell, 2007). Unfortunately, many people conduct EFA on SPSS and choose Varimax rotation, which forces the factors to be orthogonal (Cumming, 2011). Many people believe that orthogonal rotations result in simpler solutions than oblique rotations. According to Bandalos and Boehn-Kauffman (2008), this is a

myth. In fact, if the factor structure will default to oblique of the factors are not correlated. In addition, many people conduct a Principal Components Analysis (PCA) instead of an EFA because it is the first option on SPSS, even though the analysis tool is listed as "Factor" prior to getting to the PCA screen (Bandalos & Boehm-Kauffman, 2008; Talbachnick & Fidell, 2007). According to DeVellis (2012), oblique rotation is best used when the underlying constructs are believed to correlate, further adding that many do since the constructs are parts of a greater latent concept (p. 142). The factors' total variances, scree plots and factor loadings were used to determine the fit of the model and make potential changes to the instrument. Even though Eigen values >1 are often used to determine the number of factors, scree plots are more useful (Bandalos & Boehm-Kauffman, 2008).

One potential problem with the EFA deals with the knowledge items, which are dichotomous. Dichotomous items can be included in an EFA if they are of the same factor, but may present biased solutions (Floyd & Widaman, 1995). One solution to this problem is to sum two or more of the dichotomous items to create a new item that is no longer dichotomous (Krishton &Widaman, 1994). Since there are five dichotomous items this would result in two items, which may not be enough to factor well. Therefore, the solution was to exclude the dichotomous items from the EFA and include them with the CFA if reliability and difficulty results supported this decision. Mplus software does allow dichotomous variables to be included with the others if they are a part of the same factor using factor mixture modeling (Muthén & Muthén, 2012). As will be later shown, this was not necessary as the dichotomous items were removed from the model due to reliability, discrimination and difficulty concerns.

Testing the hypothesized model (CFA). The teacher writing to learn scale was hypothesized to consist of six dimensions: (a) WTL continuum, (b) WTC continuum, (c)

perceived relevance of writing, (d) efficacy of using WTL, (e) knowledge of WTL and (f) use of WTL. Each of the above factors had specific items assigned to them. These items should cluster together (Raykov & Marcoulides, 2011). After removing items given the EFA, CFA would be used to test the hypothesized model.

Mplus software was used to conduct a CFA on the three factor model. A one-factor CFA was also conducted to compare to the hypothesized factor model. Chi-square, which will test the difference between the baseline model and this model, was also examined. A statistically significant chi-square is often desirable because the baseline model expects items to be uncorrelated, whereas correlation of items is desirable for the tested model. A statistically significant chi-square is not desired when comparing the tested model to the observed data because the tested model should represent its theoretical structure. When using chi-square, however, statistical significance is also a function of sample size (Raykov & Marcoulides, 2011, p. 70). Therefore, the following indicators were examined to test the model's fit: (a) the Tucker-Lewis index (TLI), (b) the comparative fit index (CFI), and (c) the root mean square error of approximation (RMSEA). Both CFI and TLI are standardized indices and are more desirable when they are closer to 1 (Raykov & Marcoulides, 2011, p. 70). Hu and Bentler (1998), suggest that CFI should be $\geq .9$. Although related to it, RMSEA represents the misfit of the model for each degree of freedom. Therefore, it is often used as an indicator of fit in CFA. As a rule, an acceptable model should have a RMSEA $\leq .05$. The smaller the RMSEA, the better the model fits (Raykov & Marcoulides, 2011, p. 71). RMSEA, CFI and TLI are calculated by comparing the proposed CFA model to the null model, which can be seen as the worst possible fitting model. Equations 3.4 through 3.6 show each respectively. As shown in the equations, all indices use

variations of chi-square and degrees of freedom. They each give different results given their equations (Raykov & Marcoulides, 2011).

$$RMSEA = \frac{\sqrt{\chi^2 - df}}{\sqrt{df(n-1)}} \quad (3.4)$$

$$CFI = \frac{[\chi^2(null)] - [\chi^2(proposed)]}{\chi^2(null)} \quad (3.5)$$

$$TLI = \frac{[\chi^2/df(null)] - [\chi^2/df(proposed)]}{\chi^2/df(null)} \quad (3.6)$$

Mplus was also used to calculate the standardized factor loadings of the three-factor CFA. The closer a standardized loading is to one, the more desirable (Raykov & Marcoulides, 2011). The extent to which each factor correlates with the others was also examined. Since each item produces a different perimeter, this information indicated the need to alter an item or items, or the possibility of discarding one or more items (Raykov & Marcoulides, 2011). However, factor loadings do not provide enough information alone to make these decisions. Item discrepancies, as explained later, contributed to these decisions.

Item discrepancy. The extent to which the correlation matrix and the implied correlation matrix (or the matrix of the model) are contrary was examined. This is known as a discrepancy matrix. This matrix produces positive or negative values (called discrepancies). Discrepancies $\geq |-1| = 1$indicate pairs of items that possibly account for lack of fit (McDonald, 1999). In conjunction with other data, including factor loadings, I examined discrepant items, analyzed the wording of those items and considered those items' difficulty ratings to inform potential modifications of the scale if fit indices are less than desirable and if the theoretical model fit worse than the one-factor model. This may have required removal of items or rewording of items (DeVellis, 2012).

Convergent, discriminant and known-groups validity. One way to generate an estimate of the extent to which a scale measures what it purports to measure (or one way to test that scale's measurement validity) is to correlate it with other variables. This research examined convergent validity and discriminant validity and subsequent portions of this section of the proposal will iterate upon each. First, I examined the extent to which the TWTLS positively correlates with other variables that are theoretically expected to relate to it. This is known as convergent validity (Raykov & Marcoulides, 2011; DeVellis, 2012; Nedemeyer, 2003; McDonald, 1999). Finally, I examined the extent to which the RTWS neither positively nor negatively correlates with other variables it should theoretically not relate, which is known as discriminant validity (Raykov & Marcoulides, 2011; DeVellis, 2012; Nedemeyer, 2003; McDonald, 1999).

Pearson's Coefficient *r* was used to estimate the extent to which the scale positively correlates, negatively correlates, or fails to correlate with the other variables of interest. Pearson's Coefficient is used in social sciences to examine the amount one variable is related to another (Creswell, 2012). When two variables are positively correlated, they both increase in value. As one variable increases, so does the other. When two variables correlate negatively, one decreases when the other increases. When there is no evidence of one variable impacting the other, they are said to be uncorrelated (Morgan, Leech, Gloeckner & Barrett, 2013).

Evidence of convergent validity was tested by measuring the extent to which the TWTLS and all its constructs correlated with writing apprehension (Daly & Miller, 1975). The Writing Apprehension scale measures the extent to which people avoid or dislike writing tasks. (Daly & Miller, 1975; Daly & Wilson, 1983). In the mid 1970's when Bandura (1977) began to build

theory on efficacy, Daly and Miller (1975) began to build their theories on writing apprehension and designed a instrument to measure it.

Writing apprehension is frequently mentioned in research that examines writing self-efficacy. Crumbo (1999) found a strong negative correlation between writing apprehension and writing self-efficacy. However, the most prominent researchers to connect writing apprehension with self–efficacy is Pajares (1996, 2003) and Pajares and Johnson (1993, 1995, 2007 (with Usher)). Therefore, I hypothesize that the TWTLS should negatively correlate with writing apprehension. If people have high efficacy of writing and high knowledge of writing, they should be less apprehensive. The items from the WAS were included with the TWTLS. Daly and Miller's (1975) instrument has been in use for over 25 years and is well established.

TWTLS and all its constructs were correlated with the self-efficacy of teaching scale and both of its constructs of personal teaching efficacy and general teaching efficacy (Wookfolk & Hoy, 1990). The authors of this study measured the extent to which teachers feel efficacious about teaching. A shorter version of the scale was also developed (Woolfolk & Hoy, 1990), but the longer two factor version (general teaching efficacy and personal teaching efficacy) was used for this study to see how each factor of the teaching efficacy scale correlated with each factor of the TWTLS. The teacher efficacy scale has been used frequently in the literature. Notably, Coladraci (1992) examined how well the scale predicted teachers regretting their choice of profession. Henson, Kogan and Vacha-Haase measured the integrity of the scale and found it to produce acceptable reliability coefficients on both factors of personal teaching efficacy and general teaching efficacy (.78 and .70). A positive correlation between this scale both of its constructs and, specifically, the self-efficacy of WTL construct would provide evidence of validity because teachers who lack general teaching efficacy are logically less likely to be

efficacious with any writing strategies. However, the relationship between the self-efficacy of teaching scale and the others constructs were also examined to test the amount of variance explained by teacher efficacy given those constructs.

TWTLS and all its constructs were correlated with the Job Satisfaction Survey (Spector, 1985; JSS). The JSS has over 35 years of use and has been used in numerous studies. One of note was a study of job satisfaction in special education teachers (Lowry, 2004). Others have used this study to examine job turnover (Jaramillo & Locander, 2008) and it has been examined internationally (Spector & Wimalsiri, 1986). Finally Spector has published textbooks on the topic of job satisfaction (Spector, 1997). It has been translated into several languages. This measure consists of nine subscales: (a) Pay, (b) promotion, (c) supervision, (d) fringe benefits, (e) contingent rewards, (f) operating procedures, (g) coworkers, (h) nature of work, and (i) communication. Each subscale produced alpha values >.7, with a total scale alpha of .91 (Spector, 1985). This scale consists of thirty five questions. All the factors of the TWTLS were correlated with the total scores of each of the mentioned scales as well as their factors to test for convergent validity, the alternative hypothesis being that the TWTLS would correlate positively with job satisfaction.

Finally, the TWTLS and all of its constructs were correlated with teacher longevity. The instrument asked the teachers to report the number of years they taught. Some research suggests that longevity is not a good predictor of teachers trying new things. For example, Russell, O'Dwyer, Bebell and Tao (2007) found that the use of technology varied more on the way technology is defined given age than it varied given age itself. A longitudinal study by Clotfelter , Ladd and Vigdor (2007) found that teacher longevity was an important factor in student

performance. Therefore, bivariate correlation was used to examine the relationship between years teaching and all factors of the TWTLS.

The TWTLS and all its constructs were assessed for known-groups validity by using analysis of variance and Kruskal Wallis tests (Field, 2009). The independent variables were the content area of teacher (language arts, mathematics, science and social studies) and setting of the teacher's work (urban, rural and sub-urban) and the dependent variables were each of the constructs of TWTLS and the scale itself. Given that the literature on WTL is very heavily applied towards social studies and language arts teachers, less applied towards science teachers and even less towards mathematics teachers, the results of the ANOVA should reflect this hierarchy. No differences should be found given setting of teacher's work. Planned tests with Bonferonni corrections (Field, 2009) and measures of effect size (Cohen, 1988) were also used.

Two t-tests were used with gender and level teaching (middle school or high school) on all constructs of the instrument. Statistical significance is not desired between both genders and the TWTLS is designed to be applicable to all secondary grades (6-12), so no statistical significance is desired. Effect sizes were calculated if statistical significance was found.

Summary

This study develops and tests an instrument that measures teacher readiness to use WTL. Items will be tested using classical test theory methods. After consulting with experts to create and my items, I will use other experts to help establish content validity. After for checking for item difficulty, correlation and covariance, Cronbach's coefficient and McDonald's coefficient were used to test for internal consistency. Exploratory factor analyses and confirmatory factor analyses tested the fit of the model as well as item discrepancy. Correlation and ANOVA were used to test for convergent and discriminant validity.

CHAPTER 4: RESULTS

Introduction

This study first created the TWTLS and then examined its psychometric properties. As discussed in chapter 3, the appropriateness of the content and response processes were explored after item development by seeking expert input. The internal structure and the scale's relationships with other variables were then explored.

Appendix A gives the six hypothesized factors of the TWTLS and their corresponding item numbers. Appendix E gives the original version of the instrument. After checking for item difficulty and discrimination, reliability tests, factor analyses, correlation tests and tests of differences were conducted to test the scale. As will be discussed later in the chapter, items were removed from the scale to improve its fit. The final scale consisted of three factors and ten items. However, future research is needed to improve the scale, specifically to improve items that examine teachers' knowledge of WTL since, as will be discussed, those items produced poor validity evidence.

Treatment of the Data

The data were gathered by attempting to sample 6,080 teachers across a mountain west state. Overall, 419 respondents partially completed the survey and its validity scales. Campus Labs software was used to solicit survey responses. The data were exported from Campus Labs software to Microsoft Office Excel where they were stored in their original form. An additional copy of the data was made in another Excel file where it was transformed into a comma delimited file and imported to the Statistical Package for the Social Sciences (SPSS) version 22. The data were screened and cleaned. Overall, 339 respondents completed the TWTLS in its

entirety. Respondents who did not complete it in its entirety were removed from the dataset for factor analyses, but many were included in other analyses. In addition, several items were reversed on the TWTLS as well as on the Self Efficacy of Teaching Scale (Woolfolk & Hoy, 1991), the Writing Apprehension Scale (Daly & Miller, 1978) and the Job Satisfaction Scale (Spector, 1985).

Using SPSS syntax, several variables were recoded for practical analyses. First, a variable representing the grade at which a teacher works was coded. It was observed that several high school teachers work in more than one grade (e.g. 9^{th}, 10^{th}, 11^{th} and 12^{th}), so a new variable was coded to represent middle school or high school. A content area variable was coded. Although I attempted only to sample mathematics, science, social studies and language arts teachers, some teachers who teach more than one content area or who teach other areas besides the core responded. Therefore, a new variable was created that only represented teachers who only teach mathematics, science, social studies, or language arts. This variable did exclude multiple content area teachers, so this should be considered.

Finally, I calculated sum scores of the convergent scales of writing apprehension, teacher efficacy and job satisfaction. Sum scores for the TWTLS were not calculated until after the tests of reliability and validity.

Demographics

After eliminating forty-two cases that did not begin the survey, SPSS was used to run frequencies on the demographic variables of interest on the 377 remaining. Table 4.1 gives the demographic data of the sample. The majority of the sample consisted of women (72.4%) Consolidating the data between middle school and high school teachers reveals that most of respondents were high school teachers (55.4%); sixteen teachers (4.2%) did not report teaching

in either middle school or high school. Most of the sample consisted of teachers in suburban schools (62.8%) and most teachers reported teaching language arts (17%), mathematics (15.1%), science (17.5%), or social studies (12.5%), leaving the rest of the sample either teaching more than one content area, other content areas outside of language arts, teaching content not listed as an option, or fulfilling other roles outside of teaching.

Table 4.1

Gender, grade teaching, school setting, and content areas of the sample in number and percent

Demographic Variable	N	Percent
Gender		
Male	104	27.6
Female	273	72.4
Grade Teach		
6th Grade	30	8.0
7 Grade	28	7.4
8th Grade	36	9.5
9th Grade	6	1.6
10th Grade	6	1.6
12TH GRADE*	1	.3
More than one 6-8	58	15.4
More than one 9-12	196	52.0
Other	16	4.2
School Setting		
Urban	100	26.5
Rural	45	11.9
Suburban	232	62.8
Content Area of Teacher		
Language Arts**	64	17.0
mathematics **	57	15.1
Science**	66	17.5
Social Studies**	47	12.5
ESL	8	2.1
SPED	17	4.5
Remedial Reading	4	1.1
Consumer Sciences	5	1.3
Fine Art	4	1.1
Music	7	1.9
PE	4	1.1
Technology Education	7	1.9
mathematics and Language Arts	2	.5
ESL and Language Arts	4	1.1
Remedial Reading and Language Arts	11	2.9
mathematics and Science	7	1.9
Social Studies and Language Arts	18	4.8
Science and Social Studies	7	1.9
Other	38	10.1

* No teacher reported only teaching 11th grade. **"Core" content areas.

Research Question Categories One and Two

1. *Does the TWTLS show evidence of appropriate content? Doe the items represent the literature and theory? Do the experts find the measure to consist of appropriate content?*
2. *Does the TWTLS show evidence of response processes? Do the experts who reviewed the measure respond appropriately?*

Since both of these research questions relate to item development, they were mostly addressed in chapter three. To briefly recapitulate, initial items were developed from the review of literature and teacher input. The literature helped to define the latent construct and create items that theoretically seemed to fit the nomological net (Netemeyer et al., 2003, p. 82-83). To improve the items, a development workshop with middle school teachers was conducted. Of particular interest were the items measuring the construct of knowledge of WTL. The teacher input was used to develop a set of items which were then tested for content validity using expert feedback. The experts were also asked to examine the items, constructs and comment on any thoughts regarding their own response processes. The teacher experts who reviewed the instrument helped establish that respondents would approach the TWTLS appropriately. Appendices C through J show the protocols of item development and expert review.

Research Question Category Three

3. *Does the TWTLS show evidence of internal structure? The theoretical structure of the TWTLS match the empirical structure?*

Internal Consistency Reliability

Cronbach's alpha was used to assess the internal consistency of the TWTLS before conducting any further analyses. Alpha was used to assess all forty-four items (.90), the WTL

continuum factor (.48), the WTC continuum factor (.826), the factor on Relevance of writing to the respondent's content area (.90), efficacy of teaching with writing (.94), and use of writing (.90). McDonald's omega is later used and reported with the CFA results since it uses factor loadings and error terms to calculate the internal consistency of each factor. The factor of knowledge of WTL consisted of five dichotomous items. Kuder-Richardson 21 analysis calculated using Excel was conducted to assess the internal consistency of these items. Results indicate poor internal consistency (-.11).

Item Analyses

Items one through eight were reversed, indicating that lower scores were closer to WTL. Therefore, lower scores on items nine through fifteen are closer to WTC. The first set of items that were reversed consisted of writing tasks that, according to the literature, are mostly writing to learn whereas the rest of the items in that factor are either neutral or writing to communicate (Maxwell, 1996). Therefore, they were reversed to account for the relationship between the teacher's response and the theory derived from the literature. The latter set of reversed items consisted of negatively worded questions.

As discussed in chapter 2, the TWTLS consisted of 44 items with six theoretical factors (as shown in appendix A). Table 4.2 gives the item numbers, the factors of the items with their descriptions, descriptive statistics of each item and item discrimination scores. Microsoft excel was used to calculate each item's mean and standard deviation for item difficulty analyses. The psych package in R Commander statistical software (Revelle, 2014) was used to calculate item discrimination on the non-dichotomous items minus the item in question using Pearson Moment Product *r*. Since the dichotomous items were ordinal, SPSS was used to calculate discrimination

statistics on them with the entire scale minus the item in question using a Spearman correlation, which can be used to correlate ordinal data with scale data (Morgan et al., 2007).

The first eight items belonged to the first theoretically conceived factor which asked teachers to rank different WTL tasks on a continuum ranging from mostly writing to learn to mostly writing to communicate. Items nine through fifteen asked them to rank WTL tasks. Items sixteen through twenty asked teachers to rank how relevant they perceived writing to be in their content areas. Items twenty one to twenty four asked teachers to report their self-efficacies of using WTL in their classrooms. Finally, items thirty through forty-four asked teachers to report how often they used specific writing tasks.

Frequency of item responses. Appendix L gives each item, each response to each item and the frequency and percentage of each response option. In general, teachers ranked most items on the first factor as equally writing to learn or writing to communicate, or mostly writing to learn. This means that many items that asked teachers to rank tasks that are theoretically (according to the literature) writing to learn, were, ironically, ranked as equally both. This was probably due to poor wording of the items. Teachers ranked most WTC (factor 2) items as either equally both or mostly writing to communicate. For example, 59% of respondents ranked essays as equally WTL and WTC and 43% of respondents ranked writing for discussion as equally both when the former is, according to the literature, more of a WTC activity and the latter is more of a WTL activity. As a result there was little variation in these items, suggesting potential problems with item wording and thus validity.

The perceived relevance items were negatively skewed as most respondents answered within the three highest potential responses (agree, strongly agree, or very strongly agree). The same was true of the self-efficacy of writing to learn factor, which asked respondents to rank

their efficacy from 1 to 10. Most respondents ranked >5 for all questions. Thus these data were negatively skewed. However, within those high ranges (the top three for the perceived relevance items and the top five for the efficacy items), there was variation in the scores.

The knowledge items showed very little variation. With the exception of the last question, >40% got them correct. The first three knowledge items had the least variation with >80% of respondents correctly answering. This suggested validity problems.

Finally, the items asking teachers to report frequencies of using specific writing tasks showed an interesting pattern. While most teachers reported using certain WTL tasks such journals or logs, most reported using other WTL tasks. For example 80% reported using summaries in their classes. In addition, many teachers use academic writing tasks such a essays and reports, but few use creative writing.

Item difficulty and discrimination. After calculating the frequencies of each item, means and correlations were used to calculate item difficulty and discrimination. The first factor of items, which asked teachers to rank specific tasks on a continuum, indicates moderate levels of difficulty for most items. In this case the lower the mean, the less likely the item was to be ranked accurately. For example, item one asks respondents to rank reading logs on a continuum between writing to communicate and writing to learn. According to the literature, reading logs are a writing to learn activity (Maxwell, 1996). Therefore, the further from five the respondent ranks, the more difficult the item. Since items nine through fifteen were reversed, a mean closer to five meant that respondents ranked those tasks as closer to WTL.

The relevance of writing to the content area questions illustrate that most respondents reported each item as "relevant" (4) or higher. Items 18 and 19 indicate slightly higher levels of difficulty, but similar ranges. The efficacy questions also show high means, indicating that most

teachers ranked at least a seven. The knowledge questions, at first glance, appear to be problematic. With the exception of item 26, all of these items illustrate that most respondents selected the correct option. The means of the use of writing items indicate a medium to moderate range of difficulty except for items 41-44, which asked respondents about their use of creative writing tasks. These items suggest that most teachers do not ask students to write using these genres.

As shown in table 4.2, items 1-15 yielded low discrimination scores coefficients. The items that asked teachers to rank tasks on the WTL-WTC continuum had low discrimination scores. For example, the item asking teachers to rank note taking (item eight) yielded a very low discrimination scores (r=-0.065). While most responses on the TWTLS resulted in positively skewed distributions, the WTL items on the continuum factor were normally distributed, which may explain this discrimination score. The highest discrimination scores came from items 17-24 and the items asking teachers to report their uses of writing activities yielded discrimination scores >.4, except for item 37 (r=-.02).

The other items of concern relate to the knowledge items. Three of these suggest that most people either knew the answer, or were able to successfully guess. One of them shows very high difficulty and one seems to have low difficulty. To further test these items, R version 3.0.2 statistical software with the psych package (Revelle, 2014) was used to calculate the biserial and point biserial correlations between the knowledge items (items 25-29). As shown in Table 4.2 the coefficients illustrate low to moderately low discrimination scores. Item 28 showed the highest biserial and point biserial correlation (r= .42 and .60 respectively). The rest of the biserial correlations were <.4 and the rest of the point biserial correlations were <.3.

Table 4.2

Descriptive Statistics and discrimination scores for initial items (n=338)

	Description	Min	Max	$\bar{x}$	SD	DISCR
Item 1	WTL Continuum- Reading Log	0	5	2.613	1.507	0.232
Item 2	WTL Continuum- Writing in Journal	0	5	2.650	1.269	0.262
Item 3	WTL Continuum- Free Writing	0	5	3.090	1.287	0.290
Item 4	WTL Continuum- Discussion Writing	0	5	3.294	0.960	0.192
Item 5	WTL Continuum- Summary Writing	0	5	2.673	1.020	0.180
Item 6	WTL Annotating*	0	5	2.034	0.987	0.320
Item 7	WTL Continuum- Writing to Synthesize	0	5	2.446	0.984	0.169
Item 8	WTL Continuum- Notes	0	5	1.915	0.818	0.065
Item 9	WTC Continuum- Essays*	0	5	2.730	0.842	0.141
Item 10	WTC Continuum- Research Paper*	0	5	2.940	0.949	0.216
Item 11	WTC Continuum- Reports*	0	5	2.910	0.942	0.167
Item 12	WTC Continuum- Poems*	0	5	2.280	0.998	0.200
Item 13	WTC Continuum- Fiction*	0	5	2.230	0.950	0.197
Item 14	WTC Continuum- Creative Nonfiction*	0	5	2.500	0.962	0.240
Item 15	WTC Continuum- Letters*	0	5	1.910	0.908	0.269
Item 16	Relevance Question 1	1	6	4.710	1.140	0.454
Item 17	Relevance Question 2	1	6	4.680	1.157	0.453
Item 18	Relevance Question 3*	1	6	5.196	1.220	0.493
Item 19	Relevance Question 4*	1	6	5.157	1.269	0.570
Item 20	Relevance Question 5*	1	6	4.939	1.391	0.550
Item 21	Efficacy Question 1	1	10	7.610	2.102	0.687
Item 22	Efficacy Question 2	1	10	7.750	2.107	0.721
Item 23	Efficacy Question 3	1	10	7.640	2.235	0.678
Item 24	Efficacy Question 4	1	10	7.450	2.137	0.636
Item 25	Knowledge Question 1*	0	1	0.809	0.394	-.590
Item 26	Knowledge Question 2*	0	1	0.074	0.262	.032
Item 27	Knowledge Question 3*	0	1	0.746	0.436	.014
Item 28	Knowledge Question 4*	0	1	0.803	0.398	.110
Item 29	Knowledge Question 5*	0	1	0.213	0.410	-.099

Table 4.2 (continued)

Descriptive Statistics and discrimination scores for initial items (n=338)

	Description	Min	Max	$\bar{x}$	SD	DISCR
Item 30	Use of Reading Logs	1	4	1.950	1.035	0.505
Item 31	Use of Journals	1	4	2.430	1.176	0.507
Item 32	Use of Free Writes	1	4	2.430	1.073	0.594
Item 33	Use of Writing for Discussion	1	4	3.070	0.951	0.624
Item 34	Use of Summaries	1	4	3.090	0.875	0.457
Item 35	Use of Annotation	1	4	2.680	1.135	0.617
Item 36	Use of Synthesis	1	4	3.140	0.925	0.608
Item 37	Use of Notes	1	4	3.420	0.775	-0.019
Item 38	Use of Essays	1	4	2.780	1.101	0.653
Item 39	Use of Research Papers	1	4	2.480	0.937	0.536
Item 40	Use of Reports	1	4	2.450	0.970	0.378
Item 41	Use of Poems	1	4	1.840	0.921	0.583
Item 42	Use of Letters	1	4	1.970	0.921	0.534
Item 43	Use of Fiction	1	4	1.890	0.939	0.577
Item 44	Use of Nonfiction	1	4	1.920	0.964	0.536

Table 4.3

Biserial and point biserial correlations of dichotomous items (n=338)

Item	Biserial	Point Biserial
25	0.268	0.359
26	-0.198	-0.370
27	0.248	0.336
28	0.415	0.595
29	0.240	0.033

Items asking teachers to rank tasks may be problematic due to their distributions and their discrimination parameters. The dichotomous items relating to the factor of knowledge also yielded low or negative discrimination scores. Since they are dichotomous, their mean scores represent the percentage of respondents who correctly answered the items. Given these results, a decision was made to exclude the knowledge items from the EFA, but include items in the

factors with acceptable reliability as measured by alpha. Item difficulty and discrimination are not always sufficient enough to eliminate items (Raykov & Marcoulides, 2012), despite several low scores. Factor loadings and fit statistics, in combination with the item difficult and discrimination parameters, were later used to eliminate items from the model.

Factor Models of the TWTLS

The testing of the construct validity and internal consistency reliability using omega of the data gathered for the TWTLS were tested with four different factor analysis models. As shown in table 4.4, the first model was a exploratory factor analysis (EFA) with five factors, followed by a one factor confirmatory factor analysis (CFA), then a three factor CFA followed by a two factor CFA. The chi-square, change in chi-square, RMSEA, CFI and TLI are all given in the table. As shown, each model illustrated improvement in all areas of fit. A different sample was used for the EFA than the CFAs. Each model will be discussed respectively.

Table 4.4

The, chi-square $(\chi)^2$, degrees of freedom (df),change in chi-square $(\Delta\chi)^2$, RMSEA, CFI, TLI and omega (ω) values of each factor analysis, starting with the first EFA and finishing with the final two factor CFA solution

Model	χ^2 (df)	$\Delta\chi^2$	RMSEA	CFI	TLI	ω(s) respectively
5 factor EFA	1268.937 (556)	N/A	.087	.830	.774	N/A
1 factor CFA with factors 1&2 removed	1276.963 (135)	N/A	.003	.554	.495	.943
3 factor CFA with factors 1&2 removed	418.361 (132)	858.602**	.113	.879	.860	.997 .938 .998
Final 2 factor CFA factors 1,2&5 removed	34.053 (19)	1242.910**	.068	.987	.981	.873 .918

Note. *p<.05, ** p < .001 relating to comparison with the baseline model.

Exploratory factor analysis. The psychometric properties of the TWTLS were initially tested using an exploratory factor analysis (EFA) to better understand the underlying structure of the instrument. The statistical assumptions of EFA were checked. Specifically, each item correlated with at least one other item (r<.3). Mplus's chi-square test of model fit, which is equivalent to Bartlet's test of sphericty, stipulated no linear relationship between the items (Raykov & Marcoulides, 2011, p. 69).

Mplus software was used to examine the eigenvalues and scree plots of the factor model. The first rotated factor produced an eigenvalue of 10.366. Eight factors produced an eigenvalue of 1.239. Fit indices did improve as the number of factors increased. Eight factors showed better fit indices (χ^2=855.158, p<.001, *RMSEA*=.07, *TLI*=.85, *CFI*=.91) than five factor model did (χ^2=1268.937, p<.001, RMSEA=.087, *TLI*=.774, *CFI*=.830). Additionally, no more than eight factors could be run due to a lack of items. Even though the eight factor model produced better numbers than five factor model, both models exhibited chi-square statistics substantially larger than their degrees of freedom thus resulting in p<.001. However, chi-square is a function of sample size. Therefore, neither model was retainable. The five factor model, which had an eigenvalue of 1.849 and appeared to be better on the scree plot, which, according to Bandalos and Boehn-Kaufman (2009) is a better indicator than eigenvalues, was used to examine factor loadings and potential relationships between items. In addition, the five factor model was selected due to the a-priori theoretical structure of the WTLS, which hypothesized five factors. When developing an instrument, its theoretical structure should be considered as well as the fit indices (DeVellis, 2012). Thus, the five factor EFA model was used.

There is debate about the cut-off score for factor loadings. According to Raykov and Marcoulides (2011), factor loadings >.3 are consider to contribute to an interpretation of the

factor structure (p.78). However, Netemeyer et. al. (2003, p. 125) recommend loadings >.4. Table 4.5 shows the factor loadings of the five factor EFA model. The first four items yielded very low loadings. Items five through seven exhibited adequate (according to Raykov and Marcoulides, (2011)) loadings(>.3) and item eight was <.3. These items seemed to be factored on the construct asking teaching to rank activities. Items 9-15 loaded >.6, but had mixed results in terms of factors. Some of these items loaded higher than the recommended maximum of .9 (Netemeyer et al., 2011). These items were written to theoretically relate to the second factor non-WTL writing activities, but some were factored on the first factor which asks teachers to rank WTL activities. These items (10-12), asked teachers to rank research papers, reports and poems. The EFA produced favorable factor loadings for the a-priori factors of perceived relevance of WTL to the content area (factor 3, items 16-20) and efficacy of WTL (factor 4, items 21-24); all loadings were >.7, though two of the efficacy items were<.9. All subsequent items loaded acceptably (>.4) with the exception of item 33 (.3) which asked teachers to report their uses of writing for discussion and notes respectively and item 37 (-.14), which asked teacher to report how much they use writing for discussion. Subtracting each item's estimated residual variance from one gave a variety of communalities, many of which were very small. Most factors did not correlate at statistically significant level. Perceived relevance and efficacy of WTL correlated highly (r=.507); perceived relevance correlated moderately with use of WTL (r=.338) and use of WTL correlated highly with use of WTC (r=.602).

The fit statistics and communalities indicated problems with this model. The factor loadings were used to eliminate items for the first CFA model. The item discrimination scores and item distributions were also used. Items with poor loadings also had low variances and discrimination scores. In addition, most of these items were nested on the WTL continuum

factor, which exhibited low internal consistency reliability. Therefore, a decision was made to exclude the first two factors from the CFA models, which included items 1-15.

Even though loadings for items 9-15 were <.4, several items factored above .9. However, this was not the only information considered. In addition, it was decided that these items would not be useful if one wanted to measure teacher readiness to use WTL. This is because these items all relate to WTL activities. The items that preceded them, items one through seven, relate to WTL activities. Both of these constructs are needed to fully evaluate teachers' understandings of writing tasks. For example is not useful to know how a teacher ranks an essay (as WTL or WTC), but not how he/she ranks a reading journal. Unless all items 1-15 are used, neither factor is useful. This is because items one through fifteen represents all WTL and WTC activities gathered from the literature. Without both factors, there would be incomplete information regarding teacher perceptions of writing activities.

In addition, items 33 and 37 were eliminated. They both exhibited low factor loadings on factors to which they were not theorized to belong. Item 33, which asked respondents to rank the use of writing for discussion, had its highest loading under self-efficacy of WTL. Item 37 (use of notes) factored highest under perceived relevance. Neither of these items made sense under these factors and were thus eliminated. Even though these items were eliminated, the information gained from the EFA was used to create new items to be tested in the future. Items with loadings of >.9, items twenty-one and twenty-two were not removed.

Table 4.5

Pattern Matrix of the EFA model including factor loadings for factors one through five. Only the highest loadings for each factor are shown

Item	f1	f2	f3	f4	f5
1		**0.204***			
2	**0.239***				
3		**0.155***			
4		**-0.116**			
5	**0.346***				
6	**0.342***				
7	**0.311***				
8	**0.273***				
9		**0.640***			
10		**0.913***			
11		**0.928***			
12	**0.957***				
13	**0.981***				
14	**0.782***				
15	**0.724***				
16			**0.757***		
17			**0.755***		
18			**0.861***		
19			**0.864***		
20			**0.738***		
21				**0.932***	
22				**0.962***	
23				**0.775***	
24				**0.762***	
30					**0.560***
31					**0.459***
32					**0.567***
33				**0.299***	
34					**0.323***
35					**0.384***
36					**0.360***
37			**-0.135**		
38					**0.489***
39					**0.445***
40					**0.367***
41					**0.804***
42					**0.837***
43					**0.912***
44					**0.819***

*p<.05

Unidimensional confirmatory factor analysis. To test the hypothesis that three (and later two) factors account well for the data on the TWL, a unidimensional CFA was conducted on Mplus software. This created a nested model against which the next CFA was tested (Raykov

& Marcoulides, 20011). Items 16-24, 30-32, 38-39 and 41-44 were tested on one factor. Table 4.6 gives the results of the model. All items loaded >.4. However, fit indices were less than desirable (χ^2 =1276.96, df= 556, p<.001, *RMSEA*=.003, *CFI*=.554, *TLI*=.495). Even though the RMSEA were better than the desired .05 level, the other fit indices of CFI and TLI were much less than the suggested .9 (Raykov & Marcoulides, 2011). In addition, the chi-square and degrees of freedom suggest that one factor is not sufficient to account for all the items, but this is sensitive to sample size. Reliability coefficients suggest desirable internal consistency on the one factor model (ω=.943).

Table 4.6

The estimated factor loadings (Estimate), the standard error (S.E.) of each loading, the loading divided by the standard of error (Est./S.E), and the statistical significance (p) of each item

Item Number	Estimate	S.E.	Est./S.E	p
16	**0.493**	0.061	8.126	0.000
17	**0.485**	0.061	7.906	0.000
18	**0.596**	0.053	11.337	0.000
19	**0.587**	0.054	10.972	0.000
20	**0.563**	0.055	10.164	0.000
21	**0.849**	0.030	28.775	0.000
22	**0.860**	0.028	30.908	0.000
23	**0.838**	0.029	29.209	0.000
24	**0.748**	0.039	19.014	0.000
30	**0.581**	0.055	10.589	0.000
31	**0.585**	0.055	10.649	0.000
32	**0.691**	0.045	15.432	0.000
38	**0.747**	0.037	20.431	0.000
39	**0.505**	0.059	8.499	0.000
41	**0.667**	0.049	13.745	0.000
42	**0.655**	0.049	13.413	0.000
43	**0.705**	0.045	15.821	0.000
44	**0.646**	0.050	12.967	0.000

Note. Factor loadings>.4 in boldface.

Three factor CFA. With the elimination of the first CFA, a three factor model (relevance of WTL, WTL efficacy and use of writing) using the same items as the unidimensional nested model was tested on Mplus software. The factors tested, respectively, were perceived relevance

of writing, efficacy of WTL and use of writing. Table 4.7 gives the factor loadings of the model. Overall, the model fit better than the nested model (χ^2 =418.36, *RMSEA*=.113, $\Delta\ \chi 2=8.58.60$, *CFI*=.879, *TLI*=.860, p<.001). The RMSEA was higher than the desired level. However, other fit indices indicate desirable results (note CSI and TLI). There is a statistically significant difference between this model and the one-factor model. The table also shows the correlations between the factors, which are in the acceptable to high range. Factor reliability coefficients (*omega*) indicate strong internal consistency (.997, .938, .998 respectively). Table 4.8 gives the discrepancy table for this model. As shown in the table, items 16 (perceived relevance), 20 (perceived relevance), 38 (use of WTL), 39 (USE of WTL) and 44 (use of WTL) showed the most discrepancies. All discrepant items except 20 were removed for the next model. Item 20 was not removed because three out of four of its discrepancies were with other discrepant items.

Table 4.7

The estimated factor loadings (Estimate), the standard error (S.E.) of each loading, the loading divided by the standard of error (Est./S.E), and the statistical significance (p) of each item for each factor of Perceived Relevance, Efficacy of using WTL, and Use of Writing.

	Estimate	S.E.	Est./S.E.	p
Relevance				
ITEM16	0.760	0.066	11.577	<.001
ITEM17	0.761	0.066	11.607	<.001
ITEM18	0.905	0.060	15.187	<.001
ITEM19	0.930	0.058	15.925	<.001
ITEM20	0.757	0.066	11.520	<.001
WTL Efficacy				
ITEM21	0.917	0.059	15.659	<.001
ITEM22	0.952	0.057	16.715	<.001
ITEM23	0.889	0.060	14.854	<.001
ITEM24	0.784	0.064	12.193	<.001
Use of Writing				
ITEM30	0.679	0.069	9.824	<.001
ITEM31	0.677	0.069	9.794	<.001
ITEM32	0.738	0.067	11.000	<.001
ITEM38	0.621	0.071	8.755	<.001
ITEM39	0.486	0.074	6.542	<.001
ITEM41	0.820	0.064	12.844	<.001
ITEM42	0.771	0.066	11.726	<.001
ITEM43	0.830	0.063	13.086	<.001
ITEM44	0.743	0.067	11.108	<.001

Table 4.7 (Continued)

The correlations between each factor(r) are given on the last three rows

Relevance with Efficacy	0.502	.062	8.166	<.001
Relevance with Use	0.407	.070	5.828	<.001
Efficacy with Use	0.610	.053	11.418	<.001

Table 4.8

All the items of the three factor model and their discrepancies with themselves and other items.

	ITEM16	ITEM17	ITEM18	ITEM19	ITEM20	ITEM21	ITEM22	ITEM23	ITEM24
ITEM16	0								
ITEM17	**0.326**	0							
ITEM18	-0.029	-0.058	0						
ITEM19	-0.048	-0.028	0.023	0					
ITEM20	-0.06	-0.051	0.009	0.011	0				
ITEM21	0.041	0.042	-0.015	0.004	0.056	0			
ITEM22	0.048	0.019	-0.041	0.015	0.075	0.008	0		
ITEM23	0.01	-0.015	-0.046	-0.039	0.08	0.002	-0.011	0	
ITEM24	0.013	-0.011	-0.079	-0.046	0.087	-0.039	0	0.048	0
ITEM30	0.024	0.036	-0.017	-0.019	**0.131**	0.031	0.037	0.042	0.048
ITEM31	-0.004	-0.021	-0.001	0.004	0.058	-0.024	0.017	0.005	0.056
ITEM32	-0.061	-0.064	-0.005	-0.001	0.09	-0.043	-0.033	0.024	-0.008
ITEM38	0.071	**0.123**	**0.161**	**0.15**	**0.198**	**0.197**	**0.178**	**0.126**	**0.109**
ITEM39	0.047	**0.126**	0.09	**0.146**	**0.153**	0.089	0.097	**0.142**	**0.138**
ITEM41	-0.068	-0.06	-0.011	0.018	**0.133**	-0.082	-0.049	-0.018	0.045
ITEM42	-0.021	-0.039	-0.053	-0.021	0.045	-0.017	-0.016	0.015	0.054
ITEM43	-0.072	-0.08	-0.066	-0.052	0.093	-0.073	-0.05	-0.011	-0.003
ITEM44	**-0.106**	**-0.102**	-0.056	-0.032	**0.101**	-0.02	-0.023	-0.009	0.055

	ITEM24	ITEM30	ITEM31	ITEM32	ITEM38	ITEM39	ITEM41	ITEM42	ITEM43
ITEM30	**0**								
ITEM31	**0.167**	**0**							
ITEM32	0.078	**0.128**	0						
ITEM38	-0.044	-0.061	0.03	0					
ITEM39	-0.078	0.01	-0.026	0.12	**0**				
ITEM41	-0.004	-0.059	-0.026	-0.015	0.011	0			
ITEM42	-0.066	-0.041	-0.061	0.003	0.049	0.053	0		
ITEM43	-0.017	-0.058	-0.013	-0.027	-0.095	0.028	0.034	0	
ITEM44	-0.057	0.008	-0.02	-0.045	0.01	-0.006	-0.011	0.07	0

Note. Discrepant items in boldface.

Two factor CFA. Given the discrepancy matrix, a final two factor CFA model was tested using Mplus software. The factor of use of writing was removed for similar reasons that the first factor was removed after the EFA. Without all possible writing tasks measured, the use of writing factor is not beneficial to the overall purpose of the TWTLS. The two factors tested were perceived relevance of WTL and efficacy of WTL. These factors were deduced from the previous models. However, the same sample that generated the first to CFA results was re-used on this model, so caution is advised in interpreting the results. Future research will examine the results of this model using a fresh sample.

This model produced better fit results than the nested one factor model (χ^2 =34.05, *RMSEA*=.068, $\Delta \chi 2=1242.91.60$, *CFI*=..987, *TLI*=..981, p<.001). Like the previous model, this showed a statistically significant difference from the baseline model (p<.001). There was also a statistically significant chi-square, which tested how the model fit the population covariance (χ^2 =34.05, *df*=19, p=.018). Again, chi-square is sensitive to sample size.

As shown in table 4.9, all factors loaded >.7. Internal reliability as calculated by factor loadings and their error terms indicate desirable coefficients ($omega_1$=.873 and $omega_2$=.918); it is interesting to note the decrease in omega on factor one (perceived relevance). This was probably due to discarding item sixteen from the factor. The factors correlate at r= .492. The discrepancy matrix (table 4.10) shows that all items are > |-.1| = .1 indicating discrepancies less than the minimum level.

These factors should be tested on a fresh sample to confirm the structure with replication. In addition, if possible, a random sample would improve the generalizability of the model. Small changes may be made to future samples by testing these factors without items seventeen and twenty-four on one model and without items twenty two and nineteen. The first model to be

examined by future research exhibited the highest discrepancies and lowest factor loadings. The second model to be examined eliminates the items with the highest factor loadings >.9 in each factor. Nevertheless, these data indicate a good model for self-efficacy of WTL and perceived usefulness of writing to the content area.

Table 4.9

The estimated factor loadings (Estimate), the standard error (S.E.) of each loading, the loading divided by the standard of error (Est./S.E), and the statistical significance (p) of each item for each factor of Perceived Relevance and Efficacy of using WTL. The last row includes the correlation between the two factors (r)

	Estimate	S.E.	Est./S.E.	p
Relevance of Writing				
Item 17	0.709	0.068	10.502	<.001
Item 18	0.906	0.060	15.105	<.001
Item 19	0.953	0.058	16.487	<.001
Item 20	0.758	0.066	11.525	<.001
Efficacy of WTL				
Item 21	0.919	0.059	15.652	<.001
Item 22	0.953	0.057	16.699	<.001
Item 23	0.887	0.060	14.741	<.001
Item 24	0.780	0.065	12.077	<.001
Relevance with Efficacy	0.492	0.062	7.915	.000

*Pearson's Moment Product Correlation

Table 4.10

All the items of the two factor model and their discrepancies with themselves and other items

	ITEM17	ITEM18	ITEM19	ITEM20	ITEM21	ITEM22	ITEM23	ITEM24
ITEM17	0							
ITEM18	-0.011	0						
ITEM19	0.004	0.002	0					
ITEM20	-0.012	0.008	-0.007	0				
ITEM21	**0.073**	-0.008	0.002	0.062	0			
ITEM22	0.05	-0.033	0.013	**0.082**	0.005	0		
ITEM23	0.016	-0.037	-0.039	**0.087**	0.003	-0.01	0	
ITEM24	0.016	-0.07	-0.045	**0.094**	-0.037	0.002	0.053	0

Research Question Category Four

4. *What are the relationships of the TWTLS with other variables? Does it show evidence of convergent and discriminant validity with other measures and/or respondent attributes? Does it show evidence of known-groups validity?*

Correlations with other measures. The final two factors of the TWL scale were tested with Pearson's Moment Product *r* correlations in contrast to the years teachers taught ($\bar{x}$=12.71, *SD*=7.90) the Teacher Efficacy scale (Woolfolk & Hoy, 1991; $\bar{x}$=54.19, *SD*=5.67) , Writing Apprehension Scale (Daly & Miller, 1975; $\bar{x}$=46.84, *SD*=11.66), and the Job Satisfaction scale (Spector, 1994; $\bar{x}$=94.32, *SD*=14.10). CFA was used to test the theoretical structures of the validity scales in the same model as the final two factor TWTLS. Table 4.10 gives the factor loadings of all constructs of all scales and the omega values, which examined the internal consistency of each factor of each instrument. All *omega*'s are considered high.

Loaded together, the fit of the model was less than desirable (χ^2 =6057.82, *RMSEA*=.053, *CFI*=.787, *TLI*=.776). Even though the RMSEA was close to the desired level of <.5, the TLI and CFI indices indicate poor fit. The null hypothesis about the model fitting the covariance matrix was accepted due to the chi-square test and statistical significance (p.<.001). There was a statistically significant difference with the test of chi-square fit to the baseline model (χ^2 =15214.005, *df*=3828, *p*<.001), which indicates no linear relationships between the items, which is desirable.

One possible explanation for the fit indices is these items are not intended to measure the same latent construct. With the exception of the first two factors, which make up the TWTLS, these scales were used to examine the convergent and discriminant validity of the TWTLS.

Therefore, it was necessary to examine the standardized factor loadings and internal consistency of each validity scale.

As shown in table 4.11, there was some variation with the way the items loaded for each construct of each scale. The Writing Apprehension scale was coded to load two factors, one representing positive values and one representing negative values. The decision to do this was based on the literature about the scale (Daly & Miller, 1975) and the suggestion of one of the authors via personal communication (2014). The items that were reversed were coded as the negative factor and the items that were not reversed were coded as the positive factor. Item 30 ("I avoid writing") and item 42 ("I have no fear of my writing being evaluated") had loadings <.5, but were still high enough to contribute to an interpretation of the structure of the scale. The rest of the loadings were >.5

The teaching efficacy scale had some items <.4. Under the factor of personal teaching efficacy, the item that states, "When the grades of my students improve, it is usually because I found more effective approaches . . ." factored at a very poor -.129, the item that states, "If a student masters a new concept quickly, this might be because I knew the necessary steps in teaching the concept" factored at .257 and "My teacher training program and/or experience has given me the necessary skills to be an effective teacher" factored at .005. The factor of general teaching efficacy had one item <.3. This item states, "When I really try, I can get through to most difficult students." A decision was made not to remove these items from the analysis. Since these factors came from one sample, findings could be less than perfect. However, this information should be considered when interpreting the results.

All loadings on the job satisfaction scale were >.4. No problematic items were found on this scale. The factors with the lowest loadings were operating conditions and coworkers. Each of these factors had one item <.5.

All scales were located in the literature. Permission was obtained to use each. A four point likert scale was used. However, Spector (1985) and Woolfolk and Hoy (1991) do recommend a six-point likert scale. This presents a limitation when interpreting the correlation coefficients. The addition of two more options may be enough to better detect relationships. In addition Hoy and Hoy (2001) do have a short form of the teacher efficacy scale. The longer form was used to test the two factors against the TWTLS. Future research will examine the relationship between the factors of TWTL and the shorter and newer teacher efficacy scale.

Table 4.11

CFA Estimated loadings (Estimate), standard errors (S.E.), the ration of the estimated loadings and the standard error (Est./S.E.), and statistical significance (p) of all factors of the TWTLS, Writing Apprehension Scale, Teacher Efficacy Scale and job Satisfaction Scale (n=240)

	Estimate	S.E.	Est./S.E.	p
Perceived Relevance				
ITEM17	0.672	0.037	17.965	<.001
ITEM18	0.946	0.012	78.730	<.001
ITEM19	0.922	0.014	66.997	<.001
ITEM20	0.813	0.024	33.78	<.001
WTL Efficacy				
ITEM21	0.931	0.011	82.454	<.001
ITEM22	0.954	0.009	102.698	<.001
ITEM23	0.877	0.017	52.355	<.001
ITEM24	0.766	0.028	27.107	<.001

Table 4.11 (continued)

CFA Estimated loadings (Estimate), standard errors (S.E.), the ration of the estimated loadings and the standard error (Est./S.E.), and statistical significance (p) of all factors of the TWTLS, Writing Apprehension Scale, Teacher Efficacy Scale and job Satisfaction Scale (n=240)

	Estimate	S.E. E	Est./S.E.	p
Positive Writing Apprehension				
ITEM30	0.480	0.053	9.138	<.001
ITEM31	0.586	0.045	12.934	<.001
ITEM32	0.714	0.035	20.502	<.001
ITEM33	0.634	0.042	15.208	<.001
ITEM34	0.516	0.05	10.259	<.001
ITEM35	0.777	0.029	26.886	<.001
ITEM36	0.648	0.040	16.01	<.001
ITEM37	0.592	0.045	13.197	<.001
ITEM38	0.726	0.034	21.544	<.001
ITEM39	0.718	0.034	20.803	<.001
ITEM40	0.697	0.036	19.155	<.001
ITEM41	0.696	0.036	19.076	<.001
Negative Writing Apprehension				
ITEM42	0.452	0.053	8.471	<.001
ITEM43	0.632	0.041	15.487	<.001
ITEM44	0.590	0.044	13.347	<.001
ITEM45	0.726	0.033	22.211	<.001
ITEM46	0.777	0.028	27.891	<.001
ITEM47	0.637	0.04	15.767	<.001
ITEM48	0.665	0.038	17.455	<.001
ITEM49	0.601	0.043	13.871	<.001
ITEM50	0.876	0.018	49.499	<.001
ITEM51	0.842	0.021	39.811	<.001
ITEM52	0.704	0.035	20.254	<.001
ITEM53	0.769	0.029	26.921	<.001
ITEM54	0.613	0.042	14.461	<.001

Table 4.11 (continued)

CFA Estimated loadings (Estimate), standard errors (S.E.), the ration of the estimated loadings and the standard error (Est./S.E.), and statistical significance (p) of all factors of the TWTLS, Writing Apprehension Scale, Teacher

	Estimate	S.E. E	Est./S.E.	p
Personal Teaching Efficacy				
ITEM55	**-0.129**	0.069	-1.877	0.060
ITEM62	0.754	0.038	19.758	<.001
ITEM63	0.891	0.032	27.636	<.001
ITEM64	**0.257**	0.065	3.926	<.001
ITEM65	0.503	0.054	9.3	<.001
ITEM66	0.414	0.059	7.032	<.001
ITEM67	**0.339**	0.062	5.423	<.001
ITEM68	**0.358**	0.062	5.822	<.001
ITEM69	**0.005**	0.07	0.076	0.939
General Teaching Efficacy				
ITEM56	0.674	0.041	16.39	<.001
ITEM57	0.565	0.049	11.448	<.001
ITEM58	0.636	0.044	14.419	<.001
ITEM59	0.598	0.047	12.72	<.001
ITEM60	0.804	0.03	26.475	<.001
ITEM61	0.653	0.043	15.261	<.001
ITEM70	**0.255**	0.065	3.908	<.001
ITEM71	**0.363**	0.061	5.943	<.001
ITEM72	0.539	0.051	10.527	<.001
ITEM73	0.457	0.056	8.11	<.001
Job Satisfaction- Pay				
ITEM74	0.646	0.042	15.265	<.001
ITEM83	0.692	0.039	17.912	<.001
ITEM92	0.772	0.032	24.358	<.001
ITEM101	0.804	0.029	27.711	<.001
Job Satisfaction- Promotion				
ITEM75	0.626	0.045	13.896	<.001
ITEM84	0.701	0.039	17.848	<.001
ITEM93	0.603	0.047	12.877	<.001
ITEM106	0.807	0.031	26.005	<.001
Job Satisfaction- Supervision				
ITEM76	0.848	0.022	38.7	<.001
ITEM85	0.739	0.032	22.785	<.001
ITEM94	0.830	0.024	34.969	<.001
ITEM103	0.895	0.018	50.959	<.001

Table 4.11 (continued)

CFA Estimated loadings (Estimate), standard errors (S.E.), the ration of the estimated loadings and the standard error (Est./S.E.), and statistical significance (p) of all factors of the TWTLS, Writing Apprehension Scale, Teacher

	Estimate	S.E. E	Est./S.E.	p
Job Satisfaction-Fringe Benefits				
ITEM77	0.674	0.043	15.699	<.001
ITEM86	0.798	0.035	22.971	<.001
ITEM95	0.811	0.034	23.871	<.001
ITEM102	0.410	0.06	6.839	<.001
Job Satisfaction-Contingent Rewards				
ITEM78	0.723	0.036	19.874	<.001
ITEM87	0.631	0.044	14.413	<.001
ITEM96	0.722	0.036	19.832	<.001
ITEM105	0.774	0.032	24.099	<.001
Job Satisfaction-Operating Conditions				
ITEM79	0.535	0.058	9.186	<.001
ITEM88	0.469	0.062	7.591	<.001
ITEM97	0.609	0.054	11.248	<.001
ITEM104	0.611	0.054	11.311	<.001
Job Satisfaction-Coworkers				
ITEM80	0.846	0.028	30.663	<.001
ITEM89	0.494	0.052	9.506	<.001
ITEM98	0.944	0.024	39.762	<.001
ITEM107	0.442	0.055	8.053	<.001
Job Satisfaction-Nature of Work				
ITEM81	0.574	0.05	11.508	<.001
ITEM90	0.717	0.039	18.231	<.001
ITEM100	0.726	0.039	18.783	<.001
ITEM108	0.819	0.032	25.472	<.001
Job Satisfaction-Communication				
ITEM82	0.793	0.030	26.408	<.001
ITEM91	0.644	0.043	15.113	<.001
ITEM99	0.693	0.039	17.965	<.001
ITEM109	0.780	0.031	25.077	<.001

Table 4.12 gives the descriptive statistics for each of the scales and their factors. Each validity scale was coded on a 4 point Likert scale ranging from strongly disagree (1) to strongly agree (4). The highest possible score for the TWTLS was 64 ($\bar{x}$=45.748, *SD*=10.125). The highest possible score for the writing apprehension scale was 100 ($\bar{x}$=46.838, *SD*=11.658). The low mean on the scale is interesting. Future research could examine writing apprehension differences given profession. The total possible score on teaching efficacy was 76 ($\bar{x}$=54.199, *SD*=5.688) and for job satisfaction it was 144 ($\bar{x}$=94.326, *SD*=14.098). This also presents results worth examining with future research.

Table 4.12

Means and standard deviations of the final two factors of the TWTLS and the validity scales of writing apprehension, Teaching efficacy, and job satisfaction

Variable	Total Possible	Mean	Std. Deviation
Teacher WTL Scale	**64**	**45.748**	**10.125**
Perceived Relevance	24	15.292	3.551
WTL Efficacy	40	30.456	7.913
Total Writing Apprehension	**100**	**46.838**	**11.657**
Positive	38	20.025	5.471
Negative	52	26.813	7.138
Teaching Efficacy	**76**	**54.199**	**5.688**
Personal	36	25.318	2.712
General	40	28.881	4.161
Job Satisfaction	**144**	**94.326**	**14.098**
Pay	16	8.230	2.724
Promotion	16	8.859	2.295
Supervision	16	12.126	2.849
Fringe Benefits	16	9.956	2.269
Contingent Rewards	16	9.567	2.527
Operating Conditions	16	8.693	2.113
Coworkers	16	12.459	2.061
Nature of Work	16	13.122	1.952
Communication	16	11.315	2.376

Table 4.13 gives the correlation matrix between the total sum score of the TWTLS, the two factors of the TWTLS and the total scores of the validity scales. Table 4.14 gives the correlations of the factors of the TWTLS with the factors of each of the validity scales. H_0 purports no relationship between any of these scales and their factors with the TWLS and its factors TWTLS. The alternative hypotheses were that all variables positively correlated with the TWTLS's factors except writing apprehension, which correlates negatively.

Table 4.13

Correlation matrix of years teaching (YT), teacher efficacy (TE), writing apprehension (WA) and job satisfaction (JS) with the two final factors of the TWLS, which includes perceived relevance (PR), self-efficacy of using WTL (WTLE) and the total score for the TWTLS

	YT	TE	WA	JS	PR	WTLE	TWTLS
YT	1						
TE	.083	1					
WA	-.046	-.**210****	1				
JS	-.**169****	.**156***	.043	1			
PR	-.**124***	.036	-.**388****	.063	1		
WTLE	.**169****	.**259****	-.**554****	-.067	.**486****	1	
TWTLS	.089	**.216***	**-.567****	-.030	**.730****	**.952****	1

Note. Correlations with other scales are highlighted. *pp<.05, **p<.001

Table 4.14

Correlation matrix of both factors of the TWTLS and all factors of the validity scales.

	1	2	3	4	5	6	7	8
1) PR	1							
2) WTLE	.486**	1						
3) JSP	-.017	-.029	1					
4) JSPRO	.085	-.068	**.658****	1				
5) JSSUP	.062	-.061	**.178****	**.326****	1			
6) JSFB	-.025	**-.139***	**.516****	**.351****	**.168****	1		
7) JSCR	.119	-.073	**.546****	**.594****	**.542****	**.378****	1	
8) JSOP	.084	.019	**.397****	**.404****	**.374****	**.261****	**.500****	1
9) JSCW	-.002	-.101	**.187****	**.248****	**.431****	**.182****	**.384****	**.227****
10) JSNW	.058	**.123***	**.176****	**.166****	**.396****	**.166****	**.408****	**.296****
11) JSCOM	.010	-.046	**.292****	**.325****	**.688****	**.183****	**.506****	**.415****
12) WAP	**.398****	**-.529****	.069	-.007	.006	.072	.066	.046
13) WAN	**-.329****	**-.499****	-.009	-.047	.065	.076	.029	.009
14) TEP	.047	**.197****	-.035	-.015	.055	.007	.052	-.024
15) TEG	.019	**.225****	.084	.054	.092	.078	**.171****	**.205****

	9	10	11	12	13	14	15
10) JSNW	**.294****	1					
11) JSCOM	**.560****	**.408****	1				
12) WAP	.121	-.108	.033	1			
13) WAN	.055	-.093	.078	**.704****	1		
14) TEP	.019	**.179****	.081	-.116	-.031	1	
15) TEG	.000	**.351****	.087	**-.213****	**.227****	**.340****	1

Note. Correlations with other scales are highlighted. *pp<.05, **p<.001. PR= Perceived Relevance, WTLE= Efficacy of Writing to learn, JSP= Job Satisfaction Pay, JSPPRO=Job Satisfaction Promotion, JSSUP=Job Satisfaction Supervisor, JSFB=Job Satisfaction Fringe Benefits, JSCR= Job Satisfaction Contingent Rewards, JSOP= Job Satisfaction Operating Conditions, JSCW= Job Satisfaction Coworkers, JSNW= Job Satisfaction Nature of Work, JSCOM= Job Satisfaction Communication, WAP= Writing Apprehension Positive, WAN= Writing Apprehension Negative, TEP= Teacher Efficacy Personal, TEG= Teacher Efficacy General.

The strongest correlate with the TWTLS is writing apprehension followed by teacher efficacy. Writing apprehension correlates highly with perceived relevance and efficacy of WTL. Teacher efficacy correlates with efficacy of WTL moderately. Years teaching yields low correlations. Job satisfaction does not seem to relate to either construct of the TWTLS (Drummond & Jones, 2010). The negative correlations between writing apprehension and both

of its factors with the TWLS and both of its factors provide evidence of convergent validity. This correlation is negative because a high score on the writing apprehension scale means that the respondent is less likely to write. Therefore, the less likely a teacher is to write (or the more apprehensive), the more likely he or she is to exhibit low efficacy and to see writing a relevant to his/her content area.

The correlation between teacher efficacy (and both of its factors) and efficacy of teaching with writing is considered moderate to acceptable (Drummond & Jones, 2011) and indicates that as efficacy of teaching increases, so does efficacy of teaching with writing. The low correlations between years teaching and both factors suggest a noticeable relationship between experience teaching and perceived relevance of writing to the content area and efficacy of using writing. It is interesting to note that job satisfaction seems to explain very little of the variance of the TWTLS factors. Given the results of the correlation matrix, the H_0 regarding the job satisfaction scale on both TWTL factors and regarding the teacher efficacy scale on the perceived relevance factor were accepted. The null was rejected for both TWTLS factors on writing apprehension.

Participant attributes. It was important to test the TWTLS for differences between different levels of participant attributes. ANOVA was used to test for differences on each factor of the TWTLS on the attributes of setting of school (urban, suburban, or rural) and content area taught (language arts, mathematics, science, or social studies). H_0 for each of these is $\bar{x}_1=\bar{x}_2=\bar{x}_3=\bar{x}_4$ for the ANOVAs examining content areas, $\bar{x}_1=\bar{x}_2=\bar{x}_3$ for the ANOVAS examining setting of school and $\bar{x}_1=\bar{x}_2$ for all t-tests. I generated no alternative hypotheses for the first ANOVA. The alternative hypothesis for the latter ANOVA group was to reject the null with a specific order of mean magnitude- that there would be statistically significant differences in the means of perceived relevance and efficacy of WTL given content area taught, with language arts

teachers scoring highest on both, followed by social studies teachers, then science teachers, then mathematics teachers. In addition, two t-tests were used to test the null hypothesis that, simply put, there were no differences on both factors of the TWLS given the dependent variables of level of teacher (middle or high) and gender. No alternative hypotheses were generated for these as the null was desired.

These test known-groups validity. This is because, certain groups should have higher values on each construct than others. For example, math teachers should see writing as less relevant to their content area than language arts teachers do.

The results of the t-tests and ANOVA tests examine known group validity. Accepting the null with the setting of school ANOVA as well as the t-tests of gender and of level of teacher would provide validity evidence as it is not desired to have variation based on these dependent variables. Rejecting the null given the results of the ANOVA that tested the content area of the teachers on the dependent variables of relevance and efficacy would provide evidence of known group validity as different content teachers should exhibit different levels on those factors.

To test the difference in the two factors of the TWTLS given setting of school of participant (urban, suburban, or rural), a one-way ANOVA was conducted. The assumptions of equal variances, normality, nearly equal cell sizes and independent observations were checked. Variances were not equal, so a Kruskall Wallis test was used to verify the results. No statistically significant difference was found between the three settings of schools on perceived usefulness of writing, F (1,374) = 0.90, p =.914 or on WTL efficacy F(2,374)=.207, p=.813. Table 4.15 shows the descriptive statistics for both levels of the independent variable given the dependent variable. Table 4.16 is the ANOVA table. The lack of statistical significance between settings of schools

of respondents suggests that the two factors tested on the TWTLS can be used at either setting. However, further research is needed to strengthen the generalizability of this suggestion.

Table 4.15

Means and standard deviations of perceived usefulness and WTL efficacy on the independent variable of setting of school (urban, suburban, or rural)

Group	n	$\bar{x}$	SD
Perceived Usefulness			
Urban	100	15.23	3.72
Suburban	45	15.00	3.86
Rural	232	15.34	3.00
Total	377	15.29	3.55
WTL Efficacy			
Urban	100	30.14	8.55
Suburban	45	30.08	7.71
Rural	232	30.66	7.69
Total	377	30.45	7.91

Table 4.16

ANOVA table of setting of school with each factor of the WTL Scale.

	SS	df	MS	F	Sig.
Perceived Usefulness					
Between Groups	2.28	2	1.14	.09	.91
Within Groups	4737.63	374	12.67		
Total	4739.91	376			
WTL Efficacy					
Between Groups	26.07	2	13.03	.21	.81
Within Groups	23519.46	374	62.89		
Total	23545.53	376			

Note. SS= Sum of Squares, df= degrees of freedom, MS= Mean Squares

One-way ANOVA was used to test the difference between core content areas (language arts, mathematics, science and social studies) on the two factors of the TWTLS (perceived relevance and efficacy). The assumptions of equal variances, normality, nearly equal cell sizes and independent observations were checked and the equality of variance assumption was violated on

both dependent variables. Therefore, to account for this violation, the results for the ANOVA test and a Kruskal Wallis test (Morgan et al., 2013) are given. Results of the ANOVA show that a statistically significant difference was found given the omnibus test for perceived relevance, $F(3,230) = 52.06$, $p < .001$ and for efficacy of WTL $F(3,230)=60.50$, $p<.001$. Table 4.17 shows that language arts teachers scored higher in both factors followed by social studies teachers, then science teachers, then mathematics teachers, in addition, the lowest standard deviation was for language arts teachers, indicating that the variation of perceived relevance and efficacy was very small. Conversely the other content areas had higher variance on both factors. Table 4.18 gives the ANOVA table.

A Kruskal-Wallis tests of differences between content areas given the dependent variables of perceived usefulness was also conducted because there was a violation of the assumption of equality of variance. However, like the ANOVA tests, results show a statistically significant difference for perceived relevance $\chi 2(3, N=234)=103.70$, $p<.001$ and for efficacy of using writing $\chi^2(3, N=234)=102.90, p<.001$.

Table 4.17

Means and standard deviations of perceived usefulness and WTL efficacy on the independent variable of core content area taught

Group	n	$\bar{x}$	SD
Perceived Usefulness			
Language Arts	64	17.77	0.96
Mathematics	57	12.00	3.31
Science	66	15.58	3.00
Social Studies	47	16.30	2.73
Total	234	15.50	3.23
WTL Efficacy			
Language Arts	64	36.25	4.14
Mathematics	57	21.19	8.20
Science	66	28.29	6.62
Social Studies	47	31.11	5.21
Total	234	29.30	8.29

Table 4.18

ANOVA table of core content area taught with each factor of the WTL Scale

	SS	df	MS	F	Sig.
Perceived Usefulness					
Between Groups	982.183	3	327.39	52.06	<.001
Within Groups	1446.313	230	6.29		
Total	2428.496	233			
WTL Efficacy					
Between Groups	7058.582	3	2352.86	60.50	<.001
Within Groups	8944.876	230	38.89		
Total	160003.457	233			

SS= Sum of Squares, df= degrees of freedom, MS= Mean Squares

A post-hoc planned comparisons test was conducted using t-test. Even though the assumption of equal variances was violated on the ANOVA omnibus test, the non-parametric test verified the statistically significant differences found on the ANOVA. In addition, this violation can be accounted for on the t-test by adjusting for the degrees of freedom (Field, 2011). Finally, using a Bonferonni correction (Field, 2011), the critical α was adjusted for each post-hoc planned comparison t-test to account for family wise error (Field, 2011). This set the new critical α at (.05/7) = .007 for both dependent variables. Table 4.19 gives the planned comparisons between each content area given the two factors. Figure 4.1 shows the means and standard deviations of each content area.

Table 4.19

Planned comparisons of the dependent variables given perceived relevance and WTL efficacy.

Comparison	x̄ difference	df	p	d
LA vs mathematics				
Perceived Rel.	5.57	64.31*	<.001	2.29
WTL Efficacy	15.06	80.59	<.001	2.32
LA vs Science				
Perceived Rel.	2.20	82.99*	<.001	1.14
WTL Efficacy	7.96	109.52*	<.001	1.44
LA vs SS				
Perceived Rel.	1.47	54.30	<.001	0.72
WTL Efficacy	5.14	109.00	<.001	1.14
mathematics vs. Science				
Perceived Rel	-3.38	121.00	<.001	2.00
WTL Efficacy	-7.10	107.49*	<.001	0.95
mathematics vs. SS				
Perceived Rel.	-4.11	102.00	<.001	1.51
WTL Efficacy	-9.91	96.22*	<.001	1.44
Science vs. SS**				
WTL Efficacy	-2.82	109.83*	<.001	0.27

Note. x̄ difference= difference in means, df= degrees of freedom, p= critical alpha, *d*=Cohen's (1988) effect size.

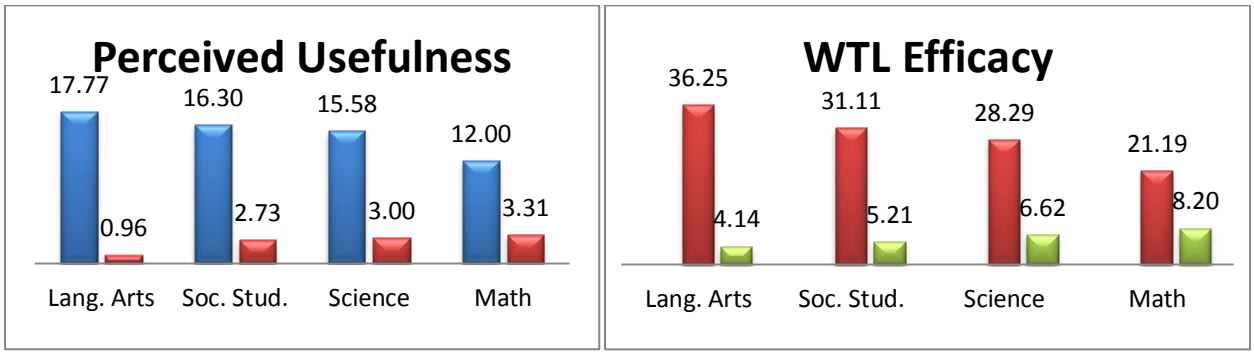


Figure 4.1. Means and standard deviations of perceived usefulness of writing and WTL efficacy given core content area of teacher respondents (*n*=234) showing the hierarchy of scores on both variables given content area. The means are the tall bars and the standard deviations are the smaller bars to the left of the respective means.

Language arts teachers consistently yield the highest mean on both factors followed by social studies, then science, then mathematics. No statistically significant differences were found between social studies and science on perceived relevance of writing. The effect sizes range from high to typical (Cohen, 1988). The higher effect sizes come from differences between content areas of higher contrast. For example, the difference between mathematics and language arts on perceived relevance of writing is more than two standard deviations while the difference between language arts and social studies is less than one. Figure 4.1 shows the differences between the means and standard deviations of each content area for each factor of the TWTLS. These differences fall as expected for each content area.

Two independent samples t-tests were used test the differences of the two factors given the independent variables of gender and level of school (middle or high). Tables 4.20 and 4.21 show the results. No statistically significant difference was found between middle school teachers and high school teachers on perceived relevance or efficacy. In addition, no statistically significant difference was found on perceived relevance of writing to the teachers' content areas between the genders. However, a difference was detected between males ($\bar{x}$=28.57) and females ($\bar{x}$=31.18) on efficacy of using writing in the classroom (p=.004). The difference between the means is 2.61 points on a 40-point scale. The effect size, d=.33, which is considered typical according to Cohen (1988), though little is known about typical effect sizes in this field since this scale is new.

To further explore the difference in gender on efficacy, assumptions were checked to conducted an analysis of covariance (ANCOVA), statistically controlling for content area, to see if differences in gender given efficacy were still statistically significant. However, the dependent

variable of gender shared too much variance with the independent variable of content area. Therefore, the assumption of independence of the covariate was violated (Field, 2011).

This difference in genders given efficacy of using WTL should be explored in future research. However, the non-significant results given level teaching suggest some evidence that the factors on these two scales may be used with middle school and high school teachers. The results of the ANOVAs, the nonparametric tests and the t-tests result in a rejection of a difference in efficacy of WTL and perceived given content area and the null that there is no difference in gender given teacher efficacy of WTL. The other null hypotheses were accepted.

Table 4.20

Means (standard deviations below in parentheses), t scores, and degrees of freedom of middle and high school teachers on each factor of the TWTLS

Factor	Middle	High	t	df
Perceived Relevance	15.36	15.27	.24	359
	(3.42)	(3.57)		
WTL Efficacy	31.11	29.73	1.63	359
	(7.65)	(8.23)		

Note. No statistically significant differences were found on either DV given grade level. The smallest difference was found on efficacy of using writing to learn (t=1.627).

Table 4.21

Means (standard deviations below in parentheses), t scores, and degrees of freedom of males and females on each factor of the TWTLS

Factor	Male	Female	t	df
Perceived Relevance	15.07	15.38	-.73	375
	(3.34)	(3.63)		
WTL Efficacy	28.57	31.18	-2.89*	375
	(6.02)	(6.06)		

*p=.004, d=.33

Research Question Category Five

5. *What are the consequences of the TWTLS?*

Chapter 5 speculates upon the benefits of the TWTLS to the educator, administrator and the field of education in general. The issue of gender bias was examined with the independent samples t-test. Even though no statistically significant difference was found between middle school and high school teachers on both factors and gender on the factor of perceived relevance of WTL, a difference was found between males and females on the factor of efficacy of using WTL with a typical effect size. This is not enough evidence to speculate on gender consequences of the TWTLS, but future work should examine whether this is due to bias or whether gender attributes relate to efficacy to teach writing or use WTL activities. Future research should also examine other possible consequences. This will be discussed further in the next chapter.

Summary of Results

The psychometric properties of the TWTLS were examined. After gathering the data, cleaning and screening it and examining the demographics, Cronbach's α and Kuder-Richardson 20 were used to test the internal consistency of each of the five factors of the TWTLS. The coefficient of concern came from the knowledge factor. Item difficulty and discrimination scores indicated low difficulty and low correlations of the knowledge items. Therefore, they were excluded from the EFA.

A five factor EFA was conducted without the knowledge items. Even though an eight factor solution provided the best fit statistics, a five factor solution more closely modeled the theoretical structure of the instrument as developed in the item development and content validation stages and the scree plot indicated it was a better model. The five factors did split the theoretical factor of continuum into two different factors (which separated the continuum items

into a factor of WTL and a factor of WTC). However, all items on the first two factors were excluded from future models due to low factor loading and because the items with acceptable loadings did not sufficiently cover the spectrum of writing activities.

A one factor CFA was conducted as a nested model. Fit indices were poor. Two more CFAs were conducted. First, a three factor CFA, which showed improvement in comparison to the EFA and to the baseline model, but fit indices were still less than desirable. Given item discrepancies and factor loadings, the third factor of use of writing was removed from the scale for similar reasons that the first factor was removed after the CFA. The spectrum of the concept the items on that factor attempt to measure was not sufficiently covered if only the discrepant items were removed.

A final two factor CFA was run. This model fit better than the EFA and the nested model. In addition, fit indices showed improvement as compared to the three-factor CFA. However, chi-square test of model fit was not yet satisfactory. Two alternative models will be tested for fit in the future.

Pearson's moment product *r*, ANOVA and t-test were used to test the convergent and discriminant properties of the scale's two remaining factors. Convergent validity was supported the most by the correlation of each factor with the writing apprehension scale and efficacy of using WTL was supported moderately with the teacher efficacy scale. Known group validity was supported the strongest by the results of the ANOVA on both factors or the TWTLS given setting of school of teacher and by the t-tests examining both factors given middle school versus high school. Perceived relevance did not seem to differ by gender, but efficacy of using WTL did.

CHAPTER 5: DISCUSSION

Overview of the Problem

Recent national and state assessment results indicate unsatisfactory student performance in assessed core content areas which includes writing, reading, mathematics and science. Nationally, students in 8th and 10th grade score 27% and 24% proficient in writing, In Colorado, 53% of 8th grade students and 34% of 10th grade students scored proficient in science and 52% and 51% of those respective grades scored proficient in reading (CDE, 2013). In addition, students continue to struggle with reading as 52% of eighth grade students and 51% of tenth grade students scored proficient or higher on the Colorado state test (CDE, 2013). Finally, although little is known about student performance in social studies, the Common Core Standards (CCS) for English Language Arts (ELA), which were adopted in 2010, encourage all content areas to support and facilitate school wide literacy programs and encourages all content areas to utilize multi-content strategies in their lessons.

Since the late 1970s, much scholarly discussion has focused on the ideas of WAC and WTL. Nevertheless, very few teachers of content areas outside of language arts, English, or other similar content areas receive adequate training to use writing within their content areas (NCSAWC, 2003, p. 23). Therefore, many teachers may lack the adequate skills to implement writing in their content areas to improve student learning in those content areas. This may be due to several factors including their perceived relevance of writing given their content areas, their efficacies of using writing in their content areas, or even their knowledge and understand of WTL. NCLB (2001), which requires secondary teachers to be highly qualified in their content areas, may influence this. In addition, much of the literature on WTL is theoretical and/or

inductive. Little deductive quantitative research examines the effects of WTL on student performance in content areas outside of language arts, English, et cetera. Further, little empirical research examines the extent to which teachers are ready to use WTL in their classrooms.

Therefore, the main problem this study focused on was the gap of deductive quantitative evidence relating to WTL in secondary core (language arts, mathematics, social studies and science) content courses. The literature provides a rich tradition of theory, but the testing of this theory lacks deductive testing. This study began the process of testing this theory by attempting to create an instrument to measure teacher readiness to use WTL across the content area.

Findings from Research Question Categories One and Two

1. *Does the TWTLS show evidence of appropriate content? Doe the items represent the theory and the literature? Do the experts find the measure to consist of appropriate content?*
2. *Does the TWTLS show evidence of response processes? Do the experts who reviewed the measure respond appropriately?*

The most amount of time on this research occurred during the item development phase. It was challenging to draw from the rich theory, create categorize and then write items. Therefore, in addition to the literature, experts were consulted during the item development phase and different experts were consulted after the development of the initial items. This was to ensure that the instrument came from the nomological net and that it had evidence of content validity (Haynes, et al. 1995, Netemeyer et al., 2003; DeVellis, 2011).

My consultation with teachers during the teacher workshop helped me to develop the items relating to the construct of knowledge of WTL. The literature informed the other constructs as did my consultation with a university level expert to clarify my items and my

construct labels. Consultation with teacher experts helped me to verify these changes, refine some items and evaluate their response processes.

The expert reviewers and literature support the content of the items. Reviewers agreed with the distractors of the multiple choice items and with the scales used with the other items. One main concern of all content experts was that teachers may not have enough background knowledge in WAC to adequately answer the questions. This feedback was considered, but a decision was made to keep them structurally the same. So little is known about teacher background knowledge of WAC and WTL, it was decided that the items tested might shed light and inform future changes.

Overall content validity is well supported for the final two factors of relevance and self-efficacy. These items were created from a rigorous search of literature. Although it was thought that the other factors' items showed strong content validity and response processes, in retrospect, refinement is necessary for those items. The literature does inform the WTL and WTC listed on factors one, two and six. However, one problem may be the way teachers interpret the item. For example, though there is a difference between journals and reading logs in the literature, these two items may seem the same to respondents. Also, "writing for discussion" may confuse respondents. To discuss is to communicate. However, writing for discussions is a rich topic in the WTL literature. Therefore, this question may be oxymoronic and result in inconsistent responses simply due to respondents' understanding of the question. The same might be said for the rest of the continuum factors' items. These conclusions, of course, also come from the quantitative results.

One final concern comes from the content validity of the convergent and divergent scales. Since these scales were established in the literature and to save the reviewers' time, these scales

were not included for the experts. However, in retrospect, it would have been beneficial to get their thoughts regarding these scales, including how they were presented, response processes and how they might answer my hypotheses about convergent and discriminant validity.

Findings from Research Question Category Three

3. *Does the TWTLS show evidence of internal structure? Does theoretical structure of the TWTLS match the empirical structure?*

The short answer to this is that the theoretical structure did not relate to the empirical structure. This was first evident after the reliability analyses when the items that make up the construct of knowledge produced coefficients far lower than acceptable and supported with biserial and point biserial correlations with remainder. The WTL continuum items also demonstrate low reliability coefficients but remained for the EFA. In retrospect, these items could have also been removed prior to the EFA. The other four constructs show evidence of acceptable reliability given α, though the first construct of WTL continuum was not as high as the other four. Other psychometric properties of the TWTLS were thus used to assess those factors.

After assessing reliability, item distribution, difficulty and discrimination, an EFA with an oblique rotation was conducted without the knowledge items. Five factors was selected due to the scree plot and the theoretical structure of the instrument. The Eigenvalue was >1 and five factors remained after removing the knowledge items. However, Eigenvalues are not necessarily the best to use to determine factor structure (Bandalos & Boehm-Kaufman, 2009); hence the use of scree plots. Naturally the results showed problems with the WTL continuum items, which also showed problems with internal consistency, response distribution, difficulty and discrimination. They demonstrated low communalities and thus factor loadings. In addition, they were factored

strangely. Several items loaded under the first factor and several of these items loaded under the second factor. The second factor of WTC continuum's items loaded well above .4, but these items were also split into factors one and two, which did not make sense in terms of the theoretical structure of the instrument since factor one was theorized to relate to WTL and not WTC. A decision was made to exclude the first fifteen items from the CFA because of the low reliability of several items, the strange and low loadings and because even if the items that factored well remained, the meaning of the instrument would be compromised.

The three subsequent factors loaded well and as expected with the exception of items thirty-three and thirty-seven, which asked teachers to rank how often they used writing for discussion and how often they asked students to write notes. These items exhibited low loadings and their highest loadings did not fit where they were theorized. In all, the best factored items came from perceived relevance of writing and self-efficacy of using writing.

The first CFA was conducted, with a different sample, with the three remaining factors of perceived relevance of writing, self-efficacy of teaching with writing and use of writing. Omega values were also coded in the Mplus syntax to measure the internal consistency of each factor. Despite loadings >.4, the fit indices were less than desirable with RMSEA much higher than .5 and CFI and TLI much lower than .9. An item discrepancy matrix was run to see which items were in disagreement and may account for poor fit. Many of these items came from the use of writing factor and two came from the perceived relevance factor, but one of those shared a discrepancy with an item on the fourth factor and had a higher factor loading. Therefore, all of the items with discrepancies >.1 from the fourth factor were removed. Item sixteen was also removed because it did not share any discrepancies with the fourth factor and it had the lowest factor loading. Upon removal of these items, it became clear that the interpretability of the fourth

factor was greatly compromised. Many of the items relating to WTL (given the literature) were now removed. Thus, the factor would only measure use of WTC tasks and not be of any use to measure WTL use. Therefore, all of the items on factor four were removed for the final model.

A second CFA, using the same sample as the previous CFA, was conducted on the two remaining factors of perceived relevance and efficacy. Fit indices showed improvement, but the however, the test of how the model fit the population covariance was less than desirable. Many factor loadings may also be considered too high. Finally, this model was not tested on a fresh sample. Omega values were above acceptable, though the relevance omega decreased, which was probably due to a decrease in items (DeVellis, 2012). The discrepancy matrix of this model did reveal that item twenty showed the highest values, though none of them were >.1. Future samples should test the model without either the highly discrepant items, or without the items that factor >.9. This would leave a final six-item scale for these two factors. Later, the next model to be tested will be discussed.

In general, the initial theoretical structure of the TWTLS did not match the empirical structure, especially for four of the factors. As the process of testing the instrument ensued, more and more items were removed to meet acceptable fit, leaving the final model with eight questions and two factors, which is a reduction of 36 and four factors. Nevertheless, the two factors that remain show promise to lay the foundation of a new scale that tests those items on those factors with newly written items that attempt to capture the objectives of the factors and items that were removed. The newly written items are later presented in this chapter.

Findings from Research Question Category 4

4. *What are the relationships of the TWTLS with other variables? Does show evidence of convergent, discriminant, and known-groups validity?*

The two factors of perceived relevance and efficacy were summed and correlated with the factors of three other instruments: (a) Writing Apprehension (Daly & Miller, 1975), (b) The Teacher Efficacy Scale (Wookfolk & Hoy, 1991) and (c) The Job Satisfaction Scale (Spector, 1995). Sum scores of each factor of each scale were calculated as well as total sum scores of each instrument. All of these were correlated with the sum score of each factor of the TWTLS as well as the sum of its two factors. In addition, the TWTLS and its two factors were correlated with number of years teaching.

The TWTLS correlated best with writing apprehension followed by teaching efficacy. The writing apprehension scale correlated highest with the TWLS total sum score (r=-.567) then with efficacy of teaching writing (r=-.554), followed by perceived relevance (r=-388). The negative correlations indicate that as TWTL increased, apprehension decreased. This makes sense as, for example efficacy and apprehension are opposites. Therefore, as apprehension decreases, efficacy would be expected to improve. The positive items on the writing apprehension scale did correlate slightly better than the negative items.

Teacher efficacy also showed some relationships, correlating the most with efficacy of using writing to teach (r=.259). This positive correlation is to be expected if using WTL is a teaching task. Those with less efficacy of teaching may be less likely to use many teaching strategies including writing tasks.

Job satisfaction showed no noticeable correlation with any factor of the TWTLS, or with its entirety, nor did it show any significant relationship with writing apprehension or teaching

efficacy. This is an interesting finding that should be examined in future research, especially since job satisfaction did have a variance comparable to the other variables.

Years teaching did show a small positive correlation with perceived relevance and efficacy, but a very small one with the entire TWTLS. This finding is also interesting and merits future research. While the small positive correlation suggests an increase in the two independent variables of perceived relevance and efficacy of WTL, one might expect experience to account for higher coefficients. The correlation between years teaching and teaching efficacy is even more interesting as it is very small.

Finally difference tests (t-tests, KW and ANOVAs) were used to examine the differences in the factors of the TWTLS given setting of school (urban, suburban, or rural), content area of teacher (language arts, mathematics, social studies, or science), gender and level teaching (middle school or high school). This tested known-groups validity. Statistically significant differences were not found for setting of school, but were found for content area taught on both factors of the TWTLS. As expected, language arts had the highest means, followed by social studies, then science and mathematics. The planned comparison tests yielded effect sizes that were hierarchical. For example, the difference between language arts and mathematics was more than two standard deviations, while the difference between mathematics and science was less. This supports the way in which teachers are trained to be highly qualified as not much writing instruction is given to non-humanities and social science teacher candidates (NCLB, 2001). No differences were found between middle school and high school teachers on both factors; however, there was a difference between males and females on efficacy to writing with teaching, but not between the genders on perceived relevance. The difference in efficacy by gender may be parallel to assessment results that suggest girls outscore boys in writing (CDE, 2013; NAEP,

2011), but they might also be a function of sampling as more women teach language arts classes than men in the sample (which, may still be related to writing efficacy).

The correlations with writing apprehension provide evidence of convergent validity of the data produced by the TWTLS. The small correlation between efficacy of WTL and teaching efficacy suggests a relationship, however may be expected. Teaching efficacy and efficacy to use WTL may share some variance, but many other factors may influence both variables. For example, given this sample, writing apprehension shares much variance with efficacy to use WTL, but not much variance with efficacy of teaching. Therefore, efficacy of teaching might have little or nothing to do with efficacy of writing and thus efficacy of teaching using WTL. Many more variables might relate to efficacy of teaching, but not efficacy using WTL, thus the small shared variance.

The other validity scales yield inconclusive results and raise more questions than they answer. For example, what is the relationship between job satisfaction and teaching? How much does experience effect different mind-sets of teachers (including efficacy)? The lack of strong correlations with these variables might suggest discriminant, or even divergent validity evidence if they are theoretically not related. However, no theory has been found in the search for literature to suggest this. Therefore, future research should examine these variables.

Dunkin and Biddle (1974) write about presage variables. These are variables that teachers bring with them based on their formative experiences (such as class, ethnicity, et cetera) and based on their teacher training experiences (p. 39). Therefore, difference tests were used to test the differences between content areas, grade level and gender. Since content areas represent specialties at the secondary level and since teachers are trained within those content areas, it was

expected that these content areas would represent presage variables and that math, for example, would be lower on both efficacy and perceived relevance than language arts.

The ANOVAs and non-parametric tests that examined differences between content areas suggest strong known-groups validity. The hierarchy of differences on both factors resulted as expected and suggests that both factors can differentiate between content area teachers and supports the literature on presage variables (Dunkin & Biddle, 1974). Though, from a non-measurement standpoint, this finding may be uninteresting and intuitive, from a measurement point of view, these results provide evidence of validity. The lack of statistically significant relationships with the other variables also provides evidence of known-groups validity given the desire that these presage variables do not account for the dependent variables. The purpose of the scale is to be used as universally as possible. Therefore, the non-significant results between setting of school, level teaching and (with the exception of efficacy of using writing to teach) gender, support that it may be practical to use these factors in diverse areas. The gender differences should be examined further, as it is always of a concern when they arise, though they might have perfectly reasonable explanations for the small effect size between men and women. Finally, these results are just preliminary. More work is to be done on the scale with other convergent and discriminant measures.

Findings from Research Question Category Five

5. *What are the consequences of the TWTLS?*

This is the most important, yet most difficult question to answer. This question is difficult to answer because it has not yet been implemented enough to know the consequence. Yet, it is important to answer because the consequences of any scale can have lasting effects on those who take them. In a culture of endless educational reform and constant reports regarding

general dissatisfaction with the educational system and teachers, any instrument within the field of education runs the risk of misuse. The purpose of the TWTLS scale is not to evaluate teacher competency or compliance with any policy or idealism. It is to merely asses what the factors purport to success, which, at the present time include perceived relevance of writing and efficacy of WTL. This scale was not developed with any preconceived opinion that teachers of any content area should use writing. Rather, it was developed from questions that stem from the literature, the biggest of which is *does writing really help students learn in other content areas?*

If one were to ask the experts, given these results on the relevance scale, the answer to that question is that it depends on the content area and this makes sense. Though the literature and theory regarding WTL make compelling and logical arguments, one cannot dispute the logic that different things have different relevancies. Thus, WTL and WAC may very well be ordinal. That is, there may be a qualitative and difference in magnitude regarding WTL. Some content areas have more strategies than others and different content areas have different strategies. Intuitively, this makes sense.

The consequences of the TWTLS, as its development is continued, should be used to develop innovative pedagogies and curriculums that use writing in ways relevant to contexts and contents. The TWTLS should never be used for an administrative agenda, to, for example, perpetuate a WAC program conceptualized willy-nilly. Instead, it should be used by thoughtful educators and educational leaders and the consequences of the scale, ideally, should be to better the field and to help it continue to improve society at large.

All of that aside, the scale is not yet fully developed. There are only two factors after the final model and that model used the same sample as the previous model. Therefore, much work is to be done before the achievement of those lofty goals. Yet, it is important to think of the

potential long-term consequences of the scale as it is my agenda to work on it until nature or God intervene.

The Future Structure of the TWTLS

Appendix M gives a conceptualization the next model to be tested for the TWTLS. This model includes the remaining items and factors after the final model. Additions are made. These additions combine what was learned from the analyses. First, the three factors that were discarded are now replaced with two new factors, knowledge of WTL (a new version) and perceived knowledge of WTL. As shown in Appendix N, which gives a sample of the items, instead of asking teachers multiple choice questions that result in dichotomous items, teachers will be presented with similar scenarios as the item stems, only now, they will be asked to report how much they think they know to answer the question and then they will be asked to demonstrate what they know. Rubrics will be developed to score the written responses and tested with several raters including experts in WTL/WAC as well as teachers of various content areas. The result will be a short scale that can be easily scored to inform staff development or measure interventions, among other uses. The result will be a four factor scale with purely dichotomous items.

The idea for these types emerged during the factor analyses after the knowledge items were removed and while the other two factors were removed. The use of writing items and the continuum items are thus combined to inform the two new factors. Instead of asking teachers to rank tasks, which seem to be arbitrary and capricious given their factor structure, rubrics will be designed to link specific tasks to specific item stems, thus creating a scoring system. Much work needs to be done to develop this scale, but it promises to help progress the research and generate something that can eventually be used in research or staff development settings.

Implications for Future Research

There are a number of limitations to this study as well as things that could have been done differently. First, the creation of the stems of the knowledge items was rigorous and difficult. However, the multiple choice format was not the best, in retrospect. The use of dichotomous items with Likert items is tricky in and of itself. However, more importantly, the distractors were not of enough quality to make that factor reliable. On some items, teachers appeared to know what to answer. The future proposed scale hopes to address this issue with the new format.

Second, despite a several month process of tediously gathering email addresses, this study only had 340 completed surveys, which means that half were used for the EFA and half for both CFAs. In addition, though the sample was collected from a broad range of emails, the sample lacks external validity.

Third, more validity scales should be tested with the TWTLS and they should have a broader range of scales. Many recommend six levels and this study used four. This limitation may have inhibited the ability to detect relationships, or it may have produced smaller correlations than a larger scale would have shown.

Finally, the two factor model still needs improvement. Its RMSEA is above the desired level and it is statistically significantly different than the theoretical matrices. Using Mplus to eliminate items given discrepancies and loading does improve it to desired levels using the same sample. However, this should be done with a fresh sample and with the new models as proposed in Appendix M.

Future models will be tested. However, different methods may also suffice. For example, item response theory (IRT) may offer solutions to many problems, particularly the problem of

mixing scales in one instrument (DeVellis, 2012). In addition, IRT does not assume equality of difficulty of all items on the same factor.

Future research should examine different ways to test the effects of using WAC and WTL. As stated earlier, though there is a healthy amount of qualitative and theoretical literature, much is left to be deductively tested.

Some peripheral results also raise other questions, in particular the relationship between aspects of teaching and job satisfaction. Many anecdotes and jokes suggest low satisfaction relates to job performance, but these results contradict this notion. The relationship between longevity and trying new things is also of interest given these results. Also perceived relevance of WTL is different than the concept of trying something new, there may be shared variance between the two concepts.

In sum, the final goal of this work is to get into classrooms with teachers implementing strategies to use writing to improve (or test the improvement of) those content areas. The development of the TWLS and its two humble factors is a small step toward that end.

Conclusion

The development of this scale was an immensely difficult endeavor. It required a thorough examination of the literature on WTL and WAC. Much of this literature is opaque. This presented a great challenge. This research required structure, boundaries and clear definitions. Therefore, the majority of this work came in the content validity and item development phases, the end goal was to compartmentalize and quantify something that stems from the Department of English.

Even though four out of six factors were removed, a little contribution has been made to the field of writing to learn. We might be able to speculate that one reason teachers do not use

writing in their classrooms is because they simply don't think it is relevant and another reason is they are not efficacious in using it. These two pieces seem intuitive, but they might now be measurable. In addition, they are two very important pieces. People's confidence and attitudes towards things predict behavior. Though more work needs to be done to develop items that test what teachers know, these two factors may (or may not) explain a lot of the variance as to why they do or do not use WTL.

REFERENCES

Adamson, P., Adamson, B. anderson, L., Clausen-Grace, N., Eames, A., Einarson, C., . . . Wooten, D. A. (2006). Teaching writing in middle and secondary schools. *School Library Journal, 52*, 91-91.

Adeyemi, A. A. (2012). Effect of peer and self-assessment on male and female students' self-efficacy and self-autonomy in the learning of mathematics. *Gender and Behaviour, 10*(1), 4492-4508.

Ackerman, J. M. (1993). The promise of writing to learn. *Written Communication, 10*(3), 334-370.

Alber-Morgan, S. R., Hessler, T., & Konrad, M. (2007). Teaching writing for deeps. *Education and Treatment of Children, 30*(3), 107-128.

Albert, L. R. (2000). Outside-in - inside-out: Seventh-grade students' mathematics ematical thought processes. *Educational Studies in Mathematics, 41*(2), 109-141.

American Educational Research Association, American Psychological Association and National Council on Measurement in Educaiton. (1999). *Standards for educational and psychological testing*. Washington, D.C.: Author.

Anderson, L. W. (1976). An empirical investigation of individual differences in time to learn. *Journal of Educational Psychology, 68*(2), 226-233. doi: 10.1037/0022-0663.68.2.226

Anderson, L. W. and Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., & Wittrock, M.C. (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy of educational objectives.* New York, NY: Longman.

Applebee, A. N.(1984). Writing and reasoning. *Review of Educational Research, 54*(4), 577-596.

Armor, D., Conroy-Oseguera, P., Cox, M., King, N, McDonnell, L, Pascal, A., et al. (1976). *Analysis of the school preffered reading program in selected Los Angeles minority schools*. Santa Monica, CA: The RAND Corporation.

Ashton, P. (1984). Teacher efficacy: A motivational paradigm for effective teacher-education. *Journal of Teacher Education, 35*(5), 28-32. doi: 10.1177/002248718403500507

Avery, N. L. (1999). Music and the writing of poetry: A collaboration of parallel styles of communication. *Reading Improvement, 36*(4), 187-192.

Bandalos, D.L. & Boehm-Kaufman, M.R. (2009). Four common misconceptions in exploratory factor analysis. In Lance, C.E. and Vandenberg, R.J. (eds.), *Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences* (61-86). New York, NY: Routledge.

Backman, C. A. (1994). Finding an effective note-taking system for mathematics students. *Teaching & Change, 2*(1), 73.

Bagert-Downs, R. L., Hurley, M., & Wilkinson, B. (2004). The effects of school-based writing-to-learn interventions on academic achievement: A meta-analysis. *Review of Educational Research, 74*(1), 29-58.

Baker, W. P., Barstack, R., Clark, D., Hull, E., Goodman, B., Kook, J., . . . Lang, M. (2008). Writing-to-learn in the inquiry-science classroom: Effective strategies from middle school science and writing teachers. *Clearing House: A Journal of Educational Strategies, Issues and Ideas, 81*(3), 105-108.

Balgopal, M. M. and Wallace, A. M. (2009). Decisions and dilemmas: Using writing to learn activities to increase ecological literacy. *Journal of Environmental Education, 40*(3), 13-26.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1980). Gauging the relationship between self-efficacy judgement and action. *Cognitive Therapy and Research,* 4(2), 263-268. doi: 10.1007/bf01173659

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 122-147. doi: 10.1037//0003-066x.37.2.122

Bandura, A. (1986). Feaful expectations and avoidant actions a co-effects of perceived self-inefficacy. *American Psychologist, 41*, 1389-1391.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology, 25*(5), 729-735. doi: 10.1037/0012-1649.25.5.729

Bandura, A. (2006). Guide for constructing self-efficacy scales. In F. Pajares and Urdan, T.C. (Ed.), *Self-efficacy beliefs in adolescents* (pp. 307-337). Charlette, NC: Information Age Publishing.

Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *Journal of Management, 38*(1), 9-44. doi: 10.1177/0149206311410606

Bandura, A. & Adams, N. E. (1977). Analysis of self-efficacy theory of behavioral change. *Cognitive Therapy and Research, 1*(4), 287-310.

Bandura, A. & Locke, E.A. (2003). Negative self-efficacy and goals effects revisited. *Journal of Applied Psychology*, 88(1), 87-99.

Baxter, J. A., Woodward, J., & Olson, D. (2005). Writing in mathematics : An alternative form of communication for academically low-achieving students. *Learning Disabilities Research and Practice (Blackwell Publishing Limited), 20*(2), 119-135.

Bazerman, C., Little, J., Bethe, L., Chavkin, D.F., & Garufis, J. (2005). *Reference guide to writing across the curriculum*. Bazerman, C. (ed.). West Lafayette, Indiana: Parlor Press.

Berliner, D. C. (1990). What's all the fuss about instructor time? In M. Ben-Peretz and Bromme, R. (Eds.), *The nature of time in schools: Theoretical concets, practioner perceptions* (pp. 3-36). New York, NY: Teachers College Press.

Bowie, R. L. (1996). *Future teachers' perceptions of themselves as writers and teachers of writing: Implications for teacher education programs*.(Doctoral Dissertation). Retrieved from ERIC. (ED408594)

Bercu, W. M. (2010). *Student self-efficacy in online instruction in a lower division history course*. (Doctoral Dissertation). Retrieved from ERIC. (ED517117)

Betz, N. E., & Hackett, G. (1983). The relationship of mathematics self-efficacy expectations to the selection of science-based college majors. *Journal of Vocational Behavior, 23*(3), 329-345. doi: 10.1016/0001-8791(83)90046-5

Bloom, B. S. (1956). Taxonomy of educational objectives: The classification of educational goals. *Handbook 1: Cognitive Domain.* New York, NY: David McKay Co. Inc.

Boers, D. (2007). *History of american education*. New York, YN: Peter Lang Publishing.

Boothby, P. R. & Alvermann, D. E. (1982). What are we proud of in the teacing of reading: A collaborative effort! *Language Arts, 59*(8-??), 840-843.

Boyer, T. L. (2006). Writing to learn social studies. *The Social Studies, 97*(4), 158-160.

Boyle, J. R. (2013). Strategic note taking for inclusive middle school science classrooms. *Remedial & Special Education, 34*(2), 78-90. doi: 10.1177/0741932511410862

Brewster, C. & Klump J. (2004). *Writing to learn, learning to write: Revisiting writing accross the curriculum*. Portland, OR: Northwest Regional Educational Laboratory.

Britner, S. L. (2002). *Science self-efficacy of African American middle school students: Relationship to motivation self-beliefs, achievement, gender and gender orientation.* (Doctoral Dissertation). Retrieved from Proquest. (AAI3050081)

Britton, J. N., Burgess, T. Martin, N., McLeod, A., a Rosen, H. (1975). *The development of writing abilities (11-18).* London: Macmillan Education.

Bruner, J. S. (1960). *The processes of education*. Cambridge, MA: Harvard Eduation Press.

Bruning, R., Dempsey, M., Kauffman, D. F., McKim, C., & Zumbrunn, S. (2012). Examining dimensions of self-efficacy for writing. *Journal of Educational Psychology*. doi: 10.1037/a0029692

Burns, M., & Silbey, R. (2001). Mathematics journals boost real writing. *Instructor, 110*(7), 18.

Burton, L. M., C. (2000). Mathematicians writing. *Journal of Research in Mathematics Education, 31*(4).

Butler, M. B., & Nesbit, C. (2008). Using science notebooks to improve writing skills. *Science Activities: Classroom Projects and Curriculum Ideas, 44*(4), 137-145.

Campbell, D. T. & Fiske, D.W. (1959). Convergent and discriminant validation by the multitrait-mutlimethod matrix. *Psychological Bulletin, 56*(2), 81-105.

Canrinus, E. T., Helms-Lorenz, M., Beijaard, D., Buitink, J., & check throughut Hofman, A. (2012). Self-efficacy, job satisfaction, motivation and commitment: Exploring the relationships between indicators of teachers' professional identity. *European Journal of Psychology of Education, 27*(1), 115-132. doi: 10.1007/s10212-011-0069-2

Cantrell, R. J., Fusaro, J. A., & Dougherty, E. A. (2000). Exploring the effectivenss of journal writing on learning in social studies: A comparative study. *Reading Psychology, 21*(1), 1-11.

Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of School Psychology, 44*(6), 473-490. doi: 10.1016/j.jsp.2006.09.001

Carrol, J.B. (1963). A model of school learning. *Teachers College Record, 64*, 723-733.

Champion, J. K. (2010). *The mathematics self-efficacy and calibration of students in a secondary mathematics teacher preparation program.* (Doctoral dissertation). Retrieved from ProQuest Information and Learning, US. (3404504)

Clotfelter, C.T., Ladd, H.F., & Vigdor, J.L. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. *Economics of Education Review, 26*(6), 673-682.

Clutts, D. W. (2011). *Mathematics self-efficacy of community college students in developmental mathematics courses.* (Doctoral dissertation). Retrieved Digital Commons, Liberty University. (396)

Coffey, H. (2010). Bloom's Taxonomy. *K-12 Teaching and Learning from the UNC School of Education* Retrieved October 15, 2010, from http://www.learnnc.org/lp/pages/4719

Coladarci, T. (1992). Teachers' sense of efficacy and commitment to teaching. *Journal of Experimental Education, 60*(4), 323-337.

Colorado Department of Education (2000). *CSAP/TCAP Data and Results.* Retrieved August 1, 2013 from http://www.cde.state.co.us/assessment/coassess-dataandresults.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2 ed.). Thousand Oaks, CA: Sage.

Creswell, J. W. (2012). *Educational research: Planning, conducting and evaluating quantitative and qualitative research* (4 ed.). Boston, MA: Pearson.

Crumbo, G. B. (1999). *Writing apprehension and the effects of "I think I can, I think I can".* Psy.D. 9921965, Spalding University, United States -- Kentucky. Retrieved from http://0-proquest.umi.com.catalog.library.colostate.edu/pqdweb?did=733946231andFmt=7andclientId=14436andRQT=309andVName=PQD

Cumming, J. M. (2011). *Statistical modeling of caregiver burden and distress among informal caregivers of individuals with Amyotrophic Lateral Sclerosis, Alzheimer's disease and cancer.* (Doctoral dissertation). Retrieved from Proquest Information and Learning. (3468761)

Czerniak, C. M. (1989). *An investigation of the relationships among science teaching anxiety, self-efficacy, teacher education variables and instructional strategies.* (Doctoral dissertation). Retrieved from ProQuest Information and Learning. (0419-4217)

Daly, J. A. & Miller, M. D. (1975). The empirical development of an instrument to measure writing apprehension. *Research in the Teaching of English, 9*(3), 242-249.

Daly, J. A. & Wilson, D. A. (1983). Writing apprehension, self-esteem and personality. *Research in the Teaching of English, 17*(4), 327-341.

Dembo, M. H., & Gibson, S. (1985). Teachers' sense of efficacy: An important factor in school improvement. *Elementary School Journal, 86*(2), 173-184. doi: 10.1086/461441

Desouza, J. M. S., Boone, W. J., & Yilmaz, O. (2004). A study of science teaching self-efficacy an doutcome expectancy believes of teachers in India. *Science Education, 88*(6), 837-854. doi: 10.1002/sce.20001

DeVellis, R. F. (2012). *Scale development: Theory and applications* (3 ed.). Thousand Oaks, CA: Sage.

Dewey, J. (1897). My pedagogic creed. *School Journal, 54*, 77-80.

Drummond, R. J. & Jones, K. D. (2011). *Assessment procedures for counselors and helping professionals* (7th ed.). Boston, MA: Pearson.

Dunkin, M.J. & Biddle, B.J. (1974). *The study of teaching*. New York, NY: Holt, Rinehard and Winston, Incorporated.

Ediger, M. (2000). *Reading, writing and the social studies*. Englewood Cliffs, NJ: Prentice-Hall Inc.

Field, A. (2009). *Discovering statistics using SPSS* (3 ed.). London: Sage.

Fitchett, P. G., Starker, T. V., & Salyers, B. (2012). Examining culturally responsive teaching self-efficacy in a preservice social studies education course. *Urban Education, 47*(3), 585-611. doi: 10.1177/0042085912436568

Flowers, L. & Hayes, J. R. (1981). A cognitive process theory of writing. *College Composition and Communication, 32*(4), 365-387.

Floyd, F.J. & Widaman K.F. (1995). Factor analysis in the development of clinical assessment instruments. *Psychological Assessment, 7*(3), 289-299.

Freidman, I. A. (2003). Self-efficacy and burnout in teaching: The importance of interpersonal relations efficacy. *Social Psychology of Education, 6*(3), 191-215. doi: DOI: 10.1023/A:1024723124467

Freisinger, R. (1982). Cross-disciplinary writing programs: Beginnings. In T. Fulwiler and Young, A. (Ed.), *Language connections: Reading and writing accross the curriculum* (pp. 3-15). Urubana, ILL: National Coujcil of Teachers of English.

Fry, S. W. (2009). Exploring social studies through multicultural literature: Legend of the St. Ann's flood. *Social Studies, 100*(2), 85-92.

Fuhler, C. J., Farris, P. J., & Nelson, P. A. (2006). Building literacy skills across the curriculum: Forging connections with the past through artifacts. *Reading Teacher, 59*(7), 646-659. doi: 10.1598/rt.59.7.4

Fulwiler, T. (1982). The personal connection: Journal writing across the curriculum. In T. Fulwiler, & Young, A. (Ed.), *Language Connections: Writing and Reading across the Curriculum* (pp. 15-32). Urbana, Ill: National Council of Teachers of English.

Gehlbach, H., Brown, S. W., Ioannou, A., Boyer, M. A., Hudson, N., Niv-Solomon, A., . . . Janik, L. (2008). Increasing interest in social studies: Social perspective taking and self-efficacy in stimulating simulations. *Contemporary Educational Psychology, 33*(4), 894-914. doi: 10.1016/j.cedpsych.2007.11.002

Gettinger, M. (1985). Time allocated and time spent relative to time needed for learning as determinants of achievement. *Journal of Educational Psychology, 77*(1), 3-11. doi: 10.1037/0022-0663.77.1.3

Giroux, H. A. (1978). Writing and critical thinking in the social studies. *Curriculum Inquiry, 8*(4), 291-310.

Glenn, C., & Goldthwaite, M.A. (2008). *The St. Martin's guide to teaching writing* (6 ed.). Boston, MA: Bedford/St. Martin's.

Gliner, J. A., Morgan, G.A., & Leech, N.L. (2009). *Research methods in applied settings (2nd ed.)*. New York, NY: Routledge.

Goodman, S. B., & Cirka, C. C. (2009). Efficacy and anxiety: An examination of writing attidutes in a first-year seminar. *Journal on Excellence in College Teaching, 20*(3), 5-28.

Graham, S. & Perin, D. (2007). A meta-analysis of writing instruction for adolescent students. *Journal of Educational Psychology, 99*(3), 445-476. doi: 10.1037/0022-0663.99.3.445

Grant, M. C., & Fisher, D. (2010). *Reading and writing in science*. Thousand Oaks, CA: Corwin, A Sage Company.

Grisham, D. L. & Wolsey, T. D. (2005). Improving writing: Comparing the responses of eight-graders, preservice teachers and experienced teachers. *Reading and Writing Quarterly, 21*(4), 315-330. doi: 10.1080/10573560591002259

Grossman, P. L. & Richert, A. E. (1988). A study in unacknowledged knowledge growth: A re-examination of the effects of teacher-education. *Teaching and Teacher Education, 4*(1), 53-62. doi: 10.1016/0742-051x(88)90024-8

Guba, E. G. (1990). *The paradigm dialog*. Newbury Park, CA: Sage.

Gunel, M., Hand, B., & McDermott, M. A. (2009). Writing for different audiences: Effects on high-school students' conceptual understanding of biology. *Learning and Instruction, 19*(4), 354-367. doi: 10.1016/j.learninstruc.2008.07.001

Guskey, T. R. (1982). Differences in teachers perceptions of personal control of positive versus negative student learning outcomes. *Contemporary Educational Psychology, 7*(1), 70-80. doi: 10.1016/0361-476x(82)90009-1

Hackett, G. (1985). Role of mathematics self-efficacy in the choice of mathematics -related majors of college women and men: A path analysis. *Journal of Counseling Psychology, 32*(1), 47-56. doi: 10.1037/0022-0167.32.1.47

Hamdan, M. (2005). Nonlinear learning of linear algebra active through journal writiing. *International journal of mathematics Education in Science and Technology., 36*(6), 607-615.

Hamilton, M. (2012). *An exploratory study of the use of resources by students with diverse levels of mathematics Self-Efficacy*. (Doctoral dissertation). Retrieved from ProQuest Information and Learning. (3483560)

Hand, B., Wallace, C. W., & Eun-Mi Yang, C. W. (2004). Using a science writing hueristic to enhance learning outcomes from laboratory activities in seventh-grade science: Quantitative and qualitative aspects. *International Journal of Science Education, 26*(2), 131-149.

Henson, R.K., Kogan, L.R., & Vacha-Hasse, T. (2001). A reliability generalization study of the teacher efficacy scale and related instruments. *Educational and Psychological Instruments, 61*(3), 404-420.

Hinkle, S. & Hinkle, A. (1990). An experimental comparison of the effects of focuses freewriting and other study strategies on lecture comprehension. *Teaching of Psychology, 17*(1), 31.

Holt, D. (2010). *Teacher self-efficacy and the civic knowledge of secondary social studies teachers in a large urban school district: A policy study.* (Doctoral dissertation). Retrieved from University of South Florida Graduate Theses and Dissertations. (2017)?

Hoy, W. K. & Woolfolk, A. E. (1990). Organizational socialization of student teachers. *American Educational Research Journal, 27*, 279-300.

Information about expository writing. (2014). Retrieved January 13, 2014, from http://www.stanford.edu/~arnetha/expowrite/info.html

Jocson, K. (2010). Unpacking symbolic creativities: Writing in school and across contexts. *Review of Education, Pedagogy & Cultural Studies, 32*(2), 206-236.

Johnson, B. W. (2010). *Job satisfaction, self-efficacy, burnout and path of teacher certification: Predictors of attrition in special education teachers.* (Doctoral dissertation). Retrieved from ERIC. (ED516770)

Johnson, C. W., Sr. (2009). *The link between teacher practices and high school students' mathematics self-efficacy: A multilevel analysis.* Doctoral Dissertation. Retrived from Ohio Link. (csu1229719270)

Johnson, L. A. (1991). *Effects of essay writing on achievement in algebra.* (Doctoral dissertation). Retrived fromThe University of Connecticut. (AAI9124202)

Kasparek, R. F. (1993). *Effects of integrated writing on attitude and algebra performance of high school students.* (Doctoral dissertation). Retrieved from Sage.

Klein, P. D. (1999). Reopening inquiry into cognitive processes in writing to learn. *Educational Psychology Review, 11*(3), 203-270.

Klein, P. D. (2000). Elementary students' strategies for writing-to-learn in science. *Cognition and Instruction, 18*(3), 317-348.

Krathwohl, D. R. (2002). A revision of Bloom's Taxonomy: An overview. *Theory into Practice, 41*(4), 212-218.

Krishton, J.M. & Widaman, K.F. (1994). Unidimensional versus domain representative parceling of questionnaire items: An empirical example. *Educational and Psychological Meaurement, 54*, 757-765.

Langer, J. A. & Applebee, A.N. (1986). Reading and writing instruction: Toward a theory of teaching and learning. *Review of Research in Education, 13*, 171-194.

Langer, J. A. & Applebee, A.N. (1987). *How writing shapes thinking*. Urbana, Ill: National Council of Teachers of English.

Lavelle, E. (2006). Teachers' self efficacy for writing. *Electronic Journal of Educational Psychology, 63*(489-499).

Lincoln, Y. S. (1990). The making of a constructivist: A remembrance of transformations past. In E. G. Guba (Ed.), *The paradigm dialog*. Newbury Park, CA: Sage.

Locke, J. (1779). *Some thoughts concerning education*. London: J. and R. Tonson in the Strand.

Lowry, P. E. (2004*). Job satisfaction of directors of special education*. (Doctoral dissertation). Retrieved from Rutgers University. (9783845435053)

Lyons-Wagner, E. C. (2011). *The effects of a self-regulation learning-strategies instructional program on middle-school students' use of learning strategies and study tools, self-efficacy and history test performance.* (Doctoral dissertation). Retrieved from Proquest Dissertations and Theses. (3442082)

Maloy, R. W., Edwards, S. A., & Anderson, G. (2010). Teaching mathematics problem solving using a web-based tutoring system, learning games and students' writinng. *Journal of STEM Education: Innovations and Research, 11*(1-2), 82-90.

Martin, N. (1976). *Writing and learning accross the curriculum 11-16*. Washington, DC: Acropolis Books.

Marzano, R. J. (2009). *Designing and teaching learning goals and objectives*. Bloomington, IN: Marzano Research Laboratory.

Maxwell, R. J. (1996). *Writing across the curriculum in middle and high schools*. Boston, MA: Allyn and Bacon.

McCarthy, D. S. (2008). Communication in mathematics : Preparing preservice teachers to include writing in mathematics teaching and learning. *School Science and Mathematics, 108*(7), 334-340.

McDonald, R. P. (1999). *Test theory a unified treatment*. Mahwah, N.J.: L. Erlbaum Associates.

Meluso, A., Zheng, M., Spires, H. A., & Lester, J. (2012). Enhancing 5th graders' science content knowledge and self-efficacy through game-based learning. *Computers and Education, 59*(2), 497-504. doi: 10.1016/j.compedu.2011.12.019

Mendelman, L. (2007). 'Yeah, but what's writing for?' *Teacher Magazine, 18*(6), 56-57.

Monroe, B. W. & Troia, G. A. (2006). Teaching writing strategies to middle school students with disabilities. *Journal of Eductional Research, 100*(1), 21-33.

Morgan, Leech, Gloeckner, & Barrett (2013*). IBM SPSS for introductory statistics: Use and interpretation (5th ed.)*. New York, NY: Roultledge.

Moxley, R. A. & Lutz, P. A. (1995). Self-recorded word counts of freewriting in grades 1-4. *Education & Treatment of Children (ETC), 18*(2), 138.

Mulki, J. P., Jaramillo, J. F., & Locander, W. B. (2008). Effect of ethical climate on turnover intention: Linking attitudinal- and stress theory. *Journal of Business Ethics, 78*, 559-574.

Muthén L.K. & Muthén, B.O. (2012). Mplus statistical analysis with latent variables: A user's guide (7th Ed.). Los Angelas, CA: Muthén & Muthén.

Munday, R. & Cartwright, C. (1990). Effects of the use of focused freewriting activities on secondary preservice teachers' critical. *Journal of Instructional Psychology, 17*(4), 237.

National Governer's Association (2010). *The common core standards for english language arts*. Washington, DC.

National Governer's Association (2010). *The common core standards for mathematics*. Washington, DC.

Nation's report card: Writing (2007). *National assessment of educational progress at grades 8 and 12: National, state and trial urban district results*. Washington, D.C.: National Center for Education Statistics.

Nation's report card: Writing (2011). *Writing 2011: National assessment of educational progress at grades 8 and 12*. Washington, D.C.: National Center for Educational Statistics.

National Writing Project (2012). *History of NWP*. Retrieved July 13, 2012, from http://www.nwp.org/cs/public/print/doc/about/history.csp

Netemeyer, R. G., Bearden, W.O., & Sharma, S. (2003). *Scaling procedures: issues and applications*. Thousand Oaks, CA: Sage.

New Tools for teaching writing. (2008). *Instructor, 117*(4), 18-19.

Novak, A. M., McNeil, K.L., & Krajcik, J.S. (September, 2009). Science sampler: Helping students write scientific explanations. *Science Scope, 33,* 54-56.

O'Brien, D. G., Stewart, R. A., & Moje, E. B. (1995). Why content literacy is difficult to infuse into the secondary school: Complexities of curriculum, pedagogy and school culture. *Reading Research Quarterly, 30*(3), 442-463.

Ofiesh, N. S., Hughes, C., & Scott, S. S. (2004). Extended test time and postsecondary students with learning disabilities: A model for decision making. *Learning Disabilities Research and Practice, 19*(1), 57-70.

Pajares, F., Britner, S. L., & Valiante, G. (2000). Relation between achievement goals and self-beliefs of middle school students in writing and science. *Contemporary Educational Psychology, 25*(4), 406-422. doi: 10.1006/ceps.1999.1027

Peach, R. C. (2008). Improving literacy across the curriculum: A study of instructional development. New York, New York: New York City Writing Project.

Penrose, A. M. & Katz, S.B. (2004). *Writing in the sciences*. New York, NY: Pearson Longman.

Plato (1998). The rebublic. In Kolak, D. (Ed.), *The mayfield anthology of western philosophy*. Montain View, CA: Mayfield Publications Company.

Prain, V. (2006). Learning from writing in secondary science: Some theoretical and practical implications. *International Journal of Science Education, 28*(2-3), 179-201.

Prat-Sala, M. & Redford, P. (2012). Writing essays: Does self-efficacy matter? The relationship between self-efficacy in reading and in writing and undergraduate students' performance in essay writing. *Educational Psychology, 32*(1), 9-20. doi: 10.1080/01443410.2011.621411

Pugalee, D. K. (2004). A comparison of verban and written descriptions of students' problem solving processes. *Educational Studies in mathematics, 55*(13), 27-47.

Creative Writing. (2014). Retrieved January 15, 2014, from https://owl.english.purdue.edu/owl/section/4/20/

Raykov, T. M., G.A. (2011). *Introduction to psychometric theory*. New York, NY: Routledge.

National Council of Teachers of English. (2001). *Reading and writing across the curriculum: A policy research brief produced by the National Council of Teachers of English*. Urbana, Illinoise: Author.

Revelle, W. (2014). Psych: Procedures for personality and psychological research (Version 1.4.4) [Computer software]. Retrieved April 2, 2014 from http://CRAN.R-project.org/package=psych

Richardson, M. (2008). Writing is not just a basic skill. *Chronicle of Higher Education, 55*(11).

Riggs, I. M. & Enochs, L. G. (1990). Toward the development of an elementary teachers science teaching efficacy belief instrument. *Science Education, 74*(6), 625-637. doi: 10.1002/sce.3730740605

Rijlaarsdam, G., Couzijn, M., Janssen, T., Braaksma, M., & Kieft, M. (2006). Writing experiment manuals in science education: The impact of writing, genre and audience. *International Journal of Science Education, 28*(2-3), 203-233.

Ritchie, S., Rigano, D., & Duane, A. (2008). Writing an Ecological Mystery in Class: Merging Genres and Learning Science. *International Journal of Science Education, 30*(2), 143-166.

Rose, J. S. & Medway, F. J. (1981). Measurement of teachers' beliefs in their control over student outcomes. *Journal of Educational Research, 74*(3).

Rudell, R. M. (2001). *Teaching Content reading and writing* (3 ed.). New York, NY: John Wiley and Sons, Inc.

Russel, M., O'Dwyer, L.M., Bebell, D., & Tao, W. (2007). How teachers' uses of technology vary by tenure and longevity. *Journal of Educational Computing Research, 37*(4), 393-417.

Sakiz, G. (2007). *Does teacher affective support matter? An investigation of the relationship among perceived teacher affective support, sense of belonging, academic emotions, academic self-efficacy beliefs and academic effort in middle school mathematics classrooms?* (Doctoral dissertation). Retrived from OhioLink. (65599)

Sayers, M. P. (1988). *The relationship of self-efficacy expectations, interests and academic ability to the selection of science and nonscience college majors.* (Doctoral dissertation). Retrived from ProQuest.

Schickore, J. (2008). Doing science, writing science. *Philosophy of Science Association, 75*. 323-343

Schunk, D. H. & Swartz, C. W. (1993). Goals and progress feedback: Effects on self-efficacy and writing achievement. *Contemporary Educational Psychology, 18*(3), 337-354. doi: 10.1006/ceps.1993.1024

Scwarzer R., H., S. (2008). Percieved teacher self-efficacy as a predictor of job stress and burnout: Mediation analysis. *Applied Psychology: An International Review, 57*, 152-171. doi: 10.1111/j.1464-0597.2008.00359.x

Sexton, T. L. (1987). *Self efficacy, outcome expectations and mathematics ematical performance: A path analysis investigation.* (Doctoral dissertation). Retrieved from ProQuest. (3086607)

Shanahan, T. S. C. (2008). Teaching disciplinary literacy to adolescents: Rethinking content-area literacy. *Harvard Educational Review,78*(1), 40-60.

Smist, J. M. (1996). *Science self-efficacy, attributions and attitudes toward science among high school students.* (Doctoral dissertation). Retrived from DigitalCommons @ UConn. (AAI9634556)

Spector, P. E. (1986). Assessing employee job satisfaction with the job satisfaction survey. *Mental Retardation Systems, 3,* 5-13.

Spector, P. E. (1997). *Job satisfaction: Application, assessment, causes and consequences*. Thousand Oaks, CA.: Sage.

Spector, P. E. & Wimalasiri, J. (1986). A cross-cultural comparison of job satisfaction dimensions in the United States and Singapore. *Applied Psychology: An International Review, 35,* 147-158.

Stern, D. (1995). *Teaching english so it matters*. Thousand Oaks, CA: Sage.

Sommers, N. & Saltz, L. (2005). The novice as expert: Writing freshman year. *College Composition and Communication, 56*(1), 124-149.

Syh-Jong, J. (2007). A Study of students' construction of science knowledge: Talk and writing in a collaborative group. *Educational Research, 49*(1), 65-81.

Tabachnick, B. G. & Fidell, L.S. (2007). *Using multivariate statistics (5th ed.)*. Boston:: Allyn and Bacon.

Tancock, S. M. (2002). Reading, writing and technology: A healthy mix in the social studies curriculum. *Reading Online, 5*(8).

The National Commission on Excellence in Education (1983). *A nation at risk: A report to the nation and the secretary of education*. Washington, DC: United States Department of Education.

The United States Department of Education (2003). *The neglected "R": The need for a writing revolution. Report of the national commission on writing in america's schools and colleges.* Washington, D.C.: Author.

Tobin, K. (1987). The role of wait time in higher cognitive level learning. *Review of Educational Research, 57*(1), 69-95. doi: 10.2307/1170357

Tschannen-Moran, M., Hoy, W.K., & Hoy, A.W. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research, 68*(2), 202-248. doi: 10.3102/00346543068002202

Tynjala, P., Mason, L., & Lonka, K. (2001). Writing as a learning tool: An introduction. In P. Tynjala, Mason, L., & Lonka, K. (Eds.), *Writing as a learning tool: Integrating theory and practice* (pp. 7-22). Alphen aa den Rijon, Netherlands: Kluwer Academic Publishers.

Ulusoy, M. & Dedeoglu, H. (2011). Content area reading and writing: Practices and beliefs. *Australian Journal of Teacher Education, 36*(4), 1-17.

Vygotsky, L. S. (1962). *Thought and language.* Cambridge, MA: MIT Press.

Vygotsky, L. S. (1978). *Mind in society.* Cambridge, MA: Harvard University Press.

Willey, L. H. (1988). *The effects of selected writing to learn approaches on high school students' attitudes and achievement.* (Doctoral dissertation). Retrieved from ProQuest.

Woolfolk, A. E. (2005). *Educational psychology* (9th ed.). Boston, MA: Allyn and Bacon.

Woolfolk, A. E. & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology, 82*(1), 81-91. doi: 10.1037//0022-0663.82.1.81

Woolfolk, A. E., Rosoff, B. & Hoy, W. K. (1990). Teachers' sense of efficacy and their beliefs about managing students. *Teaching and Teacher Education, 6*(2), 137-148. doi: 10.1016/0742-051x(90)90031-y

Workforce Investment Act, WIA--P.L.105-220, Senate 112 (1998).

Writing to Learn Clearinghouse (2012). *What is writing to learn*. Retrieved January 12, 2013, from http://wac.colostate.edu/intro/pop2d.cfm

Yalvac, B., Smith, H. D., Hirsch, P. L., & Birol, G. (2006). Teaching writing in a laboratory-based engineering course with a "How People Learn" framework. *New Directions for Teaching and Learning*, (108), 59-73. doi: 10.1002/tl.256

Young, A. & Fulwiler, T. (1986). *Writing across the disciplines: Research into practice*. Upper Montclair, NJ: Boynton/Cook Publishers Inc.

Young, A. (2006). *Teaching writing across the curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.

Young, L. (2007). Portals into poetry: Using generative writing groups to facilitate student engagement with word art. *Journal of Adolescent & Adult Literacy, 51*(1), 50-55.

Zigmond, N. (2006). Reading and writing in co-taught secondary school social studies classrooms: A reality check. *Reading and Writing Quarterly, 22*, 249-268.

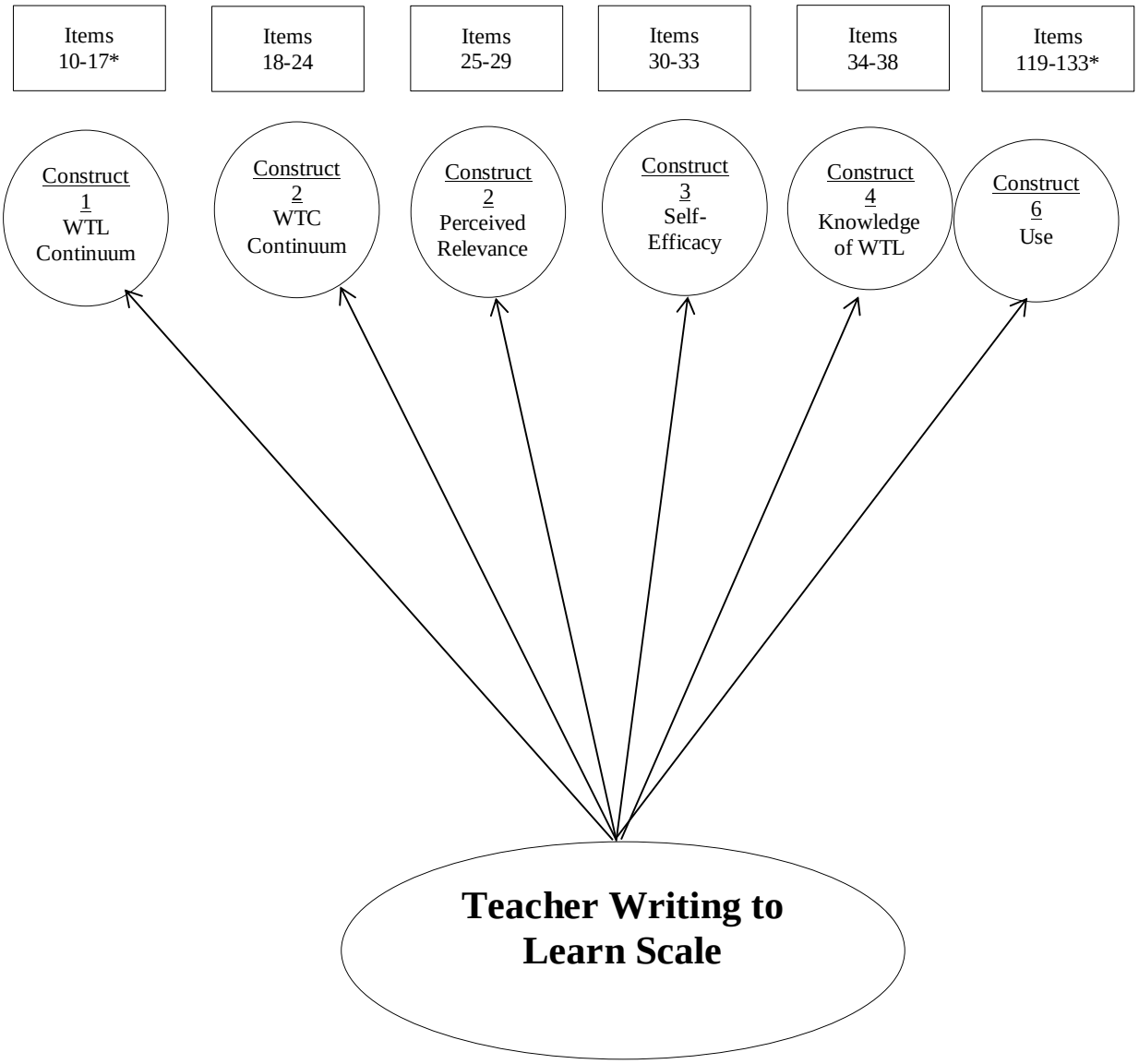
Zimmerman, B. J. & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. *American Educatioal Research Journal., 31*, 845-862.

Zimmerman, B. J. & Kitsantas, A. (2002). Acquiring writing revision and self-regulatory skill through observation and emulation. *Journal of Educational Psychology, 94*(4), 660-668. doi: 10.1037//0022-0663.94.4.660

Zuriff, G. E., (2000). Extra examination time for students with learning disabilities: An examination of the maximum. *Applied Measurement in Education, 13*(1), 99.

APPENDICES

APPENDIX A: THE THEORETICAL MODEL OF THE TWTLS



*Note. Items 1-10 were related to demographics and 42-130 were validation scale items.

APPENDIX B: WRITING STRATEGIES

The Writing Across the Curriculum strategies found in the literature by type, sub, type, general description and classification as writing to learn (WTL), writing to communicate (WTC), or both WTL and WTC.

Journals/Logs

Sub-type	Description	WTL?	WTC?	BOTH?
Reading Logs	Students use writing to learn the content of their subject matter reading.	Yes		
Learning Logs	Students use learning logs to process learning activities by: 1) Expressing questions or concerns 2) Re-address the contents of a lecture 3) Journal about their labs 4) Process things that confuse them 5) Process processes given their content 6) Respond to questions in class 7) Write problem statements	Yes		

Free Writing

Sub-type	Description	WTL?	WTC?	BOTH?
As a warm-up	Students use free writing assignments to respond to questions prior to the beginning of a lesson or class period.	Yes		
Prior to verbal answers	Students are given time to write thoughts to questions to which they are expected to respond verbally.	Yes		
After class/lesson	Students free write to review class material.	Yes		
During lesson	Use freewriting to help students get back on task.			

Discussion

Sub-type	Description	WTL?	WTC?	BOTH?
Prior to discussion	Students write prior to sharing with their peers in classroom discussion.	Yes		
During Discussion	Discussions may pause to allow students to write their thoughts or more things to share.	Yes		
After discussion	After a discussion, a student may free-write to review what their learned or express thoughts/feelings.	Yes		

Notes

Sub-type	Description	WTL?	WTC?	BOTH?
Only one type	Students use writing to take notes during lecture, presentations, while reading, etc. May relate to annotation.	YES		

Summary

Sub-type	Description	WTL?	WTC?	BOTH?
One Type	Students use summaries as a way to shorten other written materials, or to give an overview of class discussions, lectures, presentations, film, et cetera.			Yes

Annotation

Sub-type	Description	WTL?	WTC?	BOTH?
Only one type	Students use writing to capture the key elements or fragments of their reading, or other sources.			Yes

Synthesis

Sub-type	Description	WTL?	WTC?	BOTH?
One type	Students use writing to connect different sources of information such as one reading source with another, or a reading source with a class presentation.			Yes

Expository Writing

Sub-type	Description	WTL?	WTC?	BOTH?
Essays/Theses	Students write essays or theses to express opinions, give information and demonstrate their general writing abilities. The process of writing may relate to WTL, but the product is used to communicate.			Yes
Research Papers	Students gather credible sources of information, piece them together and write a report.			Yes
Lab write-ups	Students write using the template of the scientific process. The process relates to WTL, but the product is used to communicate.			Yes
Reports	Students may write various reports.			Yes

Creative Writing

Sub-type	Description	WTL?	WTC?	BOTH?
Poetry	Students can write in verse to communicate feelings or information. Perhaps some verse may be used to also learn content.		Yes	Maybe?
Fiction	Can this be used to teach content at the secondary level?		Yes	Maybe?
Non fiction	Can this be used to teach content at the secondary level?		Yes	Maybe?
Drama	Can this be used to teach content at the secondary level?		Yes	Maybe?

APPENDIX C: ITEM CREATING ACTIVITY

Objective: To help me produce items for a scale measuring knowledge of writing to learn and its relationship to Bloom's new Taxonomy.

Introduction (two activities):
How do you use writing in your content area (can say you don't)? Share and discuss while I take notes.

What sorts of things do your students read in your classroom? Make a list.

Initial input:
I will give a 5 minute overview of writing to learn. The medium used will be handouts and we will be arranged in a circle and will later move to small groups. The following content will be covered:

1) The theoretical origins of WTL
    a. Social cognitive theory
    b. Social constructivism
    c. Learning and time
2) The history of WTL and the crux of the research
3) Specific activities that can be done to use WTL across the content
    a. Reading Journals
    b. Discussions
    c. Response assignments
    d. Annotations
    e. Summaries
4) Specific ways in which WTL addresses the following thinking skills
    a. Remember
    b. Apply
    c. Comprehend
    d. Analyze
    e. Synthesize
    f. Evaluate
    g. Create

Workshop Activity:
Ask the teachers to spit into content area groups and break down their curriculum to identify lessons that may use specific writing activities. I will then turn these into specific items.

What will happen after?
These items will then be pooled and taken to experts on WTL at the following universities:

1) Colorado State
2) University of Colorado
3) University of Denver
4) University of Northern Colorado

The feedback of these experts will narrow the items down to a final measure. I will then test the measure for validity and reliability and use it to test programs that teach teachers WTL.

This group of teachers is to help me develop a pilot measure. These teachers are not considered participants as no data are collected today.

I will be happy to return to those who helped to present the results and may even need more help if they are willing.

APPENDIX D: WRITING TO LEARN ACTIVITIES USED AT TEACHER WORKSHOP

Reading log-
A reading log is a tool that consists of a separate notebook where students write about what they read in content classes. Teachers can ask students to write in logs to help them process the reading material of a content area.

Summaries-
A summary is when a student briefly restates a reading passage, learning concept, or other content. Teachers can ask students to write summaries of course information and materials.

For example, students could write a summary of the water cycle in science class.

Annotations-
Students annotate when they write a note about a section of text, only covering the important parts.

For example, an algebra student can annotate the section of the class's textbook on the property of distribution. His annotation includes step by step key points.

Response Assignments-
A response assignment occurs when a teacher gives a topic and students are asked to respond in writing.

A U.S. History teacher can ask students to respond to a prompt asking students what they think about the concept of "No taxation without representation."

Synthesis assignments-
Synthesis assignments ask students to bring together two or more separate reading assignments, pulling from them similarities.

For example, a science teacher can ask students to read two accounts of famous experiments and synthesize how the scientists followed similar protocols.

Discussions- Prior to or during class discussion, the teacher can ask students to write their thoughts on a topic or question, or to refocus the discussion.

For example, a mathematics teacher might begin class by asking students to write and then discuss the uses of the Pythagorean Theorem.

Analyzing processes – Many content areas have processes and steps. Teachers can have students write about these processes.

For example, an algebra teacher might have students write about the process of order of operations, describing each step in the correct order.

Problem statement-
In many content areas, we are confronted with various problems. Teachers can ask students to write about these problems.

In science, students could write why it is important to find out why different element make different colored flames and why this might be useful to know.

APPENDIX E: FIRST ITEMS FOR KNOWLEDGE OF WTL

What is the **MAIN** purpose of reading journal?

a. To make sure students are reading.
b. To help students improve their writing skills.
c. To help improve student reading comprehension.
d. All of the above.

A history teacher assigns each 8th grade student a book about the civil war. To monitor their reading, she gives each student a notebook to keep as a reading journal where they will regularly write about the assigned book. Which of the following offers the **BEST** way to launch this project?

a. Allow the students to "free write" the first few entries.
b. Ask the students to summarize their first few readings.
c. Provide the students with a specific journal page format and questions.
d. None of the above.

What would be the **MOST** consistent way to help mathematics students comprehend the reading of the mathematics texts?

a. Assign a reading log
b. Assign a summary assignment for each reading
c. Assign an annotation assignment for each reading
d. Have students write about each reading to use to aid with class discussions

A 10th grade biology teacher would like to assign a series of articles on the organic cycle for her students to read at home over the next few weeks. She would like to monitor their reading comprehension while also implementing writing in a systematic way. Which strategy would work the **BEST**?

e. She could require students to summarize each reading each night
f. Should could assign reading logs
g. She could have students engage in discussion after writing their thoughts at the beginning of each class
h. She could require students to annotate each reading

A language arts teacher is facilitating a discussion on the book *Black Like Me*. During the discussion, the class gets off-task with some students not sharing, but others holding side conversations. How can the teacher **BEST** using writing to help the discussion?

a. Have students stop discussing and write a summary on the previous chapter.
b. Have the students pause, free write about the topic of discussion and then use their writing to continue the discussion.
c. Have the students write a letter about their behavior during the discussion
d. All of the above are good

Which of the following scenarios is BEST suited for students to write freely where they will not be evaluated (free write)?

a. A teacher wants students to write to enhance class discussions.
b. A teacher assigns students a reading journal assignment.
c. A teacher asks students to write a summary.
d. None of the above

At the beginning of each class, the students and the teacher engage in a discussion about a specific mathematics problem. The students form a semi-circle around the teacher who introduces the problem and then asks for responses on the process of solving it. What can this teacher do to use writing to improve accuracy and response rates?

a. Ask students to summarize in writing the processes they would go through to solve it.
b. Ask students to reproduce the problem and make annotations.
c. Have the students keep journals on all of these talks.
d. Ask the students quickly jot answers before asking for responses.

An 8th Grade science teacher is demonstrating friction and gravity to her students. To build interest, she begins her class by having the students watch a race between three carts, rolling down at different angles. She then shows them three carts rolling down at the same angle, but on different track materials. Before asking the students to discuss why some were faster than others on each race, what writing strategy could she use to help students with their answers?

a. Have the students jot a "free write" of their answer before sharing.
b. Have the students summarize the events of each race.
c. Have the students reproduce the problem in a diagram with annotations.
d. None of the above.

A teacher wants his students to understand the main conflict of a short story they are reading in class and to predict the possible solutions to the main conflict before continuing the reading. How would you use writing to achieve this goal? Please respond in a sentence or more.

No Points	One Point
Response does not include any mention of writing of the problem.	Response includes a problem statement.

A geography teacher wants to introduce the problem of world hunger to her students. First, she has them read a short article about the problem. Which of the following will help her use writing to get her students to think about the problem more in depth?

a. Hold a class discussion after a writing warm-up activity
b. Have the students write about the problem and potential solutions
c. Have students write a letter to an important political figure
d. Have students summarize the reading

An Algebra teacher gives the students the following directions:

Read this beginning to a story problem:

Jack was selling tickets to the baseball game. He sold ten more tickets to Seniors than he sold to Juniors and he sold twice as many tickets to Sophomores than he sold to Juniors.

1) Finish writing the story problem.
2) Identify what expression is best used and why.
3) Solve the problem.

What Writing to Learn Strategy is best addressed here?

a. Statement of the problem
b. Reading journal
c. Response assignment
d. Summary

Before conducting an experiment, a chemistry teacher wants her students to demonstrate a deeper understanding of the purpose of the assignment. What could the teacher do next to use writing to strengthen her ability to reach her goal?

a. Ask the students to write a statement of the experiment's problem
b. Ask the students to hand-in notes on what she said
c. Ask the students to write about what they think about the experiment to come
d. None of the above

A sixth grade teacher is using The Outsiders to teach theme. Give an example of how the teacher could use writing to respond to the following quote from the novel:

"It seemed funny that the sunset she saw from her patio and the one I saw from the back steps was the same one. Maybe the two worlds we lived in weren't so different. We saw the same sunset."

No Points	One Point
Response does not give a logical assignment.	Response gives a logical way to use a response assignment to connect quotations to themes.

A history teacher shows a film about Auschwitz to her students. Every once in a while, she pauses the film and asks students to "write their thoughts." What writing to learn strategy is she using?

a) Journals
b) Response Assignment
c) Annotation
d) Problem Statement

To help bring relevance to his classroom, a mathematics teacher has a local member of the community speak to the class about the importance of mathematics in her life. After the end of the talk, the teacher asks the students to informally write their thoughts about the relevance of mathematics. What writing to learn strategy is this teacher using?

a) Problem statement
b) Journal
c) Annotation
d) Response assignment

A chemistry teacher is giving a lesson on elements and the spectrum by holding different elements over a Bunsen burner so students can observe the colors of the flames. Between each element, she asks the students to react to what they see by informally jotting things down on a loose paper. These observations will be addressed later. What writing to learn strategy is she using?

a) Response assignment
b) Journal
c) Summary
d) Reading Log

The media specialist and the language arts teacher are working collaboratively to help students with a thematic unit on survival in nature. One major assignment of the unit is for students to research a survival story and the survival techniques relevant to that story. To help the students organize their information, the media specialist teachers the students how to identify key portions of their sources, notice patterns and mark up their texts. She then has them write-out their work to help them further understand it. What WTL strategy is she using?

a) Summary
b) Annotation
c) Analysis
d) None of the above.

A high school U.S. History teacher wants to begin the year with a background on enlightenment philosophy. She provides her 10th grade students with very rigorous readings by John Locke. To help them, she reads aloud while they read along, but finds students still complain that it is "too hard." In a sentence or two, explain how you would use annotation to help these students understand the reading as they read it along with you.

No Points	One Point
No use of annotation given.	Response includes a strategy that uses annotation.

Which of the following strategies of writing would help students solve the problem.

a. Having the students write the step-by step process of solving in a journal before solving it.
b. Having the students annotate the processes on the handout why they solve the problem.
c. Having the students write how they should solve it and then hold a discussion.
d. All are viable options.

A biology teacher is interested in students learning the process of photosynthesis. After providing a brief presentation on the concept, he asks the students to read a handout. What strategy would help students to understand the main points of the handout?

a) Having the students annotate the reading.
b) Having the students write a summary of the reading.
c) Having the students discuss the reading.
d) None of the above.

A teacher asks her students to write a concise review of "Sinners in the Hands of an Angry God." What is this type of assignment called?

a) An essay
b) A summary
c) An annotation
d) A log entry

A U.S. History teacher wants his students to understand the main ideas of the American Revolution. Therefore, before addressing the colonial rebellion, he decides to introduce the students to some rather rigorous readings by Locke. It is not long until he realizes that the reading level is a bit much, so he asks students to break it into small chunks and then write each chunk in their own words, covering just the main points while they read. Essentially, what is he asking them to do?

a) Annotate
b) Evaluate
c) Summarize
d) None of the above

A teacher shows students an example of the Pythagorean Theorem and the steps of its resolution:
Whereas a=2 and b=4:

$2^2+4^2=C^2$
$4+16=C^2$
$\sqrt{20} = \sqrt{C^2}$
C=4.47

Instead of asking the students to solve the problem, the teacher asks the students to write in prose each step of its resolution. One of the students wrote the following correct answers:

First, he squared side a and got 4 and he squared side b and got 16. Next, he added a and b and got 20. To cancel out the square, he square rooted 20 and C-squared and got that side C equals 4.47.

Which of the following *Writing to Learn* Strategies is this?

a. Annotation
b. Analysis
c. Journaling
d. Summarizing

A teacher has the students read an informative article about the most common forms of energy on our planet. To better understand the article, the teacher asks the students to re-write the main points in their own words in paragraph form. What writing to learn strategy is she using?

a. Annotation
b. Reading log
c. Summary
d. None of the above

APPENDIX F: INITIAL ITEMS FOR SELF EFFICACY OF USING WTL

Select the option that is the most relevant to you.

I am confident about using writing in my class.			
Disagree Strongly	Disagree	Agree	Strongly Agree
When I really think hard, I am able to find ways to integrate writing into my class.			
Disagree Strongly	Disagree	Agree	Strongly Agree
I don't know enough about writing to teach it in my class.			
Disagree Strongly	Disagree	Agree	Strongly Agree
I am nervous to use writing with my students.			
Disagree Strongly	Disagree	Agree	Strongly Agree
I can use writing in my class just as well as any other teacher.			
Disagree Strongly	Disagree	Agree	Strongly Agree

APPENDIX G: INITIAL ITEMS FOR WTC AND WTL CONTINUUM AND FOR USE OF WRITING (SCALE CHANGE FOR USE OF WRITING)

Identify each writing strategy given below. Place a check in ***ONE*** box per strategy to indicate whether you think the strategy is an example of writing to communicate, writing to learn, or a combination of both.

Strategy	Purely Writing to Communicate	Mostly Writing to Communicate	Equally Both	Mostly Writing to Learn	Purely Writing to Learn
Reading logs					
Reading journals					
Free writing					
Writing for discussion					
Summary writing					
Annotating					
Writing to synthesize					
Writing to take notes					
Writing essays					
Writing research papers					
Writing reports					
Writing poems					
Writing fiction					
Writing creative non-fiction					
Writing letters					

APPENDIX H: PERCIEVED RELEVANCE OF WRITING TO CONTENT

Select the option that is the most relevant to you.

Writing adds to my content area.			
Disagree Strongly	Disagree	Agree	Strongly Agree

When students write, it helps them to improve in my class.			
Disagree Strongly	Disagree	Agree	Strongly Agree

Writing is not really related to my content area.			
Disagree Strongly	Disagree	Agree	Strongly Agree

I don't think that writing is important in my area of focus.			
Disagree Strongly	Disagree	Agree	Strongly Agree

If I used writing, it would take away from the things I really need to teach.			
Disagree Strongly	Disagree	Agree	Strongly Agree

APPENDIX I: THE EXPERT REVIEW PROTOCOL FOR THE WRITING EXPERT

		Construct Categories (choose one)						Confidence Rating			Relevance Rating		
Item	I. WTL Strategies	II. WTC Strategies	III. Perceived Usefulness	IV. Knowledge of WTL	V. Self-Efficacy of Using WTL	VI. Use of writing in the classroom	None of the above	Low Certainty	Moderate Certainty	Complete Certainty	Low Relevance	Moderate Relevance	Complete Relevance
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													

		Construct Categories (choose one)						Confidence Rating			Relevance Rating		
Item	I. WTL Strategies	II. WTC Strategies	III. Perceived Usefulness	IV. Knowledge of WTL	V. Self-Efficacy of Using WTL	VI. Use of writing in the classroom	None of the above	Low Certainty	Moderate Certainty	Complete Certainty	Low Relevance	Moderate Relevance	Complete Relevance
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													

Finally, take a look at the multiple choice items (numbers given below). Note that I have highlighted what I think is the correct answer in gray. Go through these items and use the table below to tell me what you think about the correct answers and list distractors that might be problematic, including any misconceptions that might arise.

Item Number	Is the identified answer the "correct" answer in your view? Write "Yes," or "No."	List any distractors that may be misaligned. Use back of sheet if needed, just label clearly. ☺
2		
6		
7		
19		
20		
31		
32		

Do you feel the multiple choice options are suitable for the other items (besides the ones above)? If not, do you have any suggestions?

Do you have any comments about the survey, its items and/or its constructs?

Is there anything that could be added to make this survey better?

APPENDIX J: THE EXPERT REVIEW FORM FOR PUBLIC SCHOOL EDUCATORS

_____,

Thank you for taking the time to look at the instrument I'm writing for my dissertation. I have asked you to take part in the content validity process during which I ask professionals and experts to help me review my items. You are a highly respected educator in your field and in general, so your input is invaluable to me.

This instrument's goal is to measure the extent to which secondary teachers of ALL content areas are "ready" to teach writing to learn in their content areas regardless of what those content areas are. I will define what ***ready*** means below.

This scale includes four factors, or parts. Each factor has its own items. I define "readiness to use writing to learn" with these four factors which are:

1) Knowledge of purpose of writing tasks
2) Relevance of writing to one's content area
3) Self-efficacy of using writing
4) Knowledge of strategies that use writing to learn

Take a few moments and read the descriptions of each factor (construct) and the relevant items that I have created and answer the questions that I have after them. Also, check for typos and things like that!

Thank you very much. I will keep you updated on this. Once I finish refining, this, I will send it out to thousands of teachers in Colorado to run regression analyses as well as factor analyses and structural equation models to test for validity and reliability. Once I collect and analyze my data, I will defend it in front of my committee. This will happen before May.

Thanks,

Mark

Construct 1, Knowledge of purposes of writing tasks-
According to the literature, writing to learn is a writing task that is done just for the sole purpose of learning content, whereas writing to communicate is done only to relay information to the reader. I am asking teachers to demonstrate where they think different writing tasks fit.

Directions for teacher:
Identify each writing strategy given below. Place a check in ***ONE*** box per strategy to indicate whether you think the strategy is an example of writing to communicate or writing to learn.

Strategy	Purely Writing to Communicate	Mostly Writing to Communicate	Equally Both	Mostly Writing to Learn	Purely Writing to Learn
Reading logs					
Reading journals					
Free writing					
Writing for discussion					
Summary writing					
Annotating					
Writing to synthesize					
Writing to take notes					
Writing essays					
Writing research papers					
Writing reports					
Writing poems					
Writing fiction					
Writing creative non-fiction					
Writing letters					

Questions for _____ about Factor 1, Knowledge of Purposes of Writing Tasks (each factor will have the same questions, FYI)

1) Do you in your view, do you think that these questions belong together as one construct? If not, what is amiss? What recommendations would you make?

2) Do you feel that the response format (putting the questions on a grid and asking them to ex the appropriate box) is appropriate for this?

3) As a teacher, do you feel that you and your colleagues would be able to answer these questions in a what that accurately reflects what you and they really know and think?

4) If I used the same strategies, but asked teachers to rank their use as (0=never, 1=rarely, 2=frequently, 3=sometimes, 4=often), do you think this would work as a separate set of items? Why or why not?

5) Are any of the items listed problematic? Explain?

6) Did I miss any items or things to ask? Should I add more items? If so, do you have an example?

7) Do you have any other thoughts/concerns/recommendations about this construct and its items?

Construct 2:

Relevance of writing to respondent's content

These items ask respondents to explain how relevant writing is to their content area. For example, mathematics teachers will rank relevance of writing to mathematics.

Select the option that is the most relevant to you.

Writing is useful to my content area.			
Disagree Strongly	Disagree	Agree	Strongly Agree

When students write, it helps them to improve in my class.			
Disagree Strongly	Disagree	Agree	Strongly Agree

Writing is not really related to my content area.			
Disagree Strongly	Disagree	Agree	Strongly Agree

I don't think that writing is important in my area of focus.			
Disagree Strongly	Disagree	Agree	Strongly Agree

If I used writing, it would take away from the things I really need to teach.			
Disagree Strongly	Disagree	Agree	Strongly Agree

Questions for _____ about Factor 2,

1) Do you in your view, do you think that these questions belong together as one construct? If not, what is amiss? What recommendations would you make?

2) Do you feel that the response format (putting the questions on a grid and asking them to ex the appropriate box) is appropriate for this?

3) As a teacher, do you feel that you and your colleagues would be able to answer these questions in a what that accurately reflects what you and they really know and think?

4) Are any of the items listed problematic? Explain?

5) Did I miss any items or things to ask? Should I add more items? If so, do you have an example?

6) Do you have any other thoughts/concerns/recommendations about this construct and its items?

Construct 3:
Self-efficacy of using writing

Self-efficacy is defined as "confidence" and comes from the work of the psychologist Alfred Bandura, who, realized that performance is a function of how confident a person is at doing a given task. For example, high self-efficacy of skiing double-black diamond runs means that a person is really confident about doing that!

Select the option that is the most relevant to you.

I am confident about using writing in my class.			
Disagree Strongly	Disagree	Agree	Strongly Agree

When I really think hard, I am able to find ways to integrate writing into my class.			
Disagree Strongly	Disagree	Agree	Strongly Agree

I don't know enough about writing to teach it in my class.			
Disagree Strongly	Disagree	Agree	Strongly Agree

I am nervous to use writing with my students.			
Disagree Strongly	Disagree	Agree	Strongly Agree

I can use writing in my class just as well as any other teacher.			
Disagree Strongly	Disagree	Agree	Strongly Agree

1) Do you in your view, do you think that these questions belong together as one construct? If not, what is amiss? What recommendations would you make?

2) Do you feel that the response format (putting the questions on a grid and asking them to ex the appropriate box) is appropriate for this?

3) As a teacher, do you feel that you and your colleagues would be able to answer these questions in a what that accurately reflects what you and they really know and think?

4) Are any of the items listed problematic? Explain?

5) Did I miss any items or things to ask? Should I add more items? If so, do you have an example?

6) Do you have any other thoughts/concerns/recommendations about this construct and its items?

Constructs 4 and 5
Knowledge of WTL and WAC

Here, I basically attempt to measure what teachers know about writing strategies. This was the most difficult part of the scale to develop. I've written over 200 items and reduced it to this. This, after consultation with dozens of teachers!

A 10th grade biology teacher would like to assign a series of articles for her students to read at home over the next few weeks. She would like then to read better and she would like to implement writing in a systematic way. Which strategy would work the **BEST**?

e. She could require students to summarize each reading each night
f. Should could assign reading logs
g. She could have students engage in discussion after writing their thoughts at the beginning of each class
h. She could require students to annotate each reading

A language arts teacher is facilitating a discussion on the class assigned novel. During the discussion, the class gets off-task with some students not sharing, but others holding side conversations. How can the teacher **BEST** using writing to help the discussion?

e. Have students stop discussing and write a summary on the previous chapter.
f. Have the students pause, free write about the topic of discussion and then use their writing to continue the discussion.
g. Have the students write a letter about their behavior during the discussion
h. All of the above are good

A biology teacher is interested in students learning the process of photosynthesis. After providing a brief presentation on the concept, he asks the students to read a handout. What is the best strategy to show his students to gather key information from the text?

a. Have the students summarize it
b. Have the students annotate it
c. Have the students free write about it
d. None of the above

A U.S. History teacher wants his students to understand the main ideas of the American Revolution. Therefore, before addressing the colonial rebellion, he decides to introduce the students to some rather rigorous readings by Locke. It is not long until he realizes that the reading level is a bit much. What is a good strategy to use so that students are able to understand the reading in their own words.

e) Have the students break into parts and evaluate how good of a writing piece it is.
f) Have the students break it into parts and summarize each part.
g) Have the students break it into parts and free write about it.
h) None of the above

An algebra teacher asks students to create a Venn Diagram to plan a response to the following question: "How is an exponential function *similar* to a linear function?" What is she asking them to do?

a. Create a new way of solving a problem.
b. Analyze the parts of functions.
c. Synthesize two different functions.
d. Remember things about functions.

Which of the following illustrates the BEST use of a learning log?

a. Answer questions for the teacher to check
b. Journal about course content that confuses them
c. Write prior to answering verbal questions
d. All of these work well for learning logs

Which of the following are examples of using freewriting effectively?

a. Students use freewriting assignments to respond to questions prior to a lesson
b. Students are given time to freewrite thoughts or answers to questions they will subsequently answer verbally.
c. Students freewrite to review class materials.
d. All of the above.

Which of the following is probably **best** used as writing to communicate?

a. Reading log
b. Freewrite
c. Lab report
d. Summary

_____'s Responses to These items (I added 3 additional questions)

1) Do you in your view, do you think that these questions belong together as one construct? If not, what is amiss? What recommendations would you make?

2) Do you feel that the response format (putting the questions on a grid and asking them to ex the appropriate box) is appropriate for this?

3) As a teacher, do you feel that you and your colleagues would be able to answer these questions in a what that accurately reflects what you and they really know and think?

4) Do you agree with the highlighted correct answer? Explain.

5) What do you think of the distractors (non-correct options)? Would you change any of them? Which ones? How?

6) Are any of the items listed problematic? Explain?

7) Did I miss any items or things to ask? Should I add more items? If so, do you have an example?

8) Do you have any other thoughts/concerns/recommendations about this construct and its items?

9) Are there any comments to make about this whole scale in general?

APPENDIX K: THE ENTIRE TWTLS INCLUDING VALIDATION ITEMS FOR ONLINE VERSION INCLUDING CODES OF RESPONSES

Page - 1

Dear Participant,

My name is Mark Perkins and I am a researcher from Colorado State University in the School of Education. We are conducting a research study to develop a new measure of how teachers feel about and use writing to learn in their content-area classrooms. The title of our project is "Measuring Teacher Readiness to Use Using Writing to Learn Across the Curriculum." The Principal Investigator is Gene Gloeckner, Ph.D. and I am the Co-Principal Investigator. I choose your school because I feel it represents a good perspective for my topic.
We would like you to take an anonymous online survey. The survey consists of 146 multiple choice (or otherwise click to select) questions. Participation will take approximately 10-25 minutes to complete. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty.

We will not collect your name or personal identifiers. When we report and share the data to others, we will combine the data from all participants. While there are no direct benefits to you, we hope to gain more knowledge on the topic and we will make a donation to a charity from you can select from the survey.

There are no known risks associated with this research. It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential (but unknown) risks.

To indicate your consent to participate in this research and to continue on to the survey, please click below. In exchange for taking this survey, please select an educational cause to which I will make a donation. You will be asked to select this at the start of the survey.

If you have any questions about the research, please contact Mark Perkins at mark.perkins@colostate.edu or Gene Gloeckner, Ph.D. at 970-491-7661. If you have any questions about your rights as a volunteer in this research, contact Janell Barker, Human Research Administrator, at 970-491-1655.

Gene Gloeckner, Ph.D.
Principal Investigator & Professor
(970) 491-7661
Gene.Gloeckner@colostate.edu

Mark Perkins, Ph.D. Candidate
Co-Principal Investigator & Instructor
mark.perkins@colostate.edu
Required answers: 0 Allowed answers: 0

Q1 Do you consent to take the survey?
Yes[Code = 1]
No[Code = 2] (Go To End)
Required answers: 1 Allowed answers: 1

1) Before we start, to which charity would you prefer I make a donation to thank you for your time? Please open any links in a new browser (right click and select "open in a new window).

a. **Make a Wish Foundation-** this organization fulfills the wishes of children with terminal illnesses (found at: http://wish.org/)
b. **Adopt a Classroom** – This helps teachers find funding for their classroom needs. I will randomly select a teacher to make your donation (found at: http://www.adoptaclassroom.org/)
c. **Children's defense fund-** this organization takes a multi-tiered approach towards helping children with poverty (found at: http://www.childrensdefense.org/about-us/)
d. **Boys and Girls Clubs of America-** This organization brings together young people from all backgrounds, keeping them off the streets and furthering their education with mentorships and lessons when they are not in school (found at: http://www.bgca.org/whoweare/Pages/Mission.aspx)

2) What is your gender?
____Male
____Female

3) What is your undergraduate degree?
_____Bachelor of Arts
_____Bachelor of Science
_____Bachelor of Education
_____Other (Please Specify)_____

4) What is your master's degree?
_____Master of Arts
_____Master of Science
_____Master of Education
_____Education Specialist (Ed.S.)
_____Other (Please Specify)_____\
_____None

5) What is your doctoral degree?
_____Doctor of Philosophy (Ph.D).
_____Educational Doctorate (Ed.D.)
_____Other (Please Specify)_____
_____None

6) In what type of a setting is your school?
_____Urban
_____Rural
_____Suburban

7) Counting this year, how many years have you been teaching (for example, a first year teacher would mark "1")?

_____1	_____10	_____19
_____2	_____11	_____20
_____3	_____12	_____21
_____4	_____13	_____22
_____5	_____14	_____23
_____6	_____15	_____24
_____7	_____16	_____25
_____8	_____17	_____More (Please Specify)_____
_____9	_____18	

8) What grade do you teach (CHECK ALL THAT APPLY)?

_____6th
_____7th
_____8th
_____9th
_____10th
_____11th
_____12th
_____Other (Please specify)_____

9) What subject(s) do you teach (CHECK ALL THAT APPLY)?

_____Special Education
_____ mathematics
_____Science
_____Social Studies
_____Language Arts, Literacy, or English (not remedial reading)
_____Technology Education
_____Physical Education
_____Music
_____Fine Arts
_____Consumer Science or Studies (Home Economics)
_____Music (band, orchestra, choir, etc).
_____ English as a Second Language
_____Remedial Reading
_____Other (Please specify)_____

Scholars identify two different purposes for writing. One is called "Writing to Learn" which is when students use writing to learn subject matter. The other is called "Writing to communicate," which is when students use writing to share knowledge or otherwise communicate ideas.

I am interested in where you think certain writing tasks fall (writing to learn, writing to communicate, somewhere between, or none). Therefore, to help me, please identify each writing strategy given below.

For numbers 10- 25, place a check in <u>ONE</u> box per strategy to indicate whether you think the strategy is an example of writing to communicate, writing to learn, some combination of both, or none of the above.

Strategy	Purely Writing to Communicate	Mostly Writing to Communicate	Equally Both	Mostly Writing to Learn	Purely Writing to Learn	None of These
10) Reading logs						
11) Reading journals						
12) Free writing						
13) Writing for discussion						
14) Summary writing						
15) Annotating						
16) Writing to synthesize						
17) Writing to take notes						
18) Writing essays						
19) Writing research papers						
20) Writing reports						
21) Writing poems						
22) Writing fiction						
23) Writing creative non-fiction						
24) Writing letters						

Perceived Relevance of Writing to the Content Area
Very Strongly Disagree, Strongly Disagree, Disagree, Strongly Agree, Very Strongly Agree

25) Writing helps students learn the content of my class.
26) When students write, it helps them to improve in my class.
27) Writing is not really related to my content area.
28) Writing is not an important part of my content area.
29) If I used writing in the classes I teach, it would take away from the things I really need to teach.

Self-Efficacy of Using Writing

30) On a scale from 1 to 10, this is how confident I am at using writing to help students learn the content of my class:

31) On a scale from 1 to 10, this is how confident I am at integrating writing activities in my class to help students learn my content area.

32) On a scale from 1 to 10, this is how confident I am in my knowledge about writing to use it to teach my content area.

33) On a scale of 1 to 10, this is how confident I am to use writing in my class just as well or better than other teachers of my content area.

Knowledge of WTL

34) A U.S. History teacher wants his students to understand the main ideas of the American Revolution. Therefore, before addressing the colonial rebellion, he decides to introduce the students to some rather rigorous readings by Locke. It is not long until he realizes that the reading level is a bit much. What is a good strategy to use so that students are able to understand the reading in their own words?

- Have the students break into parts and evaluate how good of a writing piece it is.
- Have the students break it into parts and summarize each part.
- Have the students break it into parts and free write about it.
- None of the above.

35) An algebra teacher asks students to create a Venn Diagram to plan a response to the following question: How is an exponential function similar to a linear function? What is she asking them to do?

- Create a new way of solving a problem.
- Analyze the parts of functions.
- Compare two different functions.
- Remember things about functions.

36) Which of the following illustrates the BEST use of a learning log as a writing to learn activity regardless of the content area?

- Answer questions for the teacher to check.
- Journal about course content that confuses them.
- Write prior to answering verbal questions.
- All of these work well for learning logs.

37) Which of the following are examples of using freewriting effectively?

- Students use freewriting assignments to respond to questions prior to a lesson.
- Students are given time to freewrite thoughts or answers to questions they will subsequently answer verbally.
- Students freewrite to review class materials.
- All of the above.

38) Which of the following is probably best used as writing to communicate?

- Reading log
- Freewrite
- Lab report
- Summary

Writing Apprehension Validity Scale (Daly & Miller, 1975)
Strongly Disagree, Disagree, Agree, Strongly Agree

39) I avoid writing.
40) I have no fear of my writing being evaluated.
41) I look forward to writing down my ideas.
42) When I take a class, I am afraid of writing essays when I know they will be evaluated.
43) Taking a composition course is a very frightening experience.
44) When I take a class, handing in a composition makes me feel good.
45) My mind seems to go blank when I start to work on a composition.
46) Expressing ideas through writing seems to be a waste of time.
47) I would enjoy submitting my writing to magazines for evaluation and publication.
48) I like to write my ideas down.
49) I feel confident in my ability to clearly express my ideas in writing.
50) I like to have my friends read what I have written.
51) Generally speaking, I'm nervous when I have to write.
52) People seem to enjoy what I write.
53) I enjoy writing.
54) I never seem to be able to clearly write down my ideas.
55) Writing is a lot of fun.
56) I expect to do poorly in composition classes even before I enter them.
57) I like seeing my thoughts on paper.
58) Discussing my writing with others is an enjoyable experience.
59) I have a difficult time organizing my ideas in a composition course.
60) When I hand in a composition for a class I'm taking, I know I'm going to do poorly.
61) When I take a class, it's easy for me to write good compositions.
62) Generally speaking, I do not think I write as well as most other people.
63) I do not like my compositions to be evaluated when I'm taking a class.

Teaching Efficacy (Wookfolk & Hoy, 1990)
Strongly Disagree, Disagree, Agree, Strongly Disagree

64) When the grades of my students improve it is usually because I found more effective approaches.

65) When a student gets a better grade than he/she usually gets, it is usually because I found better ways of teaching that student.

66) If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him/her quickly.

67) If a student masters a new concept quickly, it was because I knew the necessary steps in teaching that concept.
68) If parents would do more for their children, I could do more.

69) When a student does better than usual, many times it is because I exert a little extra effort.

70) If one of my students couldn't do a class assignment, I would be able to accurately assess whether the assignment was at the correct level of difficulty.

71) When a student is having difficulty with an assignment, I am usually able to adjust it to his/her level.

72) My teacher training program gave me the necessary skills to be an effective teacher.

73) I am very limited in what I can achieve with students because a student's home environment is a large influence on students' achievement.

74) Teachers are not a very powerful influence on student achievement when all factors are considered.

75) If a student did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson.

76) If students are not disciplined at home, they are not likely to accept any discipline.

77) I have enough training to deal with almost any learning problems of my students.

78) If I try really hard, I can get through to even the most difficult or unmotivated students. When I really try, I can get through to most difficult students.

79) The amount a student can learn is primarily related to family background.

80) When it comes right down to it, as an educator, I really cannot do much because most of a student's motivation and performance depends on his/her home environment.
81) The hours in my class have little influence on students compared to the influence of their home environment.

Job Satisfaction Scale (Spector, 1985)
Strongly Disagree, Disagree, Agree, Strongly Agree

82) I feel I am being paid a fair amount for the work I do.
83) There is really too little chance for promotion on my job.
84) My supervisor is competent in doing his/her job.
85) I am not satisfied with the benefits I receive from my employer.
86) When I do a good job at work, I receive warranted recognition.
87) Many of the rules and procedures at work make doing a good job difficult.
88) I like my coworkers.
89) I sometimes feel my job is meaningless.
90) Communication seems good within my school.
91) Raises at my job are too few and far between.

92) Those who do well on the job at my place of work stand a fair chance of being promoted. My supervisor is unfair to me.
93) The benefits we receive are as good as most other organizations (educational or other) offer.
94) I do not feel that the work I do is appreciated.
95) My efforts to do a good job are seldom blocked by red tape.
96) I find I have to work harder at my job because of the incompetence of my colleagues.

97) I like doing the things I do at work.
98) The goals of my place of work are not clear to me.
99) I feel unappreciated by the organization when I think about what they pay me.
100) People at my work get ahead as quickly as people who work at other places get ahead.
101) My supervisor shows too little interest in the feelings of subordinates.
102) The benefit package we have is equitable.
103) There are few rewards for those who work at my school.
104) I have too much to do at work.
105) I enjoy my coworkers.

106) I often feel that I do not know what is going on with my school.
107) I feel a sense of pride in doing my job.
108) I feel satisfied with my chances for salary increases.
109) There are benefits at my work that we do not have that should have.
110) I like my supervisor.
111) I have too much paperwork.
112) I do not feel my efforts are rewarded the way they should be.
113) I am satisfied with my chances for promotion.
114) There is too much bickering and fighting at my place of work.
115) My job is enjoyable.
116) Supervisors at my work do not explain work assignments very well.

Use of Writing

Now I am interested in what writing activities you use in your classroom. For numbers 131 through 145, please check *ONE BOX* for each category to indicate how often you use each writing strategy to teach your content.

THIS IS HOW OFTEN I . . .	NEVER	RARELY	SOMETIMES	FREQUENTLY
119) Have students write in Reading Logs .				
12 Have students write in journals.				
121) Have students use free writing.				
122) Have students write in conjunction with class discussions.				
123) Have students write summaries.				
124) Have students annotate.				
125) Have students synthesize things in writing.				
126) Have students write notes.				
127) Have students write essays.				
128) Have students write research papers.				
129) Have students write reports.				
130) Have students write poems.				
131) Have students write letters.				
132) Have students write fiction.				
133) Have students write creative nonfiction.				

APPENDIX L: FREQUENCIES AND PERCENTAGES FOR EACH ITEM'S RESPONSE OPTIONS

Frequencies and percentages for each item's response options.

1) Freewriting

	Frequency	Percent
None of these	21	5.57
Purely writing to communicate	53	14.06
Mostly writing to communicate	85	22.55
Equally both	147	38.99
Mostly writing to learn	48	12.73
Purely writing to learn	23	6.10
Total	377	100

2) Writing for Discussion

	Frequency	Percent
None of these	7	1.86
Purely writing to communicate	31	8.22
Mostly writing to communicate	126	33.42
Equally both	162	42.97
Mostly writing to learn	46	12.20
Purely writing to learn	5	1.33
Total	377	100

Frequencies and percentages for each item's response options.

3) Summary Writing

	Frequency	Percent
None of these	4	1.06
Purely writing to communicate	18	4.77
Mostly writing to communicate	54	14.32
Equally both	134	35.54
Mostly writing to learn	133	35.28
Purely writing to learn	34	1.06
Total	377	100

4) Annotating

	Frequency	Percent
None of these	16	4.2
Purely writing to communicate	8	2.1
Mostly writing to communicate	23	6.1
Equally both	57	15.1
Mostly writing to learn	191	50.7
Purely writing to learn	82	21.8
Total	377	100

Frequencies and percentages for each item's response options.

5) Writing to Synthesize

	Frequency	Percent
None of these	5	1.3
Purely writing to communicate	7	1.9
Mostly writing to communicate	33	8.8
Equally both	142	37.7
Mostly writing to learn	139	36.9
Purely writing to learn	51	13.5
Total	377	100

6) Notes

	Frequency	Percent
None of these	2	0.5
Purely writing to communicate	4	1.1
Mostly writing to communicate	11	2.9
Equally both	52	13.8
Mostly writing to learn	194	51.5
Purely writing to learn	114	30.2
Total	377	100

Frequencies and percentages for each item's response options.

7) Reading Log Reversed

	Frequency	Percent
None of these	49	13
Purely writing to communicate	39	10.3
Mostly writing to communicate	71	18.8
Equally both	101	26.8
Mostly writing to learn	77	20.4
Purely writing to learn	40	10.6
Total	377	100

8) Free Write Reversed

	Frequency	Percent
None of these	21	5.6
Purely writing to communicate	23	6.1
Mostly writing to communicate	48	12.7
Equally both	147	39
Mostly writing to learn	85	22.5
Purely writing to learn	53	14.1
Total	377	100

Frequencies and percentages for each item's response options.

9) Essays

	Frequency	Percent
None of these	7	1.9
Purely writing to communicate	19	5
Mostly writing to communicate	90	23.9
Equally both	223	59.2
Mostly writing to learn	29	7.7
Purely writing to learn	9	2.4
Total	377	100

10) Research Papers

	Frequency	Percent
None of these	9	2.4
Purely writing to communicate	17	4.5
Mostly writing to communicate	59	15.6
Equally both	211	56
Mostly writing to learn	64	17
Purely writing to learn	17	4.5
Total	377	100

Frequencies and percentages for each item's response options.

11) Reports

	Frequency	Percent
None of these	7	1.9
Purely writing to communicate	19	5
Mostly writing to communicate	72	19.1
Equally both	198	52.5
Mostly writing to learn	66	17.5
Purely writing to learn	15	4
Total	377	100

12) Poems

	Frequency	Percent
None of these	20	5.3
Purely writing to communicate	52	13.8
Mostly writing to communicate	136	36.1
Equally both	146	38.7
Mostly writing to learn	16	4.2
Purely writing to learn	7	1.9
Total	377	100

Frequencies and percentages for each item's response options.

13) Fiction

	Frequency	Percent
None of these	20	5.3
Purely writing to communicate	50	13.3
Mostly writing to communicate	151	40.1
Equally both	138	36.6
Mostly writing to learn	14	3.7
Purely writing to learn	4	1.1
Total	377	100

14) Creative Nonfiction

	Frequency	Percent
None of these	16	4.2
Purely writing to communicate	32	8.5
Mostly writing to communicate	117	31
Equally both	177	46.9
Mostly writing to learn	29	7.7
Purely writing to learn	6	1.6
Total	377	100

Frequencies and percentages for each item's response options.

15) Letters

	Frequency	Percent
None of these	16	4.2
Purely writing to communicate	111	29.4
Mostly writing to communicate	151	40.1
Equally both	91	24.1
Mostly writing to learn	5	1.3
Purely writing to learn	3	0.8
Total	377	100

16) Writing helps students learn the content of my class

	Frequency	Percent
Very strongly disagree	8	2.1
Strongly disagree	10	2.7
Disagree	15	4
Agree	129	34.2
Strongly agree	102	27.1
Very strongly agree	113	30
Total	377	100

17) When students write, it helps them to improve in my class.

	Frequency	Percent
Very strongly disagree	9	2.4
Strongly disagree	8	2.1
Disagree	20	5.3
Agree	132	35
Strongly agree	95	25.2
Very strongly agree	113	30
Total	377	100

Frequencies and percentages for each item's response options.

18) Writing is not really related to my content area (reversed)

	Frequency	Percent
Very Strongly Disagree	8	2.1
Strongly Disagree	9	2.4
Disagree	19	5
Agree	59	15.6
Strongly Agree	52	13.8
Very Strongly Agree	230	61
Total	377	100

19) Writing is not an important part of my content area (reversed)

	Frequency	Percent
Very Strongly Disagree	12	3.2
Strongly Disagree	5	1.3
Disagree	23	6.1
Agree	59	15.6
Strongly Agree	51	13.5
Very Strongly Agree	227	60.2
Total	377	100

20) If I used writing in the classes I teach, it would take away from the things I really need to teach (reversed)

	Frequency	Percent
Very Strongly Disagree	17	4.5
Strongly Disagree	11	2.9
Disagree	24	6.4
Agree	68	18
Strongly Agree	63	16.7
Very Strongly Agree	194	51.5
Total	377	100

Frequencies and percentages for each item's response options.

21) This is how confident I am at using writing to help students learn

	Frequency	Percent
1	3	0.8
2	6	1.6
3	13	3.4
4	9	2.4
5	32	8.5
6	28	7.4
7	70	18.6
8	75	19.9
9	49	13
10	92	24.4
Total	377	100

22) This is how confident I am at integrate writing activities in my class to help students learn my content area.

	Frequency	Percent
1	4	1.1
2	6	1.6
3	11	2.9
4	10	2.7
5	27	7.2
6	24	6.4
7	59	15.6
8	80	21.2
9	59	15.6
10	97	25.7
Total	377	100

Frequencies and percentages for each item's response options.

23) his is how confident I am in my knowledge about writing to use it to teach my content area.

	Frequency	Percent
1	7	1.9
2	2	0.5
3	13	3.4
4	16	4.2
5	35	9.3
6	26	6.9
7	51	13.5
8	63	16.7
9	65	17.2
10	99	26.3
Total	377	100

24) This is how confident I am to use writing in my class just as well or better than other teachers of my content area.

	Frequency	Percent
1	3	0.8
2	6	1.6
3	11	2.9
4	18	4.8
5	40	10.6
6	27	7.2
7	63	16.7
8	73	19.4
9	57	15.1
10	79	21
Total	377	100

Frequencies and percentages for each item's response options.

25) A U.S. History teacher wants his students to understand the main ideas of the American Revolution. Therefore, before addressing the colonial rebellion, he decides to introduce the students to some rather rigorous readings by Locke. It is not long until he realizes that the reading level is a bit much. What is a good strategy to use so that students are able to understand the reading in their own words?

	Frequency	Percent
Have the students break into parts and evaluate how good of a writing piece it is.	6	1.64%
Have the students break it into parts and summarize each part.	296	80.87%
Have the students break it into parts and free write about it.	32	8.74%
None of the Above	32	8.74%
	366	100

26) An algebra teacher asks students to create a Venn Diagram to plan a response to the following question: How is an exponential function similar to a linear function? What is she asking them to do?

	Frequency	Percent
Create a new way of solving a problem.	4	1.09%
Analyze the parts of functions.	44	12.02%
Compare two different functions.	310	84.70%
Remember things about functions.	8	2.19%
Total	366	100

27) Which of the following illustrates the BEST use of a learning log as a writing to learn activity regardless of the content area?

	Frequency	Percent
Answer questions for the teacher to check.	6	1.64%
Journal about course content that confuses them.	60	16.39%
Write prior to answering verbal questions.	27	7.38%
All of these work well for learning logs.	273	74.59%
Total	366	100

Frequencies and percentages for each item's response options.

28) Which of the following are examples of using freewriting effectively?

	Frequency	Percent
Students use freewriting assignments to respond to questions prior to a lesson.	17	4.64%
Students are given time to freewrite thoughts or answers to questions they will subsequently answer verbally.	43	11.75%
Students freewrite to review class materials.	12	3.28%
All of the above.	294	80.33%
Total	366	100

29) Which of the following is probably best used as writing to communicate?

	Frequency	Percent
Reading Log	35	9.56%
Freewrite	95	25.96%
Lab report	158	43.17%
Summary	78	21.31%
Total	366	100

30) This is how often I have students write in reading logs.

	Frequency	Percent
Never	155	45.72%
Rarely	81	23.89%
Sometimes	68	20.06%
Frequently	35	10.32%
Total	339	100

31) This is how often I have students write in journals.

	Frequency	Percent
Never	108	31.86%
Rarely	61	17.99%
Sometimes	86	25.37%
Frequently	84	24.78%
Total	339	100

Frequencies and percentages for each item's response options.

32) This is how often I have students use freewriting.

	Frequency	Percent
Never	93	27.43%
Rarely	67	19.76%
Sometimes	119	35.10%
Frequently	60	17.70%
Total	339	100

33) This is how often I have students writing in conjunction with class discussion.

	Frequency	Percent
Never	32	9.44%
Rarely	46	13.57%
Sometimes	128	37.76%
Frequently	133	39.23%
Total	339	100

34) This is how often I have students write summaries.

	Frequency	Percent
Never	24	7.08%
Rarely	43	12.68%
Sometimes	149	43.95%
Frequently	123	36.28%
Total	339	100

35) This is how often I have students annotate.

	Frequency	Percent
Never	71	20.94%
Rarely	75	22.12%
Sometimes	83	24.48%
Frequently	110	32.45%
Total	339	100

Frequencies and percentages for each item's response options

36) This is how often I have students synthesize things in writing.

	Frequency	Percent
Never	32	9.44%
Rarely	28	8.26%
Sometimes	139	41.00%
Frequently	140	41.30%
Total	339	100

37) This is how often I have students writing notes.

	Frequency	Percent
Never	9	2.65%
Rarely	33	9.73%
Sometimes	102	30.09%
Frequently	195	57.52%
Total	339	100

38) This is how often I have students write essays.

	Frequency	Percent
Never	66	19.47%
Rarely	52	15.34%
Sometimes	111	32.74%
Frequently	110	32.45%
Total	339	100

39) This is how often I have students write research papers.

	Frequency	Percent
Never	63	18.58%
Rarely	94	27.73%
Sometimes	139	41.00%
Frequently	43	12.68%
Total	339	100

Frequencies and percentages for each item's response options

40) This is how often I have students write reports.

	Frequency	Percent
Never	70	20.65%
Rarely	95	28.02%
Sometimes	127	37.46%
Frequently	47	13.86%
Total	339	100

41) This is how often I have students write poems.

	Frequency	Percent
Never	159	46.90%
Rarely	89	26.25%
Sometimes	76	22.42%
Frequently	15	4.42%
Total	339	100

42) This is how often I have students write letters.

	Frequency	Percent
Never	136	40.12%
Rarely	91	26.84%
Sometimes	99	29.20%
Frequently	13	3.83%
Total	339	100

43) This is how often I have students write fiction.

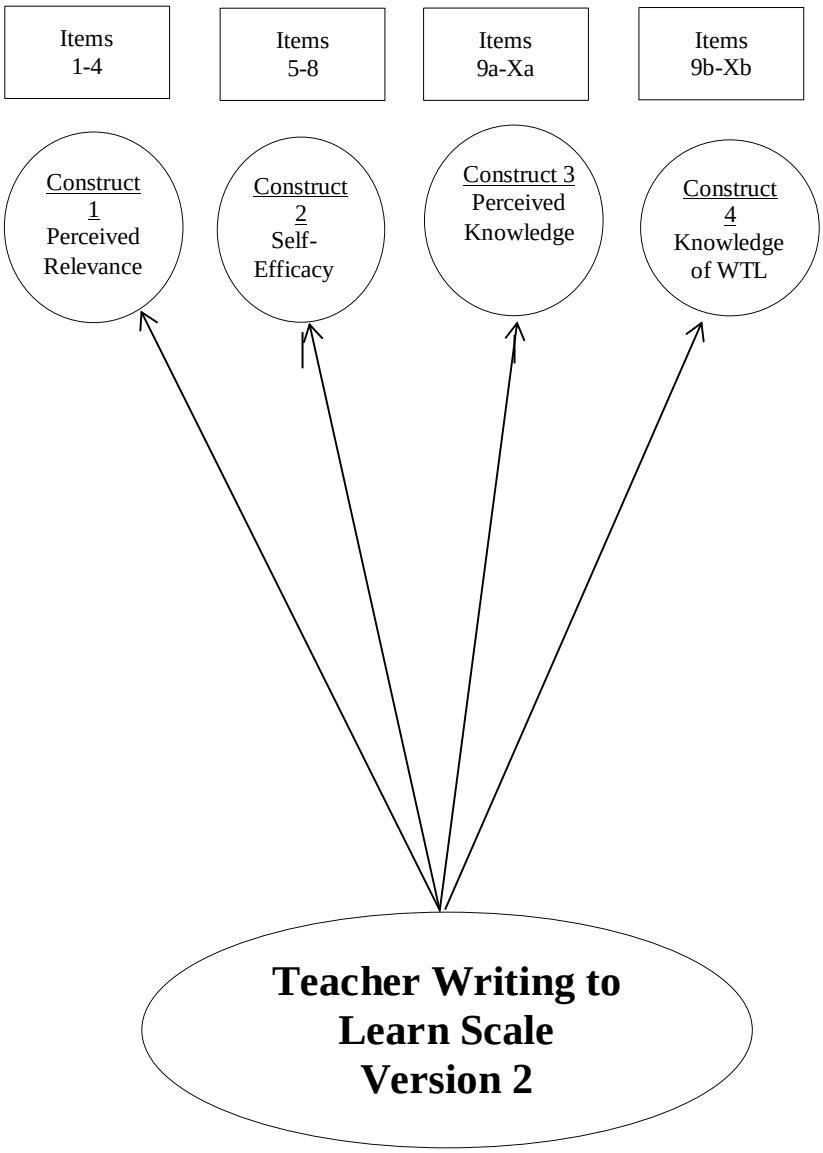
	Frequency	Percent
Never	156	46.02%
Rarely	79	23.30%
Sometimes	90	26.55%
Frequently	14	4.13%
Total	339	100

Frequencies and percentages for each item's response options

44) This is how often I have students write creative nonfiction.

	Frequency	Percent
Never	150	44.25%
Rarely	86	25.37%
Sometimes	82	24.19%
Frequently	21	6.19%
Total	339	100

APPENDIX M: THE NEXT TEXTED MODEL OF THE TWTLS



APPENDIX N: EXAMPLE PERCEIVED KNOWLEDGE AND KNOWLEDGE ITEM ON THE NEXT MODEL

X) A biology teacher is interested in students learning the process of photosynthesis. After providing a brief presentation on the concept, he asks the students to read a handout. What is the best strategy to show his students to gather key information from the text?

a) On a scale from 1-10, 10 being extremely knowledgeable, how much do you feel you know about writing to answer this question (circle one)?

1 2 3 4 5 6 7 8 9 10

b) Now, in the box below, briefly write your answer.*

*A rubric will be created to score this part.