

## ABSTRACT

Title of Dissertation: EXAMINING TRANS-SYMBOLIC AND  
SYMBOL-SPECIFIC PROCESSES IN POETRY  
AND PAINTING

Sandra Michelle Loughlin, Doctor of Philosophy,  
2013

Dissertation Directed By: Professor Patricia A. Alexander  
Department of Human Development and  
Quantitative Methodology

There is a growing interest in multiliteracies and the processes by which nonlinguistic and multisymbolic compositions are understood. However, as indicated by Unsworth (2008), there is currently no “trans-disciplinary” theoretical framework robust to these examinations. This study investigated the degree to which the Trans-Symbolic Comprehension framework (TSC; Loughlin & Alexander, 2012; Loughlin et al., 2013) might serve this purpose. The TSC posits that every act of comprehension, text or otherwise, entails both *trans-symbolic* and *symbol-specific* processes. Trans-symbolic comprehension processes are general processes that are necessary for understanding information encoded in a variety of compositional forms (e.g., text, paintings, musical score, physical formula), while symbol-specific processes are particular to a given symbol-system (e.g., text-specific processes).

This study used the symbol systems of language and visual array to determine the viability of the TSC framework. Offline and online comprehension processes measures

were administered before, during, and after studying a poem and a painting to capture the comprehension processes used by 12 English and 12 Art education majors. Verbal protocol analyses of these data resulted in the identification of 7 poem and 8 painting comprehension processes, which manifested in 48 associated subprocesses. The 48 comprehension subprocesses were then compared to determine degree of trans-symbolism.

It was determined that a significant portion of the comprehension processes and subprocesses were shared; that is, iterative manifestations applied to both poem and painting. However, processes that did not appear to iterate were also identified (e.g., inferring mood). The discovery of these apparent trans-symbolic processes and symbol-specific processes is in line with the predictions of the TSC framework.

Implications of this study for education research are discussed, specifically with respect to the burgeoning literature on nonlinguistic literacies. Preliminary implications for educational practice are also drawn in relation to the growing praxis of teaching literature, including poetry, through visual art in middle and high schools, and ongoing policy efforts to expand this type of instruction.

EXAMINING TRANS-SYMBOLIC AND SYMBOL-SPECIFIC PROCESSES IN  
POETRY AND PAINTING

by

Sandra Michelle Loughlin

Dissertation submitted to the Faculty of the Graduate School of the  
University of Maryland, College Park, in partial fulfillment  
of the requirements for the degree of  
Doctor of Philosophy  
2013

Advisory Committee:  
Professor Patricia A. Alexander, Chair  
Professor Peter Afflerbach  
Professor Ann Battle  
Professor Donald Bolger  
Professor Susan Hendricks

© Copyright by  
Sandra Michelle Loughlin  
2013

**DEDICATION**

For Scott, without whom this endeavor would be  
unimagined and impossible.

As always: you and me.

## ACKNOWLEDGMENTS

This dissertation—indeed, the entirety of my graduate experience—would be impossible but for the guidance and support of my professors, colleagues, friends, and family.

First and foremost, I would like to acknowledge the brilliance and benevolence of my adviser, Dr. Patricia Alexander. There are few people who have meant as much to me, professionally or personally, and no one who has challenged me more. Patricia thinks of her students as her academic family, and I view myself as her academic daughter—feisty and annoying at times, but deeply and forever committed to her mother. Patricia, you are amazing and it has been my absolute pleasure to have learned from and worked with you these years.

I would also like to thank my committee members, professors, and colleagues. This dissertation is the culmination of many courses, conversations, and collaborations that pushed my thinking and refined my ideas. In particular, I am grateful to the members of the Disciplined Reading and Learning Research Laboratory, both past and present, for their continuous feedback and suggestions, especially Emily Fox, Daniel Dinsmore, Alexandra List, and Emily Grossnickle. I want also to acknowledge the essential support of Alice Donlan, who taught me a lot about friendship, in both an academic and personal sense. From the start of my program at Maryland, Alice has been the closest of friends and, quite possibly, the reason I am still somewhat sane at the end.

My family has been a tremendous support in this effort, as well. I am grateful to Timothy and Carol Loughlin for their empathy and frequent calls of support, especially because they have gone through this, too. I want to deeply thank my parents, David and

Carol Hooker, who allowed me to be both an academic and a parent. I could not have done any of this without them, especially during the last four years. It has been my absolute pleasure to watch my son grow up under the influence of his Mommom and Grumpa, talking up a storm, and eating beets.

Finally, and most significantly, I want to thank my husband, Scott. Twelve years ago, in the living room of the world's smallest apartment, he made me promise to earn a doctorate and told me he would help me get there. He did. Without the support he has provided in every sense of the word, I would not have lasted even one semester, let alone the past six years. Scott, you have helped me fulfill my every dream, including and especially this one. With all my heart, thank you.

## TABLE OF CONTENTS

|  |      |
|--|------|
| DEDICATION .....   | ii   |
| ACKNOWLEDGMENTS .....  | iii  |
| TABLE OF CONTENTS.....   | v    |
| LIST OF TABLES .....   | viii |
| LIST OF FIGURES .....  | ix   |
| CHAPTER 1: INTRODUCTION.....   | 1    |
| Statement of the Problem.....  | 5    |
| Purpose of the Study .....   | 9    |
| Research Questions.....  | 11   |
| Organization of the Study .....  | 12   |
| Key Terms.....   | 12   |
| CHAPTER 2: REVIEW OF THE LITERATURE .....  | 15   |
| Theories of Comprehension Processing.....  | 15   |
| Constructive Responsivity Theory.....  | 16   |
| Trans-Symbolic Comprehension Framework .....   | 20   |
| A Conceptual Model of the Trans-Symbolic Comprehension Framework .....   | 28   |
| Rationale for Examining Poem and Painting in the Model .....   | 30   |
| Comparison of Poem and Painting .....  | 33   |
| Review of the Literature Bearing on the Conceptual Model .....   | 36   |
| Poem and Painting Comprehension Processes in the Literature.....   | 37   |
| Trans-Symbolic, Poem-Specific, and Painting-Specific Comprehension Processes<br>Suggested from the Literature..... | 46   |
| Measuring Comprehension Processes.....   | 48   |
| Controls on the Study.....   | 53   |
| CHAPTER 3: METHODOLOGY .....   | 63   |
| Design .....   | 63   |
| Participants.....  | 64   |
| Measures .....   | 66   |
| Expertise .....  | 67   |
| Comprehension Processes.....   | 71   |

|  |     |
|--|-----|
| Comprehension Outcomes .....   | 74  |
| Demographics .....   | 75  |
| Materials .....  | 76  |
| Poem .....   | 76  |
| Painting .....   | 76  |
| Procedure .....  | 77  |
| Data Analysis .....  | 79  |
| Online Measures of Comprehension Processes .....                                   | 81  |
| Degree of Overlap between Poem and Painting Comprehension Processes .....          | 83  |
| CHAPTER FOUR: RESULTS .....  | 85  |
| Commonly-Occurring Poem Comprehension Processes and Subprocesses.....              | 85  |
| Descriptive Findings of Poem Comprehension Processes .....                         | 86  |
| Numeric Findings of Poem Comprehension Processes .....                             | 102 |
| Commonly-Occurring Painting Comprehension Processes and Subprocesses .....         | 105 |
| Descriptive Findings of Painting Comprehension Processes.....                      | 107 |
| Numeric Findings of Painting Comprehension Processes .....                         | 123 |
| Trans-Symbolic Comprehension Processes and Subprocesses.....                       | 126 |
| Poem-Specific Subprocesses .....   | 130 |
| Painting Specific Subprocesses.....  | 132 |
| Summary of Findings.....   | 133 |
| CHAPTER FIVE: DISCUSSION.....  | 135 |
| Significance of the Study .....  | 136 |
| Limitations and Delimitations of the Study and Recommendations for Future Research | 141 |
| Implications of the Study .....  | 156 |
| Conclusions.....   | 162 |
| APPENDICES .....   | 164 |
| Appendix A: Western Literature Subject-Matter.....                                 | 165 |
| Appendix B: Western Visual Art Subject-Matter.....                                 | 169 |
| Appendix C: Domain Interest Questionnaire.....                                     | 172 |
| Appendix D: Poem Activities Questionnaire.....                                     | 173 |
| Appendix E: Painting Activities Questionnaire.....                                 | 174 |

|  |     |
|--|-----|
| Appendix F: Poem Comprehension Outcome .....     | 175 |
| Appendix G: Painting Comprehension Outcome ..... | 178 |
| Appendix H: Demographic Questionnaire.....       | 181 |
| Appendix I: Poem .....                           | 182 |
| Appendix J: Painting.....                        | 183 |
| REFERENCES .....                                 | 184 |

**LIST OF TABLES**

|          |   |     |
|----------|---|-----|
| Table 1  | Comprehension Processes Discerned from Studies of Poetry  | 38  |
| Table 2  | Comprehension Processes Discerned from Studies of Painting  | 44  |
| Table 3  | Participant Demographic Information   | 66  |
| Table 4  | Amount of Time Spent Studying the Poem and Painting by Major  | 78  |
| Table 5  | Commonly Observed Poem Comprehension Processes and Subprocesses   | 86  |
| Table 6  | Commonly Observed Poem Comprehension Processes and Subprocesses with Definitions and Example Statements         | 88  |
| Table 7  | Frequency of Observed Poem Comprehension Processes Occurring While Studying the Poem                            | 104 |
| Table 8  | Commonly Observed Painting Comprehension Processes and Subprocesses   | 106 |
| Table 9  | Commonly Observed Painting Comprehension Processes and Subprocess with Definitions and Example Statements       | 108 |
| Table 10 | Frequency of Observed Painting Comprehension Processes Occurring While Studying the Painting                    | 125 |
| Table 11 | Commonly Observed Trans-Symbolic, Poem-Specific, and Painting-Specific Comprehension Processes and Subprocesses | 128 |

**LIST OF FIGURES**

|          |                                      |    |
|----------|--------------------------------------|----|
| Figure 1 | Conceptual Model of the Study        | 11 |
| Figure 2 | Alexander's Model of Domain Learning | 55 |

## CHAPTER 1: INTRODUCTION

I maintain, on the contrary, that we have to read the painting as well as the poem, and that the aesthetic experience is dynamic rather than static. It involves making delicate discriminations and discerning subtle relationships, identifying symbol systems and characters within these systems and what these characters denote and exemplify, interpreting works and reorganizing the world in terms of works and works in terms of the world. Much of our experience and many of our skills are brought to bear and may be transformed by the encounter.

Nelson Goodman (1976, p. 241)

In the last century, there has been differential interest in how individuals process and comprehend (i.e., come to understand) meaningful information encoded in the many symbol systems that have evolved to represent human ideas (e.g., language, music, or mathematics; Halliday & Hansen, 1985). Specifically, throughout the history of educational psychology and related fields, the literature has differentially privileged the importance of studying comprehension processes in language (i.e., text or talk) over studying comprehension processes elicited to understand the message or messages of compositions encoded in nonlinguistic symbol systems (e.g., musical notation, mathematics, visual display).

Early efforts to articulate meaning-making processes (e.g., Bartlett, 1932; James, 1890/1950; Mead, 1912) were expansive in their scope, incorporating both linguistic and nonlinguistic compositions. For instance, the father of educational psychology, William James (1890/1950) proposed “operations of the mind” that aid people in making meaning from the “great blooming, buzzing confusion” (p. 488) of information perceived by the

senses: attention, discrimination and comparison, association, and conception. In exemplifying these operations, James described how they were enacted to understand a variety of informational sources including different types of compositions, from musical scores to scientific and mathematical theory, to paintings and text. Likewise, Bloom and colleagues' (1956, 1971) influential *Taxonomy of Educational Objectives* demonstrated how comprehension (i.e., understanding the message of a communication) was instantiated across the curriculum, in language arts, mathematics, music, and art. It should be noted that, generally speaking, compositions within this literature refer to intentional, meaningful, human communications that have been encoded linguistically and nonlinguistically, whereas non-compositions signify unintentional, meaningless, or unreified information.

The latter half of the 20<sup>th</sup> century, however, brought the cognitive revolution and with it an emphasis on compositions encoded in one primary symbol system: language. In investigating and articulating the computer-like mechanisms of meaning-making, theorists, particularly those espousing an Information Processing approach, relied primarily upon language-based inputs, specifically text (Reynolds & Sinatra, 2005). This emphasis on language resulted in the nesting of comprehension within the linguistic symbol system. For instance, while the literature on comprehension includes many theories and models (for an overview see Tracey & Morrow, 2006), and while myriad comprehension processes have been identified (e.g., Pressley & Afflerbach, 1995), these comprehension models and processes emphasize comprehension of linguistic compositions, particularly reading written texts or connected discourse.

Currently, most examinations of comprehension do not consider linguistic compositions as only one of many comprehension-necessary compositional forms. Rather, for the most part, theories and models of comprehension either exclude nonlinguistic compositions (e.g., Graesser, 2007) or assume that they are understood in the same manner as text (e.g., Kintsch, 1998). This has resulted in the frequent conflation of comprehension with *reading* comprehension. Indeed, a cursory search for the term *comprehension* in the indices of prominent texts educational psychology handbooks and textbooks yields the following directive: “see Reading Comprehension” (e.g., Alexander & Winne, 2006).

There is a growing movement, however, from beyond and within the field of reading that seeks to expand the traditional definition of *literacy* (i.e., reading and writing) to embrace *multiliteracies* (i.e., understanding and creating communication in multiple symbol systems; Alexander & Jetton, 2003; Flood, Lapp, & Heath, 2008; Gee, 2007; Kress & Van Leeuwen, 1996; Leu et al., 2009; National Council of Teachers of English, 2003; New London Group, 1996; Street, 1995). For instance, Alvermann (2001) suggested that the term *literacy* be broadened to include computer, visual, graphic, scientific literacies, and the like. Au and Raphael (2000) go further to include movement-based communications like dance. In describing the breadth of what constitutes literacy, Barton, Hamilton, and Ivanic (2000) observed that “people read timetables, maps, and music, as well as novels and academic articles... There is a great deal in common in the practices associated with these diverse texts” (p. 95).

This expanded scope of literacy is being translated into a robust area of research within educational psychology, and two recently published handbooks have been

dedicated to compiling and presenting research examining how individuals understand and communicate in a variety of compositional contexts (Flood, Lapp, & Heath, 2008; Leu et al., 2008). Central to these handbooks and related manuscripts is a call for an expansion of terminology and research emphasis to include nonlinguistic compositions. For instance, Flood et al. (2008) state, "This handbook carries the strong suggestion throughout that art forms—visual, communicative, and performative—belong together and must not be pulled apart in our consideration of what achieving ‘literacy’ means" (p. xvii).

This expanded notion of literacy has led some to suggest a similarly expansive view of comprehension. For instance, the aesthetic philosophy of Goodman (1976), quoted previously, argues that *reading* and *interpreting* are as important in a painting as in a poem. Goodman’s (1976) work and that of others (e.g., Kress, 2008) suggest that, similar to linguistic compositions, meaningful information encoded in numeric, graphic, and musical symbol systems must be decoded and comprehended. However, this line of inquiry remains underspecified. Specifically, while more than a century of research has illuminated the processes inherent in comprehending text, our understanding of how individuals comprehend messages encoded in nonlinguistic symbol systems remains rudimentary. For instance, what comprehension processes are commonly used for understanding non-verbal compositions, such as visual displays, both realistic and abstract, or mathematics? Moreover, what is the relation between these processes and what research has shown to be important in text comprehension?

### Statement of the Problem

The problem undergirding this study arises from an insufficient mechanism for addressing these aforementioned questions. Specifically, examination of the literature on nonlinguistic compositions (operationalized here to include literature on new literacies, multimedia, and multiliteracy studies) does not reveal a clear theoretical framework for investigating comprehension processes within and between linguistic and nonlinguistic compositions. Moreover, at present, there is insufficient methodological precedent for such an investigation.

Coiro and colleagues (2008) noted in their examination of *new literacies* (i.e., non-traditional text compositions, often including nonlinguistic or multisymbolic compositions) that current efforts to address meaning-making in this field are uncoordinated, use different terminology, and often reflect different paradigmatic orientations. This lack of cohesion has led to complications in the appropriate grounding and framing of examinations. Indeed, Azripe and Styles (2008) noted that much of the research on the comprehension of nonlinguistic compositions, particularly in the arts, is atheoretical or inadequately framed in the literature. Thus, there have been many calls for a comprehensive theoretical framework to ground investigations of linguistic and nonlinguistic compositions (Azripe & Styles, 2008; Felini, 2008; Kist, 2008; Unsworth, 2008).

For instance, Unsworth (2008) articulated the need for a "trans-disciplinary" framework that provides a unified resource for research in the comprehension of information presented in *meaning-making* systems, such as language, visual display, sound, and movement. He urged literacy educators, linguists, information and media

researchers, as well as psychologists to find common, compatible, or complementary theoretical frameworks that, together, inform the ways in which individuals' process and understand information. Additionally, he argued that this framework should allow researchers to pursue a focused study within a single meaning-making system, while building bridges between symbol systems. Thus, while there appears to be some shared desire to explore and describe meaning-making processes in different symbol systems, at present there is no theoretical framework that is robust to this examination.

In addition to, or possibly resulting from, the lack of theoretical cohesion and clarity, the burgeoning literature examining the comprehension of nonlinguistic compositions also faces methodological challenges. For instance, much of the research on nonlinguistic compositions has been conducted under the umbrella of multi-representational or multimedia learning, which tends to investigate the combination of non-traditional compositions (e.g., visual/pictorial representations and music/sound effects) with the traditional, linguistic forms (Ainsworth, 2008; Mayer, 2001, Schnotz, 2005). Specifically, these models seek to understand how various nonlinguistic compositions (e.g., images, sounds) can enhance how learners comprehend traditional, complementary text. As noted by Reed (2006), however, the mechanisms individuals use to comprehend these nonlinguistic text adjuncts are underspecified in these models, suggesting a need to examine comprehension processes of nonlinguistic compositions that stand alone and are not dependent upon text.

A second methodological concern involves the assumed relation between the comprehension of linguistic and nonlinguistic compositions. Specifically, as observed by Felini (2008), many examinations of nonlinguistic compositions assume a largely

untested similarity to text. For instance, van Kraayenoord and Paris (2002) frame their examination of how individuals *read* and understand objects in museums under the assumption that these objects are comprehended in the same fashion as text. However, the authors do not provide a theoretical rationale to support this assertion, although they do find potential evidence of print-similar comprehension processes. Likewise, Flood et al. (2008) argue that, “[Art forms, such as painting, sculpture, drama, dance, singing, and playing a musical instrument] call for interpretation and integration of past knowledge with new information, just as print does” (p. xvii). According to Felini (2008), however, the assumption that comprehension processes are shared between linguistic and nonlinguistic compositions, while probable, should be investigated directly, not assumed. The assumption is also problematic because, while there may be some overlap in comprehension of different compositional types, there may be some differences, as well (Desmond, 1997; Kress, 2008). Kress (2008), for instance, suggests that different compositional types (what he terms *modes*) may have distinct affordances and communicative potentials and limitations, arguing that for research that investigates the differences between compositions.

A third methodological concern centers around the focus of research on nonlinguistic compositions. Burger and Winner (2000) organized an influential series of meta-analyses of research on the impact of the arts (i.e., visual art, music, dance, and drama) on reading and comprehending text. The authors observed that most of the reviewed studies did not explicate the cognitive processes inherent in creating and comprehending these non-text compositions. Rather, the examinations generally tested the assumption that reading skills, broadly defined, were enhanced by instruction in the

arts, without considering the similarities or differences between underlying processes. The authors concluded that future research should be process-oriented rather than outcome-oriented; that is, focusing on unearthing the processes inherent in creating and comprehending artistic compositions before testing their relation to educational outcomes.

A final and significant challenge to the literature on non-linguistic compositions described here relates to applicability. In her critique of *new literacies*, one umbrella term for investigations of non-linguistic compositions, Kim (2003) points to a serious limitation of new literacies research, namely the evasion of concrete suggestions for literacy practitioners, especially classroom teachers. As noted by Tierney (1997), an expanded definition of what constitutes a text, and therefore what *texts* require comprehension and comprehension instruction, is critical knowledge for schools and must be treated as such. This concern is echoed by Kapinus and Roller (2008), who argue that the research on non-linguistic compositions must establish a clear and deliberate path to application in order to impact literacy policy makers.

In sum, while there is a growing body of research investigating nonlinguistic compositions, and there appears to be a shared desire to explore and describe related comprehension processes, at present, there is no unifying framework to anchor these investigations. A framework is needed that allows for focused study of comprehension within and across symbol systems. Moreover, there is a need for theoretically-grounded research that directly tests the relation between linguistic and nonlinguistic compositions in an effort to identify comprehension processes that might be shared as well as specific to each compositional type. As well, this research should examine nonlinguistic

compositions independently, not just as adjuncts to text. Finally, the outcomes of research on nonlinguistic compositions, and their relation to traditional print comprehension, must be made clear, and a deliberate pathway to practice must be articulated.

### **Purpose of the Study**

The purpose of this study was to address the aforementioned gaps in the literature by interrogating a new framework for examining comprehension processes within and across symbol systems; namely the Trans-Symbolic Comprehension framework (TSC; Loughlin & Alexander, 2012; Loughlin, Grossnickle, Dinsmore & Alexander, 2013). The TSC posits that all acts of composition comprehension, regardless of the symbol system in which the composition is encoded, require both trans-symbolic and symbol-specific processes. Trans-symbolic comprehension processes are general processes that are necessary for understanding information encoded in multiple compositional forms (e.g., comprehension processes required for understanding information encoded in print, paintings, music, or mathematics), while symbol-specific processes are particular to a given symbol-system (e.g., print-specific processes). For instance, comprehending a print composition might entail trans-symbolic comprehension processes like connecting to prior knowledge, as well as print-specific comprehension processes like interpreting figurative language.

According to Loughlin (Loughlin & Alexander, 2012; Loughlin et al., 2013), the TSC framework arose from a theoretical review of a variety of literatures (i.e., aesthetics, cognitive neuroscience, cognitive psychology, educational psychology, museum education, philosophy, and semiotics) and is limited to the comprehension of unisymbolic

compositions. As such, the TSC is not intended to apply to multisymbolic compositions; compositions that combine two or more symbol systems (e.g., picture books that combine language and visual display or recordings that combine music with lyrics). The choice to exclude multisymbolic compositions is supported by evidence that the field does have a clear understanding of how the nonlinguistic aspects of multisymbolic compositions are comprehended and, therefore, do not have a way of truly understanding how they are integrated together with text (Ainsworth, 2006; Kamil, Intrator, & Kim, 2000; Kress, 2008; Reed, 2006).

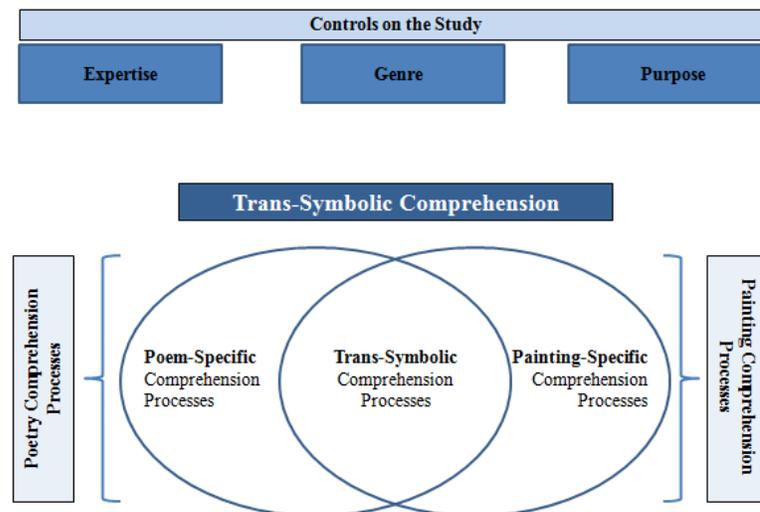
The TSC framework may, however, fulfill four purposes: a) allow for focused study of comprehension within and across symbol systems; b) provide a theoretical rationale for research that directly tests the relation between linguistic and nonlinguistic compositions in an effort to identify comprehension processes that might be shared as well as specific to each compositional type; c) facilitate examinations of nonlinguistic compositions independently, not just as adjuncts to text; and d) provide educational practitioners and policy makers with a practical framework for the comprehension of nonlinguistic compositions in school contexts. Thus, the TSC might be a fruitful avenue for addressing the gaps in the literature articulated previously. However, to date, the TSC framework has not been applied to an examination of comprehension processes in two symbol systems. The current study was intended to serve this role.

Specifically, this study identified and tested a conceptual model of the TSC framework, in which comprehension processes are examined in poem and painting contexts. Comprehension processes evidenced in both poem and painting contexts were considered evidence of trans-symbolic processes, while those particular to poem or

painting were considered evidence of symbol-specific processes. Moreover the study controlled for expertise, genre, and purpose. The conceptual model is presented in Figure 1.

Figure 1

*Conceptual Model of the Study*



### Research Questions

The conceptual model was used to generate the following research questions.

They adhere to the pathways and conditions shown in Figure 1.

- What, if any, observed comprehension processes are shared between poem and painting contexts?
- What, if any, observed comprehension processes are particular to poetry?
- What, if any, observed comprehension processes are particular to painting?

### **Organization of the Study**

The study is organized in the following manner. The current chapter concludes with definitions of key terms. Chapter Two examines the theoretical underpinnings of comprehension processes, describes the TSC framework, and discusses the component processes of the TSC (i.e., trans-symbolic and symbol-specific processes) in light of related theoretical and empirical literature. In addition, the conceptual model underlying the study is offered and its pathways and conditions are examined in light of relevant literatures. As well, conceptual and methodological implications for the study are articulated. In Chapter Three, the methodology for the study is discussed, including description of study design, participants, measures, materials, procedures, and data analysis. Chapter Four provides the results of the study and is organized by research question. Finally, Chapter Five discusses the findings of the study in light of the TSC framework and previous research on poem and painting comprehension processes, outlines limitations and delimitations of the study, identifies directions for future research, and suggests possible implications for educational research and practice.

### **Key Terms**

*Competence* refers to individuals who have advanced beyond the novice stage, but who have not yet achieved expert status in their domain. These individuals demonstrate medium levels of domain-related knowledge, interest, and strategic processing (Alexander, 2003).

*Composition* is defined as intentional, meaningful, human communications that have been encoded symbolically and reified (Moje, 2008).

*Comprehension* an interactive process through which an individual comes to understand the message or messages of a composition (Kintsch, 1998).

*Comprehension processes* are skills or strategies that aid in the comprehension of a composition (Afflerbach et al., 2008; Graesser, 2007). These processes are enacted before, during, and after the comprehension activity in response to the demands of the composition (Pressley & Afflerbach, 1995).

*Efficacy* refers to the beliefs individuals have about their capabilities to learn or perform a behavior at a designated level (Schunk & Zimmerman, 1997). For the purposes of this study, behavior is the comprehension of the poem or the painting and the designated level is success on the comprehension test or the personal satisfaction of the individual.

*Expertise* refers to the study of authorities or masters in a given domain or field with the goal of understanding their characteristics (Alexander, 2003)

*Genre* refers to categorical schemes for organizing compositional families into like groups based on purpose. The four purposes for compositions are to inform, to be beautiful, to persuade and to express (Kinneavy, 1971).

*Intertextuality* is the process of making connections across compositions in an effort to comprehend them (Lenski, 1998).

*Literacy* is understanding and creating compositions, either linguistic or nonlinguistic (Flood, Lapp, & Heath, 2008).

*Purpose* refers to the goal of the comprehension task and used synonymously in the study with goal (Geiger & Millis; van den Broek et al, 2001)

*Symbol system* are structures that give meaning to perceptual patterns (e.g., *cat*, +, or ♪ are understood in the structures of language, mathematics, and music, respectively) and includes both symbols and the rules governing the meaning of those symbols (Newell, 1994). *Symbol systems* refers to both a class (language, mathematics, visual arrays; Moje, 2008) and subclasses (e.g., poetry and encyclopedia entries are both language-based systems; Hanauer, 1998) of compositions.

*Thought unit* is an independent clause and all of the subclauses and phrases that accompany it; that is, the shortest grammatically allowable sentence (Hunt, 1965).

*Understanding*, see *Comprehension*.

## **CHAPTER 2: REVIEW OF THE LITERATURE**

The previous chapter examined the current state of the literature with respect to the comprehension of linguistic and nonlinguistic compositions. It was concluded that, while there is a growing body of research investigating nonlinguistic compositions, and there appears to be a shared desire to explore and describe related comprehension processes, at present, there is no unifying framework to anchor these investigations. A framework is needed that allows for focused study of comprehension within and across symbol systems (Unsworth, 2008).

The purpose of this chapter is to provide a theoretical rationale for the study interrogating such a framework. Specifically, this chapter will begin with a theoretical discussion of comprehension processes, focusing on the relation between comprehension processes and outcomes. Next, the Trans-Symbolic Comprehension framework (TSC; Loughlin & Alexander, 2012; Loughlin et al., 2013) will be described. Then, a rationale for modeling the TSC for empirical investigation through poetry and painting will be provided. Finally, a conceptual model underlying the study will be offered and framed in light of existing theoretical and empirical literature.

### **Theories of Comprehension Processing**

As noted, comprehension research has been examined primarily in linguistic contexts, particularly written text. Thus, this section will begin with a discussion of theories of text comprehension and the role of comprehension processes. Potential implications for the comprehension of nonlinguistic compositions will follow.

## **Constructive Responsivity Theory**

The reading literature has identified a number of factors that influence the comprehension of linguistic compositions, including prior knowledge (Anderson & Pearson, 1984; Graesser, Singer, & Trabasso, 1994; Romance & Vitale, 2001), vocabulary (Anderson & Freebody, 1991; Nagy, Anderson, & Herman, 1987), beliefs about the topic of the text (Schraw, 2000), monitoring (Baker & Brown, 1984), epistemic beliefs about the nature of reading (Alexander et al., 2013), comprehension goals (Geiger & Millis, 2004), topic interest (Hidi, 2001), motivation for the task (Guthrie et al., 2004; Guthrie et al., 2007), perceived self-efficacy for reading (Schunk & Zimmerman, 1997), and emotional responses to text (Eva-Wood, 2004). Another aspect of comprehension of particular interest to the study is the appropriate implementation of comprehension skills and strategies, jointly termed *comprehension processes*. In the case of text reading, comprehension skills are automated processes that have become second nature to a more expert reader (Afflerbach et al., 2008). In contrast, reading comprehension strategies are cognitive or behavioral actions used by readers, which are purposefully and effortfully enacted under particular contextual conditions with the goal of improving some aspect of comprehension (Graesser, 2007). Both skills and strategies are comprehension processes, distinguished only by their intentional and effortful implementation. Thus, as defined here, *comprehension processes* are skills or strategies used by individuals to understand a composition regardless of the symbol system through which it is encoded.

There are a number of text processing theories emanating from a constructivist paradigm that address the role of comprehension processes (for reviews, see Pressley & Afflerbach, 1995 or Tracy & Morrow, 2006), including reader response theory

(Rosenblatt, 1938), metacognition (Baker & Brown, 1984; Flavell, 1979), schema theory (e.g., Anderson & Pearson, 1984), and the Construction-Integration model (Kintsch, 1998; van Dijk & Kintsch, 1983). However, the theory most directly addressing the role of comprehension processes in understanding text is Constructive Responsivity (Pressley & Afflerbach, 1995).

Constructive Responsivity theory derived from an examination of conscious processes involved in reading revealed through think aloud protocols. Specifically, using a grounded theory approach (Corbin & Strauss, 1990), Pressley and Afflerbach (1995) systematically reviewed think-aloud studies of text comprehension to determine how people process text. The researchers identified a number of processes that “individuals use to interact with and respond to information in text while reading for a particular purpose” before, during, and after reading (p. 83).

For instance, before reading, successful comprehenders set goals and are aware of why they are reading a text, gain an overview of the text, identify and use text structure to meaningfully navigate the text, and read selectively based on their overview. During reading, they make predictions about upcoming events in the text, associate ideas in text to what they already know, note whether their predictions and expectations about text content are being met, and revise their prior knowledge when compelling new ideas conflicting with prior knowledge are encountered, and interpret the text. At the conclusion of reading, successful comprehenders evaluate text quality based on externally-derived and internally-derived criteria, review important points at the conclusion of reading, and think about how ideas encountered in the text might be applied or used in the future. (It should be noted, however, that many processes can

occur in more than one time point in the comprehension activity.) Broadly speaking, these comprehension processes reflect strategic meaning-making, monitoring, and evaluative activities.

Based on their findings, Pressley and Afflerbach (Afflerbach, 2000; Pressley, 2000; Pressley & Afflerbach, 1995; Pressley & Hilden, 2004) argue that text comprehension is constructive and responsive, in that readers enact a wide variety of comprehension processes of varying degrees of complexity in relation to the demands of the text at hand. Not all of these comprehension processes, however, are evidenced for all proficient readers in every comprehension activity. Indeed, Pressley and Afflerbach (1995) note that one of the hallmarks of proficient readers is their flexible enactment of comprehension processes to meet the demands of the text and the goals for the comprehension activity. More recent reviews of the literature conducted by Cromley (2005) and Fox (2009) of think aloud studies are consistent with the processes identified by Pressley and Afflerbach.

There is also empirical support for the role of comprehension processes in text comprehension. For instance, Cromley (2005) conducted a review of 27 studies of with varying methodology (i.e., path analyses, regression, think aloud, and correlational) representing a broad pool of participants (i.e., fourth grade through adult) demonstrating the relation between comprehension processing and reading comprehension outcomes. There is also evidence of the impact of reading comprehension processes on academic achievement outcomes. Indeed, when elementary, middle, and high school students are taught a repertoire of comprehension strategies, their comprehension of text increases, particularly when flexible frameworks for instruction are employed (National Reading

Panel, 2000; Palinscar & Brown, 1984; Pearson & Dole, 1987; Pressley et al., 1992).

Thus, there is little question that comprehension processes, whether effortfully enacted or automated (i.e., strategies or skills), are essential to understanding information encoded linguistically.

While Constructive Responsivity theory (Pressley & Afflerbach, 1995) was developed to address text comprehension, it may have implications for understanding the role of comprehension processes in nonlinguistic compositions, as well. At the heart of the rationale for extending Constructive Responsivity theory into nonlinguistic realms is the assumption that, like text, nonlinguistic compositions encode information symbolically, and thus they also require decoding and comprehension.

Loughlin (2013) addresses this assumption in a theoretical review of foundational and contemporary writings in a variety of literatures, including the philosophical writings of Aristotle (Sachs, 1995), the aesthetic philosophies of Goodman (1976) and Elgin (1993), the social semiotic theories forwarded by Halliday, Kress, and van Leeuwen (Halliday, 1994; Halliday & Hansen, 1985; Kress, 2008; Kress & van Leeuwen, 1996; van Leeuwen, 1999), and the sociocultural perspectives of Street (1995, 2003), Alvermann (2001), and the New London Group (1996). From these sources, there is sufficient evidence to support the assumption that, like text, nonlinguistic compositions require comprehension. By extension, then, there is sufficient evidence to assume that comprehension of nonlinguistic compositions might also entail comprehension processes. However, these literatures do not address the degree to which comprehension processes are similarly or differentially enacted within and across symbol systems.

Thus, while Constructive Responsivity theory (Pressley & Afflerbach, 1995) and its related text comprehension processes may have implications for nonlinguistic compositions, the degree of overlap between text and nonlinguistic comprehension processes is not clear. Moreover, as Constructive Responsivity theory is grounded in text comprehension, a broader, but related, framework is necessary for framing investigations of compositions encoded in nonlinguistic symbol systems.

### **Trans-Symbolic Comprehension Framework**

Recently Loughlin and colleagues (Loughlin, 2013; Loughlin & Alexander, 2013; Loughlin et al., 2013) have forwarded the Trans-Symbolic Comprehension (TSC) as a framework robust to examinations of linguistic and nonlinguistic composition comprehension. The TSC framework argues that every act of comprehension requires two types of comprehension processes: trans-symbolic and symbol-specific processes. Trans-symbolic comprehension processes are general processes that are essential to understanding any form of communication, while symbol-specific comprehension processes are particular to understanding information encoded in a given symbol system. When reading a text, for instance, the TSC predicts that individuals comprehend an encoded message through trans-symbolic processes, as well as through processes that are particular to understanding text. Likewise, comprehending a painting entails both painting-specific and general, trans-symbolic, processing.

The TSC arose from an examination of literatures, both theoretical and empirical, addressing nonlinguistic compositions in psychology (i.e., cognitive psychology and educational psychology) as well as complementary literatures in other domains (i.e., aesthetic philosophy, semiotics, curriculum design, museum education, and cognitive

neuroscience). A brief discussion of the literatures offered in support of trans-symbolic and symbol-specific processes follows, along with a listing of possible trans-symbolic and symbol-specific comprehension processes suggested by the literature.

**Trans-symbolic comprehension processes.** A number of theories or studies emphasize the universality of comprehension processes, regardless of the symbol system in which the message is encoded (Bartlett, 1932; Bloom, Hastings, Madaus, 1971; Clyde, 2003; Fletcher, Lucas, & Baron, 1999; Flood, Lapp, & Heath, 2008; Gernsbacher, 1990; Gernsbacher, Varner, & Faust, 1990; Kendeou, et al., 2005, 2009; Kintsch, 1998; Mantione & Smead, 2002; Paris & Paris, 2003; van Kraayenoord & Paris, 2002; Williams, 2007). For instance, the foundational work of Bartlett (1932) and James (1890/1950) suggests that all efforts after meaning (i.e., comprehension) involve applying prior knowledge to the understanding of new information. Likewise, Bloom and colleagues (1956, 1971) argue that interpretations are required for understanding a statement in mathematics and music as in text; just as extrapolating beyond the given context is important in understanding a message of a painting as well as prose. Thus, there is ample evidence in the literature to suggest that, at some level, comprehension processes are trans-symbolic.

Moreover, a listing of potential trans-symbolic comprehension processes is discernible in from these literatures. Specifically, trans-symbolic comprehension processes might include: integrating parts of a composition together to form a coherent whole, connecting to prior knowledge, questioning, inferring, exploring viewpoints, interpreting, reasoning, and grappling with complexity. As would be expected, these predicted trans-symbolic processes are general and likely iterative. For instance,

integrating parts of a composition together to form a coherent whole would necessarily be slightly different in a text and a painting, due to their different symbolic encoding. In a text, the parts could include words, sentences, and paragraphs, while the parts of the painting might include color, space, and line. However, at a broad level, the process of integrating the parts together might be fundamentally similar across the symbol systems.

**Symbol-specific comprehension processes.** There also exists literature emphasizing the differential nature of symbol systems and their influence on comprehension processes. In particular, research in cognitive psychology and semiotics suggests that the symbol system in which information is encoded may affect how individuals process and comprehend it. For instance, both Dual Coding theory (Paivio, 1971) and the Integrated Theory of Picture Comprehension (ITPC; Schnotz, 2005; Schnotz & Bannert, 2003) emphasize the distinction between how individuals process and remember linguistic and nonlinguistic compositions. The ITPC framework also suggests that levels of representations (i.e., surface, textbase, and situation model) are differentially ordered in processing descriptive (e.g., linguistic) and depictive (i.e., nonlinguistic) compositions, and that descriptions are processed semantically while depictions are processed analogically. As well, semioticians Kress and van Leeuwen (1996) stress the differences between symbol systems. They have articulated highly detailed “grammars” of visual displays and music, noting the different structures through which visual and musical compositions convey meaningful information.

Based on these works and others (Barsalou, Solomon, & Wu, 1999; Desmond, 1997; Mayer, 2001; National Council of Teachers of English, 2003; Neisser, 1967; Schnotz, 2005, Unsworth, 2001), in addition to trans-symbolic processes, comprehension

might also entail processes that are more specific to the symbology in which information is presented; that is, symbol-specific comprehension processes. Identifying examples of symbol-specific processes from the literature is likely difficult, however, as symbol-specific comprehension processes might be identifiable only in relation to trans-symbolic processes. Thus, one must first cull out the comprehension processes that are shared between two symbol systems (i.e., trans-symbolic processes) in order to identify those comprehension processes that remain. However, symbol-specific comprehension processes are likely related to meaning of symbolic objects and the rules governing the symbol system.

Thus, while both trans-symbolic and symbol-specific processes may be evidenced in comprehension efforts, it is not suggested that they are orthogonal. Indeed, the literature on domain-specific thinking (e.g., Alexander & Judy, 1988; Paris, Wasik, & Turner, 1991; Smith, 2002) suggests that the relation is likely to be more iterative. That is, some trans-symbolic and symbol-specific processes might differ by degree. For instance, interpreting mood is critical to comprehending a variety of compositions, including some types of music (Woody & Burns, 2001), text (Eva-Wood, 2004), and painting (Jolley & Thomas, 1995). However, the way in which mood is discerned in these compositions may be quite different. In Western music, for example, tempo (i.e., the speed of the beat) or the mode (e.g., major or minor) are often integral to mood of a musical composition (van Leeuwen, 1999), while in Western paintings, the color palette is perceived to convey mood (e.g., blue is sad, while yellow is happy; Kress & van Leeuwen, 1996). This suggests that there is also a symbol-specific aspect to comprehending the mood of a composition. However, other potential trans-symbolic

processes (e.g., connecting to prior knowledge) do not have easily discernible iterations. Accordingly, it seems plausible that, at least in some cases, trans-symbolic and symbol-specific processes are iterations of processes that differ by degree. However, this remains an empirical question.

**Scope of the Trans-Symbolic Comprehension framework.** In proposing the TSC framework, Loughlin and colleagues (Loughlin, 2013; Loughlin & Alexander, 2013; Loughlin et al., 2013) also delineated its scope; that is, what falls within or outside the framework.

*Within the scope.* The TSC addresses the comprehension of compositions. This section defines and discusses two key aspects of this scope: compositions and symbol system. In an effort to uncover the processes individuals use to comprehend compositions, it is first necessary to examine the nature of the composition, or, as described by Alexander, Reynolds, and Schallert (2010), the *what* of learning. For these investigations, compositions are *intentional, meaningful, human communications that have been encoded symbolically and reified*. Intentional communication is thus distinguished from unintentional communication by the deliberative intent of the communicator. For instance, the definition of composition is inclusive of a pen and ink drawing of a dog, but exclusive of an accidental scribble that may coincidentally resembles a dog. Moreover, compositions are necessarily communicative (Kress, 2008); that is, they intend to convey some idea, belief, or emotion. Further, this meaningful communication must be encoded in a symbol system (i.e., linguistics, mathematics; Moje, 2008). Finally, a composition is reified, in that the deliberate, meaningful, encoded communication has been given concrete or material form (e.g., poem, mathematical

argument, or sculpture). In other words, the composition must be rendered in a form to be retrieved, modified, and made available independently of the physical presence of another person (Knobel & Lankshear, 2007). Thus, this definition of composition is exclusive of communications that have not, in some form, been recorded.

The TSC focuses on symbol systems as the descriptor of compositions. In the literature, many discriminatory descriptors are used to distinguish text from other compositions, including *signs* or *codes* (Halliday & Hansan, 1985; Kress & van Leeuwen, 1996), *modes* (Unsworth, 2008), *genre* (Felini, 2008), *channels* (Sadoski & Paivio, 2001), *discourses* (Gee, 1996) *media* (Mayer, 2001), *arts* (i.e., visual, communicative, and performing; Flood, Lapp, & Heath, 2008), *representations* (Ainsworth, 2008), *literacies* (Leu et al. 2009), *languages* (Goodman, 1976), and *structures* (Gernsbacher, 1990). The TSC, however, emphasizes the perspective that information is *encoded* in linguistic and nonlinguistic forms and, therefore, must also be *decoded* and comprehended. Thus, the TSC takes the perspective of Moje (2008) and others (Marzano, 2006; Salomon, 1997) in describing compositions in terms of their symbol systems. *Symbol systems are structures that give meaning to perceptual patterns* (e.g., *cat*, *+*, or *♩* are understood in the structures of language, mathematics, and music, respectively).

Broadly speaking, symbol systems are composed of two interrelated aspects: symbols and structures. Symbols (also called tokens; Newell, 1994) are patterns that denote or connote meaning in a given structure, while the structure involves the rules governing the operation and meaning of those symbols (Goodman, 1976; Newell, 1994). Symbols and symbol structures are interrelated because a structure cannot exist with

symbols, and a symbol cannot be interpreted without an understanding of the structure. For instance, the meaning of the symbol O is dependent upon the structure in which it is found: it is understood as the value of nothing in mathematics, the sound *oh* in language, a whole note in musical notation, and so on.

According to Moje (2008), symbol systems include language (speech or text), numbers, musical notation, visual arrays, icons, or mathematical symbols. However, it should also be noted that, within these broad categories, there are likely subcategories that are, themselves, symbol systems (Ainsworth, 2006; Hanauer, 1998). Hanauer (1998), for instance, conducted a study comparing the comprehension of two linguistic compositions (i.e., poetry and encyclopedia entries), and found that they elicited different comprehension outcomes. Hanauer concluded that there was support for a genre-specific theory of text comprehension.

Subcategories of visual displays (e.g., diagrams, photographs, illustrations, paintings) are also slightly different from one another and may require different comprehension processes (Ainsworth, 2006). The rules governing the interpretation of a multi-colored pie in a diagram (i.e., a pie chart), for example, likely differ from the rules governing the interpretation of multi-colored pie in a painting. In a pie chart, the multi-colored pieces might be interpreted as relative amounts of something, while the multi-colored pieces of a pie in a painting might be interpreted as the artist's deliberate deviation from reality. Thus, while both diagrams and paintings can be grouped together as visual arrays, they may also constitute unique symbol systems in their own right and require slightly different comprehension processes.

In this study, the term *symbol system* is used to both describe a class (i.e., visual display) and subclasses (i.e., painting) of compositions. However, for purposes of clarity, efforts will be made to identify the level at which the term is being used.

***Beyond the scope.*** So delimited, multisymbolic compositions are beyond the scope of the TSC framework. This delimitation is noteworthy for the fact that much of the information that individuals encounter on a daily basis is multisymbolic (Mayer, 2005) and in light of the large and growing body of research on meaning making with multiple representations under the umbrella terms *new literacies*, *multimedia learning*, and *multiple representations* (e.g., Ainsworth, 2008; Coiro et al., 2008; Mayer, 2001; Schnotz, 2005). Loughlin supports this delimitation by citing evidence that, as a field, we do not have a clear understanding of how the nonlinguistic aspects of multisymbolic compositions are comprehended and therefore do not have a way of truly understanding how they are integrated together with text (Ainsworth, 2006; Kamil, Intrator, & Kim, 2000; Kress, 2008; Reed, 2006). If the TSC is borne out in the study, however, it might serve as a step toward understanding the comprehension of multisymbolic compositions.

**Empirical support for the Trans-Symbolic Comprehension framework.** To date, only one study has used the TSC framework to explore the comprehension processes associated with a nonlinguistic text. This study, conducted by Loughlin et al. (2013), used the TSC framework to explore the degree to which painting comprehension processes mapped onto to text comprehension processes in an elementary- and middle-school sample. In particular, the authors used think aloud protocols to examine the painting comprehension processes used by 35 fourth-grade and 34 eighth-grade students and compared the manifest processes to the literature on text comprehension. Protocol

analysis revealed six painting comprehension process—observing, activating prior knowledge, inferring and interpreting, elaborating, evaluating and responding, and monitoring—comprising 23 subprocesses. Of the identified painting comprehension subprocesses, 17 are commonly associated with text comprehension and six are not.

The authors concluded that compositions—be they encoded visually, linguistically, or in another symbol system—may entail general comprehension processes that transcend symbol systems (i.e., are trans-symbolic), as well as processes that are particular to a given symbol system (i.e., symbol-specific). However, the authors also noted that additional research directly comparing comprehension processes in a single study, rather than relying previous literature was an essential next step. Thus, the current study represents a more thorough and direct examination of the TSC framework.

### **A Conceptual Model of the Trans-Symbolic Comprehension Framework**

In the previous section, the TSC framework was forwarded and delimited, and its constituent parts (i.e., trans-symbolic and symbol-specific processes) were examined in light of related theory and research. This section presents a rationale for modeling the TSC framework for empirical investigation in this study.

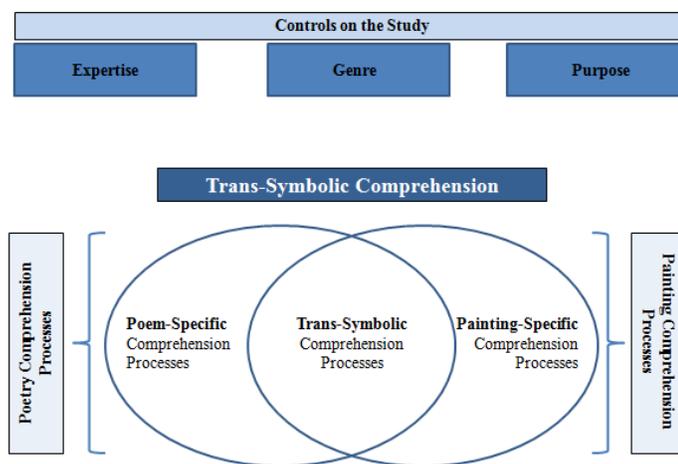
The TSC framework is conceptually large, in that it attempts to explain a complex phenomenon (i.e., comprehension) across and within multiple symbol systems. As such, it conforms to the definition of a theory (Hillix & L'Abate, 2012), and cannot be examined in its complete form. Rather, investigating its robustness requires iteratively exploring and modeling particular relations that are implied by it (Carlisle & Christensen, 2006; Eisenhardt & Graebner, 2007). However, because the study represents the initial attempt to interrogate the TSC, it is necessary to first determine whether *any*

commonalities in comprehension processes exist between any two symbologies by using the TSC to construct and empirically test a model comparing comprehension processes in two symbol systems. If the initial examination reveals the existence of trans-symbolic and symbol-specific processes, subsequent research can investigate other relations, and the scope TSC can be further articulated.

There appears to be a logical first step in this interrogative process. In particular, it is suggested that the robustness of TSC can best be determined by creating and testing a model of the relation between two symbol systems that are maximally distinct in their symbols and symbol structures, while being maximally similar in the ideas they can convey. In other words, two symbol systems that seem, on the surface, to be as different as possible, but still capable of communicating similar ideas. This relation, it will be argued, can be found in an examination of print (i.e., text) and visual display, specifically poetry and painting. If significant overlap is found between the comprehension processes inherent in understanding a poem and a painting, so different in their symbols and structures, then the existence of trans-symbolic comprehension processes can be tentatively affirmed. Further, differences in the features of the two symbol systems are likely to give rise to any processes that are specific to a poem or to painting, creating a robust opportunity to interrogate the inclusion of symbol-specific processes in the TSC framework. Because of this relation between poetry and painting, for the initial interrogation of the TSC, modeling their relation is an appropriate, rigorous first step.

To this end, a conceptual model of the expected relation between poetry and painting comprehension processes was constructed (see Figure 1).

Figure 1

*Conceptual Model of the Study*

It is a visual representation of a subset relation of the TSC and adheres to the scope, parts, and parameters of the TSC; as such, it meets the criteria for a model (Hillix & L'Abate, 2012; L'Abate, 2009). The conceptual model (Figure 1) posits that comprehension of a poem and a painting involves both shared comprehension processes (i.e., trans-symbolic comprehension processes), and processes that are particular to the two symbol systems (i.e., poem-specific and painting-specific processes). As well, the conceptual model includes three controls on the study: expertise, genre, and purpose.

### **Rationale for Examining Poem and Painting in the Model**

This section presents the rationale for examining the relation between poem and painting comprehension in the conceptual model.

Print (i.e., text) is everywhere (Unsworth, 2008). Daily, individuals encounter print in many sources: on containers for food and personal items, in newspapers and periodicals, in work and school-related documents, on the internet, and on television.

There is a clear explanation for the ubiquity of print: it is a highly flexible symbol system

that can fulfill a wide variety of communicative functions. Indeed, print can, among other things, inform, persuade, entertain, and emote (Halliday, 1975). Comprehension of print has long been considered fundamental to programs of education and the success of an individual (Freire, 1983; Kamil, Pearson, Moje, & Afflerbach, 2011). In fact, Mayer (2003) noted that, in United States elementary school classrooms, more time is devoted to print-related instruction (i.e., reading and writing) than to any other subject.

Additionally, research on how individuals comprehend print greatly outpaces research on how individuals comprehend other forms of composition (Kress, 2008). In short, print is ubiquitous, can fulfill a wide variety of communicative functions, is viewed as critical to success in school and in society, and has been extensively researched. For these reasons, print is included in the conceptual model.

Poetry, one form of print, is examined in the current study. In comparison to other forms of print, poetry comprehension has received relatively little attention in the literature (Hanauer, 1998; Peskin, 1998). However, it is a rich compositional type that can be understood in multiple ways, often includes symbolism and themes, engages both cognitive and affective aspects of the reader, and includes a number of stylistic and literary devices that require interpretation (Earthman, 1992; Eva-Wood, 2004; Peskin, 1998). As well, Culler (1976) suggested that readers come to a poem expecting it to be significant and important and are therefore predisposed to search for the poem's significance (Peskin, 1998). For these reasons, it was expected that a poem would elicit a rich repertoire of comprehension processes and was therefore included in the study.

Like text, compositions that are presented as images are everywhere (e.g. diagrams, photographs, film); these are collectively described here as visual displays

(Park & Hopkins, 1993). Several synonyms for visual display are used in the literature, including *images* (Kress & van Leeuwen, 1996), *visual media* (Aigrain, Zhang, & Petkovic, 1996), *pictorial forms* (Mayer, 2005), *pictures* (Schnotz & Bannert, 2003), and *visual arrays* (Moje, 2008). According to Mayer (2005), visual displays can be divided into two broad categories: static (e.g., illustrations, photographs, diagrams) and dynamic (e.g., animation, film, video).

Comprehension processes have been studied in the context of several types of visual displays, including advertisements (Harris, 1977), diagrams (Butcher, 2006; Cromley et al., 2010; Moore & Scevak, 1997), photographs (Mendelsohn, 2008), historical artwork (e.g., renderings of the Battle of Lexington; Wineberg, 1991), illustrations (Azripe & Styles, 2008), film (Magliano, Miller, & Zwaan, 2001), maps (Rapp et al., 2007), and fine art paintings (Moore, 1973). These examinations reflect differing degrees of intensity in the literature; diagrams and illustrations have received more attention than have photographs and paintings, for instance.

Several types of visual displays were considered for inclusion in the conceptual model, but dismissed for a variety of reasons. For instance, advertisements and illustrations were eliminated because of their heavy dependency upon text, while wordless picture books and silent film were delimited due to the temporal nature of their processing (i.e., serial processing, which is associated with print). Maps and diagrams were not included in the conceptual model because of their limited ability to represent a variety of genres; they cannot, for instance, communicate a narrative story or an emotion, as can print and painting. Finally, photographs were eliminated because they are often perceived to be easily understood (Mendelsohn, 2008) and thus might not elicit a level of

engagement optimal for the study. Thus, in light of the limitations of other types of visual displays, painting was chosen and modeled with poetry for this initial interrogation of the TSC framework.

### **Comparison of Poem and Painting**

Poems and paintings are, at first blush, quite different, most notably because they arise from different symbol systems, with different symbols and structures. The symbols of poems are letters representing sounds, while the symbols of painting are images (Goodman, 1976). The structures of poetry and painting are also different; letters are combined into words, sentences, and paragraphs in printed texts (Rayner et al., 2001), while the images in a painting are understood in relation to one another (Goodman, 1976; Kress & van Leeuwen, 2008). This distinction between poem and painting also impacts how they are decoded. Decoding (i.e., deciphering) printed texts like poems requires specific and necessary processes, such as sound/symbol associations, which must be executed in rather rigid, proscribed, and linear fashion (e.g., moving across the line of text and making required sweeps from line to line; Kress, 2008; Sadoski & Paivio, 2004). When it comes to paintings, however, there may be a more holistic, gestalt-like parallel processing required to decode it (Locher, Krupinski, & Mello-Thomas, 2008; Sadoski & Paivio, 2004), even though there may be some prosodic rhythm to the movement of the eye across the canvas (Wooding et al., 2002).

Another important difference between printed poems and painting arises from the distinction between descriptive and depictive representations (Schnotz, 2005; Schnotz & Bannert, 2003). Schnotz (2005) argues that descriptive and depictive representations are useful for different purposes. Descriptive representations like print are more powerful

than depictions in expressing some forms of abstract knowledge. On the other hand, descriptive representations like paintings are more informationally complete and are thus more useful for communicating a large amount of relatively concrete information efficiently.

Despite these differences in symbolic structure, poetry and painting share significant similarities. For one, poetry and painting are both compositions, in that they have internal principles of organization, some of which are shared; balance, rhythm, and pattern are common to both print and painting (Kiefer, 1995). As compositions, both poetry and painting have syntactic and semantic properties (Kiefer, 1995). In printed text like poems, syntax refers generally to the grammatical structure of text, while semantics refers to the meaning of the words. Likewise, Hellman (1977) identified similar properties in painting; syntactic properties in painting involve the organization, for instance, of lines and color, while the semantic properties are the ways in which these lines and colors evoke quiet, warm, or angry.

Poetry and painting are also similar in that they can communicate many of the same ideas, feelings, and experiences (Arnheim, 1989; Perkins, 1994; Wyman, 2004). For example, poet Langston Hughes and painter Palmer Hayden both communicated their experiences as African American artists during the Harlem Renaissance, but used different compositions to convey their ideas. Moreover, both poetry and paintings can be conceptually complex, utilize symbolism and metaphor, subject to multiple interpretations, and have layers of meaning (Hall, 1979; Parsons, 1987). In poetry, for instance, ideas can be presented abstractly, using figurative language or allusions to meaning (Peskin, 1998). Similarly, paintings can be symbolic or non-representational,

requiring the viewer to go beyond the literal image (Barrett, 1994; Yenawine, 1991). Moreover, comprehension of both poetry (Eva-Wood, 2006) and paintings (Hagtvedt, Hagtvedt, & Patrick, 2008; Silvia, 2005) can involve the emotions.

For these reasons, some have deliberately linked understanding in painting contexts to understanding or comprehension in print contexts, terming understanding of imagery like paintings “visual literacy” (Messaris, 1994; Yenawine, 1997). For instance, Yenawine (1997) described visual literacy as

the ability to find meaning in imagery. It involves a set of skills ranging from simple identification--naming what one sees--to complex interpretation on contextual, metaphoric and philosophical levels. Many aspects of cognition are called upon, such as personal association, questioning, speculating, analyzing, fact-finding, and categorizing (p. 845).

In addition to the aforementioned theoretical reasons, there is a practical rationale for examining the relation between poetry and painting: their parent symbol systems, print and visual art, are frequently combined in educational research (for a review see Burger & Winner, 2000) and practice (e.g., Barton & Swanson, 2007; Mantione & Smead, 2002; Miller & Hopper, 2010), often under the umbrella of arts integrated instruction (Burnaford, Aprill, & Weiss, 2001; Cornett, 2007). At the heart of these research orientations and pedagogical practices is the assumption that text and art comprehension processes are the same or similar (e.g., Mantione & Smead, 2002; Winner & Hetland, 2000).

However, there is inadequate support for this assumption in the literature (Burger & Winner, 2000; Felini, 2008). Specifically, in a meta-analysis of studies linking visual

art instruction (usually in the form of paintings) to text comprehension, Burger and Winner (2000) found minimal support for the assertion that training in visual art helped students learn to read. However, the authors were quick to point out that their findings did not imply that there was no link between art and reading (Burger & Winner, 2000; Winner & Hetland, 2001; Winner et al., 2006). Rather, they highlighted empirical weakness in art-reading studies, the lack of a theoretical framework for examining the relation between visual art and reading, and the dearth of studies investigating shared comprehension mechanisms in the two symbol systems. From these studies and others (e.g., Burnaford, 2007), it is evident that rigorous, theory-grounded research is needed to investigate the comprehension processes evoked by printed text and painting. The study endeavored to address this limitation in the research.

In short, there is ample rationale, both theoretical and practical, to suggest that an examination of poetry and painting provides a rigorous interrogation of the TSC. While poems and paintings arise from symbol systems that are distinct in their symbols and structures, they share a number of communicative commonalities. Also, there is a call for rigorous, theory-driven research into the comprehension processes elicited while reading paintings and examining those painting comprehension processes in light of what is known about text comprehension. Thus, poems and painting are included in the conceptual model (Figure 1).

### **Review of the Literature Bearing on the Conceptual Model**

This section reviews literature bearing on the investigation of the conceptual model (Figure 1). In particular, this section a) examines the literature on poetry and painting comprehension processes; b) predicts from these literatures trans-symbolic,

poem-specific, and painting-specific comprehension processes; c) and discusses the potential influence of expertise, genre, and purpose on comprehension processes.

Throughout, measures are discussed and implications for the study are stated.

### **Poem and Painting Comprehension Processes in the Literature**

This section examines the literatures on poem and painting comprehension in an effort to discern potential trans-symbolic (i.e., comprehension processes that are shared by poem and painting) and symbol-specific processes (i.e., poem-specific and painting-specific processes) for use in interrogating the TSC framework. As well, this section discusses measures of comprehension processes.

**Poetry comprehension processes.** Poetry comprehension is an underspecified area of the literature (Eva-Wood, 2006; Hanauer, 1996; Peskin, 1998). As evidence of the fact, a search of the PsychInfo database using combination of search terms for comprehension (i.e., comprehend, understand, interpret), think aloud methodology (i.e., think aloud, talk aloud, verbal report, verbal protocol), and poetry (i.e., poem, poetry), as well as examinations of the references, yielded only 6 studies. These studies were, however, helpful in identifying a set of comprehension processes that have been evidenced in poem contexts. These studies and the identified comprehension processes are presented in Table 1.

Table 1

*Comprehension Processes Discernible from Poetry Studies*

| Citation               | Comprehension Processes   |
|------------------------|---|
| Earthman<br>(1992)     | Gap-filling (inferencing, interpreting, expanding beyond)<br>Text repertoire (all prior knowledge associated with the text)<br>Multiple perspectives (seeing that the text can be understood in a variety of ways)  |
| Eva-<br>Wood<br>(2004) | Author's craft (identification of literary stylistic devices: figurative language, rhyme, diction, allusion, tone)<br>Interest in the poems<br>Elaborations (exploratory comments that moved beyond the text's literal, surface level content) related to speaker, words, personalizing, visualizing<br>Thematic commentary (exploration of themes, overarching philosophical statements)   |
| Hemphill<br>(1999)     | Narrative Structure (abstract, code, orientation, event, durative, character speech)<br>Evaluation (performed evaluation, intensifier, prosodic emphasis, repetition for emphasis, textualized evaluation, characters' cognition, conjecture or speculation, characters' emotion, characters' intention, narrator's direct evaluation of events)  |
| Peskin<br>(1998)       | Intertextuality<br>Contextualization of the poem in genre and history<br>Prediction<br>Rule of significance<br>Thematic unity (identifying or attempting to identify the central unifying element around which everything should fit)<br>Metaphorical significance (recognizing/searching for/ making sense of symbolism)<br>Structure as cue ("meaning is usually at the end")<br>Binary oppositions<br>Wordplay and language as cue to meaning<br>Rhyme and rhythm as cue to meaning<br>Scanning for patterns<br>Pencil representation (used to notate poems)<br>Title as cue<br>Stating confusion or disorientation<br>Backtracking or rereading<br>Skip portions that are confusing and read on<br>Appreciation for the poem as a whole<br>Appreciation for a portion of the poem |

|                   |  |
|-------------------|--|
| Peskin<br>(2010)  | Typographical features (graphic layout of the text)<br>Genre categorization (this is a poem)<br>Rule of significance (reader expects the poem to make a point OR reader makes a significant point)<br>Symbolic extrapolation (acknowledgement that the poem might have symbolic content)<br>Expectation of complexity<br>Identification of literary or stylistic devices and their effect on meaning (repetition, alliteration, metaphor, graphic deviations (indentations), binary oppositions (black and white)) |
| Shimron<br>(1980) | Activation of memory schemas (stating prior knowledge related to the poem content, genre, and structure)<br>Identification of theme in poem<br>Test of relevance (rest of the reading seeks to confirm or disconfirm the theme)<br>Synthesis of parts of the poem<br>Discovery of parallelism in the poem and seeking to understand its meaning<br>Drawing inferences<br>Test of correspondence (rereading to determine that portions of the poem fit into the theme)  |

From Table 1, a number of poetry comprehension processes is discernible, including connecting to prior knowledge, inference-generation, synthesizing, responding emotionally, evaluating, using the poem's title, interrogating the author's purpose, drawing conclusions (e.g., symbolism, mood/emotion of the poem, or historical implications), intertextuality, identifying and interpreting multiple perspectives, identifying and interpreting literary and stylistic devices, identifying and using text genre and structure, and predicting, among others. While described as comprehension processes in these studies, however, some of the content presented in Table 1 does not meet the definition of a comprehension process for this study. For instance, Peskin's (1998) "Rule of Significance" refers to the perception by readers that every aspect of the poem is important. This perception is not, however, a comprehension process in and of

itself. Rather, it is more appropriate to consider rule of significance as a rationale for a comprehension processes; namely an inference or interpretation.

**Painting comprehension processes.** As with poetry comprehension, the literature on painting comprehension processes is relatively sparse. Indeed, most studies of paintings address perception (often from a neuroscience perspective; e.g., Solso, 1999; Ramachadan & Hirstein, 1999), aesthetic experiences and judgments (e.g., Leder et al., 2004; Winston & Cupchik, 1992), or the design and creation of paintings (e.g., Suwa & Tversky, 1997). There are significantly fewer examinations of the processes by which paintings are understood (Millis & Larson, 2008). However, several theoretical perspectives and empirical examinations bearing on painting comprehension processes were identified in the psychological, educational, and visual arts literature. A discussion of these theoretical and empirical perspectives follows.

A number of theorists have suggested the existence and nature of painting comprehension processes, although most do not describe them as such (Feldman, 1970; Parsons, 1987; Perkins, 1994; Tishman & Palmer, 2006). For instance, Feldman (1970) forwarded a highly influential model of art criticism that was intended to help individuals understand and appreciate art (Anderson, 1993). The model suggests that viewers engaged in four ordered processes in order to understand a composition: description, analysis, interpretation, and evaluation. Description involves verbalization of the visible aspects of the composition, including objects, subjects, and elements of the artwork (e.g., color, line, space); it is focused on individual aspects of the painting. Analysis, on the other hand, is focused on explaining how the parts fit together to make the whole. During analysis, the overall organization of the work is emphasized. Interpretation, the third of

Feldman's criticism steps, involves finding meaning in the work by identifying themes, ideas, symbolism, or emotion. During this stage, individuals attempt to explain the composition and inferences about details that are not stated or obvious. Finally, in the evaluation stage, individuals make decisions about success, value, or worth of the composition. This considered judgment should be grounded in compelling evidence. More recently, Barrett (1997) forwarded another influential approach to art criticism that includes four, similar processes (i.e., describing, interpreting, judging, and theorizing about art) but the processes are not ordered. Rather, Barrett argues that the four processes overlap and that interpretation, which is interwoven throughout, is the most important and complex activity.

Others have also suggested processes that might be implicated in art comprehension. Perkins (1994) argues that art looking is a highly cognitive and thoughtful exercise, requiring a range of processes, including asking questions, analyzing parts, reasoning, utilizing prior knowledge of social and historical events, engaging emotions, and analyzing formal structures of art. Parsons (1987) states that aesthetic evaluation and response (e.g., response to color, beauty, medium, form, or style), connecting the artist with the painting, and connecting the painting to historical and social knowledge as necessary processes for understanding art. Recently, Tishman and Palmer (2006) proposed six types of thinking that they believe are required to explore and appreciate works of art: reasoning, questioning and investigating, exploring points of view, comparing and connecting, exploring complexity, and observing and describing. It is notable that none of these perspectives is derived from a theory of learning.

Two other perspectives are grounded in cognitive theories. Using an information-processing model, Korosckin (1984) identified two broad categories of processing that participants used to view and understand artwork: structural and semantic. Structural processing includes encoding an artwork's physical properties such as size and media; visual elements of the painting such as color, shapes, lines, and values; and observing relationships among these elements. Of interest to this study is the description of semantic information processing, which is similar to comprehension. Korosckin described semantic processing as identification of representational features, recognition of symbolic denotation, and determination of underlying principles (e.g., religious, political, or philosophical ideas).

Solso (1999, 2003) also used an information-processing approach, as well as neuroscience research, to ground his perspective on cognitive processing of artwork. Similar to Kintch's (1998) Construction-Integration model, Solso argues that comprehending artwork like paintings involves three levels of representation. Level 1 entails representing the surface information of the painting, including color, shading, and contours. In Level 2, a representation is made of the concepts explicitly depicted in the painting. Due to its similarity with Kintsch's *textbase* representation, Millis and Larson (2008) describe Solso's Level 2 as the *artbase*. Finally, in Level 3, inferences and interpretations made by the viewer are incorporated, as well as emotional connections to the artwork. Millis and Larson (2008) suggest that Solso's level three is analogous to Kintsch's situation model. Solso's work suggests that comprehending artwork entails connecting to historical and social knowledge; discriminating, analyzing, and

synthesizing parts of a painting; generating inferences and interpretations; and responding emotionally.

The empirical studies relating to art comprehension processes were identified via a search in the PsychInfo, Academic Search Premier, and JSTOR databases using combinations of key words related to comprehension (i.e., comprehend, understand, interpret), think aloud methodology (i.e., think aloud, talk aloud, verbal report, verbal protocol), and painting (i.e., painting, visual art). Additionally, the reference lists of these articles were search for additional sources. In total, eight empirical studies of painting comprehension processes were identified. These studies and the identified comprehension processes are presented in Table 2.

In these studies, terminology for comprehension processes was variable. For instance, Franklin, Becklin, and Doyle (1993) and Moore (1973) identified synthesizing as a painting comprehension process, but used different terms to describe it (*scene elaboration* and *association*, respectively). Additionally, there were several qualitative studies in the pool that alluded to, but did not expressly identify, painting comprehension processes. For instance, Benton (1992) conducted a qualitative analysis of two novice adolescents' free conversation while viewing a realistic painting. While he did not articulate a list of comprehension processes, several are clearly discernible. For instance, connecting to prior knowledge and experiences can be discerned from the statement, "re-creative reading [of text and painting] involves making a synthesis of those elements within the reader's/viewer's own nature and those aspects of experience to which the text/painting actually refers" (p. 141).

Table 2

*Comprehension Processes Discernible from Studies of Paintings*

| Citation                                   | Comprehension Processes   |
|--|---|
| Benton<br>(1992)                           | Synthesis between prior knowledge/experience and the painting<br>Filling the indeterminate gaps<br>Analysis and synthesis of elements in the painting.  |
| Bruder &<br>Ucok<br>(2000)                 | Evaluation (preference, judgment)<br>Attraction (color, subject matter, figure the painting out, artist's technique)<br>Storytelling (enigmatic, imaginative, self-reflective stories)<br>Connecting to prior knowledge<br>Using the title<br>Synthesizing parts<br>Asking questions<br>Interpreting symbolic representation<br>Intertextuality<br>Inferring<br>Drawing conclusions   |
| Franklin,<br>Becklin, &<br>Doyle<br>(1993) | Simple designation<br>Interpretive designation<br>Naming expressive properties<br>Sequencing related parts<br>Scene elaboration<br>Narrative construction   |
| Ishisaka &<br>Takahashi<br>(2006)          | Drawing techniques (accurate or inaccurate perspective)<br>Drawing touch (color, line, contrast, texture)<br>Observation of represented objects<br>Identifying school of art<br>Informational impression (well-organized, geometric, clutter, looks solid)<br>Emotional impression (loneliness, anxiety, warmth)<br>Imagined scene or story (time and period, country and place, character and job of the person)<br>Strangeness. |
| Koroscik et<br>al. (1992)                  | Formal dimension (visual characteristics of artworks)<br>Descriptive dimension (references to subject matter content)<br>Interpretative (expressive meanings to form or content)  |

|   |   |
|---|---|
| Moore<br>(1973)                                 | Objective statements (facts or assumed facts)<br>Associative statements (references to personal experiences)<br>Subjective statements (mood or emotion of the viewer)<br>Character expression (feelings of objects in the painting) |
| Schmidt,<br>McLaughlin, &<br>Leighton<br>(1989) | Semantic content<br>Mood or atmosphere<br>Formal elements<br>Style<br>Artist's intent<br>Idiosyncratic comments about personal preference or frustration  |
| Stout<br>(1995)                                 | Influences on artist's work<br>Themes<br>Narratives<br>Cultural implications<br>Multiple points of view<br>Emotional response<br>Intertextuality  |

For clarity in reporting, painting comprehension processes, whether stated expressly or by allusion, are described here using common terms. Moreover, when appropriate, the processes are described using terms that are also used in the print comprehension literature. Table 2 provides the findings from the eight painting comprehension studies.

From Table 2, a number of comprehension processes is evident, including connecting to prior knowledge, inference-generation, questioning, analyzing, synthesizing, responding emotionally, evaluating (e.g., painting quality or style of painting), using the painting's title, interrogating the artist's purpose, drawing conclusions (e.g., symbolism, mood/emotion of the painting, or historical implications), intertextuality, and observing (e.g., objects and their location, color, line, or action). Additionally, it is notable that researchers in several studies observed a tendency for

viewers to construct narratives to *tell the story* of the painting (e.g., Bruder & Ucock, 2000; Franklin, Becklin, & Doyle, 1993).

### **Trans-Symbolic, Poem-Specific, and Painting-Specific Comprehension Processes Suggested from the Literature**

The foregoing discussions of literatures on poem and painting comprehension processes suggest a number of potential trans-symbolic processes. For instance, connecting to prior knowledge and experiences, inferring, intertextuality, evaluating, elaborating, and drawing conclusions, synthesizing, responding emotionally, and using title, among others, are evidenced in both the poem and painting comprehension literatures. Thus, the print and painting comprehension literatures suggest the current examination will reveal trans-symbolic comprehension processes. This listing of processes was used *a priori* to guide analysis of the data in the study.

As discussed previously, in contrast to painting, poetry is encoded in the linguistic symbol system using groupings of letters and words. Also unlike painting, poetry comprehension is subject to temporal constraints, in that it is generally processed in a serial fashion; in the English language, from left to right and top to bottom. These symbolic objects and rules suggest several poem-specific comprehension processes. For example, making and monitoring predictions is identified as poem comprehension process (Peskin, 1998). Predictions are likely an artifact of the temporal nature of poetry in that predictions occur as the text content unfolds over time, as do periodic checks to monitor the degree to which the reader's prediction was verified. As such, there are no apparent corollaries to predicting in the painting comprehension processes literature. Summarizing or paraphrasing, another poetry comprehension process (Hemphill, 1999) is

similarly situated. Interpreting figurative language (e.g., metaphors, similes, alliteration, binary opposition) and figures of speech may also be an example of poetry-specific comprehension processing (Eva-Wood, 2004; Peskin, 1998, 2010), in that figurative language is an artifact of the linguistic symbol system. Thus, although not exhaustive, these examples from the poetry literature suggest the current study may reveal poetry-specific comprehension processes.

The literature on painting comprehension processes also suggests that some processes, likely related to visual-graphic symbol system and rules governing meaning-making in paintings, and might be painting-specific. For instance, Benton's (1992) analysis suggests that comprehending paintings may require a "wandering viewpoint" as suggested by Iser (1978; p. 119) as the viewer rapidly identifies and incorporates myriad aspects of the work: color, line, space, objects, figures, and symbolic meaning. This wandering viewpoint is likely an artifact of the immediacy of paintings; that is, unlike poetry, their content does not unfold over a period of time. Other possible painting-specific processes are related to the visuographic symbol system. For instance, color itself might impact the comprehension of a painting. A bright, yellow-hued palette might be regarded as happy, lighthearted, or hopeful, while a blue-hued palette might be alternatively perceived as somber, tragic, or depressed (Matthews, 1977). Likewise, the orientation of major lines in the painting, and frequency of their repetition, can be interpreted as calming or exciting (Mathews, 1977). Other painting-specific processes might be found in an examination of the "elements of art" (Cornett, 2007): shape, form, space, texture, and value.

## Measuring Comprehension Processes

Broadly speaking, measures of comprehension processes can be classified as offline or online (McCrudden, Trabasso, & Schraw, 2011; Rapp & Mensink, 2011).

**Offline comprehension measures.** Offline measures are self-reported perceptions that individuals have of their use of comprehension processes. For instance, a reader may be asked to report how frequently she referred to prior knowledge or asked herself questions during a print comprehension task. Offline or self-report surveys are the most common way of measuring comprehension processing, presumably because they are relatively easy to administer, complete, and score (Cromley & Azevedo, 2006; Perry & Winne, 2006; Samuelstuen & Braten, 2007).

Offline measures can be constrained or open-ended. Constrained measures ask participants to respond to a given statement or question. For instance, participants might be asked to rate their level of agreement with, “While I am studying, I refer to prior knowledge.” Common examples of constrained self-reported measures of comprehension processes include the Inventory of Learning Processes (Gadzella & Masten, 1998), the Strategic Processing Questionnaire (Furnham, Christopher, Garwood, & Martin, 1998), the Motivated Strategies for Learning Questionnaire (Lau, Liem, & Nie, 2008), and the Learning and Study Strategies Inventory (Weinstock & Palmer, 2002). In contrast, open-ended self-reported measures ask the individual to generate their comprehension processes. For example, Taraban, Rynearson, and Kerr (2000) asked undergraduate students “What are some things that you can do if you are having difficulty understanding something you are reading?” under the assumption that

participants would be most aware of their processing in those instances where there was a breakdown in comprehension.

Offline measures can also be prospective or retrospective. In a prospective measure, comprehension processes are reported in anticipation of a comprehension activity. For instance, Cromley and Azevedo (2000) asked participants to self-report what processes they use to read academic or school-related materials before engaging in a comprehension activity. In contrast, retrospective self-reports are provided after the completion of a comprehension activity. For instance, Camps (2003) asked participants to, "Please, talk about what you remember with regard to how you went about performing the multiple-choice activity you just completed" and coded the responses for evidence of processes utilized during the comprehension task.

Often, offline measures are global in nature; that is, they ask individuals to make general statements about their comprehension processes (e.g., When I am studying, I refer to prior knowledge), instead of contextualizing the processing in a particular task (e.g., When I studied this text, I referred to prior knowledge). This approach assumes that that comprehension is context-free, and that generalized reports of comprehension processing can be broadly applied to domains and tasks (Samuelstuen, Bråten, & Valas, 2007).

Recently, the validity of offline measures has been criticized, particularly those that treat comprehension processes as global or context-free (Cromley & Azevedo, 2006; Hadwin, Winne, Stockley, Nesbit, & Woszczyzna, 2001; Samuelstuen & Bråten, 2007). For instance, Samuelstuen et al. (2007) found that a global measure of comprehension processing was less predictive of a comprehension outcome measure than was a context-

specific measure. They concluded that context effects students' self-reports of learning and, as such, contextualized measures are more desirable than those that are general or context-free.

**Online comprehension measures.** In contrast to offline measures, online measures of comprehension processes infer individuals' use of comprehension processes through observation of behaviors that occur during a comprehension activity; that is, through an analysis of moment-by-moment processing of a composition. Although not as commonly used as offline instruments, online or real-time measures of strategic processes are readily apparent in the literature on strategic processing, and can take on a number of forms including think aloud protocol (Magliano, Trabasso, & Graesser, 1999), concurrent survey (Cromley & Azevedo, 2006), eye-tracking (Kaakinen & Hyönä, 2005), and tracing (Perry & Winne, 2006). Of these, think-aloud protocols are the most commonly used (Veenman, 2005). Moreover, as noted by Magliano and Millis (2010), there is a growing body of evidence that the processes revealed by thinking aloud are indicative of comprehension.

Think-aloud protocols are research methodologies in which a participant performs a task while continuously reporting thoughts that occur during its implementation under the assumption that verbalizations are related to a participant's concurrent thoughts that emanate from working memory (Ericsson & Simon, 1984). Typically, participants are prompted to verbalize their thoughts while completing a task using an unstructured or semi-structured interview, which is transcribed and coded for evidence of strategic processing. Due to the high costs of think-aloud research (i.e., collection, transcription, and analyses), most think-aloud studies have a relatively low number of participants

(Fox, 2009; Pressley & Afflerbach, 1995). For instance, in the 38 studies reviewed by Pressley and Afflerbach (1995), the number of participants ranged from 3 to 80, with a mean of 20.3 participants. Reliability for think-aloud protocol is typically assessed through interrater agreement on the coding scheme derived from a verbal protocol analysis of the data.

One example of think-aloud protocol used to assess print comprehension processing was conducted by Magliano et al. (1999). In this study, 48 undergraduate students were prompted to think aloud while reading eight short stories. Specifically, participants were prompted to, “Tell me any thoughts or ideas that come to mind while reading a story sentence or immediately after reading the sentence.” Think aloud protocols were audiotaped and coded for inferences, sources of inference, and memory operations by two, independent raters.

Recently, Veenman (2005) conducted a review of the literature examining studies that utilized multiple measures of print comprehension processes, what he termed executive metacognitive skills. The review showed high correlations among online measures of comprehension processes, but low correlations among offline measures, both prospective and retrospective. Veenman concluded that,

Generally speaking, people simply don't do what they say they will do, or they do not recollect accurately what they have done....The present overview at least suggests that [online] measures are far more adequate representatives of executive metacognitive skills. (2005, p. 13)

Likewise, Cromley and Azevedo (2006) conducted a study in which they compared three comprehension processes measures with comprehension outcomes: a

prospective self-report measure, a concurrent multiple-choice measure asking individuals to report the comprehension processes they were currently using, and a think aloud protocol. The findings were consistent with Veenman's (2005) conclusions. Specifically, Cromley and Azevedo found that the online measures (i.e., multiple-choice and think aloud protocol) were significantly correlated with one another and with the comprehension measures, but the offline measure had non-significant correlations with all of the other measures. It is notable, however, that the offline measure was global rather than particular to the context of the study; the directions required participants to generate responses about "what people do when they read academic or school-related material" (p. 258; Mokhari & Reichard, 2002 as cited in Cromley & Azevedo, 2006) rather than what the participants expected to do to understand the specific materials in the study. The authors concluded that online measures of comprehension processes are preferable to offline measures.

Online measures of comprehension processes, particularly think aloud protocols, are not without limitations, however. Indeed, since Watson (1920), questions have been raised about the relation between individuals' thoughts and their capacity for being expressed in words—verbal reports can only reflect a portion of the thoughts that occur at any given moment. As such, it is widely understood that processes manifest in think aloud protocols do not and cannot reflect the totality of the processes used by individuals. Moreover, participants must be introspective (Watson, 1920) and metacognitive (Flavell, 1979) in order to accurately and appropriately verbalize relevant thoughts and comprehension processes.

For these reasons, many suggest that valid and reliable measurements of comprehension must incorporate both offline and online measures (Graesser, 2008; Perry & Winne, 2006; Samuelstuen & Bråten, 2007). This triangulation of sources can address issues of grain size and source of information (i.e., self-report or observation), as well as provide additional sources of validity and reliability in the measure of strategic processing of text.

**Measuring comprehension in the study.** The study drew on the findings in the literature related to offline and online measures of comprehension processes and incorporated the suggestion to use a multi-method approach that combines offline and online measures (Graesser, 2008; Perry & Winne, 2006; Samuelstuen & Bråten, 2007). Specifically, in the study, comprehension processes were measured using two sources: an offline, open-ended, self-reported prospective comprehension processes and an online think aloud protocol. In addition, in light of Samuelsteun and Bråten's (2007) findings, the prospective measure was constrained to the context of the study. That is, participants were asked to report the comprehension processes they anticipate using to understand the poem and painting materials in the study.

### **Controls on the Study**

The conceptual model (Figure 1) includes expertise, genre, and purpose as controls.

**Expertise.** Expertise is the study of authorities or masters in a given domain or field with the goal of understanding their characteristics (Alexander, 2003; Bransford, Brown, & Cocking, 1999; Chi, 2006; Hoffman, 1998). At the heart of many studies of expertise is the distinction between novice and expert (Chi, 2006). For instance,

Hoffman (1998) identifies seven stages of expertise, ranging from naïve to master, emphasizing the accumulation of skill through experience in the field, particularly knowledge structures and reasoning processes. In contrast, Alexander (1997, 2003) argues for a more nuanced, multi-dimensional view of expertise development. Specifically, Alexander's Model of Domain Learning (MDL; Alexander, 1997, 2003; Alexander, Jetton, & Kulikowich, 1995; Murphy & Alexander, 2002) adds two additional components to the identification and examination of experts: strategic processing and interest. Thus, the MDL address the ways in which knowledge, strategic processing, and interest are differentially manifest at three stages of expertise development (i.e., acclimation, competence, and proficiency/expertise). The inclusion of strategic processing makes the MDL particularly informative for the present investigation. Thus, the MDL is used as the model of expertise in the study.

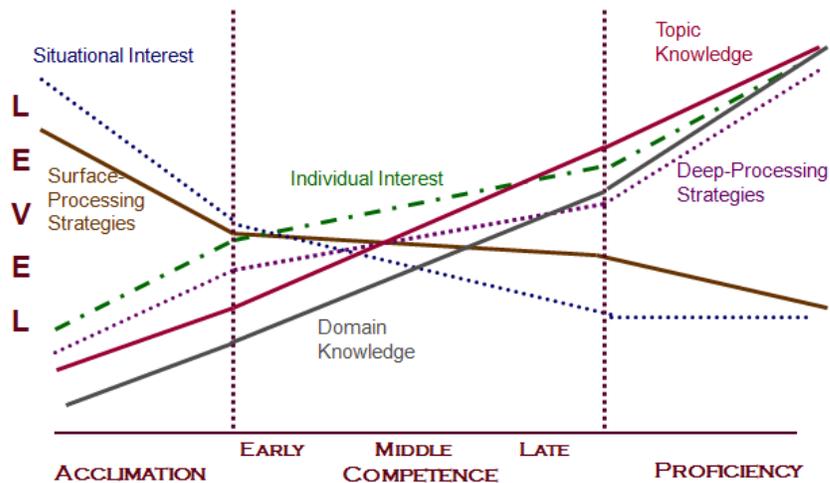
According to Alexander (2003), the MDL distinguishes between types of knowledge, interest, and strategic processing. There are two forms of knowledge: domain and topic. Domain knowledge relates to the breadth of knowledge in a domain (e.g., knowledge about Western visual art), while topic knowledge is defined as how much an individual knows about a particularly topic within a domain (e.g., knowledge about Western paintings). The MDL also distinguishes between the two types of interest identified by Hidi (1990). Situational interest relates to the fleeting "arousal or piquing of attention sparked by events or features of the environment" (Alexander, 2003; p. 11). In contrast, individual interest is an enduring interest in the study and practice of the domain, typified by domain-related engagement in everyday activities (e.g., visiting art museums or painting for a hobby) and/or professional activities (e.g., teaching painting

techniques or engaging in art criticism). Finally, the MDL references the work of Marton and Säljö (1986, 1997) in identifying two types of strategic processing: surface and deep. Surface processes are those used to make sense of domain-related object or situation, while deep processes involving “delving into” the object or situation.

The MDL also predicts the interrelation of knowledge, interest, and strategic processing at three stages in the development of expertise: acclimation/novice, competence, and proficiency/expertise (Figure 2).

Figure 2

*Alexander’s Model of Domain Learning*



Of particular interest to this study are the MDL’s predictions for individuals in the competency stage of development. These individuals are predicted to utilize medium amounts of knowledge, interest, and strategic processing. Thus, according to the MDL, competency represents a critical and complex period of expertise development.

***Influence of expertise on comprehension processes.*** Expertise has been used to predict differential comprehension processes in print contexts, often to determine what “good” or expert readers do, as a guide for policy and practice (e.g., Alexander & the

DRLRL, 2010; Pearson, Roehler, Dole, & Duffy, 1992). For instance, Peskin's (1998) expert-novice examination of poetry readers revealed that, as compared to relative novices, experts were superior in their application of knowledge, poetry convention, and interpretive comprehension processes. Moreover, poetry experts were more likely than the relative novices to find the poem pleasing and interesting. Likewise, in a review of studies investigating comprehension processes in informational text contexts, Fox (2009) found that relative expert readers were more likely than their novice peers to use deep-level processes, aim for global comprehension, utilize comprehension processes more effectively and flexibly, draw more accurate conclusions and accurate mental representations of the text, and evaluate the text and author critically. These findings suggest that expertise is related to comprehension processes in print contexts.

The concept of expertise has frequently been applied in painting comprehension contexts, as well (e.g., Cela-Conde et al., 2011; Schmidt, McLaughlin, & Leighton, 1989; Winston & Cupchik, 1992). In general, art novices focus on the semantic features of paintings (i.e., the objects and their relation), particularly those in the foreground and center of the canvas, often creating narratives to "tell the story" of the painting. In contrast, art experts tend to analyze the formal elements of the painting (e.g., background features, composition) and include knowledge of the time period, style, and background of the artist in their analysis (Cela-Conde et al., 2011).

As predicted by the MDL (Alexander, 2003), these studies suggest that individuals' expertise might influence observable comprehension processes in both print (i.e., poetry) and painting contexts. In particular, the MDL (Alexander, 2003) suggests that novices will be more likely to utilize surface-level processes, while expert

individuals will likely demonstrate deep-level processes. However, there is also evidence that, after a certain point in expertise development, the degree to which comprehension processes will be vocalized diminishes because the comprehension processes have become automated, and thus not likely to be verbalized in a think aloud context (Ericsson & Simon, 1984)

It is essential for this study, then, that participants be competent enough to utilize comprehension processes, but not be so expert that these processes have become automatic. This relation, it is argued, can be found in individuals at the competence stage of expertise (Alexander, 2003). Thus, the study targeted individuals in the competence stage of expertise in the domains of Western literature and art, the parent domains of the poem and painting used in the study.

*Measures of expertise.* As noted by Chi (2006), there are a variety of measures of expertise, broadly relating to performance on expertise measures or situational proxies of expertise. For instance, a number of expert-novice studies utilize performance on domain-related measures as indicators of expertise. Performance can be reported by self or others, based on objective measures, or determined through a combination of these measures. Torff (2003), for example, designated teachers as expert, experienced, and novice based on supervisor nomination, a subjective rating, and years of classroom experience, an objective measure. Fox, Maggioni, and Riconscente (2005) used objective domain and topic knowledge measures, as well as self-reported individual interest measures, to determine relative expertise in reading and history. Leder, Carbon, and Ripsas (2006) also considered combined scores on measures of art knowledge (objective) and art interest (self-reported) as an indication of art expertise.

Researchers also make assumptions about expertise from external factors. For instance, Schmidt, McLaughlin, and Leighton (1989) used years of training as indicators of expertise in an art domain context: novices were undergraduate psychology students with no background in art history, while experts were upper-class students majoring in art history and a professor of art history. Likewise, Peskin (1998) used doctoral candidacy in English as a proxy for expertise in poetry reading.

*Expertise in the study.* Due to the impact of expertise on comprehension processes, the present study includes a criterion sampling procedure as a designed control. In particular, this study selectively sampled from individuals predicted to be in the competent phase of expertise development in relation to Western literature and art (i.e., English education and Art education students, respectively, at the end of their program). Competence in poetry and painting was determined using both external factors (i.e., academic standing) and performance measures. Particularly, in light of the characteristics of competency predicted by the MDL (Alexander, 2003), subject-matter knowledge (including domain knowledge and topic knowledge) and individual interest measures were taken to confirm competency designations for the sample.

It is important to note that the MDL (Alexander, 2003) was not used to differentiate between deep and surface comprehension processes in the study. Rather, all comprehension processes, both those potentially deep and surface, were pooled in an effort to discern the existence of trans-symbolic and symbol-specific processes.

**Genre.** In addition to expertise, genre is included in the conceptual model as a control on the study. Genres are categorical schemes for organizing compositional families. One way of discerning genres is by investigating the purpose for the creation of

the composition. Kinneavy (1971) argues that there are four purposes of compositions: to inform, to be beautiful, to persuade, and to express. Informational discourse aims to inform about the reality of something; “reality talked about” (e.g., exploratory, scientific, or informational communication). The goal of literary discourse is beautiful, appreciated, or admired; the language calls attention to itself (e.g., stories, dramas, songs, poetry). Other discourses are intended to persuade by eliciting a specific reaction from the decoder (e.g., political speeches, religious sermons, legal oratory, or advertising). Further, the goal of some discourses is to express the ideas or emotions of the creator (e.g., conversations, journals, diaries, or prayers). Kinneavy notes that there is significant overlap in these genres; a poem can be both expressive and literary, for instance. Moreover, Kinneavy expressly applied his theory to both print (Kinneavy, 1971) and paintings (Kinneavy, 1997). Thus, Kinneavy’s purposes are operationalized as genre in this study.

*Influence of genre on comprehension processes.* Genre type has been investigated in relation to comprehension processes in both print and painting contexts. In print contexts, comprehension processes have been investigated with a variety of print genres, including narratives (i.e., literary discourse; van den Broek, 1994), informational texts (i.e., informational discourse; Cote, Goldman, & Saul, 1998), and poems (i.e., literary discourse; Eva-Wood, 2006; Peskin, 1998). However, as noted by Best et al. (2008) and others (Weaver & Bryant, 1995; Wolfe & Woodwyk, 2010), there have been relatively few direct examinations of comprehension processes in multiple genres in the same study. One exception is Wolfe and Woodwyk’s (2010) comparison of comprehension process events in literary and informational texts in an undergraduate

sample. The authors found that the informational texts elicited more prior knowledge connections than did the literary text, while the literary text was associated with a high degree of coherence-seeking processes. No statistically significant differences were found between genres for paraphrasing, prior text elaboration, evaluation, or monitoring comprehension processes.

Genre has also been examined in light of painting comprehension processes. However, these examinations have been framed using a different scheme for genre based upon degree of relation to reality: representational, abstract, and non-representational (Moore, 1973; Pipes, 2003). Representational art aims to represent the reality of objects or subjects, while abstract art takes subjects from reality but presents them in an unrealistic way. Non-representational art, on the other hand, makes no attempt to depict anything from reality. Rather, non-objective art aims simply to create a visually stimulating work using the elements and principles of art. Painting comprehension processes have been examined in representational (Franklin, Becklin, & Doyle, 1993; Millis & Larson, 2008), abstract (Koroscik, 1984; Koroscik et al., 1992), and non-representational genres (Moore, 1973; Schmidt, McLaughlin, & Leighton, 1989).

There have also been several studies directly examining two or more genres (Franklin, Becklin, & Doyle, 1993; Moore, 1973). For example, Moore (1973) compared comprehension processes in representational, abstract, and non-representational paintings. Moore's findings suggested that participants are more likely to interpret characters' feelings and make subjective interpretations with representational paintings than with abstract or non-representational paintings, and that abstract paintings are more likely than representation or non-representational paintings to elicit references to personal

experiences and memories. Moore concluded that participants' responses differed by type of painting.

In summary, genre has been demonstrated to influence comprehension processes in print (Wolfe & Woodwyk, 2010) and painting (Moore, 1973) contexts.

***Genre in the study.*** Given the influence of genre on print and painting comprehension processes, it was important to control for the influence of genre in the conceptual model. This study included a genre condition for that reason. Specifically, the poem and painting chosen for use in the study can be interpreted to reflect at least one shared purpose; that is, to convey the creator's ideas about the creative process in an artistic form. Thus, the compositions were both expressive and literary, according to Kinneavy's (1971) scheme. As well, the compositions' surface features (i.e., painting birds) were similar.

**Purpose.** Purpose was also included in the conceptual model as a control on this study. Purpose refers to the goal of the comprehension activity.

***Influence of purpose on comprehension processes.*** Previous research has shown that purpose of the reader can influence reading processes (Geiger & Millis, 2004; Schmalhofer & Glavanov, 1986). For instance, van den Broek, Lorch, Linderholm, and Gustafson (2001) randomly assigned participants to one of two purpose conditions: read a text as if you are studying for an essay exam or read as if you are browsing through a magazine. Four texts were presented, balanced across conditions, and every text presented was expository. Despite this, the two sets of goal instructions facilitated different processing during reading, as evidenced by comprehension processes observed in a think-aloud protocol. In particular, individuals in the "study" condition demonstrated

deeper comprehension processes and higher information recall than individuals in the “magazine” condition. A search of the literature did not reveal a similar study in a painting comprehension context. However, it is probable that purpose might also influence painting comprehension.

*Purpose in the study.* The study was designed to control for the influence of purpose. Specifically, during the comprehension tasks, participants were told to study the poem and painting. As well, the participants were given relevant comprehension tasks; namely poem and painting comprehension measures. The “study” directions and subsequent comprehension measures were expected to give participants a purpose for engaging in the comprehension activities. Moreover, it was hoped that this purpose will encourage participants to engage fully with the compositions.

## CHAPTER 3: METHODOLOGY

This chapter describes the design, participants, measures, materials, procedure, and data analytic plan of the study. The elements of the study were driven by the conceptual model (Figure 1) and the following research questions:

- What, if any, observed comprehension processes are shared between poem and painting contexts?
- What, if any, observed comprehension processes are particular to poetry?
- What, if any, observed comprehension processes are particular to painting?

### Design

The purpose of the study was to determine the extent to which individuals manifest trans-symbolic, poem-specific, and painting-specific processes during poem and painting comprehension tasks. Individuals presumed to be in the competency phase of expertise in relation poetry or painting comprehension completed online and offline measures of comprehension processes before, during, and after studying a poem and a painting. The poem and painting were parallel in that they shared a surface structure (i.e., painting a bird) and could be interpreted to share a broad theme (i.e., the creative process). In addition, participants completed measures related to subject-matter knowledge (i.e., Western literature and visual art), individual interest, and poem and painting comprehension outcomes. The knowledge and interest measures were included to verify the assumption that the individuals were, indeed, at the competent stage of expertise development, while the comprehension outcome measures were included to maximize the window of opportunity for individuals to report comprehension processes.

Individuals' performance on the expertise and comprehension outcome measures were not analyzed vis-à-vis demonstrated comprehension processes.

### **Participants**

Due to the exploratory nature of this study, a criterion sampling strategy was used, with the intent to identify information-rich cases that afford a sufficiently complex view of the relation between poetry and painting comprehension. Specifically, participants presumed to be in the competent phase of expertise development in relation to poetry and painting, respectively, were recruited. As suggested by the review of literature, individuals in the competence stage of expertise are more likely than their novice or expert peers to articulate comprehension processes in think-aloud protocols (Ericsson & Simon, 1993).

English and Art education students enrolled at one of two mid-Atlantic universities in the latter stages of their program were expected to be competent in poem and painting comprehension, respectively, due to their academic program and standing. As part of their undergraduate coursework, these students have taken many formal courses related to poetry and painting, respectively, but are not likely as expert in the domains as those with more advanced degrees or more experience in the field. Thus, it was expected that the junior and senior English and Art education students had advanced beyond the novice stage, but had not yet achieved expert status, placing them in the competence phase of expertise development in their respective domains (Alexander, 2003). Participants' competence designation was corroborated via performance on expertise measures. Additionally, as aspiring educators, these students are required to take at least two courses in reading comprehension (i.e., Cognition and Motivation in

Reading and Reading in Secondary Schools), which were assumed to provide them with language to articulate their comprehension processes.

For these reasons, it was expected that these participants would produce a robust set of comprehension processes for analysis in their area of specialty. In their domain of competence, participants were expected to demonstrate a wide range of comprehension processes, as predicted by the MDL (Alexander, 2003). In the domain in which they are likely novice (i.e., English education students are likely novice in Western art and Art education students are likely novice in Western literature), participants were also predicted to demonstrate comprehension processes, but not to the same degree as in their area of specialty. Think alouds in both domains for all participants were anticipated to reflect a wide range of variability, suitable for the exploratory nature of the study.

Participants included 12 Art education and 12 English education upper-division (i.e., Junior or Senior) students at two mid-Atlantic universities. All students identified themselves as native English speakers. Based on mean number of participants identified in Fox (2009) and Pressley and Afflerbach's (1995) reviews of think aloud studies (i.e., 24.4 and 20.4, respectively), it was expected that 24 participants would provide sufficient data to identify comprehension process trends.

Descriptive data for the participants is provided in Table 3. Notably, the sample included a high proportion of female and Caucasian students, which is not unexpected given the larger demography of the undergraduate schools of education at the institutions from which these students were recruited.

Table 3

*Participant Demographic Information*

|                  | English Education Students<br>N = 12 |         | Art Education Students<br>N = 12 |         |
|------------------|--------------------------------------|---------|----------------------------------|---------|
|                  | N or Mean                            | Percent | N or Mean                        | Percent |
| Gender           |                                      |         |                                  |         |
| Female           | 8                                    | 66.67   | 11                               | 91.67   |
| Male             | 4                                    | 33.33   | 1                                | 8.33    |
| Age              | 20.3                                 |         | 23.1                             |         |
| Race             |                                      |         |                                  |         |
| American Indian  | 0                                    | 0       | 1                                | 8.33    |
| Asian            | 1                                    | 8.33    | 1                                | 8.33    |
| Black            | 1                                    | 8.33    | 0                                | 0       |
| Hispanic         | 0                                    | 0       | 0                                | 0       |
| Other            | 1                                    | 8.33    | 0                                | 0       |
| White            | 9                                    | 75      | 10                               | 83.33   |
| GPA              | 3.60                                 |         | 3.57                             |         |
| Year in School   |                                      |         |                                  |         |
| Junior           | 11                                   | 91.67   | 3                                | 25      |
| Senior           | 1                                    | 8.33    | 9                                | 75      |
| Painting Courses | 1                                    |         | 7                                |         |
| Poem Courses     | 4                                    |         | 1.67                             |         |

**Measures**

The study included measures related to expertise, comprehension processes, comprehension outcomes, and demographics.

## **Expertise**

The study targeted individuals at the competence stage of expertise development in relation to Western literature or visual art in general, and Western poetry or paintings in particular. In addition to the criterion sampling procedure describe previously, subject-matter knowledge and individual interest measures were used to corroborate the assumption of competence in this sample.

**Subject-matter knowledge.** Participants completed Western Literature and Western Art Subject-Matter Knowledge measures, including items particular to poetry and paintings (included as Appendices A and B, respectively). The Western literature knowledge measure included questions related to novels, plays, short stories, and poetry in the Western tradition; the Western visual art measure included questions related to sculpture, painting, architecture, and installed art. Both measures had 15 items. For the literature measure, nine items addressed poetry knowledge. Likewise, nine painting questions were included in the art measure. Thus, the subject-matter knowledge measures included both domain and topic knowledge, which is consistent with an assessment of expertise based on the Model of Domain Learning (MDL; Alexander, 2003)

For each measure, participants completed multiple-choice questions requiring them to match a famous quote or image to the creator (i.e., author or artist) or the title of the work. For instance, the Western literature and visual art measures contained the following items, respectively:

Which novel includes the following lines?

*It was the best of times, it was the worst of times...*

- A. *The Count of Monte Cristo* by Alexandre Dumas
- B. *A Tale of Two Cities* by Charles Dickens
- C. *An American in Paris* by Margaret Vandenberg
- D. *Scarlet Pimpernel* by Emmuska Orkzy

Which artist painted *The Large Turf*, pictured to the right?

- A. Charles Sheeler
- B. Jean Vermeer
- C. Claude Monet
- D. Albrecht Durer



This format of matching compositions with their creator or title has been successfully used as a measure of subject-matter knowledge in previous studies (e.g., Leder, Carbon, & Ripsas, 2006).

The subject-knowledge measures were reviewed by experts (i.e., professors of Western literature and visual art, respectively) to determine their accuracy, representation of the subject-matter, and relative difficulty vis-à-vis the sample following the expert judgment guidelines set by Crocker and Algina (2006). As well, Cronbach's alpha reliability statistics were calculated for each measure. Unfortunately, the internal reliabilities of both the Literature and Art Knowledge measures were poor ( $\alpha = 0.54$  and  $0.26$ , respectively).

It was expected that the Literature and Art Knowledge measures would discriminate participants competent in their domains from those who are not; that is, English education students were expected to perform better than Art education students on the Western Literature measure, and Art education students were expected to outperform English education students on the Art measure. This prediction was borne

out in the findings, with English education students ( $M = 8.75, SD = 2.53$ ) performing significantly better on average than the Arts education students ( $M = 6.92, SD = 1.56$ ) on the Literature Knowledge measure ( $F(1, 23) = 4.57, p < 0.05, \eta_p^2 = .17$ ), and Art education students ( $M = 8.92, SD = 1.16$ ) outscoring their English peers ( $M = 6.17, SD = 1.70$ ) on the Art Knowledge measure ( $F(1, 23) = 21.43, p < 0.01, \eta_p^2 = .49$ ). However, given the poor reliability of both measures, the interpretation of this finding is extremely tenuous.

**Individual interest.** Participants also completed three measure of individual interest addressing attitudes and behaviors relative to literature and art (included as Appendices C, D, and E, respectively). The three measures were Domain Interest, Poem Activities, and Painting Activities. These measures were adaptations of those developed by Fox and colleagues' (Fox, Alexander, & Dinsmore, 2007; Fox, Maggioni, Dinsmore, & Alexander, 2008; Fox, Maggioni, & Riconscente, 2005). In their original forms, the measures were Domain Interest, Reading Activities and History Activities scales. Fox demonstrated high reliabilities for all three measures in both undergraduate and expert samples ( $\alpha$  ranging from 0.77 to 0.92). Adaptations in the current study involved a) eliminating the History Activities scale, b) changing *reading* to *literature* throughout with appropriate examples, c) adding two items in the adapted Literature Activities scale to reflect teaching literature and engaging in literary criticism, d) collapsing *Visit bookstores* and *Visit libraries* into a single item on the Literature Activities scale, e) creating an Art Activities scale in parallel to the Literature Activities scale, f) and removing the word “not” from the reverse-coded items.

The Domain Interest measure included 20 items probing attitudes toward four domains: Literature, History, Science, and Art. The Domain Interest scale directed participants to rate their interest (i.e., *Reading literature is really important to me.*) on a five-point Likert scale from Strongly Disagree to Strongly Agree. The Cronbach's alpha coefficient reliability for this measure in the current sample was high ( $\alpha = 0.83$ ).

The Poem and Painting Activities scales included 15 parallel self-report items that probed frequency of participation in domain-related everyday (e.g., *Talk with friends or family about poetry; Talk with friends or family about poetry*) and professional (e.g., *Teach others about poetry; Teach others about poetry*) activities. All items were presented using a five-point Likert scale ranging from Never/Rarely to About Daily. The inclusion of both everyday ( $n = 9$ ) and professional ( $n = 6$ ) activities is consistent with the definition of individual interest in the Model of Domain Learning (Alexander, 2003). The reliabilities of the Poem and Painting Activities measures were also high in this sample ( $\alpha = 0.82$  and  $0.91$ , respectively).

It was expected that the Individual Interest measure would discriminate participants competent from in the domains from those who are not. It was expected, in particular, that English education students would demonstrate higher mean scores on the literature items on Domain Interest scale and more frequent engagement in literature-related activities than the Art Education students. Likewise, the Art education students were expected to show preference for art on the Domain Interest scale and report engaging in art-related activities than the English education sample.

The data bore out these predictions. On the Domain Interest measure, the English education students ( $M = 4.58$ ,  $SD = 0.47$ ) reported significantly higher literature interest

than did the Art education students ( $M = 3.57$ ,  $SD = 1.02$ ;  $F(1, 23) = 6.07$ ,  $p < 0.05$ ,  $\eta_p^2 = .31$ ). Likewise, the Art education students ( $M = 4.92$ ,  $SD = 0.19$ ) reported being more interested in art than did their English education peers ( $M = 4.38$ ,  $SD = 0.56$ ;  $F(1, 23) = 5.73$ ,  $p < 0.05$ ,  $\eta_p^2 = .31$ ). As well, English students ( $M = 2.10$ ,  $SD = 0.58$ ) reported engaging in significantly more frequent poetry-related activities than did Art students ( $M = 1.44$ ,  $SD = 0.50$ ;  $F(1, 23) = 9.40$ ,  $p < 0.05$ ,  $\eta_p^2 = .28$ ); while Art education students ( $M = 2.72$ ,  $SD = 0.47$ ) reported engaging in painting-related activities more frequently than did their English education peers ( $M = 1.70$ ,  $SD = 0.46$ ;  $F(1, 23) = 31.84$ ,  $p < 0.05$ ,  $\eta_p^2 = .57$ ).

### Comprehension Processes

Participants reported their comprehension processes through an offline and an online measure. As discussed previously, both offline and online measures are widely considered valid indicators of the comprehension processing (e.g., Veenman, 2005). In this study, measures were analyzed using a verbal protocol analysis (Ericsson & Simon, 1993; Pressley & Afflerbach, 1995) and inter-rater reliability was determined at the level of the resultant coding schemes and between coding schemes.

**Offline.** Participants completed an open-ended, self-reported, prospective measure of comprehension processes for the poem and painting tasks, respectively. In particular, participants received the following verbal directions before beginning the poem comprehension task (similar instructions were given for the painting comprehension task):

*In a moment, you will receive a poem. You will have a few minutes to study it using any method you choose with the goal of understanding it as best you can.*

*The study period will be untimed. Afterward, I am going to test your comprehension of the poem. What things are you going to do to help you comprehend the poem so that you can be successful on the test?*

Participants were asked to write down their anticipated poetry comprehension processes. The directions were repeated in writing on the measure.

**Online.** Participants engaged in four think-aloud protocols in order to provide real-time reports of their comprehension processes in relation to the poem and painting, respectively. In particular, for both the poem and painting conditions, participants were directed to think aloud at two time points: while studying the composition and again during completion of the comprehension measure. They also participated in a think aloud practice session using a math computation problem prior to engaging in the studied think aloud sessions. Audio recordings were made of all think aloud protocols.

**Think aloud during the study phase of the tasks.** Participants were directed to think aloud while studying the compositions. Specifically, participants received the following verbal directions before beginning the painting comprehension task (similar instructions were given for the poem comprehension task):

*In a moment, I will show you a painting and I would like for you to study it. While you are studying the painting, I would like you to talk out loud so I know what you are doing, thinking, and feeling. Imagine that you are turning up the volume of your thoughts and emotions as you exploring the meaning of the painting, and say anything and everything that is happening. Don't censor your activities, thoughts, or feelings, even if it seems silly. If you are not saying anything for longer than five seconds, I will remind you to talk out loud. Do you*

*have any questions about how to think and feel out loud? Now, I am going to ask you to talk out loud while you study the painting and explore its meaning. After you are finished studying it, I will test your comprehension of the painting. Let me know when you are finished.*

These think-aloud directions were developed in consideration of three criteria: purpose, neutrality, and emotional response. First, participants were directed to *study* the compositions (versus *enjoy* or *look at* or other more general term), as this has been shown to increase text comprehension processing in think-aloud contexts (van den Broek, Lorch, Linderholm, & Gustafson, 2001). Second, according to Pressley and Afflerbach (1995), neutral think-aloud directions are more defensible than directions the prompt particular process, particularly in cases like the current study, in which the goal is to learn about the processes that people naturally use in poem and painting comprehension context. Thus, the directions in the present study were neutral. Finally, Eva-Wood (2004) demonstrated that, when reading poetry, individuals directed to voice their thoughts *and* feelings in a think aloud context identified more poetic devices, expressed greater interest, made more elaborative comments, and demonstrated deeper understandings of the poems than those who were directed only to think out loud. As emotion is also perceived as critical to interpreting paintings (Barrett, 1994), and in an effort to maximize the range of processes articulated in the study, participants were likewise directed to express their thoughts and feelings in both poem and painting think aloud protocols.

**Think aloud during completion of the comprehension measures.** Participants were also asked to think aloud while completing the comprehension measure under the assumption that additional comprehension processes not articulated during the study task

might be elicited. Specifically, participants were given the following directions prior to receiving the painting comprehension measure (similar instruction preceded the poem comprehension measure):

*In a moment, I will give you the painting test. While you are completing the test, I would like you to continue to talk out loud so I know what you are doing, thinking, and feeling as you read and respond to the questions.*

### **Comprehension Outcomes**

Participants also completed measures of comprehension outcomes in the poem and painting conditions (appended as F and G, respectively). These parallel measures each contained four multiple choice and two constructed-response questions. The multiple-choice items required participants to integrate or interpret information in the compositions (for a discussion of integration/interpretation items, see National Assessment Governing Board, 2011). For instance, the poem and painting comprehension measure included the following items, respectively:

What best describes the symbolism of the bird in the poem?

- A. Artistic inspiration
- B. Freedom
- C. Peace
- D. A dream state

What best describes the symbolism of the birds in the painting?

- A. Artists' relations to their work
- B. Relations among family members
- C. The cycle of life
- D. Interpretive layer between the artist and the audience

In contrast, the constructed response addressed participants' critiques or evaluations of the compositions (for a discussion of critique/evaluation items, see

National Assessment Governing Board, 2011). For example, participants were asked to respond to the following constructed-response prompts:

Do you think the title of the poem "To Paint a Bird's Portrait" is a good title for the poem? Explain why or why not using evidence from the poem.

Do you think the title of the painting "The Creation of Birds" is a good title for the painting?  
Explain why or why not using evidence from the poem.

The format of the comprehension measures reflects the format of the 2011 NAEP reading tests for 12<sup>th</sup> grade (National Assessment Governing Board, 2011). NAEP reading was chosen as a model because the construction of its framework and items follows a complex and highly rigorous process, including a number of domain experts.

The poem and painting comprehension outcome measures were reviewed by experts in Western literature and visual art, respectively, for accuracy and appropriate complexity for the sample. However, the participant's' responses on these measures were not analyzed in the current study.

### **Demographics**

Participants also completed a general background questionnaire directing them to self-report their sex, age, race, majors, minors, year in school, current grade point average, and whether or not they are native English speakers (appended as Appendix H). These demographic data were collected for descriptive purposes only; no attempt was made to address the relation between these data and comprehension processes in the study.

## Materials

The materials for the study included the poem and painting about which the participants generated comprehension processes. The poem and painting were chosen for the study because they both a) reflect a shared surface similarity (i.e., painting birds) as well as a potentially-inferable universal theme (i.e., the creative process), thus minimizing the impact of dissimilar prior knowledge on the comprehension processes; b) are appropriately complex for the participants' level of expertise, thus limiting a floor or ceiling effect in these data, as cautioned by Pressley and Afflerbach (1995); and c) were predicted to be novel to the participants, thus eliciting authentic comprehension processes unimpeded by prior conceptions about the compositions. For these reasons, the compositions were expected to be parallel.

### Poem

The poem used in the study was *To Paint a Portrait of a Bird* by Jacques Prévert (1946), translated into English from the original French verse (Michaud, 2011). The poem is included as Appendix I. When read at the surface, the poem describes a series of directions for painting the picture of a bird. However, Fey (1949) suggests that a deeper examination of the composition reveals Prévert's credo of art-making. The nature of poetry suggests, however, that multiple interpretations are plausible. The poem was presented to the participants on one side of an 8 ½ x 11 inch sheet of paper with line numbers.

### Painting

The painting used in the study was *The Creation of Birds* by Remedios Varo (1957). The painting is included as Appendix J. This surrealist style painting depicts an

owl-human artist painting a bird using paint excreted by a vaguely technical object and a drawing utensil connected to a stringed instrument embedded in the artist's chest. As well, the artist is holding a prism through which light streams from an open window, seemingly bringing the painted bird to life. According to Kaplan (1980), in this painting Varo examines the interplay of science, nature, and divinity in the creative process. Again, however, as with the poem, other interpretations are plausible.

The painting was presented as a full-color print and re-sized to fit a standard 8 ½ x 11 inch sheet of paper. The title of the work, artist, and year of publication were included with the painting. Even though the painting was a reproduction, previous research suggests that this does not impact participants' analysis (Locher, Smith, & Smith, 1999).

### **Procedure**

English and Art education majors meeting the inclusion criteria were recruited through their respective departments. Participants completed the approximately 45-minute long study in one session in a laboratory setting and were compensated for their participation with a \$15 gift card to a popular retailer.

Upon arrival at the study site, participants completed consent forms, demographic questionnaire, and individual interest and subject-matter knowledge measures. Then, participants completed the offline comprehension process measure for one composition (e.g., painting), engaged in the think-aloud practice session, the measured think aloud, and completed the comprehension outcome measure while continuing to think out loud. This process was repeated with the other composition (i.e., poem). Finally, participants

were asked if they had questions related to the study, and were thanked, given their gift card, and dismissed.

Prior to engaging in the think aloud for each composition, participants were asked if they are familiar with the composition. No one indicated familiarity either composition. After each think aloud, but before giving them the comprehension measure, participants were also asked if the composition reminded them of another painting or poem. With this prompting several participants indicated some associations to other compositions that they did not voice in the think aloud context. These responses were retained, but not analyzed in the current study.

English and Art education participants were counterbalanced across condition (i.e. poem-painting or painting-poem) and all verbalizations during the think-aloud portion of the study were audio recorded.

Table 4

*Amount of Time Spent Studying the Poem and Painting by Major*

|                   | Poem     |           | Painting |           |
|-------------------|----------|-----------|----------|-----------|
|                   | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| English Education | 607      | 175       | 494      | 278       |
| Art Education     | 490      | 442       | 338      | 234       |

*Note:* Time data given in seconds.

Participants spent relatively long periods of time studying the compositions in an effort to comprehend them. Descriptive data for the time spent during the study is provided in Table 4. On average, participants spent 9.14 minutes studying the poem (range of 3.43 to 29.67 minutes) and 6.93 minutes studying the painting (range 3.10 to

19.38 minutes). While this amount of time might appear short to those familiar with narrative and expository text think aloud studies, it is important to keep in mind that poem was fairly short, at only 242 words. As well, paintings do not have the same temporal aspects as text, and thus are not surprisingly shorter in duration. Moreover, in comparison to viewing time in museum contexts, the time participants spent studying the paintings in the current study was quite long. A study by Smith and Smith (2001) found that visitors to the Metropolitan Museum of Art spent an average of 27.2 seconds viewing artwork in the Museum's collection, with a median view time of 17.7 seconds. In light of this finding, the roughly seven minutes spent on the paintings suggests that, on average, these participants took considerable time on the comprehension activities.

The range of these data is also noteworthy, in that there was a wide variability in the amount of time participants spent studying the compositions. Anecdotal evidence does not suggest that time was related to competence. Rather, this variability appears to be an individual difference factor that is more likely related to situational interest, talkativeness, or preference for challenge.

### **Data Analysis**

In order to answer the research questions, the data from the offline and online comprehension process measures were analyzed and checked for reliability.

#### **Offline Measures of Comprehension Processes**

Data analysis for the offline comprehension measures entailed an iterative protocol analysis involving several steps reflecting common practices in verbal protocol analyses (Ericsson & Simon, 1993; Pressley & Afflerbach, 1995). First, participants' written statements were parsed into thought-units (i.e., t-units) by the author. A t-unit is

an independent clause and all of the subclauses and phrases that accompany it; that is, the shortest grammatically allowable sentence (Hunt, 1965). T-unit analyses are widely used in protocol analyses of verbal and written data (e.g., Ackermann, 1990). Transcripts revealed an average of 5.83 poem t-units and 6.38 painting t-units per participant.

Second, *a priori* coding schemes for poem and painting comprehension were developed using information gathered from the literature. Next, these coding schemes were applied to a random sampling of 20% of the poem and painting offline measures and revised in light of emerging *post hoc* trends in these data. This process iterated using additional 20% random samplings of these data until the coding scheme reached saturation.

At scheme saturation, the author created code books for poem and painting comprehension processes, respectively, including the codes, descriptions of each code, and three sample statements. Using the code books, two research assistants (one each for poem and painting) were trained on the coding scheme and a reliability-retraining process occurred in which the author and the research assistant independently coded a random sampling of 20% of these data until  $k > 0.75$  reliability was achieved. Then, both raters coded an additional random sampling of 20% of the data to confirm reliability. At this point, the author independently coded the remainder of the dataset.

Final reliability statistics, determined with the second random sampling of 20% of the data, were  $k = 0.92$  for the Predicted Poem Comprehension measure and  $k = 0.93$  for the Predicted Painting Comprehension measure, assuming 24 potential codes per composition.

### **Online Measures of Comprehension Processes**

As with the offline comprehension measures, data analysis for the online comprehension measures entailed a multistep, iterative protocol analysis reflecting common practices in verbal protocol analyses (Pressley & Afflerbach, 1995). First, recordings of these data were transcribed verbatim and parsed into t-units by the author. Transcripts revealed an average of 102.79 poem t-units and 82.46 painting t-units per participant during the study portion, and 92 poem t-units and 82.96 painting t-units per participant during the test portion. Second, the think aloud protocols were divided into two sections: study and test. The study section of the transcripts captured participants' language uttered while studying the compositions and the test section reflected their utterances during the comprehension test portion of the protocol. With regard to the test portion, the author limited the analysis to language suggesting the participant was attempting to comprehend the poem or painting, not the measure itself. For example, statements like "Okay. This question has four answer choices" were isolated in the transcripts and not subsequently analyzed.

Next, *a priori* coding schemes for poem and painting comprehension were developed using information gathered from the literature; these schemes were the same as those used to analyze the offline comprehension process data. Fourth, these coding schemes were applied to a random sampling of 20% of the poem and painting think-aloud study transcripts, respectively, and revised in light of emergent *post hoc* trends in these data. This process iterated using additional 20% random samplings of the study transcripts until the two coding schemes reached saturation. Then, the two schemes derived from the study portion of the transcripts were applied to the test portion of the

transcripts. During this process, no comprehension process codes were found to be particular to the test portion of the transcripts for either poem or painting; that is, the test portions did not reveal any comprehension process not already identified in the study portions.

At scheme saturation, the author created code books for poem and painting comprehension processes, respectively, including the codes, descriptions of each code, and three sample statements. Using the code books, two research assistants (again, one each for poem and painting) were trained on the coding scheme and a reliability-retraining process occurred in which the author and the research assistant independently coded a random sampling of 20% of these data until  $k > 0.75$  reliability was achieved. Then, both raters coded an additional random sampling of 20% of the data to confirm reliability.

At this point, the author independently coded the remainder of the dataset and determined the frequency of the observed comprehension processes for the study portion of the data only. The frequency of comprehension processes during the test portion was not pooled with those identified in the study portion, because the nature of the test questions appeared to have influenced the types of comprehension processes used by participants. As such, pooling the data for both portions would have artificially inflated the frequency of some processes over others.

Final reliability statistics, determined with the second random sampling of 20% of the data, were  $k = 0.81$  for poem study,  $k = 0.86$  poem test,  $k = 0.86$  for painting study, and  $k = 0.89$  for painting test, assuming 24 potential codes per composition.

### **Degree of Overlap between Poem and Painting Comprehension Processes**

At the completion of data analysis relative to the offline and online measures, the author pooled, by composition, the comprehension processes identified in the offline and online measures, and created a Poem and a Painting Comprehension Processes code book reflecting the verified coding schemes. These code books included the names and descriptions of the poem and painting comprehension processes subprocesses identified before, during, or after studying. As well, the code books included two example statements per comprehension subprocess.

At this point, a third data analytic procedure was undertaken at the comprehension subprocesses level to determine the degree of overlap between the final Poem and Painting Comprehension Processes coding schemes, so as to answer the research questions guiding the study. In this effort, both code books were temporarily altered: names of each code were blanked out, so that only the descriptions of the 48 codes (i.e., 24 poem comprehension subprocesses and 24 painting comprehension subprocesses) and sample statements remained. As well, codes in the Painting Comprehension Processes code book were randomly reordered to eliminate order effects.

The altered code books were then given to a doctoral student in the Department of Human Development, Learning, and Quantitative Methodology who was familiar with the nature of the study and with the TSC framework broadly, but not with the identified comprehension subprocesses in the study or with the coding schemes. As well, the independent rater was given criteria for identifying trans-symbolic and symbol-specific comprehension processes. Specifically, she was told to identify as TS codes that that appeared to “overlap” the two coding schemes and did not seem to rely heavily on

language or visual display. Likewise, she was told to identify as SS codes that appeared to not have correlates in the other scheme because they were heavily reliant on language or visual display. In so doing, the independent described each of the 48 codes as either TS for trans-symbolic or SS for symbol-specific. Of the 48 potential codes, the independent rater correctly identified 46. This translated into a reliability of  $k = 0.86$ , when assuming 31 possible correct designations: 17 trans-symbolic (i.e., the same 17 codes for both compositions) and 14 symbol-specific codes.

## CHAPTER FOUR: RESULTS

Data analytic efforts resulted in the identification of comprehension processes associated with the poem and the painting, as well as a number of manifestations of these processes. For clarity, manifestations of the comprehension processes are termed subprocesses throughout. This chapter presents the identified poem and painting comprehension processes and subprocesses descriptively and numerically, and then examines them in light of the three research questions guiding the study. Specifically, commonly observed poem and painting comprehension processes and subprocesses are compared with predictions from literatures on poem and painting comprehension and the Trans-Symbolic Comprehension framework. As such, this chapter is organized into six sections: commonly-occurring poem comprehension processes and subprocesses, commonly-occurring painting comprehension processes and subprocesses, trans-symbolic comprehension processes and subprocesses, poem-specific subprocesses, painting-specific subprocesses, and synthesis of findings.

### **Commonly-Occurring Poem Comprehension Processes and Subprocesses**

As presented previously in Table 1, a number of predicted poem comprehension processes was discerned from the literature, including connecting to prior knowledge, inference-generation, synthesizing, responding emotionally, evaluating, using the poem's title, interrogating the author's purpose, drawing conclusions (e.g., symbolism, mood/emotion of the poem, or historical implications), intertextuality, identifying multiple perspectives, identifying literary and stylistic devices, identifying and using text genre and structure, and predicting, among others. These poem comprehension processes were used to predict the processes that would be observed in this study.

Table 5  
*Commonly Observed Poem Comprehension Processes and Subprocesses*

|  |   |
|--|---|
| <i>Rereading Text</i>                            | <i>Inferring and Interpreting From Relevant Knowledge</i> |
| Rereading  | Poem-Specific Features                                    |
| Paraphrasing                                     | Other Compositions  |
| <i>Observing</i>                                 | Literary Devices  |
| Structure  | Rule of Significance                                      |
| Punctuation                                      | General Prior Knowledge                                   |
| Text Features                                    |   |
| <i>Activating Prior Knowledge</i>                | <i>Responding to the Poem</i>                             |
| General Knowledge                                | <i>Monitoring Comprehension</i>                           |
| Intertextual Knowledge                           | Overall   |
| Literature Knowledge                             | Local or Aspect-Specific                                  |
|  | Being Efficacious   |
| <i>Inferring and Interpreting About the Poem</i> | <i>Planning</i>   |
| Characters, Actions, Context, or Relations       |   |
| Local Meaning                                    |   |
| Overall Meaning, Theme, or Purpose               |   |
| Aspect-Specific Symbolism                        |   |
| Mood   |   |
| Author   |   |

---

*Note.* The eight comprehension processes are in italics to distinguish them from the 24 subprocesses.

Analysis of participants' transcribed offline and online comprehension measures revealed many of these predicted poem comprehension processes, as well as processes that were not evidenced in previous studies. Specifically, as shown in Table 5, participants frequently engaged in eight observable poem comprehension processes, encompassing 24 subprocesses. The eight poem comprehension processes were rereading, observing, activating prior knowledge, inferring and interpreting about the poem, inferring and interpreting from relevant knowledge, monitoring comprehension, responding to the poem, and planning. These eight commonly-observed poem

comprehension processes and their associated subprocesses are presented here descriptively and numerically.

### **Descriptive Findings of Poem Comprehension Processes**

Definitions and examples of each of the eight frequently observed poem comprehension processes and the 24 subprocesses are provided in Table 6.

**Rereading.** Protocol analysis revealed that participants went back to the text after initially reading it to either reread or paraphrase portions of it. Rereading text occurred throughout the study portion and test portion of participants' think alouds. Plans to reread text were also revealed in the prospective, offline measure.

Rereading and paraphrasing efforts seemed to occur for several reasons during and after studying. Paraphrasing often occurred immediately following the initial reading or reading of text, likely in an effort to hold those portions in memory or to translate them into different words for increased comprehensibility. Both rereading and paraphrasing statements also seemed to relate to clarifying and verifying interpretations, particularly during the study portion. For example, some participants made statements indicating a breakdown in comprehension and immediately followed this monitoring statement with instances of rereading or paraphrasing, seemingly in an effort to clarify their misunderstanding. Likewise, some participants reread or paraphrased text after making an inferential or interpretive statement, perhaps in an effort to verify their emerging comprehension.

Instances of rereading and paraphrasing text found in this study are in line with previous research of poem comprehension processes (Peskin, 1998; Shimron, 1980).

Table 6

*Commonly Observed Poem Comprehension Processes and Subprocess with Definitions and Example Statements*

| <u>Rereading Text</u>  |   |
|--|---|
| Rereading<br><i>Reading verbatim from the poem text that has been previously read.</i>   | “Wait. Wait years if need be.”<br>“Gently shut the door with the brush. Then paint out the bars one by one.”              |
| Paraphrasing<br><i>Paraphrasing parts of the poem into more familiar terms.</i>  | Okay, so the first thing you’re going to do is paint the cage with something nice in it.<br>So, first paint the cage.     |
| Observing Structure<br><i>Noting structural characteristics of the poem.</i>   | My first thought is that [the poem] is really long.<br>I’m noticing a similar structure: something, something, something. |
| Punctuation<br><i>Noting punctuation characteristics of the poem.</i>  | Looking at it, there’s very little punctuation.<br>“Don’t move” has an ellipsis on it.                                    |
| Text Features<br><i>Reading aloud text features of the poem (e.g., title, author, year of publication, dedication)</i>         | “To Paint a Birds Portrait” by Jacques Prevert.<br>“Elsa Henriquez”   |
| <u>Activating Prior Knowledge</u>  |   |
| General Knowledge<br><i>Activating general prior knowledge, but not observably using that knowledge to infer or interpret.</i> | This reminds me that cicadas are going to be here again. Ugh<br>“Elsa Henriquez”...maybe Spanish?                         |

**Intertextual Knowledge**

*Activating prior knowledge of other compositions, but not observably using that knowledge to infer or interpret.*

Oh, another bird one.  
I've read poems about birds before.

**Literature Knowledge**

*Activating literature-related prior knowledge (including knowledge of poetry), but not observably using that knowledge to infer or interpret.*

It's not a sonnet—too long.  
Maybe the bird theme happens a lot [in poetry].

**Inferring and Interpreting About the Poem****Characters, Actions, Context, or Relations**

*Making inferences about the state of the characters or actors in the poem or the state of the world depicted.*

“Gently shut the door with the brush.” So we are trapping it.  
Okay, the painter is in a forest, maybe.

**Local Meaning**

*Constructing interpretations of parts of the text.*

[Reads lines.] Maybe its saying that people get so focused on the end results that everything just becomes a means to that end.  
[Reads lines]. It's like working backwards. You paint the cage first then the bird goes in it. And then you paint away the cage so you just have a bird next to a tree.

**Overall Meaning, Theme, or Purpose**

*Constructing holistic or thematic interpretations of the poem.*

I feel like the author is saying that there are certain things that, as an artist, you should work so hard to replicate. Instead, just appreciate it and enjoy it. There is omnipresence in the poem. By that, I mean a God presence, inventing and the role of nature's inventor.

**Aspect-Specific Symbolism**

*Identifying symbols or symbolic language and translating the meaning of the symbols.*

The bird is the idea. And you have to let the idea come to you. You have to be open to ideas.  
So you can take out one of my feathers and you can make me your own by putting your name in the corner of the painting, which is our life together.

|   |   |
|---|---|
| Mood<br><i>Constructing interpretive conclusions based on a generalization of the mood, atmosphere, or tone portrayed in the poem.</i>            | This is all feeling very sinister-like.<br>I feel like a tonal shift occurs, right here.  |
| Author<br><i>Constructing interpretive conclusions based on the poet's perceived purpose, goal, or character.</i>                                 | I think the poet is very hopeful that his [inspiration] will come and will wait years for it to come to him.<br>Maybe the author has some kind of confinement issue.  |
| <u>Inferring and Interpreting from Relevant Prior Knowledge</u>   |   |
| Poem-Specific Features<br><i>Constructing interpretive conclusions based on text features (e.g., author, year of publication, dedication)</i>     | So Elsa must be the painter. Or maybe the bird?<br>Usually you only see a poem that's dedicated to someone if it's a love situation.  |
| Other Compositions<br><i>Constructing interpretive conclusions based on other compositions.</i>   | So this line kinda matches the painting I just looked at, in that the artist is kind of interacting with his painting very literally. It was portrayed that way—very literally—in the painting, too.<br>Birds in a cage reminds me of Maya Angelou. But this doesn't seem like it has to do with slavery or putting people in a cage. |
| Literary Devices<br><i>Constructing interpretive conclusions based on literary or poetic devices used in the poem.</i>                            | The author is using imagery to communicate the idea of capturing a moment or capturing something.<br>The meter of the poem is very short, succinct lines. It's kind of elongating things in a way. That symbolizes the way you have to wait for the bird for so long.   |
| Rule of Significance<br><i>Constructing interpretative conclusions based on the perception that everything included in the poem is important.</i> | Okay, so what comes at the end has to be important.<br>Now I'm starting to think that I'm reading much more into this—the guy could just be talking about painting a bird—because I think I should be.  |

|   |  |
|---|--|
| <p>General Prior Knowledge<br/><i>Constructing interpretive conclusions based on general knowledge, including general literature knowledge.</i></p> | <p>A lot of times artists hit brick walls, either with individual paintings or with their work as a whole.<br/>Think of like important people having to sit there just hours having their portrait painted. Can't move, can't be very much fun. Maybe it's about how people sitting having their portrait painted is like sitting in a cage, and then you paint away the cage.</p> |
| <p><b>Responding</b></p>  |  |
| <p><i>Reacting or responding to the poem, both from evaluating and affective stances.</i></p>   | <p>I think [the perceived message of the poem] is cute.<br/>The author does a great job with the imagery in this section. I feel like I'm there.</p>   |
| <p><b>Monitoring Comprehension</b></p>  |  |
| <p>Overall<br/><i>Monitoring comprehension of the overall message, theme, or purpose of the poem.</i></p>   | <p>Oh, my gosh! That's [the meaning]!<br/>[Rereads portion of the text.] Okay, that makes me kinda go against everything I just thought about the poem.</p>  |
| <p>Local or Aspect-Specific<br/><i>Monitoring comprehension of the meaning or purpose of particular sections or aspects of the poem.</i></p>        | <p>The repetition...I don't know why he's using it. What does it mean?<br/>"A sign you can sign." Is that a typo? That doesn't make sense to me.</p>   |
| <p>Being Efficacious<br/><i>Expressing belief that the reader will or will not be successful in comprehending the poem.</i></p>                     | <p>It is going to be hard to understand the whole thing.<br/>I'm not an artist, but I have a lot of artist friends. So I think I can figure this out.</p>  |
| <p><b>Planning</b></p>  |  |
| <p><i>Overtly stating behaviors or strategies that the reader plans to use to understand the poem.</i></p>  | <p>Since it makes no sense, I'm gonna have to read [this section] again.<br/>So, I'm going to read straight through and probably get a general idea.</p>   |

**Observing.** Participants made statements revealing that discernible aspects of the poem had captured their attention. Specifically, participants observed the structure of the poem (e.g., the short lines, its length) and its use of punctuation or lack thereof. Instances in which participants read the title, author, year, or dedication line were also recorded as observations.

Observations about the poem occurred before, during, and after studying. In the prospective, offline measure, participants indicated that they planned to note the structure of the poem and its text features, in particular. During the study portion, participants made observations about the poem throughout, but more frequently at the outset. As one question on the comprehension test specifically directed participants to examine the poem for repetitive words, observations about structure were noted in the test portion of these data. The identification of observations in these data is in line with previous research on poem comprehension (e.g., Peskin, 1998, 2010).

**Activating prior knowledge.** Participants made statements reflecting an effort to activate prior knowledge with respect to the poem, but did not observably generate an inference or interpretation from that activation. Three types of prior knowledge activation were evidenced, related to general knowledge, literature knowledge, and intertextual knowledge. In making these distinctions, unless a knowledge-activation unit was focused on literature knowledge or intertextual knowledge, it was coded as general. For instance, one participant observed, “This is not a sonnet—too long.” This statement was coded as activating literature knowledge, because it specifically referenced poetry. Likewise, in instances when participants stated that they were thinking about the painting they had just seen, but did not go on to identify how the poem and painting were

related, these statements were coded as activations of intertextual knowledge. However, statements like “This reminds me that cicadas are going to be here again. Ugh,” which did not reference literature or another composition, were coded as general knowledge activation.

In determining whether a statement was coded in the activation category rather than in an inferring and interpreting category, it was necessary to look at the statement in context, usually across t-units. For example, when taken alone, the t-unit “Birds in a cage reminds me of Maya Angelou,” appears to be an activation of prior knowledge. However, in its full context, this statement is better described as the source of an inference (i.e., coded as inferring and interpreting from literature knowledge): “Birds in a cage reminds me of Maya Angelou. But this doesn’t seem like it has to do with slavery or putting people in a cage. So the bird must be symbolizing something else.” It was therefore essential to consider t-units in context with one another to determine if an activation statement, versus another comprehension process, was present.

Activations occurred primarily in the study portion of the transcripts, with few activations observed during the test period and no activating statements identified in the offline, prospective measure. This is likely due to the fact that activations were defined here as being divorced from inferential and interpretive efforts. As such, it would not be expected that participants would plan to merely activate prior knowledge before studying.

For the same reason, the activation code as used here is not reflected in previous poem comprehension studies. Generally, previous studies presumed that activation of prior knowledge is componential of efforts to use that knowledge to infer or interpret.

However, these data reveal instances in which that does not occur or, at least, the relation between the activated knowledge and interpretive efforts was not observable.

**Inferring and interpreting about the poem.** Participants made statements that seemed to reflect an effort to meaningfully and reasonably relate portions of the poem one another and with relevant prior knowledge. These efforts were considered inferences and interpretations about the poem and occurred before, during, and after studying it. Six types of inferences or interpretations were commonly observed in these data, relating to generating inferences about the nature of what was being described in the poem (i.e., characters, actions, context, or relations), interpreting the meaning of brief sections of the poem, identifying and interpreting symbols or symbolic language, interpreting the overall meaning or message of the poem, making inferences or suppositions about the poet, and interpreting the mood or tone of the composition. These inferential and interpretive statements were distinguished from prior knowledge activations by their role in an observable meaning-making effort.

Often, inferences and interpretations were followed by rereading or paraphrasing. For example, the following section of a transcript suggests that the participant is asserting her idea that the overall message of the poem is a life lesson.

I think that it's more of an instruction on how to live better than it is anything else. The way the directions are set up: "To paint likewise the green leaves and fresh breeze the sun's scintillation and the clamor of crickets," the alliteration. It kind of makes you really think about the small things that might be important to a bird, or important in life that you don't pay attention to. So I definitely think that

this poem has a lot of meaning on how to be patient, and respect the small things in life, and to recognize the beautiful things.

In this section, the participant makes an inferential statement and rereads and paraphrasing portions of the poem in an effort to verify her assertion. This pattern was evidenced many times in the study and test transcripts. However, again, this pattern was only evident when considering groups of sequential t-units. The finding that participants made inferences and interpretations about the poem is in line with previous literature on poem comprehension processes (e.g., Earthman, 1992; Eva-Wood, 2004; Hemphill, 1999; Peskin, 1998, 2010; Shimron, 1980).

**Inferring and interpreting from relevant knowledge.** In coding the referents of the inferences and interpretations (i.e., inferring and interpreting *about* the poem), several knowledge or experiential sources were also commonly discernible. As such, instances when participants overtly stated the source of their inferences and interpretations were coded in these data. Participants were found to infer and interpret from five sources: poem-specific features (e.g., author, year of publication), other compositions (most commonly the painting), literary elements in the painting (e.g., figurative language), a perceived rule of significance, and general prior knowledge. As with the Inferring and Interpreting *About* code, general knowledge was only coded as such if the stated source was not poem-specific features, other compositions, literary elements, or a perceived rule of significance. As well, multiple t-units were often necessary to determine instances when participants overtly noted the source of their inference or interpretation.

Frequently, participants attempted to coordinate their interpretations of the poem and the painting. For example, a participant who saw first the painting said,

I was thinking it was kind of like the process of painting something, but I don't think that's necessarily it. I definitely think that my mind is trying to relate what I just saw in the painting with what I'm reading now. I'm wondering because they've both been preselected if there is some kind of correlation? If I'm supposed to come to this correlation. Like if I read the poem first, I might have a different opinion of what the poem is than having seen the painting first.

This effort was not unexpected; indeed, compositions were counter-balanced in an effort to mitigate the influence of one composition over the other.

Statements in which participants' attempted to infer or interpret, but were unsuccessful, were also coded in this category. Unsuccessful interpretations from relevant knowledge were most frequently noted with respect to poem-specific features. Participants appeared very frequently to try to activate knowledge about the poet and the year of publication, in particular, but were unable to do so because they did not have the requisite knowledge. For example, at the start of the study period, a participant stated, "I'm trying to look at the author, who I don't recognize," and later, during the middle of the study period, said again, "I wish I knew something about the author." Despite the unsuccessful nature of this attempt, it was coded as an inference or interpretation from poem-specific features, because the participant was clearly making an effort to do so. While this statement could have been coded as an unsuccessful activation, rather than an unsuccessful inference, it was assumed that participants were attempting to activate poem-specific knowledge for the purpose of interpreting the poem. As such, this class of statements was coded in this category.

It is important to note, however, that the sources of a participants' inference or interpretation were not always overtly stated. If a participant did not expressly indicate that source, it was not coded; that is, not every inferences or interpretation *about* the poem received a *from* code. Additionally, as with other codes, statements in which participants observably made an inference or interpretation from relevant knowledge was often only discernible by looking across t-units.

As with the previous section, the finding that participants made inferences and interpretations about the poem from relevant knowledge is in line with previous literature on poem comprehension processes (e.g., Earthman, 1992; Eva-Wood, 2004; Hemphill, 1999; Peskin, 1998, 2010; Shimron, 1980). However, the grouping made here, discriminating between inferring and interpreting about the poem and from relevant sources is not made elsewhere; the *about* and *from* designations are combined in previous research.

**Responding to the poem.** This code reflected statements in which participants responded to the poem, either from an aesthetic-evaluative or an affective stance. For example, "The author does a great job with the imagery in this section. I feel like I'm there," revealed the participants' aesthetic-evaluative effort, while the statement, "I think [participant's interpretation of the overall meaning of the poem] is cute," appeared to be sourced from the participant's emotions. These two types of responses were collapsed into a single code, however, because the source of many of the participants' responsive comments was unclear. For instance, while "This poem is really interesting!" was clearly codable as responsive, without further explanation from the participant, it was impossible

to determine whether the interestingness of the poem was due to its literary qualities or reflected an emotional response by the reader.

Often, responsive statements were made by participants at the very beginning of the study period, perhaps representing their initial impression of the composition, or toward the end of the study period, signaling their overall assessment of its quality or its pleasantness. As well, participants responded to the poem during the test portion, usually in relation to questions about the meaning of its overall meaning. However, there were very few instances wherein participants planned to respond to the poem before reading it, as evidenced by infrequency of responsive statements in the prospective, offline measures.

The identification of responsive statements in these data reflects previously identified poem comprehension processes in the literature (e.g., Eva-Wood, 2004; Hemphill, 1999; Peskin, 1998).

**Monitoring.** Participants' statements also revealed that they were monitoring the degree to which they understood the meaning of the poem, both globally and locally, and had perceptions about their ability to comprehend it. In these data, participants made positive monitoring statements about their emerging understanding of the poem or its component parts (e.g., "Oh, that's what that means!") and negative monitoring statements noting comprehension breakdown ("A *sign you can sign*. Is this a typo? That doesn't make sense to me."). This occurred at the level of the poem overall (e.g., "Okay, [the portion of text just read] makes me go against everything I just thought about the poem."), as well as for portions or specific aspects of it (e.g., "The repetition...I don't know why he's using it. What does it mean?").

Global and local monitoring statements occurred at all points in the study portion of transcripts—upon initially seeing the poem or early on in the initial reading of it, during the middle of the study period, and at the end of the study period, at which point individuals often made conclusions about their global understanding of the poem. As well, participants overtly monitored their comprehension in the test portion, most often in response to the questions assessing the poem’s overall meaning and purpose. However, there were no examples of global or local monitoring statements in the prospective, offline comprehension measure, suggesting that participants did not consider monitoring comprehension to be essential to understanding the poem, or at least did not think to say so.

Protocol analysis also revealed instances in which participants voiced beliefs about their ability to comprehend the poem. For instance, after observing the length of the poem, one participant predicated, “It is going to be hard to understand the whole thing.” Most of the time, these statements revealed the concern that participants would not be successful in their comprehension efforts. These type of statements are described here as efficacious, as they appear to be in line Bandura’s (1997) notion of self-efficacy, which he defined as “individuals’ confidence in their ability to organize and execute a given course of action to solve a problem or accomplish a task” (p. 3). In this case, the task was the successful comprehension of the poem.

Efficacy statements occurred solely in the study portion of the transcripts. Participants did not plan to be efficacious, as revealed by the prospective, offline measure, and they did not note their perceived abilities or inabilities in the test portion. During the poem study portion, efficacy statements occurred primarily at the outset,

before or early on in the initial reading of it. However, there were a few instances of efficacy assessments during the middle portion of the study period, usually following a monitoring statement, in which participants noted their difficulties with comprehending the poem.

Previous studies of poem comprehension processes have identified instances of global and local comprehension monitoring (Peskin, 1998; Shimron, 1980), so this finding is in line with predictions from previous research. However, the finding that participants were efficacious with respect to comprehending the poem in these data represents another possible extension of the poem comprehension literature; no previous studies have identified efficacy statements in the context of poem comprehension, despite the fact that perceived self-efficacy has been shown to be a predictor of text comprehension success (Oddney, 2011).

**Planning.** Participants also made statements revealing plans and efforts to use strategies to understand the poem, before, during, and after studying it. For example, one participant, upon monitoring a comprehension breakdown, stated, “Since this makes no sense, I’m gonna have to read [this section] again.” These planning statements occurred at several different points. Of course, the prospective, offline comprehension measure was designed to elicit planning statements, as participants were directed to articulate what they *planned* to do to help them understand the poem. During the study period, planning statements often occurred prior to beginning to read the poem, when participants vocalized their expectations for what they were going to do to understand it. Planning statements were also made in the middle of the study period and during the test portion,

often immediately following a monitoring or inferential statement. For example, one participant made the following series of statements during the study portion:

I feel like the author is saying that there are certain things that, as an artist, you shouldn't work so hard to replicate. Instead of trying to capture it, just appreciate it and enjoy it.... *Sometimes the bird comes quickly but it can just as well take many years before deciding.* That's an interesting line. I feel like I don't know how that exactly fits into the idea of not capturing freedom ,because I'm not trying to capture nature. I don't know I'm not really sure how that fits in. Let's see.

[Rereads 17-19.]

As evidenced, this participant monitored a breakdown in comprehension and then planned a strategy to ameliorate this breakdown.

This pairing of monitoring and planning statements appeared often in the transcripts, both in relation to comprehension failures as in this example, but also with regard to emerging understanding. In the latter case, this manifest as a t-unit indicating the participant had had a comprehension breakthrough, and then made statements revealing the plan to go back and look for evidence in support of the emergent understanding. Again, however, these patterns were only discernible when looking across t-units in the transcripts.

Planning as comprehension process is not explicitly described in previous studies of poem comprehension. However, Peskin (1998) noted that participants would often state confusion or disorientation (i.e., make monitoring statements) and then backtrack, reread, or skip problematic portions of the poem. Thus, this study alludes to planning,

but does not describe it as such. The delineation of planning in this study may, therefore, contribute to the poem comprehension literature.

### **Numeric Findings of Poem Comprehension Processes**

In addition to identifying types of poem comprehension processes, the frequency of their use by participants was also determined, but only with respect to the study portion of these data. This delimitation was made due to the nature of the prospective, offline measure and the nature of the comprehension test. Counting the frequency of planning statements across the offline and online measures was questionable, for example, because all of the statements in the prospective, offline measure were comprehension plans. Indeed, the directions specifically asked participants to identify what they *planned* to do to understand the poem. Moreover, it was unlikely that participants would articulate plans to activate but not use prior knowledge, monitor comprehension, or be efficacious. Likewise, the nature of the comprehension test necessarily cued participants to focus on local and global inferences and interpretations of the poem, artificially inflating the frequency of related statements.

In contrast, the study portion of these data was not similarly cued or constrained, allowing poem comprehension processes to unfold more naturally. Also, all of the 24 subcodes of the commonly-occurring processes were evidenced during the study period; no code occurred only in the prospective measure or in the test portion. For these reasons, frequency counts are constrained to the poem study portion of these data.

The frequencies of rereading and paraphrasing were also not calculated, even in the study portion of these data. This delimitation was made because large portions of the poem were often reread and paraphrases occurred so frequently that the total number of

analyzed t-units would have been artificially inflated. The frequencies and relative proportions of the retained poem comprehension processes and subprocesses occurring during the study portion are presented in Table 7.

These data reveal relatively few activations of prior knowledge, at least in relation to what might be expected (4.23% of t-units). As discussed in the foregoing, however, this was likely due to delimitation of activating prior knowledge for this coding scheme. In comparison, the frequency of participants inferring and interpreting from relevant knowledge was significantly higher (12.04%), suggesting that participants activated and then observably *used* prior knowledge more often than not.

Even more frequently, participants made inferences and interpretations about the poem. Collectively, these subprocesses comprised almost half of the t-units in this analysis (48.63%). Of these, most were directed at understanding localized portions of the poem (e.g., brief sections), symbols and symbolic language, and overall meaning. The relative frequency of these subprocesses may be due to the difficulty of the poem and the considerable effort participants put for the made sense of it. This conclusion is also supported by the high frequency of monitoring statements, which comprised more than 18% of the analyzed t-units.

Table 7

*Frequency of Observed Poem Comprehension Processes Occurring While Studying the Poem*

|  | <i>N</i>   | <i>Percent</i> |
|--|------------|----------------|
| Observing  |            |                |
| Structure  | 44         | 2.56           |
| Punctuation  | 19         | 1.11           |
| Text Features                                      | 60         | 3.49           |
| <i>Total</i>                                       | <i>123</i> | <i>7.16</i>    |
| Activating Prior Knowledge                         |            |                |
| General Knowledge                                  | 21         | 1.22           |
| Intertextual Knowledge                             | 24         | 1.40           |
| Literature Knowledge                               | 26         | 1.51           |
| <i>Total</i>                                       | <i>71</i>  | <i>4.13</i>    |
| Inferring and Interpreting About the Poem          |            |                |
| Characters, Actions, Context, or Relations         | 44         | 2.56           |
| Local Meaning                                      | 210        | 12.22          |
| Overall Meaning, Themes, or Purpose                | 304        | 17.68          |
| Aspect-Specific Symbolism                          | 218        | 12.68          |
| Mood   | 32         | 1.86           |
| Author   | 28         | 1.63           |
| <i>Total</i>                                       | <i>836</i> | <i>48.63</i>   |
| Inferring and Interpreting From Relevant Knowledge |            |                |
| Poem-Specific Features                             | 51         | 2.97           |
| Other Compositions                                 | 44         | 2.56           |
| Literary Devices                                   | 26         | 1.51           |
| Rule of Significance                               | 40         | 2.33           |
| General Knowledge                                  | 46         | 2.68           |
| <i>Total</i>                                       | <i>207</i> | <i>12.04</i>   |
| Responding to the Poem                             | 90         | 5.24           |
| Monitoring Comprehension                           |            |                |
| Overall  | 87         | 5.06           |
| Local or Aspect-Specific                           | 202        | 11.75          |
| Being Efficacious                                  | 21         | 1.22           |
| <i>Total</i>                                       | <i>310</i> | <i>18.03</i>   |
| Planning   | 82         | 5.06           |

*Notes.* Number indicates the number of t-units receiving the code. Percent indicates the proportion of Number to the total t-units in this analysis (n = 1719). Total Number is the sum of all the codes in that category. Total Percent indicates the proportion of Total Number to the total t-units in this analysis (n = 1,719).

Less frequently, participants made inferences about the characters, actions, context, or relations depicted in the poem (2.56%). This may be an artifact of the poem used in this study, rather than the nature of poem comprehension generally. The poem comprised a speaker giving “directions” for painting a bird’s portrait to an unstated audience. As a consequence, there were no characters or character interactions about which to make inferences and most actions in the poem were stated outright. There was also little information in the poem to determine its context; this did not appear to be important. As such, the relative infrequency of this particular subprocess may not hold across other poems.

Similarly, these data revealed relatively few inferences from poem-specific features (2.97%), as well as fewer inferences about the author than might be expected (1.63%). Again, this is potentially due to the fact that the poem was unfamiliar to participants and so they could not bring to bear relevant prior knowledge, although, as stated previously, many did try. The difficulty and unfamiliarity of the poem may also have impacted the frequency of observed planning (5.06%) and efficacy-related statements (1.22%).

### **Commonly-Occurring Painting Comprehension Processes and Subprocesses**

A number of predicted painting comprehension processes were drawn from the painting comprehension literature, including activating and connecting to prior knowledge, inference-generation, responding emotionally, evaluating (e.g., painting quality or style of painting), using the painting’s title, interrogating the artist’s purpose, making interpretations (e.g., symbolism, mood/emotion of the painting, or historical implications), intertextuality, and observing (e.g., objects and their location, color, line,

or action). Additionally, it was noted that researchers in several studies observed a tendency for viewers to construct narratives to *tell the story* of the painting (e.g., Bruder & Ucock, 2000; Franklin, Becklin, & Doyle, 1993).

Analysis of participants' transcribed offline and online comprehension measures revealed many of these predicted painting comprehension processes, as well as processes that were not evidenced in previous studies.

Table 8

*Commonly Observed Painting Comprehension Processes and Subprocesses*

|   |  |
|---|--|
| <i>Observing</i>                            | <i>Inferring and Interpreting From</i> |
| Agents and Objects                          | <i>Relevant Knowledge</i>              |
| Location of Agents or Objects               | Painting-Specific Features             |
| Characteristics of Agents or Objects        | Other Compositions                     |
| Actions of Agents or Objects                | Visual Elements                        |
| Text Features                               | Rule of Significance                   |
| Visual Elements                             | General Prior Knowledge                |
| <i>Activating Prior Knowledge</i>           | <i>Responding to the Painting</i>      |
| General Knowledge                           |  |
| Intertextual Knowledge                      | <i>Monitoring Comprehension</i>        |
| Visual Art Knowledge                        | Overall                                |
|   | Local or Aspect-Specific               |
| <i>Inferring and Interpreting About the</i> | Being Efficacious                      |
| <i>Painting</i>                             |  |
| Characters, Actions, Context, or            | <i>Planning</i>                        |
| Relations                                   |  |
| Aspect-Specific Symbolism                   |  |
| Overall Meaning, Theme, or                  |  |
| Purpose                                     |  |
| Mood  |  |
| Artist                                      |  |

---

*Note.* The seven comprehension processes are in italics to distinguish them from the 24 subprocesses.

Specifically, as shown in Table 8, participants commonly engaged in seven observable comprehension processes, encompassing 24 subprocesses. The seven

comprehension processes were observing, activating prior knowledge, inferring and interpreting about the painting, inferring and interpreting from relevant knowledge, monitoring comprehension, responding to the painting, and planning. These seven commonly-observed processes and their associated subprocesses are presented here descriptively and numerically.

As predicted by the TSC framework, and as will be discussed subsequently, many of the painting comprehension processes overlap those identified as poem comprehension processes in the previous section. To make these relations clear, the painting comprehension processes are described here using similar language to that which was used to describe the poem comprehension processes.

### **Descriptive Findings of Painting Comprehension Processes**

Definitions and examples of each of the seven observed painting comprehension processes and the 24 subprocesses are provided in Table 9.

Table 9

*Commonly Observed Painting Comprehension Processes and Subprocess with Definitions and Example Statements***Observing**


---

|  |  |
|--|--|
| Agents and Objects<br><i>Noting discernible agents or objects</i>  | I see a bird-like creature.<br>There is a guitar.  |
| Location of Agents and Objects<br><i>Noting the proximity of agents and objects to one another</i>   | ...in a room<br>...around her neck   |
| Characteristics of Agents and Objects<br><i>Noting the characteristic features of agents or objects</i>  | The desk is angular, edgy.<br>The room is so plain, except for the birds.                                  |
| Action of Agents or Objects<br><i>Noting discernible actions by or between agents and objects</i>  | ...painting something<br>...sitting at the desk.   |
| Text Features<br><i>Reading text associated with painting (e.g., title, artist, year of publication), but not observably using that knowledge to infer or interpret.</i> | “Remedios Varo, Creation of Birds”<br>“The Creation of Birds”  |
| Visual Elements<br><i>Noting colors, lines, and shapes, but not observably using that information to infer or interpret.</i>   | The palette is muted greens, reds, yellows, and browns.<br>There’s a lot of texture on the figure sitting. |

### Activating Prior Knowledge

---

#### General Knowledge

*Activating general prior knowledge, but not observably using that knowledge to infer or interpret.*

So he's using the music to go through his paintbrush to create song birds...nightingales!

The sleeves of the shirt—tight cuff and loose like that—remind me of the skating shirts that men wear when they figure skate.

#### Intertextual Knowledge

*Activating prior knowledge of other compositions, but not observably using that knowledge to infer or interpret.*

Makes me think of something like Dr. Seuss with all these zig zags and weird shapes.

I am thinking about the relationship with the poem I just read...

#### Visual Art Knowledge

*Activating art-related prior knowledge (including knowledge of paintings), but not observably using that knowledge to infer or interpret.*

In older artworks, light would come through a window, and it was referring to the light of god shining down through windows. I'm thinking of northern European works.

[The composition] is rather classic because we see it goes up into the whole triangle thing.

### Inferring and Interpreting About the Painting

---

#### Characters, Actions, Context, or Relations

*Making inferences about the state of the characters or actors in the painting or the state of the world depicted.*

I feel like the owl is a woman for some reason; probably because the features on the face are so soft.

Oh! Something from the paintbrush is coming out of the violin. That's how [the birds] get their song!

#### Aspect-Specific Symbolism

*Identifying symbols or symbolic objects and translating the meaning of the symbols.*

Maybe [the bird like character] symbolizes that he's halfway between artist and not artist or art and reality; maybe he's the bridge between real life and what we see in art.

Here, the birds are coming off the page. So it's like, I don't know, his inspiration, his ideas and thoughts are coming to life.

**Overall Meaning, Theme, or Purpose**

*Constructing holistic or thematic interpretations of the painting.*

So I guess my interpretation is that [the painting] is kind of showing how music and art and any kind of creative expression are intrinsically connected. You can use one to inspire another. No matter what gender you are, as a human being you are capable of creating art, of creating something meaningful and inspirational.

**Mood**

*Constructing interpretive conclusions based on a generalization of the mood, atmosphere, or tone portrayed in the poem.*

It's a mysterious painting. It is happening at early at night, which is mysterious. The mood is creepy. And the windows are dark so it looks I think that's what makes it look extra creepy because it's like night outside.

**Artist**

*Constructing interpretive conclusions based on the painter's perceived purpose, goal, or character.*

Maybe the artist is comparing himself or other artists to bird and how they produce something natural. Maybe this room represents Varo's mind. [The central figure] is using outside things to make art. So maybe the artist is showing that he is thinking outside the box.

**Inferring and Interpreting From Relevant Knowledge****Painting-Specific Features**

*Constructing interpretive conclusions based on text features (e.g., artist, year of publication)*

Looking at the title, *Creation of Birds*. I guess the artist chose this title because he can create a bird. [The painting] seems kind of futuristic, science fiction, which doesn't surprise me, because the painting was done in 1957. I feel like you get a lot of weird stuff like that in the 50s.

**Other Compositions**

*Constructing interpretive conclusions based on other compositions.*

Well after reading the poem, you think of birds and artistic inspiration so [the painting] might have something to do with that. [The painting] makes me think of that as well because when I think of humans, like people in a lab, it almost makes me think of the book, *Frankenstein* by Mary Shelley. The guys working like day in and day out to make the monster.

### Visual Elements

*Constructing interpretive conclusions based on visual elements (e.g., colors, lines, shapes ) used in the painting.*

I don't think there is any significance in [the birds] being different colors.

The bird/person in the middle is really big. He must be the most important thing in the painting.

### Rule of Significance

*Constructing interpretative conclusions based on the perception that everything included in the painting is important.*

The two hanging vases are especially probably important.

Okay, how many birds are there? I'll bet that is clue.

### General Prior Knowledge

*Constructing interpretive conclusions based on general knowledge, including general visual art knowledge.*

Seems a little platonic—you need light, knowledge.

You need light to paint, but it is dark outside. Why wait until night time?

### Responding to the Painting

---

*Reacting or responding to the painting, both from evaluative and affective stances.*

[This painting is ] definitely weird. I'm used to weird art  
It seems off-putting, I guess

### Monitoring Comprehension

---

#### Overall

*Monitoring comprehension of the overall message, theme, or purpose of the painting.*

There's definitely a better story than just the birds but I don't think I have the "big huge aha" about what this painting is about.  
Oh! Now I see what's going on!

#### Local or Aspect-Specific

*Monitoring comprehension of the meaning or purpose of particular sections or aspects of the painting.*

So I can't seem to figure out what the magnifying glass is all about it seems to contradict everything that I think about creation, I guess.  
Why do I think [the central figure's] a woman?

**Being Efficacious**

*Expressing belief that the viewer will or will not be successful in comprehending the painting or aspects of it.*

Oh, wow. I don't have a background in art history, so this is going to be rough.

Not being an art critic, I can't really know the significance or the meaning of [the central-figure's appearance].

**Planning**

*Overtly stating behaviors or strategies that the viewer plans to use to understand the painting.*

Now I'm trying to look for any blatant symbolism or anything that I notice

[After reading aloud the title, artist, and year.] So, now I will go back to the picture and analyze it again with the contextual clues in mind.

**Observing.** Participants made statements revealing that discernible aspects of the painting had captured their attention. Specifically, participants observed objects or agents in the painting (e.g., the central bird figure), and their associated location (e.g., the bird-figure in the middle), characteristics (e.g., the large bird-figure), and actions (e.g., the large bird figure is painting). Participants also observed aloud visual elements of the painting itself (e.g., color or texture). Instances in which participants read the title, author, or year of the paintings were also recorded as observations.

An observation was only identified as such if there was little potential disagreement about it. A reasonable individual would not argue, for instance, that the painting included green hues or windows, so these statements were counted as observing visual elements and objects, respectively. However, the gender of the central figure is significantly less certain, so stating that this figure was female was not classified as an observation (although observing the existence of figure was).

Because of the ubiquitous nature of the observable aspects of the painting, thought-units, the unit of analysis for this investigation, could potentially include several observations. For example, one participant stated, “The human-bird figure is sitting at a desk.” This statement was coded twice for Observing Agents and Objects (i.e., observing the central figure and observing the desk) and once for Observing Action (i.e., sitting). However, once an observation was made, it was not coded as such again if repeated throughout the transcript; that is, only the initial observation was coded categorically.

The range of observations was quite broad and inclusive of almost every discernible aspects of the painting. Observations were also often repeated thought participants’ transcripts—before, during, and after studying—likely because it was

necessary to translate observations into verbalization to communicate their ideas and emerging interpretations. As well, the prospective, offline measure had revealed that participants planned to observe the painting, suggesting that observation is essential to understanding. The identification of observations in these data is in line with previous research on painting comprehension (e.g., Franklin, Becklin, & Doyle, 1993; Ishisaka & Takahashi, 2006; Koroscik et al., 1992).

**Activating prior knowledge.** Participants made statements reflecting an effort to activate prior knowledge without also an observable inference or interpretation from that activation. Three types of prior knowledge activation were evidenced, related to general knowledge, visual art knowledge, and intertextual knowledge. In making these distinctions, unless a knowledge-activation t-unit included visual art knowledge or intertextual knowledge, it was coded as general. For instance, one participant stated that Northern European paintings often used light shining through windows as symbolic of divinity, but did not explain how her interpretation of the painting was impacted by this fact. This was coded as activating visual art knowledge, because it specifically referenced visual art. When participants stated that they were thinking about the poem they had just read, but did not go on to identify how the poem and painting were related, these statements were coded as activations of intertextual knowledge. However, statements like “The sleeves of the shirt—tight cuff and loose like that—remind me of the skating shirts that men wear when they figure skate,” which did not reference visual art or another composition, were coded as general knowledge activation.

In determining whether a statement was coded in the activation category rather than in an inferring and interpreting category, it was necessary to look at the statement in

context and across t-units. For example, when taken alone, the t-unit, “Lots of different poets talk about the idea that they have to capture the essence of their writing,” appears to be an activation statement. However, in its full context, this statement is better described as the source of an inference (i.e., coded as inferring and interpreting from general knowledge).

Lots of different poets talk about the idea that they have to capture the essence of their writing. So maybe this painting has the idea of capturing something; artistically capturing creativity or whatever.

It was therefore essential to consider t-units in context with one another to determine if prior knowledge activation, versus another comprehension process, was present.

Activations occurred primarily in the study portion of the transcripts, with few activations observed during the test period and no activating statements identified in the offline, prospective measure. This is likely due to the fact that activations were defined here as being divorced from inferential and interpretive efforts. As such, it would not be expected that participants would plan to merely activate prior knowledge before studying.

For the same reason, the activation code as used here is not reflected in previous painting comprehension studies. Generally, it is presumed that activation of prior knowledge is componential of efforts to use prior knowledge to infer or interpret. However, these data reveal instances in which that does not occur or, at least, the relation between the activated knowledge and interpretive efforts was not observable.

**Inferring and interpreting about the painting.** Participants also made statements that seemed to reflect an effort to meaningfully and reasonably relate observable aspects of the paintings with one another. These efforts were considered

inferences and interpretations *about* the painting and occurred before, during, and after studying it. Five types of inferences or interpretations were commonly observed in these data, relating to generating inferences about the nature of what was depicted in the painting (i.e., characters, actions, context, or relations), identifying and interpreting symbols or symbolic objects, interpreting the overall meaning or message of the painting, making inferences or suppositions about the artist, and interpreting the mood or tone of the composition. Again, these inferential and interpretive statements were distinguished from observations by the likely degree of disagreement about the designation, and from prior knowledge activations by their role in an observable meaning-making effort.

Inferences and interpretations were often followed by observations of aspects of the painting. Take, for instance, the following section of a transcript in which the participant is questioning her belief that the central figure is female.

Why do I think it's a woman? The hands, the fingers, the nose and the lips. But otherwise there's really no indication of genre. It's definitely the hands. Small, long fingers being portrayed like that seems very womanly.

In this section, the participant makes an inferential statement and observes aspects of the painting in an effort to verify her idea. This pattern was evidenced many times in the transcripts, but only when examining groups of sequential t-units.

The finding that participants made inferences and interpretations about the paintings is in line with previous literature on painting comprehension processes (e.g., Benton, 1992; Bruder & Ucock, 2000; Franklin, Becklin, & Doyle, 1993; Ishisaka & Takahashi, 2006; Koroscik et al., 1992; Moore, 1973; Schmidt, McLaughlin, & Leighton, 1989; Stout, 1995).

**Inferring and interpreting from relevant knowledge.** In coding the referents of the inferences and interpretations (i.e., inferring and interpreting *about* the painting), several knowledge or experiential sources were also commonly discernible. As such, instances when participants overtly stated the source of their inferences and interpretations were coded in these data. Participants were found to infer and interpret from five sources: painting-specific features, other compositions (commonly the poem), visual elements in the painting, a perceived rule of significance, and general prior knowledge. As with the Inferring and Interpreting *About* code, general knowledge was only coded as such if the stated source was not text features, other compositions, visual elements, or a perceived rule of significance. Also, multiple t-units were often necessary to determine instances when participants overtly noted the source of their inference or interpretation.

Statements in which participants' attempted to infer or interpret, but were unsuccessful, were also coded in this category. Unsuccessful interpretations from relevant knowledge were most frequently noted with respect to painting-specific features. Participants appeared very frequently to try to activate knowledge about the artists and the year of publication, in particular, but were unable to do so because they did not have the requisite knowledge. For example, one participant made the following statement at the beginning of the study period, "So I've never seen this painting before. And I've never, I don't know the artist. So I don't really have anything to bring to this painting." Despite the unsuccessful nature of this attempt, it was coded as an inference or interpretation from painting-specific features, because the participant was clearly making an effort to do so. While this statement could have been coded as an unsuccessful

activation, rather than an unsuccessful inference, it was assumed that participants would be attempting to activate painting-specific knowledge for the purpose of interpreting the painting. As such, this class of statements was coded in this category.

It is important to note, however, that the sources of participants' inferences or interpretations were not always overtly stated. If participants did not expressly indicate that source, it was not coded; that is, not every inferences or interpretation *about* the painting received a *from* code. Additionally, as with other codes, statements in which participants observably made an inference or interpretation from relevant knowledge was often only discernible by looking across t-units.

As with the previous section, the finding that participants made inferences and interpretations about the paintings from relevant knowledge is in line with previous literature on painting comprehension processes (e.g., Benton, 1992; Bruder & Ucock, 2000). However, as with poetry, no previous studies of painting comprehension have discriminated between the object (i.e., inferring and interpreting *about*) and the referent (i.e., inferring and interpreting *from*) of these efforts. Moreover, in some cases, the previous painting literature does not reflect some of the specific subprocesses. For example, the fact that participants made inferences based on a perceived rule of significance is not reflected in previous studies of painting comprehension processes.

**Responding to the painting.** This code reflected statements in which participants responded to the painting, either from an aesthetic-evaluative (e.g., Schmidt et al., 1989) or an affective (e.g., Silvia, 2005) stance. For example, "This is a great example of surrealism," revealed the participant's aesthetic-evaluative effort, while the statement, "This painting makes me sad," appeared to be sourced from the participant's

emotions. These two types of responses were collapsed, however, because the source of many of participants' responsive comments was unclear. For instance, while "This painting is cool!" was clearly codable as responsive, without further explanation from the participant, it was impossible to determine whether the "coolness" of the painting was due to its aesthetic qualities or was simply in the affective eye of the beholder.

Often, responsive statements were made by participants at the very beginning of the study period, perhaps representing their initial impression of the composition, or toward the end of the study period, signaling their overall assessment of its quality or its pleasantness. As well, participants responded to the painting during the test portion, usually in relation to questions about the meaning of its overall meaning. However, there were few instances wherein participants planned to respond to the painting before seeing it, as evidenced by the lack of responsive statements in the prospective, offline measures.

The identification of responsive statements in these data reflects previously identified painting comprehension processes in the literature (e.g., Bruder & Ucock, 2000; Ishisaka & Takahashi, 2006; Moore, 1973; Schmidt, McLaughlin, & Leighton, 1989; Stout, 1995).

**Monitoring.** Participants' statements also revealed that they were monitoring the degree to which they understood or interpreted the meaning of the painting or aspects of it, as well as statements indicating their beliefs about their ability to comprehend it (i.e., perceived self-efficacy). In these data, participants made positive monitoring statements about their emerging understanding (e.g., "Oh, now I see what's going on!") and negative monitoring statements noting comprehension breakdown ("So I can't seem to figure out what the magnifying glass is all about."). This occurred at the level of the painting

overall (e.g., There's definitely a bigger story than the birds, but I don't think I have the "big, huge aha!" about what the paintings is about."), as well as for particular aspects of the painting (e.g., "Why do I think [the central figure's] a woman?").

Monitoring statements occurred at all points in the study portion of transcripts—upon initially seeing the painting, while trying to make sense of it, and at the end of the study period, at which point individuals often made conclusions about their understanding. Further, participants overtly monitored their comprehension in the test portion, most often in response to the questions assessing overall meaning and purpose of the painting. However, there were no examples of monitoring statements in the prospective, offline comprehension measure, suggesting that participants did not consider monitoring comprehension to be essential, or at least did not think to say so.

In relation to the previous painting comprehension literature, the fact that monitoring statements were revealed in these data is notable. Aside from Schmidt et al.'s (1989) observation of "idiosyncratic comments about personal preference or frustration" (p. 69), monitoring statements are not reflected in the coding schemes of previous studies of painting comprehension processes (see Table 2), despite being a significant aspect of successful text comprehension (Palinscar & Brown, 1984). The existence of monitoring statements in these painting data reinforces the presumption that understanding paintings requires the viewer to create and monitor a mental representation of the painting, as suggested by Solso (1999).

In addition to global and local monitoring, participants also voiced beliefs about their ability to comprehend the painting, indicating that they were being efficacious (Bandura, 1997). For instance, after discussing the physical appearance of the central

figure, more specifically its human and bird qualities, one participant stated, “Not being an art critic, I can’t really know the significance or the meaning of [the central-figure’s appearance].” Most of the time, these efficacy statements were negative, revealing participants’ concerns that they would not be successful in their comprehension efforts.

Efficacy statements occurred solely in the study portion of the transcripts. Participants did not plan to be efficacious, as evidenced by their responses identifying what they planned to do to understand the painting in prospective, offline measure. Further, participants did not note their perceived abilities or inabilities in the test portion. During the study portion, efficacy statements occurred primarily at the outset, right after seeing the painting for the first time. However, there were a few instances of efficacy assessments during the middle portion of the study period, usually following a monitoring statement, in which the participant noted his or her difficulties with comprehending the painting.

The finding that participants were efficacious with respect to comprehending the painting in these data represents another extension of the previous painting comprehension literature; no previous studies have identified efficacy statements in the context of painting comprehension. As such, this finding represents another connection between painting comprehension processes and those known to impact text, as efficacy for comprehension has been shown to be a predictor of text comprehension success (Oddney, 2011).

**Planning.** Participants also made frequent statements revealing plans and efforts to use strategies to understand the painting, before, during, and after studying the painting. For example, after observing many aspects of the painting during the study

period, one participant stated, “Now I’m going to look for any blatant symbolism or anything else that I notice.” These planning statements occurred at several different points. Of course, the prospective, offline comprehension measure was designed to elicit planning statements, as participants were directed to articulate what they *planned* to do to help them understand the painting. During the study period, planning statements occurred often at the beginning, when participants vocalized their expectations for what they were going to do to understand the painting. Planning statements were also made in the middle of the study period and during the test portion, often immediately following a monitoring or inferential statement. For example, one participant made the following series of statements during the study portion:

I don’t really understand what is happening [with regard to the relation between the central figure and the drawing on the desk]. I’m gonna look... I mean there’s a violin on a string around... Oh! It’s connected to the pen!

As evidenced, this participant monitored a breakdown in comprehension and then planned a strategy to ameliorate this breakdown.

This pairing of monitoring and planning statements appeared often in the transcripts, both in relation to comprehension failures as in this example, but also with regard to emerging understanding. In the latter case, this manifest as a t-unit indicating the participant had had a comprehension breakthrough, and then made statements revealing the plan to go back and look for evidence in support of the emergent understanding. Again, however, these patterns were only discernible when looking across t-units in the transcripts.

As with monitoring, participants' efforts in this study to use strategies planfully to understand the painting in this study extend previous painting comprehension literature and suggest another connection comprehension as revealed by the text comprehension literature. The planning and deployment of comprehension strategies has been linked to text comprehension (Botsas & Padelidu, 2003). These data suggest that this linkage may also occur with respect to paintings.

### **Numeric Findings of Painting Comprehension Processes**

In addition to identifying types of painting comprehension processes, the frequency of their use by participants was also determined, but only with respect to the study portion of these data. This delimitation was made for the same reasons as it was made in poem comprehension context: the nature of the prospective, offline measure and the nature of the comprehension test, which were designed to be parallel in the poem and painting contexts. Furthermore, all 24 of the commonly identified painting comprehension processes were evidenced in the study portion, so it was determined that delimiting the frequency analysis to these data would not alter participants' discernible comprehension efforts.

The frequency of several of the observation subcodes was also not calculated, even in the study portion of these data. Specifically, the decision was made not to calculate the frequency of observing agents and objects and their location, characteristics, and actions. As noted, these observations were ubiquitous in the offline and online measures, with participants observing almost every discernible aspect of the painting. Moreover, an observation could comprise an entire t-unit (e.g., "Windows."), could occur multiple times in single t-unit (e.g., "There is a huge, green and brown human-bird thing

sitting at a desk in the middle of the room.”), and were often repeated, likely because observations were used by participants to both encode the painting and to communicate their thoughts about it. As such, it did not appear that the frequency of these object- and agent-related observations could be interpreted similarly with the frequency of other codes, and thus these observation codes were delimited from this analysis. However, observing text features and observing visual elements were retained, because they were not as essential for describing the visual field and, as such, appeared to be more salient to comprehension processing.

The frequency and relative proportion of the retained painting comprehension processes occurring while studying the painting is presented in Table 10. These data reveal relatively few observations of text features (3.88%) and visual elements (4.03%), as well as fewer activations of prior knowledge, at least in relation to what might be expected (4.25% of t-units). As discussed, however, this was likely due to delimitation of observations and activating prior knowledge processes for this coding scheme. In comparison, the frequency of participants inferring and interpreting from observations and relevant knowledge was significantly higher (18.89%), suggesting that participants observed or activated and then observably *used* this knowledge more often than not.

Table 10

*Frequency of Observed Painting Comprehension Processes Occurring While Studying the Painting*

|  | <i>N</i>   | Percent      |
|--|------------|--------------|
| Observing  |            |              |
| Text Features                                      | 53         | 3.88         |
| Visual Elements                                    | 55         | 4.03         |
| <i>Total</i>                                       | <i>108</i> | <i>7.91</i>  |
| Activating Prior Knowledge                         |            |              |
| General Knowledge                                  | 24         | 1.76         |
| Intertextual Knowledge                             | 14         | 1.02         |
| Visual Art Knowledge                               | 20         | 1.46         |
| <i>Total</i>                                       | <i>58</i>  | <i>4.25</i>  |
| Inferring and Interpreting About the Painting      |            |              |
| Characters, Actions, Context, or Relations         | 214        | 15.67        |
| Aspect-Specific Symbolism                          | 184        | 13.47        |
| Overall Meaning, Themes, or Purpose                | 82         | 6.00         |
| Mood   | 24         | 1.76         |
| Artist   | 22         | 1.61         |
| <i>Total</i>                                       | <i>526</i> | <i>38.51</i> |
| Inferring and Interpreting From Relevant Knowledge |            |              |
| Painting-Specific Features                         | 55         | 4.03         |
| Other Compositions                                 | 59         | 4.32         |
| Visual Elements                                    | 38         | 2.78         |
| Rule of Significance                               | 30         | 2.20         |
| General Knowledge                                  | 76         | 5.56         |
| <i>Total</i>                                       | <i>258</i> | <i>18.89</i> |
| Responding to the Painting                         | 102        | 7.47         |
| Monitoring Comprehension                           |            |              |
| Overall  | 67         | 4.90         |
| Local or Aspect-Specific                           | 164        | 12.01        |
| Being Efficacious                                  | 17         | 1.24         |
| <i>Total</i>                                       | <i>247</i> | <i>18.08</i> |
| Planning   | 66         | 4.83         |

*Notes.* Number indicates the number of t-units receiving the code. Percent indicates the proportion of Number to the total t-units in this analysis (n = 1,366). Total Number is the sum of all the codes in that category. Total Percent indicates the proportion of Total Number to the total t-units in this analysis (n = 1,366).

Even more frequently, participants made inferences and interpretations about the painting. Collectively, these subprocesses comprised almost 40% of the t-units in this

analysis. Of these, most were directed at understanding aspect-specific symbolism and characters, actions, context, and relations depicted in the painting. Likely, these more-localized inferences were aimed at affording overall meaning, about which t-units were also often made. As was the case with the poem, the relative frequency of these subprocesses may be due to the difficulty of the painting and the considerable effort participants put for the made sense of it. This conclusion is also supported by the high frequency of monitoring statements, both at the local and global levels, which comprised more than 18% of the analyzed t-units.

Also similar to the poem, these data revealed relatively few inferences from painting-specific features (4.03%), as well as fewer inferences about the artist than might be expected (1.61%). Again, this is potentially due to the fact that the painting and artist were unfamiliar to participants and so they could not bring to bear relevant prior knowledge, although, as stated previously, many did try. The difficulty and unfamiliarity of the poem may also have impacted the frequency of observed planning (4.83%) and efficacy-related statements (1.24%).

### **Trans-Symbolic Comprehension Processes and Subprocesses**

The first research question guiding this study is: *What, if any, observed comprehension processes are shared between poem and painting contexts?* Previous studies of poem and painting comprehension processes and the TSC framework predicted that some comprehension processes would be shared between poem and painting in this study. Specifically, it was predicated that connecting to prior knowledge and experiences, inferring, intertextuality, evaluating, elaborating, and drawing conclusions,

synthesizing, responding emotionally, and using title, amongst other processes, might be evidenced in these data.

Many of these predictions were borne out in the study, both with respect to poem and painting comprehension processes and their associated subprocesses. The overlap between these processes and subprocesses is presented in Table 11. As evidenced, all but one identified comprehension process (i.e., rereading text) was found in the poem and painting contexts. As well, of the 48 poem and painting comprehension subprocesses, 17 were found to be trans-symbolic. Specifically, trans-symbolism was identified for one observation subprocess (i.e., observing text features), all three activating prior knowledge subprocesses, three of the processes associated with inferring and interpreting about the compositions, four of the subprocesses associated with inferring from relevant prior knowledge, responding, all three monitoring comprehension subprocesses, and planning. As such, the majority of the commonly observed comprehension processes were identified as trans-symbolic.

As indicated, many of these observed trans-symbolic comprehension processes and subprocesses were predicted from the literature on poem and painting comprehension. However, others were not. The painting comprehension process literature neither predicted inferring and interpreting from a perceived rule of significance, for instance, nor did it predict comprehension monitoring efforts, planning, or efficacy statements. As such, it was not expected that these processes would be observed in these data. However, the identification of unpredicted processes and subprocesses in the current study is not altogether surprising, given the complexity of painting comprehension efforts suggested theoretically (e.g., Perkins, 1994; Solso, 1999).

Table 11

*Commonly Observed Trans-Symbolic, Poem-Specific, and Painting-Specific Comprehension Processes*

| Poem-Specific              | Trans-Symbolic              | Painting-Specific         |
|----------------------------|-----------------------------|---------------------------|
| Rereading                  | Observing Text Features     | Observing Agents and      |
| Paraphrasing               | Activating General          | Objects                   |
| Observing Structure        | Knowledge                   | Observing Location        |
| Observing Punctuation      | Activating Intertextual     | Observing Characteristics |
| Inferring Mood (Poem)      | Knowledge                   | Observing Actions         |
| Interpreting Local Meaning | Activating Domain-Related   | Observing Visual Elements |
| Interpreting from Literary | Knowledge                   | Inferring Mood (Painting) |
| Elements                   | Inferring Characters,       | Interpreting from Visual  |
|                            | Actions, Relation, and      | Elements                  |
|                            | Context                     |                           |
|                            | Inferring Aspect-Specific   |                           |
|                            | Symbolism                   |                           |
|                            | Inferring Overall Meaning   |                           |
|                            | Inferring About the         |                           |
|                            | Author/Artist               |                           |
|                            | Inferring From              |                           |
|                            | Composition-Related         |                           |
|                            | Features                    |                           |
|                            | Inferring From Other        |                           |
|                            | Compositions                |                           |
|                            | Inferring From Rule of      |                           |
|                            | Significance                |                           |
|                            | Inferring from General      |                           |
|                            | Knowledge                   |                           |
|                            | Responding                  |                           |
|                            | Monitoring Overall          |                           |
|                            | Comprehension               |                           |
|                            | Monitoring Local or Aspect- |                           |
|                            | Specific Comprehension      |                           |
|                            | Planning                    |                           |
|                            | Being Efficacious           |                           |

*Note.* To highlight their trans-symbolic nature, three pairs of codes were collapsed here and retitled: the codes for Activating Literature Prior Knowledge and Activating Visual Art Prior Knowledge were collapsed here into Activating Domain-Related Knowledge, the codes for Inferring About the Author and Inferring About the Artist were collapsed into Inferring about the Author/Artist, and the codes for Inferring From Poem-Specific Features and Inferring From Painting-Specific Features were collapsed into Inferring from Composition-Specific Features.

Other trans-symbolic comprehension processes predicted for these data were not identified. For instance, elaborative statements were predicted, but not commonly found, in this study. Elaborations are instances in which individuals use their knowledge of the composition, author/artist, or subject area to speculate beyond information presented in the composition (Pressley & Afflerbach, 1995) and have been identified in poem (e.g., Eva-Wood, 2004) and painting (Bruder & Ucock, 2000) comprehension efforts. The fact that elaborations were not identified in this study does not indicate that elaborations are not trans-symbolic, however. Rather, the lack of evidence for this comprehension process is likely due to the nature of the compositions. The poem and painting chosen for this study were unfamiliar to the participants, who tried but were unable to draw upon knowledge of the composition and the author/artist. Moreover, because of the potential for several different interpretations of the meaning of the compositions, all interpretations of meaning were somewhat speculative. As such, elaborations were not as evident with regard to these particular compositions as they might be with another poem or another painting. The conclusion drawn here applies to other potential trans-symbolic processes; the lack of finding in this study does not preclude the possibility that other trans-symbolic processes exist, even with respect to poetry and paintings.

Those processes and subprocesses that have been identified herein as trans-symbolic differ in degree; some are virtually indistinguishable between poem and painting, while others are more evidently iterative across symbol systems. The processes associated with activating prior knowledge, planning, and being efficacious, for example, appear to be essentially identical for poem and painting (e.g., individuals' beliefs about their abilities to comprehend poetry and painting are not sourced from symbols or symbol

system rules). In contrast, global and local comprehension monitoring requires that the individual understand, to a degree, the rules governing meaningful interpretation of symbols in a given symbol system and the degree to those meanings are being apprehended. As such, local and global monitoring comprehension relies slightly more upon symbol systems than does perceived self-efficacy. However, monitoring is not significantly reliant on the symbol system and is therefore not considered symbol-specific here. Rather, the threshold for symbol-specific comprehension processes is a high reliance on the symbol system for the enactment of the comprehension process.

As a number of these symbol-specific processes were identified with respect to poem and painting comprehension, a more detailed description of the delimiters associated with symbol-specific designation will be provided in the subsequent discussion.

### **Poem-Specific Subprocesses**

The second research question guiding this study was: *What, if any, observed comprehension processes are particular to poetry?* From previous studies of poem comprehension processes and the TSC framework, it was predicted that Literature and Art education students would observably use poem-specific comprehension processes before, during, or after studying the poem. Moreover, it was predicted that these processes would relate to the linguistic and temporal nature of poetry.

As identified in Table 11, the results of the study confirmed the existence of seven poem-specific processes. Rereading and paragraphing, for example, were observed in the poem context, but not with the painting. These subprocesses were evidenced with respect to the poem likely because it unfolds over time, and thus participants had to go back and

read portions again make sense of it. As well, observations about the structure and punctuation of the poems did not have corollaries in the painting processes as these were functions of language. Similarly, inferring from literary elements was nested in the understanding of conventions particular to language and poetry, without clear mappings to visual array.

As suggested in the section on trans-symbolic processes, one subprocess identified as poem-specific was somewhat less clear: the interpretation of mood. While the interpretation of mood has been shown to be essential to comprehension in a variety of symbol systems (e.g., some forms of music, Woody & Burns, 2001; visual display, Kress & van Leeuwen, 1996; and text, Eva-Wood, 2004), it is heavily reliant on the symbol system. For instance, with regard to painting, the color palette is perceived to convey mood (e.g., blue is sad, while yellow is happy; Kress & van Leeuwen, 1996), while in poem, mood is often discerned from interpreting colors as described in language (e.g., linguistic description of dark colors are often interpreted as somber; Jones, 1934) and from negatively-valenced emotions or words. Likewise, in Western music, for example, tempo (i.e., the speed of the beat) or the mode (e.g., major or minor) are often integral to mood of a musical composition (van Leeuwen, 1999). Thus, while interpreting mood appeared salient to comprehending both the poem and painting in this study, it was not considered trans-symbolic, due to its strong reliance on the linguistic and visual symbol systems, respectively. However, interpreting mood highlights an area of ambiguity with respect to the TSC framework warranting further investigation and delimitation.

Despite the identification of these seven poem-specific comprehension subprocesses, the majority of the poem comprehension processes identified in these data was trans-symbolic in nature. Thus, these data suggest that the comprehension of poems is largely dependent upon comprehension processes shared, at least, by paintings.

### **Painting Specific Subprocesses**

The third research question guiding this study was: *What, if any, observed comprehension processes are particular to painting?* Using the previous studies examining painting comprehension processes and the TSC framework, it was predicted that participants would use painting comprehension processes that did not have corollaries in the poetry context, and that these painting-specific processes would likely relate to the visuographic symbol system and the rules governing what is meaningful in paintings.

This prediction, too, was borne out by the resulting painting comprehension subprocesses identified in this study; seven painting-specific subprocesses were identified, as shown in Table 11. Observations about the characters and actors in the painting, as well as their relative location, characteristics, and actions did not appear with respect to the poem and were, therefore, considered painting-specific. This difference is likely due to the differential nature of the linguistic and visual symbol systems. Characters and their associated aspects were directly stated in the poem and, thus, required reading aloud, rereading, or paraphrasing to communicate in the think aloud context. In contrast, participants had to translate the visual field into language in order to communicate in the think aloud contexts, which manifest as observations. As such, observations in the context of painting comprehension may be akin to reading aloud in

the poem context. However, in contrast, the flow of observations is dissimilar from reading text aloud in poetry, in that as suggested by Iser (1978), the viewer must rapidly identify and incorporate myriad aspects of the work: color, line, space, objects, figures, and symbolic meaning. This wandering viewpoint is likely an artifact of the immediacy of paintings; that is, unlike poetry, their content does not unfold over a period of time and in a particular order.

The other painting-specific comprehension subprocesses discerned from these data were interpreting from visual elements and interpreting mood. Interpreting mood was identified as painting-specific because of its aforementioned reliance on the visual system. Interpreting from visual elements was similarly designated because it relies on meanings assigned to particular configurations or uses of visual space, and understood from the rules governing the visual symbol system. The meaningful interpretation of the triangle configuration in the painting, as noted by several in the study, is one such meaning assigned to paintings. However, it does not have a clearly identifiable corollary in poems; it is a structural feature of paintings that does not translate symbol systems.

As with the poem, however, the findings of this study indicate that the majority of processes and subprocesses associated with painting comprehension are trans-symbolic, rather than painting-specific. As such, there appears to be more in common with poem and painting comprehension than not.

### **Summary of Findings**

Collectively, the findings from the study indicate that poem and painting comprehension efforts entail the deployment and monitoring of a rich and complex set of processes and subprocesses, some of which have not been previously identified in the

empirical literature. In particular, participants' observable and significant metacognitive efforts relative to the planning of comprehension strategies and their efforts to monitor comprehension locally and globally were notable in these data and were not reflected in much of the previous research.

Moreover, as predicted by previous studies of poem and painting comprehension and the TSC framework, many of these comprehension processes and subprocess overlapped. Indeed, the majority of comprehension processes and subprocesses identified herein were trans-symbolic in nature, either being indistinguishable between poem and painting or clearly iterative. Also, as predicated by the TSC framework, those processes identified as poem –specific and painting-specific were related to the rules and features of the linguistic and visual display systems, respectively. Indeed, these data suggest that symbol-specific processes may be primarily related to encoding the message of a composition, although there are some examples of higher-level processes related to some inferential and interpretive efforts. As such, the findings of this study provide tentative support for the TSC framework.

## CHAPTER FIVE: DISCUSSION

At the outset of this study, it was noted that there is a growing interest in multiliteracies and the processes by which nonlinguistic and multisymbolic compositions are understood. However, as indicated by Unsworth (2008), there is currently no “trans-disciplinary” framework robust to these examinations. This study investigated the degree to which the Trans-Symbolic Comprehension framework (Loughlin & Alexander, 2012; Loughlin et al., 2013) might serve this purpose, and used the symbol systems of language and the visual array to determine its viability. Specifically, the study examined poem and painting comprehension and the degree to which the associated processes were trans-symbolic and symbol-specific.

It was determined that the comprehension of both the poem and the painting involved the dynamic and complex deployment of comprehension processes. Moreover, several comprehension processes were revealed that are not reflected in the extant poem and painting literature (e.g., being efficacious). The investigation also found a significant portion of processes that emerged in participants’ examination of a carefully selected poem and painting were shared; that is, iterative manifestations of core comprehension processes (e.g., inferring and interpreting) applied to both poem and painting. However, processes that did not appear to iterate were also identified. The discovery of these apparent trans-symbolic processes and symbol-specific processes was in line with the predictions of the TSC framework.

This chapter begins by discussing the significance of the study, positioning the findings in relation the extant theoretical and empirical poem and painting literature to and the TSC framework. Next, the limitations and delimitations of the study are noted

with recommendations for future research. Implications of the study are then articulated for educational research and practice. The chapter closes by drawing conclusions about the nature of poem and painting comprehension processes and the viability of the TSC framework.

### **Significance of the Study**

The findings of the study have significance for the theoretical and empirical literatures on poem and painting comprehension, as well as the TSC framework.

### **Poem Comprehension**

The findings of this study reflect and extend previous poem comprehension theory and research. As described, a popular theoretical model of text comprehension is Kintsch's (1998) Construction-Integration model, which posits three levels of representation that readers develop of text. The first level of representation is the surface text, which includes identification of specific words and overall text structure. The second level, the textbase, requires the reader to make meaningful connections between text elements, such as words or sentences. These connections are largely cued from the text itself, thus requiring minimal reference to prior knowledge (Coté, Goodman, & Saul, 1998). Finally, the reader must situate the text in the world referenced by the text. This situation model requires the reader to meaningfully relate the text to relevant knowledge about the topic of the text and general world knowledge.

As described by Zwaan (1996), previous research on literary tests including poetry using Kintsch's model have found that individuals have a difficult time creating and settling on a situation model, because the demands of the surface and textbase representations are so high. This difficulty is manifest by the relatively poor memory for

details of the literary texts and the fact that individuals hold multiple and potentially conflicting situation models simultaneously. In essence, Zwaan argues that literary texts, in general, and poems in particular, are hard to comprehend.

This study is in line with Zwaan's assertion, despite the fact that its methodology was descriptive rather than computational in nature. Participants spent considerable time on the painting, made many inferential and interpretive efforts to understand it globally and locally, monitored their comprehension, planned and deployed comprehension strategies to fix up incomplete or conflicting situation models representations, and frequently reread or paraphrased portions of text to clarify or verify interpretations. As well, some participants made overt efficacy statements revealing their beliefs of their abilities relative to the difficulty of the comprehension tasks. These descriptive findings suggest that, indeed, participants were forced to expended significant effort on the creation of surface and textbase representations of the poem, and were therefore challenged to create coherent situational model representations of it. This challenge was likely increased, in fact, due to the minimal degree of prior knowledge vis-à-vis the poem that participants could activate, given that the poem and poet were chosen to be unfamiliar. However, as this study was not computational, the relation between these findings and Kintsch's comprehension model remains an empirical question.

The findings of this study also represent a potential extension of the poem comprehension literature. The review of the literature undertaken to frame this study found only one previous poem study that identified planning as a comprehension process (i.e., Peskin, 1998). However, participants' efforts to plan and deploy comprehension strategies were clear in this investigation. As such, planning may be an important, but

under-examined, poem comprehension process. Similarly, this study identified several instances in which participants vocalized their perceived self-efficacy for the poem comprehension task. This finding suggests that efficacy may play a role in poem comprehension monitoring efforts, as it does in text comprehension generally (Oddney, 2011). However, no previous studies were identified that considered this a poem comprehension process.

### **Painting Comprehension**

The current study also reflects and extends previous painting comprehension theory and research. From a theoretical perspective, the current study provides descriptive support for Solso's (1999, 2003) three-level model of painting comprehension and representation.

According to Solso (1999), Level 1 representation contains the elements of the artwork, such as color, line, and contour. This representation preserves the perceptual, surface information of the artwork, but is not representative of its meaning in the conventional sense. In this study, the observing visual elements subprocess appears to be related to the creation of this Level 1 representation. In contrast, the Level 2 representation contains what is explicitly shown in the artwork and recognized by the viewer. In the case of representational art, such as the painting in the current study, this would include objects, agents, and their characteristics (e.g., color of a woman's shoes). Observations made by participants with respect to the characters and objects in the paintings, along with their associated location, characteristics, and actions, are likewise suggestive that they created a Level 2 representation of the painting.

The highest level of representation, Level 3, incorporates inferences and interpretations made by the viewer, as well as his or her emotional connection to the artwork, thus moving beyond what is perceived to what can be understood in a deeper sense. As such, Level 3 is “being ‘at one’ with the art; it is commingling a painting with universal properties of the mind” (Solso, 2003, p. 258). Solso’s Level 3 also appears to be reflected in these data. Indeed, the majority of the processes identified in this study appear to have been deployed in an effort to build this Level 3 representation: inferring and interpreting local and overall messages about the painting from relevant knowledge, monitoring the attainment and coherence of the Level 3 representation, planning and enacting strategies to build the Level 3 representation, and responding to it all appeared in these data. Further, efficacy statements can also be considered evidence of the existence of a Level 3, in that participants were expressly perceiving and reacting to their ability to reach it.

As this study was descriptive and not computational in nature, it is therefore beyond the scope of these findings to suggest that the study provides empirical support for Solso’s (1999) theory. Nonetheless, these descriptive data do appear to reflect Solso’s three-level model.

The findings of this study also extend the current literature on painting comprehension processes. In particular, as described in Chapter 4, the painting comprehension studies used to frame this study did not predict several of the processes and subprocesses observed in these data; most notably monitoring comprehension, including perceived self-efficacy for the poem comprehension task, and planning and deploying strategies to afford or rehabilitate comprehension. Given the importance of

these processes for the comprehension of text, as established in the review of the literature, and their identification in this painting comprehension task, these comprehension processes may play an under-examined role in painting comprehension broadly.

### **Trans-Symbolic Comprehension**

As noted at the outset, the TSC framework is conceptually large, in that it attempts to explain a complex phenomenon (i.e., comprehension) across and within multiple symbol systems. As such, it conforms to the definition of a theory (Hillix & L'Abate, 2012) and cannot be examined in its complete form; investigating its robustness requires iteratively exploring and modeling particular relations that are implied by it (Carlisle & Christensen, 2006; Eisenhardt & Graebner, 2007). For this reason, it was not expected that this study would provide a definitive affirmation of the framework. Rather, this study was undertaken to determine whether *any* commonalities in comprehension processes existed between two symbol systems. The decision to focus herein on the linguistic and visual display symbol systems—and poem and painting in particular—was made because it appeared that these two symbol systems were as dissimilar as possible and, therefore, represented the most stringent test of the viability of the framework. Thus, it was argued that, if this initial examination revealed the existence of trans-symbolic and symbol-specific processes, subsequent research could be undertaken investigate other relations, and the scope TSC can be further articulated.

The findings of this study met the criteria set out for this initial interrogation of the TSC framework. Indeed, the examination of participants' comprehension efforts revealed 17 subprocesses that appeared to transcend symbol systems as well as 14

subprocesses (i.e., 7 poem-specific and 7 painting-specific) that did not. Moreover, the nature of the processes identified as trans-symbolic and symbol-specific seemed to meet the criteria set out in the TSC framework.

Again, it is acknowledged that the results of this single study cannot be used to affirm the viability of the TSC framework. Significant additional research is needed within both the linguistic and visual symbol systems, as well as beyond and among others, before it is possible to state with any degree of confidence anything about the TSC or the existence of trans-symbolic and symbol specific comprehension processes. Rather, the significance of this study is that it did not disconfirm the plausibility of the framework and, as such, opens the door to future empirical and experimental research.

### **Limitations and Delimitations of the Study and Recommendations for Future Research**

Although the findings of this study have significance for the literatures on poem and painting comprehension, as well as signify an important step in the development and refinement of the TSC framework, this investigation was exploratory. The nature of exploratory research is to investigate an area of the literature by determining appropriate research designs, data collection methodology, and selection of subjects. In so doing, exploratory research can identify strengths and limitations to study-related choices, discuss the impact of delimiting factors in the study, and point to future directions for research. The limitations and delimitations of this exploratory study are discussed herein, as are recommendations for future research with respect to identifying poem and painting comprehension and with regard to future TSC-based efforts.

### **Issues Pertaining to Poem and Painting Comprehension Processes**

A number of limitations and delimitations in the current study are identifiable in relation to the conclusions that can be drawn from these data as to the nature of poem and painting comprehension. In particular, this study was limited by the poor function of the prior knowledge measures. Delimitations on the study included its data analytic approach, choice of compositions and participants, audio recorded think aloud protocols, reliance on process measures of comprehension, and choice to examine particular influences on comprehension.

**Prior knowledge measures.** As discussed, English and Art education students in the latter half of their undergraduate programs were selected for this study because they were predicted to be competent in comprehending the poem and the painting, respectively. However, as academic standing is only a proxy of expertise, this study attempted to use knowledge and interest measures to verify that these participants were, in fact, competent. While both interest measures used for this purpose had high reliability and revealed significant mean differences between the two groups, the two prior knowledge measures suffered from very poor internal reliability. As such, the assumption that the participants were competent vis-à-vis poem and painting comprehension as was predicted cannot be confidently verified with these data. It is impossible to determine whether the groups were differentially knowledgeable about Western Literature and Art.

This study relied upon researcher-developed measures of these domains because no viable pre-existing measures were identified. In addition, efforts were made to establish validity and appropriateness for the targeted participants and a small-scale pilot

study was conducted to refine items. However, these efforts did not result in internally reliable measures of either domain. Future research can address this limitation by developing and using more reliable domain measures of Western Literature and Art. Alternatively, topic measures related to poetry and painting may be used, as measures of topic knowledge have been found to be reliable predictors of expertise (e.g., Alexander, Kulikowich, & Schulze, 1994; Tobias, 1994).

**Data analytic approach.** The goal of this study was to identify poem and painting comprehension processes and determine the degree of overlap between them in an effort to interrogate the viability of the TSC framework. In so doing, this study relied heavily on think-aloud protocols, parsed into thought units, which proved to be a viable method for determining many comprehension processes and their degree of similarity across composition. However, this data analytic approach was limited in its ability to determine other comprehension processes and to capture the complex nature of poem and painting comprehension, due to the unit of analysis and the use of frequency counts.

Thought-units (i.e., t-units) were chosen for as the unit of analysis for this study, because they are commonly used in think aloud studies, particularly with text. And, to a large extent, t-units did prove very useful in this study, by allowing for a consistent segmentation of the data into management units for coding purposes. It appears, however, that much of the story of these data occurred across multiple—even many—t-units, rendering this grain-size perhaps too small in some respects. As well, it was presumed at the outset that counting the frequencies of the codes applied to t-units would prove insightful and, again, to an extent, this was true. Using a frequency analysis of the coded t-units, this study was able to identify frequency patterns in these data, such as the

fact that Inferring and Interpreting about the poem was the most frequently observed comprehension process in the poetry data. Interesting aspects of these data cannot be captured by a simple frequency analysis of coded t-units, however.

The difficulty with relying on a frequency analysis of t-units in these data is particularly evident in relation to participants' efforts to verify an interpretation. Often, participants interpreted the overall meaning of the composition and then went back to the composition to find evidence in support of their interpretation. This occurred with both the poem and the painting. In this effort, participants made a number of codable, countable utterances related to, amongst others, Inferring the Overall Meaning, Inferring Aspect-Specific Meaning, Inferring Aspect-Specific Symbolism, Rereading and Paraphrasing in the poem context, and Observing in the painting context. For example, one participant made the following series of statements.

This poem is about love and waiting for the right person to come. The painting represents, I think, the person who is waiting. It says, "The pace of the birds arrival bearing no relation to the success of the painting." I guess this is Prevert's way of saying it is not a bad thing if it takes a long time. "Wait for the bird to enter the cage. And, once it has, gently shut the door with the brush." Then paint the bars out one by one. "Taking care not to touch any of the bird's feathers." Gently shut the door with a brush. And so, once somebody finds a potential person, a lover maybe or a future suitor, then they'll have to be careful, and take of them, and create a good environment for them. "If the bird does not sing," which I guess means the other person is not happy, then that is a bad sign. And

it's a sign the person is not good for this person, like the painting is not good for the bird.

As evidenced in that segment of think aloud, the participant made an inference about the overall meaning of the poem, then proceeded to seek justification for that assertion through the use of local and symbol inferences and through the rereading and paraphrasing of a section of the poem. In particular, this sequence yielded the following data: two instances of Inferring Overall Meaning, seven instances of Inferring Local Meaning, two instances of Inferring Aspect-Specific Symbolism, five instances of Rereading, and three instances of Paraphrasing.

However, a reading of this section suggests that these frequency counts do not fully capture the participant's interpretive effort for two reasons. First, by coding each unit separately, it appears that this section was largely dominated by rereading or paraphrasing, with relatively fewer inferences. When taken together, though, it is clear that the rereading and paraphrasing were in service of the larger, interpretive effort. Second, a frequency count of codes cannot capture the progression of codes or identify progressive patterns. In these data, the back and forth between inferences and textual verification is evident, but the raw frequency count masks this interesting and, possibly, more informative pattern. Again, while this example pertained to the poem, the same pattern was evident in the painting transcripts, as well.

Another challenge to the data analytic approach used in this study relates to the nature of the codes. In a number of cases, participants' interpretations of the compositions at the start of the think aloud evolved or changed markedly over time. For instance, one participant indicated that she thought the message of the painting pertained

to the relation between parents and children early in the study period. By the end of the transcript, however, she had concluded that the painting represented the relation between an artist and the larger arts community, instead. In both instances, the participant's statements were coded as Inferring the Overall Message, but the change in the nature of those interpretations was not captured. The issue of quality also relates to the rereading and paraphrasing codes in the poem and observing codes in the painting. In some cases, contextual clues suggest that these efforts were directed at gaining an initial understanding of the composition, other cases seemed to be related to clarifying an identified miscue or lack of understanding, while others appeared to verify an inference. Again, however, these were all encompassed by the same, generic code.

Thus, while the data analytic approach used in this study was appropriate for an initial investigation of comprehension processes, future research in this line of inquiry may benefit from changing the unit of analysis, using a more context-sensitive coding scheme, and, possibly, reconsidering the quantitative methodology. For example, it might be prove valuable to identify patterns of codes and create meta-codes that encompass particular code progressions. Encapsulating and examining the byplay between inference-generation and rereading, paraphrasing, or observing, for instance, would likely be interesting, particularly if the quality of the codes was taken into account. As well, the methodology may benefit from an approach beyond frequency counts that could numerically capture the progression of codes and meta-codes. Probabilistic network analysis, which analyzes sequential data, may prove useful in this regard (for a review, see Pattison & Robins, 2008).

**Choice of compositions.** As was discussed previously, it seems likely that the nature of the particular poem and painting chosen for this study significantly impacted individuals' comprehension processes. This delimitation appeared to provide both positive and negative implications for the study.

One positive outcome of the choice of compositions was that they appeared to, on average, pique the interest and engagement of the participants. This is evidenced by the fact that, as mentioned previously, participants spent considerable time on the painting, made many inferential and interpretive efforts to understand it globally and locally, monitored their comprehension, planned and deployed comprehension strategies to fix up incomplete or conflicting situation models representations, and frequently reread or paraphrased portions of text to clarify or verify interpretations. The conclusion that these compositions were interesting to the participants is also evidenced by statements of compositional response which, overwhelmingly, were positive.

Participants' apparent engagement with the compositions selected for this study may be due to a good person-composition fit and the relative interestingness of the compositions for these students. Despite the fact that participants were selected for this study based upon expected differences in their expected competence (i.e., English education students were presumed to be more competent with respect to the poem than the Art education students), both English and Art are humanities subjects. As such, both groups may have been comfortable and experienced with the difficulty of the comprehension tasks and compositional ambiguity, and were therefore willing and able to work through their initial lack of understanding. Indeed, the person-composition fit may

have been enhanced by the nature of the compositions, in that they both described creative processes, with which these two groups may feel an inherent connection.

However, the choice of these particular compositions had potentially negative consequences on the study, as well. For instance, neither the poem nor the painting seemed to elicit significant activation of general prior knowledge. This was perhaps not surprising, given the fact that these compositions were chosen specifically because their interpretability did not rely heavily upon particular areas of knowledge. However, other compositions are more likely to rely on prior knowledge. Were this same study to be conducted with the poem “Genius Child” by Langston Hughes and the painting by Palmer Hayden entitled, “The Janitor Who Paints,” both of which speak to the African American artistry during the Harlem Renaissance, the identified comprehension processes and their relatively frequency of use would likely be very different. In this case, individuals might rely more upon their prior knowledge of race relations and that period in American history, and observably activate prior knowledge in order to comprehend the compositions.

In this same vein, the poem comprehension processes identified here relied far less on inferences about characters, actions, context, or relations than might have occurred with a different poem. “To Paint a Bird’s Portrait” consisted of a speaker giving directions to the reader, and did not include multiple characters or actors for whom actions, relations, and context needed to be comprehended or inferred. Other poems inclusive of multiple actors might elicit more or different comprehension processes from individuals.

Future research may remove this delimitating factor and examine poem and painting comprehension processes using other and multiple examples of each. For instance, a future study could examine three poems with varying degrees of reliance on prior knowledge and character action, relations, and context. Only when a significant number of studies are conducted with different examples of poetry and paintings can the comprehension processes related to these composition types be fully determined.

**Choice of participants.** Participants in this study were individuals assumed to be competent at poem and painting comprehension. This delimitation was designed to maximize the comprehension processes that would be manifest in the study. However, understanding how comprehension processes are deployed in an effort to understand poetry and paintings in other populations was not investigated. In particular, future research should examine the processes used by individuals who are relatively novice at poem and painting comprehension (e.g., school-aged participants), in an effort to inform instructional practices aimed at increasing comprehension of these compositions.

**Audio recordings of online comprehension processes.** This study included both a prospective, offline measure and the use of online, think alouds to capture participants' comprehension processes before, during, and after studying the poem and the painting. However, for reasons described previously, frequency counts of comprehension processes occurred only in reference to the study period and its associated think aloud protocols, which were audio recorded. When studying the poem and the painting, participants often used gestures to indicate their attention to aspects of the compositions or were silent for periods of time during the protocols, during which point their comprehension processes were not evidenced. Unfortunately, audio recordings

could neither capture the gestures used by participants nor provide information about what was happening with participants during their silent periods. Thus, there is likely more to the story of poem and painting comprehension processes than was captured herein.

Future research would likely benefit from gathering additional bio-physiological data on participants while they are engaging with the comprehension tasks. For example, video recording of gestures, facial expressions, or text marking might provide insights as to particular areas of emphasis that were not able to be captured by an audio recording. Likewise, eye tracking data would provide researchers with a better idea of what aspects of the compositions were capturing individuals' attention during silent periods. The supplementation of these and other bio-physiological markers would likely provide a finer detail on the nature of poem and painting comprehension processes.

**Focus on process measures of comprehension.** The focus of the current study was, in part, to identify poem and painting comprehension processes. However, the relation between the identified processes and outcome measures was not assessed. As such, the relative value or impact of the identified poem and painting comprehension processes remains an open question. Future research should address this question directly by determining individuals' degree of composition comprehension and looking for patterns in the process data that would explain those findings.

For example, the literature suggests that "deep" processes are more facilitative than "surface" processes in helping individual construct meaningful, coordinated, and lasting understandings of text (Murphy & Alexander, 2002; Phan, 2009). Murphy and Alexander (2002) describe deep processing as instances when individuals seek to

meaningfully understand text by, or instance, relating the text to prior knowledge, building a mental image, and personalizing or transformation the message. Likewise, Phan (2009) describes deep processing as “an intention to understand the authors’ meaning and linking it to [readers’] prior knowledge and personal experience” (p. 159). In these data, participants’ inferences and interpretations about the compositions and from relevant knowledge would likely be deep processes. However, the effectiveness of comprehension processes must be assessed against a comprehension measure, so the “depth” of the observed poem and painting processes were not empirically tested here.

Similarly, efficacy statements were identified in these data, but were not investigated vis-à-vis comprehension outcomes. Previous research suggests that individuals’ perceived self-efficacy impacts successful comprehension of text (Guthrie et al., 2007), as well as measures of text comprehension (Solheim, 2011). It is likely that participants’ efficacy statements in relation to both poetry and painting comprehension are similarly related to their overall comprehension of the compositions. However, as the efficacy-comprehension relation was not addressed by this study, the role of efficacy in poem and painting comprehension remains an empirical question for future research.

**Focus on particular influences on comprehension processes.** This study examined comprehension processes manifest before, during, and after studying. However, potential influences on these processes were not systematically investigated and can serve as fruitful avenues for future research. For example, factors affecting the high degree of variability in the time participants spent studying the poem and painting were not explored in this study. Future research could investigate the degree to which

situational interest, talkativeness, and preference for challenge, amongst other factors, might impact the amount of time individuals spend on the compositions.

The relation between decoding and comprehending the painting, not examined in this study, also warrants significant future research. Previous research has shown the intricate and essential relation between decoding and comprehending text (e.g., Gough & Tunmer, 1986), however a similar relation has been underspecified with regard to painting, likely due to the fact that painting comprehension processes have not received wide attention in the literature. Future studies should examine the relation between decoding paintings and comprehending them. Painting decoding involves perceiving visual elements and discernible objects and agents (e.g., seeing the color red), while comprehension requires integrating perceptions with one another and with relevant prior knowledge in an effort to understand the message or messages of the painting (e.g., in this painting, the color red may symbolize blood or death). This effort will be best served through the utilization of methodologies appropriate for capturing perceptual processes such as eye-tracking in combination with think aloud protocols.

It is also important to note that this study examined comprehension processes within the minds of single individuals in a laboratory setting, and made an effort to turn the highly complex process of comprehension into a series of discrete process that could be calculated and compared. So delimited, the study neither systematically investigated the influence of social, motivational, environmental, or contextual factors on comprehension, nor did it likely reflect much of the variability and complexity inherent in poetry and painting comprehension. As well, the laboratory setting for the study may have belied what would naturally occur in settings wherein individuals encounter poetry

or paintings—privately reading poetry or listening to poetry read aloud, viewing paintings in a gallery alone or with others, or studying these types of compositions in dynamic classroom settings with opportunity for feedback. Moreover, the study did not examine the role of culture. There is no question that comprehension and literacy, indeed the entire corpus of what we consider knowable or comprehensible, is influenced by cultural norms and standards of practice (Gee, 1997; Street, 1995, 2003). However, cultural impacts and implications were not addressed in this study a Western poem and Western painting with primarily Western participants.

These influences—social, motivational, environmental, contextual, and cultural—on individuals' comprehension of poetry and paintings is not disputed. As well, the fact that the complexity of these processes was reduced in this study is acknowledged. However, the goal of this study was to provide an initial examination of poetry and painting comprehension and identify potential areas of overlap. As such, delimitations on its scope were warranted.

### **Issues Pertaining to Trans-Symbolic Comprehension**

Several limitations and delimitations in the current study are also identifiable in relation to the conclusions that can be drawn from these data regarding the TSC framework. In particular, the study is limited by potential investigator bias and delimited to the choice of compositions and their associated symbol systems.

**Potential investigator bias.** The conclusions that can be drawn from this study must be tempered by the fact that the author of the TSC framework was also the author of this study. As such, the poem and painting comprehension processes identified herein and, in particular, assertions about their degree of overlap, may have been unintentionally

and unconsciously influenced. Attempts were made to mitigate this limitation on the study through the use of multiple levels of inter-rater checks on these data, but, even still, it is plausible that an alternative model (i.e., not the TSC) may fit these data. This limitation can be addressed in future research through the replication of this study by a disinterested third-party.

**Choice of compositions.** The choice of the poem and painting used in the study also served as a delimiter for conclusions that can be drawn from these data relative to trans-symbolic and symbol-specific comprehension processes in poetry and painting. As discussed, the particular poem and painting used herein do not and cannot reflect the variation within compositions classified as poetry and painting. Paintings can be highly technical and representational, abstracted, and non-representational. Likewise, poems can be very structured and conform to rigid standards for particular poetic (e.g., sonnet) or free-formed. Thus, while the two compositions selected for this study provided a viable platform for investigating the degree of overlap between poem and painting comprehension processes, additional studies with alternate types of poem and painting must be undertaken to better understand the related comprehension processes and, by extension, the nature and degree of overlap between them.

This focus on iterative replication must also be undertaken with respect to the symbol-systems in which these compositions are encoded; namely, language and visual display. Poem and painting were chosen for this study because it was argued that language and visual display represent maximal differences with regard to their symbol systems, while being maximally similar in the messages that can be communicated by them. However, poem and painting represent only slivers, respectively, of the range of

composition types that are encoded linguistically or visually. The comprehension processes associated with other linguistically encoded compositions—encyclopedia entries, technical reports, short stories—likely differ in some ways from the poem comprehension processes identified in this study. Likewise, other visually-encoded compositions—maps, diagrams, photographs—are probably associated with some comprehension processes not identified in relation to paintings. Therefore, both the range of comprehension processes identified in relation to language and visual display, as well as their nature and degree of overlap, requires significant additional research.

**Choice of symbol systems.** In this same vein, the study was delimited by its focus on language and visual display, rather than other symbol systems. According to Moje (2008), symbol systems include language (speech or text), numbers, musical notation, visual arrays, icons, or mathematical symbols. As such, understanding the degree to which comprehension processes are trans-symbolic or symbol-specific necessitates research that examines comprehension processes in other symbol systems. For example, what is the relation between comprehending a musical score and a mathematical equation, or a recorded dance and an encyclopedia entry?

There is evidence that researchers and practitioners are interested in exploring trans-symbolic comprehension processes, such as the relation between mathematical notation and language. For instance, there Hickman and Huckstep (2003) compared math to language, in that once taught the rules of grammar, a student should be able to extract meaning from symbolic sentences (i.e., equations) and construct his or her own syntactically correct sentences, follow logical arguments, and apply descriptors to new situations. Likewise, Wakefield (2000) suggests a number of characteristics of

mathematics that overlap with characteristics of language (e.g., abstractions are used to communicate, translations and interpretations are required for novice learners, and meaning is influenced by the order of symbols). Drawing on these and other sources, Adams (2003) argues that teachers should approach mathematics in a similar fashion as they do text: teach students strategies for understanding it.

This example, one of many identified efforts to examine the relation between comprehension in two symbol systems, necessitates a dedicated and robust program of research, for which the TSC framework may serve a valuable role. Moreover, it is plausible that many of the processes identified as trans-symbolic in this investigation may be evidenced with respect to mathematics or other symbol systems. However, again, significant additional research must be undertaken to determine the degree and nature of trans-symbolic processes and, by extension, the nature of those particular to a given symbol system.

### **Implications of the Study**

In outlining the rationale for this study, several theoretical and methodological problems in the current literature were identified. Specifically, it was noted that a theoretical framework robust to linguistic and nonlinguistic composition comprehension is needed, as are process-oriented examinations of comprehension processes with nonlinguistic compositions that investigate, rather than assume, similarities in comprehension processes. Moreover, the need for concrete applications of nonlinguistic literacy for practitioners was identified.

This study was designed to be a first step toward addressing these gaps in the literature, by using the TSC as a framework for systematically and simultaneously

investigating the degree of overlap between the comprehension processes manifest with two symbol systems using think aloud methodology. It was argued, moreover, that the symbol systems of language and visual display—specifically operationalized as a poem and a painting—would represent the strictest test of the TSC.

Thus, it is appropriate to draw conclusions from this study, albeit tentative given the aforementioned limitations and delimitations, related to education research, specifically with respect to the burgeoning literature on nonlinguistic literacies. Preliminary implications for educational practice can be drawn, as well, in light of the growing praxis of teaching literature, including poetry, through visual art in middle and high schools, and ongoing policy efforts to expand this type of instruction. These implications of the study—for research, practice and policy—are discussed here.

### **Research**

The introduction of this examination noted that, while there is a growing body of research investigating nonlinguistic compositions (Alexander & Jetton, 2003; Flood et al., 2008; Kress & Van Leeuwen, 1996; Leu et al., 1999; New London Group, 1996), and there appears to be a shared desire to explore and describe related comprehension processes, at present, there is no unifying framework to anchor these investigations. A framework is needed that allows for focused study of comprehension within and across symbol systems (Azripe & Styles, 2008; Felini, 2008; Kist, 2008; Unsworth, 2008). Further, it was suggested that this theoretical framework accommodate efforts to identify comprehension processes that might be shared as well as specific to each compositional type (Magliano et al., 2007; Unsworth, 2008). According to Felini (2008), the assumption that comprehension processes are shared between linguistic and nonlinguistic

compositions, while probable, should be investigated directly, not assumed. The assumption is also problematic because, while there may be some overlap in comprehension of different compositional types, there may be some differences, as well (Desmond, 1997; Kress, 2008).

The results of this study upheld the predictions of the TSC framework, as did the conclusions drawn by Loughlin et al. (2013), tentatively suggesting that the TSC framework may be viable and may serve to address this underspecified area of the literature. By framing comprehension as the interplay of processes that are shared by a variety of symbol systems and processes that are particular to a given symbol system, the TSC may provide a theoretical framework robust to examinations of linguistic and nonlinguistic compositions and provide researchers with a framework for investigating, rather than assuming, relations amongst and between composition types. However, as noted, significantly more research—both in relation to text and visual displays and other symbol systems—is needed before the long-term viability and robustness of the TSC framework for research can be ascertained.

The review of the literature framing this study also noted that much of the research on nonlinguistic literacies has been conducted under the umbrella of multi-representational or multimedia learning, which tends to investigate the combination of linguistic and non-linguistic compositions (e.g., visual/pictorial representations and music/sound effects; Ainsworth, 2008; Mayer, 2001; Schnotz, 2005). However, as noted by many (Ainsworth, 2006; Cromley, Snyder-Hogan, & Luciw-Dubas, 2010; Kamil, Intrator, & Kim, 2000; Kress, 2008; Reed, 2006), the mechanisms individuals use to comprehend these nonlinguistic text adjuncts are underspecified in these models,

suggesting a need to examine comprehension processes of nonlinguistic compositions that stand alone. This concern was voiced by semiotician Kress (2008), who stated, “There remains the large task of understanding the affordances of all modes involved in the meaning-making of [multi-modal] texts in at least the same detail as those of writing or speech” (p. 99).

The current study directly investigated the manifest comprehension processes of a nonlinguistic, visual display, and found that understanding the painting alone required individuals to effortfully coordinate a number of comprehension processes, some of which had correlates in text comprehension and some that did not. These findings suggest that the course of comprehension of other types of visual display (e.g., graphs, tables, photographs), and possibly other symbol systems often combined with text in multi-symbolic compositions, may be equally complex, even before the non-text adjuncts are coordinated with text. Thus, the results of this study concur with previous critiques of the literature on multi-symbolic compositions, such as Ainsworth (2006), who noted that “Learning to use [multi-symbolic compositions] requires learners to understand each individual representation. This is complex process in its own right” (p. 187). It is clear that the field needs to better understand how individuals comprehend nonlinguistic compositions before we can attempt to understand how linguistic and nonlinguistic compositions are meaningfully integrated. In other words, this study implies that additional examinations of nonlinguistic comprehension processes are necessary so that they ways in which they are coordinated with text can be better understood.

### **Practice and Policy**

Another significant challenge to the literature on nonlinguistic compositions relates to the coordination of research, practice, and policy. As noted by several (e.g., Kapinus & Roller, 2008; Kim, 2003; Tierney, 1997), the research on nonlinguistic compositions has been largely devoid of concrete suggestions for literacy practitioners, especially classroom teachers. Tierney (1997) argues, for instance, that an expanded definition of what constitutes a text, and therefore what *texts* require comprehension and comprehension instruction, is critical knowledge for schools and must be treated as such. Moreover, this relation must be made clear if policy efforts are to be informed and effective (Tierney, 1997). There are potential implications from this study for education practitioners and policy makers, particularly those who endeavor to help students understanding paintings in coordination with poems.

An increasingly popular framework through which teachers coordinate poem and painting instruction is “arts integration;” colloquially, teaching through the arts (Burnaford, 2007; Burnaford, April, & Weiss, 2001; Cornett, 2007). Many of these arts integration efforts are focused around the intersection of visual art and text comprehension, particularly the comprehension of literature, including poems. Moreover, the practice of arts integration is growing. Indeed, a report recently released by the United States Department of Education found visual arts integration practices in 69% of elementary and 59% of secondary schools (USDE, 2012) and the President’s Committee on the Arts and Humanities (2011) stated that, “Arts integration has...generated a lot of enthusiasm from classroom teachers, school administrators and policy researchers for its ability to produce results” (p. 19). Indeed, the new Common Core State Standards in Literacy specifically target the integration of literature with the

arts. For instance, as described by Coleman (2013), the 9<sup>th</sup> and 10<sup>th</sup> grade Standards in Literacy require students to, “analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment” (p. 2). Coleman, one of the authors of the Common Core framework, goes on to point out that the Standards document suggests two paintings that can be taught with text for this purpose.

The results of this study may prove useful to these ongoing efforts by practitioners and policy makers to coordinate literature, such as poems, with paintings. The findings of this study suggest that understanding paintings requires the coordination of comprehension processes, many of which appear to overlap with poetry and, possibly, other literary texts. Thus, this study hints that a fruitful avenue for supporting students in the comprehension of poetry may entail its coordination with paintings, which do not have the burden of linguistic decoding or vocabulary constraints. However, as this study was not conducted with school-aged students, it more appropriately serves as a framework for future research in this population.

Moreover, the study also indicates that there may exist comprehension processes specific to paintings. Thus, the findings suggest that art and literature integration efforts not neglect painting comprehension instruction or presume that students will understand paintings, simply because they are visually encoded. Indeed, this study, along with previous studies of painting comprehension processes, indicates that understanding paintings is complex, effortful, and uncertain. Furthermore, the current investigation indicates that understanding paintings may require explicit instruction, particularly with respect to visual elements and the rules for apprehending some important meanings, such

as mood. However, given that this study was not conducted with school-aged children, additional research is necessary.

### **Conclusions**

This investigation opened with a quote from Nelson Goodman (1976), wherein he asserted,

I maintain, on the contrary, that we have to read the painting as well as the poem, and that the aesthetic experience is dynamic rather than static. It involves making delicate discriminations and discerning subtle relationships, identifying symbol systems and characters within these systems and what these characters denote and exemplify, interpreting works and reorganizing the world in terms of works and works in terms of the world. Much of our experience and many of our skills are brought to bear and may be transformed by the encounter. (p.241)

The findings of this study suggest that Goodman's (1976) insight about relation between reading poetry and reading paintings, an insight largely under-examined in the ensuing four decades, was correct. Indeed, the observed comprehension processes revealed in participants' efforts to understand a poem and a painting were rich, multifaceted, and dynamic. Moreover, the study revealed a number of comprehension processes and subprocess that appear shared by the poem and painting, as indicated by Goodman. However, this study also identified a pattern in the relation between poem and painting comprehension that was not predicted by Goodman: there appear to be comprehension processes that are not shared, as well.

Thus, the findings of this study go beyond Goodman's idea to provide tentative and emerging support for the Trans-Symbolic Comprehension framework (Loughlin &

Alexander, 2012; Loughlin et al., 2013). Specifically, the identification of processes that seem to transcend the linguistic and visual symbol systems, as well as processes that emerged only in relation to poetry and painting, give credence to the newly articulated framework. This has the potential to fill an identified gap in theories supporting the examination of nonlinguistic comprehension and the comprehension of multi-symbolic compositions. However, significant future research is necessary before the TSC framework can be considered viable or influential on educational research and practice. In this effort, to paraphrase Goodman (1976), much of our experience and many of our skills may be brought to bear.

**APPENDICES**

## Appendix A: Western Literature Subject-Matter

1. Which poet wrote *Fireworks*, which contains the following lines?

*Such firework as we make, we two!  
Because you hate me and I hate you.*

- A. Pablo Neruda
- B. Allen Ginsberg
- C. Sylvia Plath
- D. Amy Lowell

2. Which play by Shakespeare includes the following lines?

*PETRUCHIO*            *Come on, i' God's name; once more toward our father's.  
Good Lord, how bright and goodly shines the moon!*

*KATHARINA*            *The moon! the sun: it is not moonlight now.*

*PETRUCHIO*            *I say it is the moon that shines so bright.*

*KATHARINA*            *I know it is the sun that shines so bright.*

*PETRUCHIO*            *Now, by my mother's son, and that's myself,  
It shall be moon, or star, or what I list,  
Or ere I journey to your father's house.*

- A. *Much Ado About Nothing*
- B. *The Merry Wives of Windsor*
- C. *The Merchant of Venice*
- D. *The Taming of the Shrew*

3. Which poem includes the following lines?

*Beauty is truth, truth beauty—that is all  
Ye know on earth, and all ye need to know.*

- A. *Ode on a Grecian Urn* by John Keats
- B. *Oh, Captain! My Captain!* by Walt Whitman
- C. *To My Wife—With a Copy of My Poems* by Oscar Wilde
- D. *I Wondered Lonely as a Cloud* by William Wordsworth

4. Which novel includes the following lines?

*It was the best of times, it was the worst of times....*

- A. *The Count of Monte Cristo* by Alexandre Dumas
- B. *A Tale of Two Cities* by Charles Dickens
- C. *An American in Paris* by Margaret Vandenberg
- D. *Scarlet Pimpernel* by Emmuska Orkzy

5. Which poem by Robert Burns includes the following lines?

*O my Luve's like a red, red rose  
That's newly sprung in June;  
O my Luve's like the melodie  
That's sweetly played in tune.*

- A. *My Pretty Rose Tree*
- B. *Love and a Question*
- C. *Ae Fond Kiss*
- D. *A Red, Red Rose*

6. Which poet wrote *The Road Not Taken*, which includes the following lines?

*Two roads diverged in a wood, and I—  
I took the one less traveled by,  
And that has made all the difference.*

- A. William Yeats
- B. Robert Frost
- C. e.e. cummings
- D. Elizabeth Browning

7. Which short story by Edgar Allen Poe includes the following lines?

*No doubt I now grew very pale,—but I talked more fluently, and with a  
heightened voice. Yet the sound increased—and what could I do? It was a low,  
dull, quick sound—much such a sound as a watch makes when enveloped in  
cotton. I gasped for breath—and yet the officers heard it not. I talked more  
quickly—more vehemently; but the noise steadily increased.*

- A. *The Cask of Amontillado*
- B. *The Pit and the Pendulum*
- C. *The Tell-Tale Heart*
- D. *The Fall of the House of Usher*

8. Which author wrote *Jabberwocky*, which includes the following lines?

*‘Twas brillig, and the slithy toves  
Did gyre and gimble in the wabe:  
All mimsy were the borogoves,  
And the mome raths outgrabe.*

- A. Lewis Carroll
- B. Shel Silverstein
- C. C. S. Lewis
- D. Rudyard Kipling

9. Which novel includes the following line?

*Reader, I married him.*

- A. *Jane Eyre* by Charlotte Bronte
  - B. *Emma* by Jane Austen
  - C. *Wuthering Heights* by Emily Bronte
  - D. *Anne of Green Gables* by Lucy Maud Montgomery
- 

10. Which short story includes the following lines?

*Then we noticed that in the second pillow was the indentation of a head. One of us lifted something from it, and leaving forward, that faint and invisible dust dry and acrid in the nostrils, we saw a long strand of iron-grey hair.*

- A. *Gift of the Magi* by O. Henry
  - B. *The Necklace* by Guy de Maupassant
  - C. *Regret* by Kate Chopin
  - D. *A Rose for Emily* by William Faulkner
- 

11. Which poet wrote *In Flanders Field*, which includes the following lines?

*In Flanders fields the poppies blow  
Between the crosses, row on row,  
That mark our place; and in the sky  
The larks, still bravely singing, fly  
Scarce heard amid the guns below.*

- A. John McCrae
  - B. Emily Dickinson
  - C. Alan Seeger
  - D. Robert Louis Stevenson
- 

12. Which poet wrote *I Rise*, which contains the following lines?

*Out of the huts of history's shame  
I rise  
Up from a past that's rooted in pain  
I rise  
I'm a black ocean, leaping and wide,  
Welling and swelling I bear in the tide.*

- A. Rita Dove
- B. Maya Angelou
- C. Countee Cullen
- D. Elizabeth Alexander

13. Which novel includes the following lines?

*"Come on, woman!"*

*The woman knelt among the books, touching the drenched leather and cardboard, reading the gilt titles with her fingers while her eyes accused Montag.*

*"You can't ever have my books," she said.*

- A. *Brave New World* by Aldous Huxley
  - B. *1984* by George Orwell
  - C. *Slaughterhouse-Five* by Kurt Vonnegut
  - D. *Fahrenheit 451* by Ray Bradbury
- 

14. Which poem by T. S. Eliot contains the following lines?

*He is quiet and small, he is black  
From his ears to the tip of his tail;  
He can creep through the tiniest crack,  
He can walk on the narrowest rail.*

- A. *Mr. Mistoffeeles*
  - B. *Gus: The Theater Cat*
  - C. *Macavity: The Mystery Cat*
  - D. *Cats*
- 

15. Who wrote the play, *A Raisin in the Sun*, which opens the following poem by Langston Hughes?

*What happens to a dream deferred?*

*Does it dry up  
like a raisin in the sun?  
Or fester like a sore--  
And then run?  
Does it stink like rotten meat?  
Or crust and sugar over--  
like a syrupy sweet?*

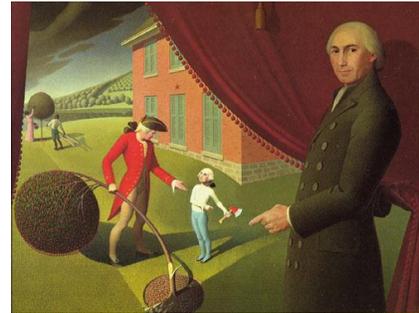
*Maybe it just sags  
like a heavy load.  
Or does it explode?*

- A. Tennessee Williams
- B. Arthur Miller
- C. Lorraine Hansberry
- D. George S. Kaufman and Edna Ferber

## Appendix B: Western Visual Art Subject-Matter

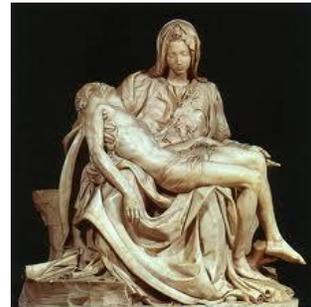
What did artist Grant Wood name the painting to the right?

- A. *Conflict and the Cherry Tree*
- B. *American Gothic*
- C. *Storm's 'a Comin'*
- D. *Parson Weem's Fable*



Which artist created the sculpture, *Pieta*, pictured at the right?

- A. Michaelangelo
- B. Raphael
- C. Donatello
- D. Da Vinci



Which artist created the painting, *The Star*, pictured at the right?

- A. Fernando Botero
- B. Edgar Degas
- C. Claude Monet
- D. Frederick Leighton



What did sculptor Constantin Brancusi name the composition to the right?

- A. *West Wind*
- B. *The Thinker*
- C. *Bird in Flight*
- D. *Unique Form of Continuity in Space*



Which artist painted *The Third of May, 1814*, pictured to the right?

- A. Diego Rivera
- B. Francisco de Goya
- C. Henri Rousseau
- D. Frida Kahlo



Which artist created *The Gates* installation to the right?

- A. Yayoi Kusama
- B. Dale Chihuly
- C. Christo
- D. Jasper Johns



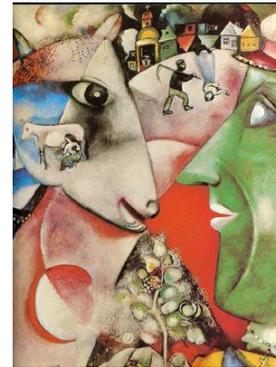
Which artist painted *The Large Turf*, pictured to the right?

- A. Charles Sheeler
- B. Jean Vermeer
- C. Claude Monet
- D. Albrecht Durer



What is the title of the Marc Chagall painting, pictured to the right?

- A. *I, and the Village*
- B. *Birthday*
- C. *Eye to Eye*
- D. *Green Farmer and Goat*



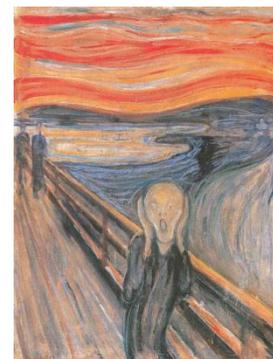
Which architect designed the Guggenheim museum in Bilboa, Spain, pictured to the right?

- A. Frank Lloyd Wright
- B. Frank Gehry
- C. I. M. Pei
- D. Richard Meier



Which artist painted *The Scream*, pictured to the right?

- A. Gustav Klimt
- B. Marcel Duchamp
- C. Edvard Munch
- D. Rene Magritte



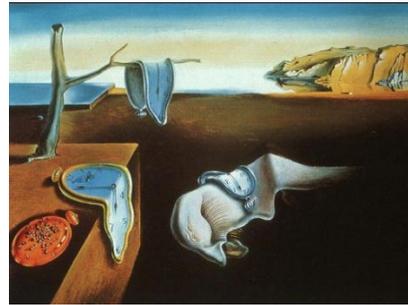
Which artist created the sculpture to the right, *Spoonbridge and Cherry*?

- A. Claes Oldenberg
- B. Alexander Calder
- C. Robert Rauschenberg
- D. Henry Moore



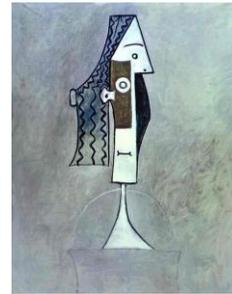
What did artist Salvador Dali title the painting to the right?

- A. *Homage to Newton*
- B. *The Persistence of Memory*
- C. *Soft Watch at the Moment of First Explosion*
- D. *Hallucinogenic Toreador*



What artist painted the painting to the right, *Jacqueline Rocque*?

- A. Kees Van Dongen
- B. Henri Matisse
- C. Egon Schiele
- D. Pablo Picasso



What sculptor created the composition to the right, *Bronco Buster*?

- A. Frederick Remington
- B. Ansel Adams
- C. Winslow Homer
- D. William Gropper



What artist created the collage to the right, *Munich Olympic Games*?

- A. Palmer Hayden
- B. William H. Johnson
- C. Jacob Lawrence
- D. Romare Bearden



### Appendix C: Domain Interest Questionnaire

|   | Strongly<br>Disagree |   | Strongly<br>Agree |   |   |
|---|----------------------|---|-------------------|---|---|
| 1. I find science to be uninteresting. *                          | 1                    | 2 | 3                 | 4 | 5 |
| 2. The processes underlying reading literature are fascinating.   | 1                    | 2 | 3                 | 4 | 5 |
| 3. Reading literature is personally important to me.              | 1                    | 2 | 3                 | 4 | 5 |
| 4. I find history to be uninteresting. *                          | 1                    | 2 | 3                 | 4 | 5 |
| 5. I rarely think about what's involved creating art. *           | 1                    | 2 | 3                 | 4 | 5 |
| 6. I enjoy reading literature.                                    | 1                    | 2 | 3                 | 4 | 5 |
| 7. History is personally important to me.                         | 1                    | 2 | 3                 | 4 | 5 |
| 8. I rarely think about what's involved in reading literature. *  | 1                    | 2 | 3                 | 4 | 5 |
| 9. I rarely think about what's involved in scientific inquiry. *  | 1                    | 2 | 3                 | 4 | 5 |
| 10. Scientific research is fascinating.                           | 1                    | 2 | 3                 | 4 | 5 |
| 11. I find the process of historical inquiry fascinating.         | 1                    | 2 | 3                 | 4 | 5 |
| 12. I enjoy science.  | 1                    | 2 | 3                 | 4 | 5 |
| 13. I find literature to be uninteresting. *                      | 1                    | 2 | 3                 | 4 | 5 |
| 14. Science is personally important to me.                        | 1                    | 2 | 3                 | 4 | 5 |
| 15. The creation of art is fascinating.                           | 1                    | 2 | 3                 | 4 | 5 |
| 16. I rarely think about what's involved in historical inquiry. * | 1                    | 2 | 3                 | 4 | 5 |
| 17. I enjoy learning about the past.                              | 1                    | 2 | 3                 | 4 | 5 |
| 18. I find art to be uninteresting. *                             | 1                    | 2 | 3                 | 4 | 5 |
| 19. I enjoy art.  | 1                    | 2 | 3                 | 4 | 5 |
| 20. Art is personally important to me.                            | 1                    | 2 | 3                 | 4 | 5 |

### Appendix D: Poem Activities Questionnaire

| <i>How often do you:</i>  |   | Rarely/<br>Never | About<br>Yearly | About<br>Monthly | About<br>Weekly | About<br>Daily |
|---|---|------------------|-----------------|------------------|-----------------|----------------|
| 1. Visit bookstores or the library to read poetry.                | G | a                | b               | c                | d               | e              |
| 2. Engage in poetry criticism                                     | P | a                | b               | c                | d               | e              |
| 3. Write poetry during your free time                             | G | a                | b               | c                | d               | e              |
| 4. Attend poetry readings, talks, or lectures in your free time   | G | a                | b               | c                | d               | e              |
| 5. Read scholarly journals related to poetry                      | P | a                | b               | c                | d               | e              |
| 6. Talk with peers about poetry                                   | P | a                | b               | c                | d               | e              |
| 7. Collect or buy poetry books                                    | G | a                | b               | c                | d               | e              |
| 8. Read the works of aspiring poets.                              | G | a                | b               | c                | d               | e              |
| 9. Talk with friends or family about poetry                       | G | a                | b               | c                | d               | e              |
| 10. Do volunteer work related to poetry                           | G | a                | b               | c                | d               | e              |
| 11. Attend conferences or professional meetings related to poetry | P | a                | b               | c                | d               | e              |
| 12. Teach others about poetry                                     | P | a                | b               | c                | d               | e              |
| 13. Conduct research related to poetry                            | P | a                | b               | c                | d               | e              |
| 14. Search online for information related to poetry               | G | a                | b               | c                | d               | e              |
| 15. Publish books or articles related to poetry                   | P | a                | b               | c                | d               | e              |

### Appendix E: Painting Activities Questionnaire

| <i>How often do you:</i>   |   | Rarely/<br>Never | About<br>Yearly | About<br>Monthly | About<br>Weekly | About<br>Daily |
|--|---|------------------|-----------------|------------------|-----------------|----------------|
| 1. Visit art museums, galleries, or exhibits online or in person to view paintings | G | a                | b               | c                | d               | e              |
| 2. Engage in painting criticism  | P | a                | b               | c                | d               | e              |
| 3. Paint during your free time   | G | a                | b               | c                | d               | e              |
| 4. Attend painting-related presentations, talks, or lectures in your free time     | G | a                | b               | c                | d               | e              |
| 5. Read scholarly journals related to paintings                                    | P | a                | b               | c                | d               | e              |
| 6. Talk with peers about paintings   | P | a                | b               | c                | d               | e              |
| 7. Collect or buy paintings  | G | a                | b               | c                | d               | e              |
| 8. Look at paintings by aspiring artists.  | G | a                | b               | c                | d               | e              |
| 9. Talk with friends or family about paintings                                     | G | a                | b               | c                | d               | e              |
| 10. Do volunteer work related to paintings   | G | a                | b               | c                | d               | e              |
| 11. Attend conferences or professional meetings related to paintings               | P | a                | b               | c                | d               | e              |
| 12. Teach others about paintings   | P | a                | b               | c                | d               | e              |
| 13. Conduct research related to paintings  | P | a                | b               | c                | d               | e              |
| 14. Search online for information related to paintings                             | G | a                | b               | c                | d               | e              |
| 15. Publish books or articles related to paintings                                 | P | a                | b               | c                | d               | e              |

**Appendix F: Poem Comprehension Outcome**

In the line, “a sign you can sign,” the underlined word most likely means

- a. Indicator
- b. Signature
- c. Sign language
- d. Direction

What does the bird most likely symbolize?

- a. Artistic inspiration
- b. Freedom
- c. Peace
- d. A dream state

What stylistic device most contributes to the sense of anticipation in lines 19-28?

- a. Repetition
- b. Lack of punctuation
- c. Rhyme scheme
- d. Alliteration

In the line, “paint likewise the green leaves and fresh breeze, the sun’s scintillation,” the underlined word most likely means

- a. light
- b. excitement
- c. heat
- d. shadow

Do you think the title of the poem "To Paint a Bird's Portrait" is a good title for the poem? Explain why or why not using evidence from the poem.

What might the author have been trying to communicate with the poem? Use evidence from the poem to support your response.

**Appendix G: Painting Comprehension Outcome**

What best describes the object in the central figure's left hand?

- a. Prism
- b. Trowel
- c. Spatula
- d. Mirror

What do the birds most likely symbolize?

- a. Artists' relations to their work
- b. Relations among family members
- c. The tension between freedom and constriction
- d. Interpretive layer between the artist and the audience

What best describes both the room and the desk at which central figure sits?

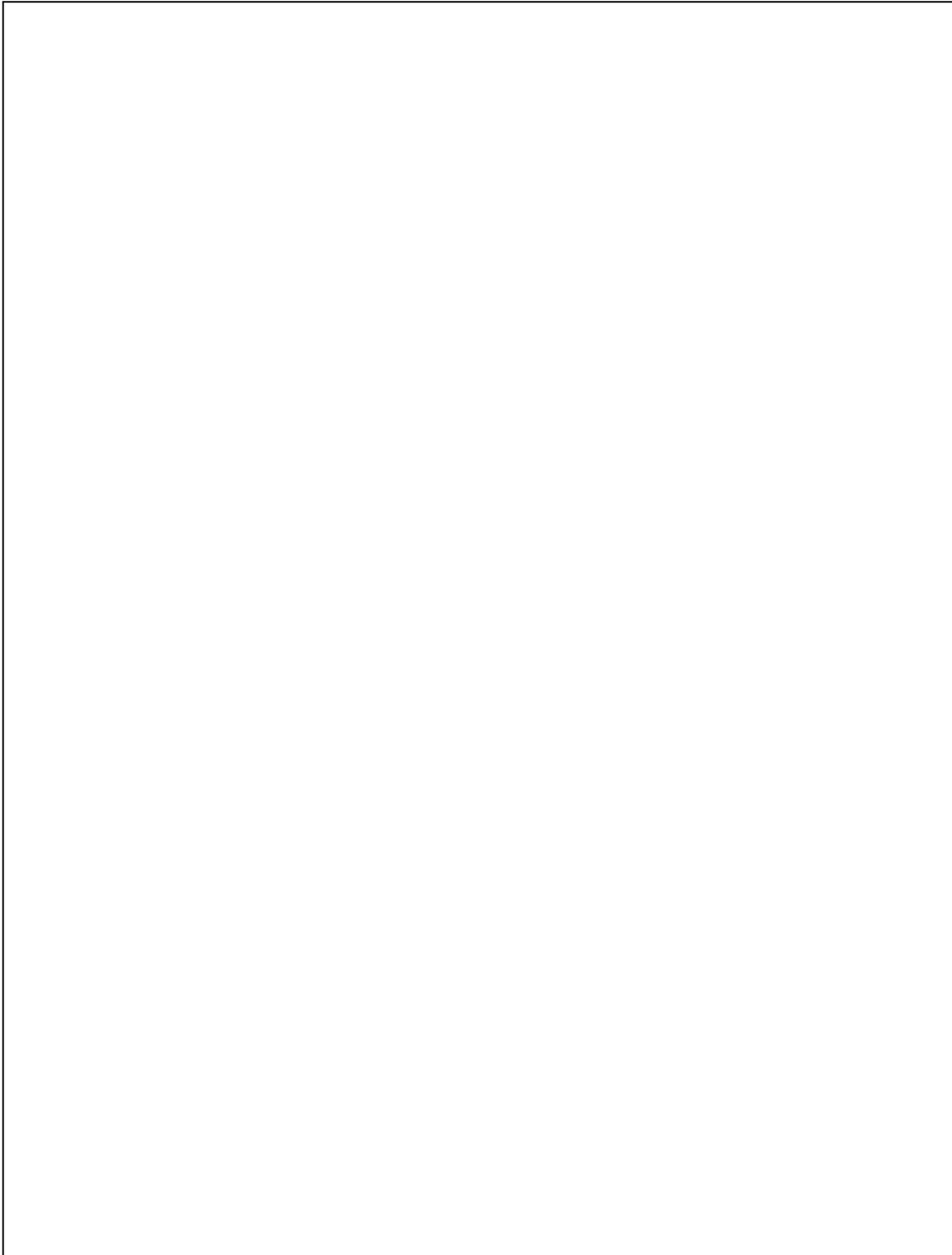
- a. Austere
- b. Ancient
- c. Contemporary
- d. Inviting

What stylistic device contributes most to drawing the viewers' eye to the center of the painting?

- a. Focal point
- b. Visual incongruity
- c. Texture
- d. Line

Do you think the title of the painting "The Creation of Birds" is a good title for the painting? Explain why or why not using evidence from the painting.

What might the artist have been trying to communicate with the painting? Use evidence from the painting to support your response.

A large, empty rectangular box with a thin black border, intended for the student to write their response to the prompt above.

**Appendix H: Demographic Questionnaire**

**DIRECTIONS:** Please circle or fill in the appropriate responses.

**Sex:**      Male              Female

**Age:** \_\_\_\_\_

**Race (check all categories that apply):**

\_\_\_\_\_ White

\_\_\_\_\_ African American/Black

\_\_\_\_\_ Hispanic

\_\_\_\_\_ Asian

\_\_\_\_\_ American Indian/Alaska Native

\_\_\_\_\_ Native Hawaiian/Other Pacific Islander

\_\_\_\_\_ Other (Please specify: \_\_\_\_\_)

**Major(s):** \_\_\_\_\_

**Minor(s):** \_\_\_\_\_

**Year in school:** \_\_\_\_\_

**Current GPA:** \_\_\_\_\_

**Are you a native English speaker?:**              Yes              No

**Appendix I: Poem****To Paint a Bird's Portrait**

by Jacques Prévert

Paint first a cage  
with the door open  
next paint  
something pretty  
something simple  
something lovely  
something of use  
to the bird  
then put the canvas near a tree  
in a garden  
in the woods  
or in a forest  
hide behind the tree  
say nothing  
don't move...  
Sometimes the bird comes quickly  
but it can just as well take many years  
before deciding  
Don't be disheartened  
wait  
wait years if need be  
the pace of the bird's arrival  
bearing no relation  
to the success of the painting  
When the bird comes  
if it comes  
keep very still  
wait for the bird to enter the cage  
and once it has  
gently shut the door with the brush  
then  
paint out the bars one by one  
taking care not to touch any of the bird's feathers  
Next paint the tree's portrait  
choosing the loveliest of its branches  
for the bird  
paint likewise the green leaves and fresh breeze  
the sun's scintillation  
and the clamor of crickets in the heat of summer  
and then wait until the bird decides to sing  
If the bird does not sing  
that's a bad sign  
A sign the painting is no good  
but if it sings that's a good sign  
a sign you can sign  
Then you pull out very gently  
one of the bird's feathers  
and you write down your name in a corner of the painting

**Appendix J: Painting**

Remedios Varo, *The Creation of Birds*, 1957



## REFERENCES

- Ackermann, J. M. (1990). *Reading, writing, and knowing: The role of disciplinary knowledge in comprehension and composing. Technical Report No. 40*. Berkeley, CA: National Writing Project.
- Adams, T. L. (2003). Reading mathematics: More than words can say. *Reading Teacher, 56*, 786-795.
- Afflerbach, P. (1999). Verbal reports and protocol analysis. In P. Pearson, M. Kamil, R. Barr, & P. Mosenthal (Eds.) *Handbook of reading research*, pp.163-179. Hillsdale, NJ: Erlbaum.
- Afflerbach, P., Pearson, P. D., & Paris, G. S. (2008). Clarifying differences between reading skills and reading strategies. *Reading Teacher, 61*, 364-373.
- Aigrain, P., Zhang, H., & Petkovic, D. (1996). Content-based representation and retrieval: A state-of-the-art review. *Multimedia Tools and Applications, 3*, 179-202.
- Ainsworth, S. (2006). DeFT: A conceptual framework for considering learning with multiple representations. *Learning and Instruction, 16*, 183-198.
- Ainsworth, S. (2008). The educational value of multiple representations when learning complex scientific concepts. In J. K. Gilbert & M. Reiner & M. Nakhlel (Eds.), *Visualization: Theory and practice in science education* (pp. 191-208). New York: Springer.
- Alexander, P. A. (1997). Mapping the multidimensional nature of domain learning: The interplay of cognitive, motivational, and strategic forces. In M. L. Maehr & P. R.

Pintrich (Eds.), *Advances in motivation and achievement* (Vol. 10, pp. 213-250).  
Greenwich, CT: JAI Press.

Alexander, P. A. (2003). Profiling the developing reader: The interplay of knowledge, interest, and strategic processing. In C. M. Fairbanks, J. Worthy, B. Maloch, J. V. Hoffman, & D. L. Schallert (Eds.), *The Fifty-first Yearbook of the National Reading Conference* (pp. 47-65). Oak Creek, WI: National Reading Conference.

Alexander, P. A. (2006). The path to competence: A lifespan developmental perspective on reading. *Journal of Literacy Research*, 37, 413-436.

Alexander and the Disciplined Reading and Learning Research Laboratory (under revision). The challenges of developing competent literacy in the 21<sup>st</sup> century. *Educational Psychologist*.

Alexander, P. A., Jetton, T. L., & Kulikowich, J. M. (1995). Interrelationship of knowledge, interest, and recall: Assessing a model of domain learning. *Journal of Educational Psychology*, 87, 559-575.

Alexander, P. A., & Judy, J. E. (1988). The interaction of domain-specific and strategic knowledge in academic performance. *Review of Educational Research*, 58, 375-404.

Alexander, P. A., Kulikowich, J. M., & Schulze, S. K. (1994). The influence of topic knowledge, domain knowledge, and interest on the comprehension of scientific exposition. *Learning and Instruction*, 6, 379-397.

Alexander, P. A., & Murphy, P. K. (1998). Profiling the differences in students' knowledge, interest, and strategic processing. *Journal of Educational Psychology*, 90, 435-447.

- Alexander, P. A., Schallert, D. L., & Reynolds, R. E. (2009). What is learning anyway? A topographical perspective considered. *Educational Psychologist*, 44, 209-214.
- Alexander, P. A., & Winne, P. H. (Eds.) (2006). *Handbook of educational psychology*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Alvermann, D. E. (2001, October 30). *Effective literacy instruction for adolescents*. Paper commissioned by the National Reading Conference. Retrieved September 11, 2013 from <http://www.nrconline.org/publications/alverwhite2.pdf>
- Anderson, R. C., & Pearson, P. D. (1984). A schema-theoretic view of basic processes in reading. In P. D. Pearson, R. Barr, M. L. Kamil, & P. Mosenthal (Eds.), *Handbook of reading research*. White Plains, NY: Longman.
- Anderson, R. C., & Freebody, P. (1981). Vocabulary knowledge. In J.T. Guthrie (Ed.), *Comprehension and teaching: Research reviews* (pp. 77-117). Newark DE: International Reading Association.
- Anderson, T. (1993). Defining and structuring art criticism for education. *Studies in Art Education*, 34, 199-208.
- Arnheim, R. (1989). *Thoughts on art education*. Santa Monica, CA: The Getty Center for Education in the Arts.
- Au, K. H., & Raphael, T. E. (2000). Equity and literacy in the next millennium. *Reading Research Quarterly*, 35, 170-188.
- Azripe, A., & Styles, M. (2008). A critical review of research into children's responses to multimodal texts. In J. Flood, S. B. Heath, & D. Lapp (Eds.), *Handbook of research on teaching literacy through visual and communicative arts, Volume II*. Newark, DE: International Reading Association.

- Baker, L., & Brown, A. L. (1984). Metacognitive skills and reading. In P.D. Pearson, R. Barr, M.L. Kamil, & P. Mosenthal (Eds.), *Handbook of reading research* (pp. 353-394). White Plains, NY: Longman.
- Baltissen, R. D., & Ostermann, B. M. (1998). Are the dimensions underlying aesthetic and affective judgment the same? *Empirical Studies of the Arts*, 16(2), 97-113.
- Barrett, T. (1994). *Criticizing Art: Understanding the Contemporary*. Mountain View, California: Mayfield Publishing Company.
- Barrett, T. (1997). *Talking about student art*. Worcester, MA: Davis Publications.
- Barsalou, L. W., Solomon, K. O., & Wu, L. L. (1999). Perceptual simulation in conceptual tasks. In M.K. Hiraga, C. Sinha, & S. Wilcox (Eds.), *Cultural, typological, and psychological perspectives in cognitive linguistics: The proceedings of the 4th conference of the International Cognitive Linguistics Association*, Vol. 3 (209-228). Amsterdam: John Benjamins.
- Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge, UK: Cambridge University Press.
- Barton, D., Hamilton, M., & Ivanic, R. (2000). *Situated literacies: Reading and writing in context*. London: Routledge.
- Barton, J., Sawyer, D., & Swanson, C. (2007). They want to learn how to think: Using art to enhance comprehension. *Language Arts*, 85, 125-133.
- Benton, M. (1992). Looking at paintings: Representation and response. *Perspectives on reading: CLE working papers 2*, 128-144.

- Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., Krathwohl, D. R. (Eds.). (1956). *Taxonomy of educational objectives: Handbook I: The cognitive domain*. New York: David McKay.
- Bloom, B. S., Hastings, J. T., & Madaus, G. F. (1971). *Handbook on formative and summative evaluation of student learning*. New York: McGraw-Hill.
- Botsas, G., & Padeliadu, S. (2003). Goal orientation and reading comprehension strategy use among students with and without reading difficulties. *International Journal of Educational Research*, 39, 477-495.
- Brewer, W. E (1980). Literary theory, rhetoric, and stylistics: Implications for psychology. In R. J. Shapiro, B. G. Bruce, & W. F. Brewer (Eds.), *Theoretical issues in reading comprehension* (pp. 221-239). Hillsdale, NJ: Erlbaum.
- Bransford, J., Brown, A., & Cocking, R. (2000). *How people learn: Brain, mind, and experience, and school*. Washington, DC: National Academy Press.
- Brewer, W. F. (1995). Discourse force and empirical studies of literature. In D. Buber & E. Finegan (Eds.), *Approaches to literature: Proceedings of the Fourth Biannual Conference of the International Society for the Empirical Study of Literature* (pp. 89-95). Siegen: Germany: LUMIS-Publications.
- Brewer, W. F., & Lichtenstein, E. H. (1982). Stories are to entertain: A structural-affect theory of stories. *Journal of Pragmatics*, 6, 473-486.
- Bruder, K. A., Ucock, O. (2000). Interactive art interpretation. *Symbolic Interaction*, 23, 337-358.
- Burger, K, & Winner, E. (2000). Instruction in visual art: Can it help students learn to read? *Journal of Aesthetic Education*, 34, 277-293.

- Burnafor, G., with Brown, S., Doherty, J., & McLaughlin, H. J. (2007). *Arts integration frameworks, research, and practice: A literature review*. Washington, DC: Arts Education Partnership.
- Burnafor, G., Aprill, A., Weiss, C. and Chicago Arts Partnerships in Education (CAPE), Eds. (2001). *Renaissance in the classroom: Arts integration and meaningful learning*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Butcher, K. R. (2006). Learning from text with diagrams: Promoting mental model development and inference generation. *Journal of Educational Psychology, 98*, 182-197.
- Camps, J. (2003). Concurrent and retrospective verbal reports as tools to better understand the role of attention in second language tasks. *International Journal of Applied Linguistics, 13*, 201-221.
- Carlisle, P. R., & Christensen, C. M. (2006). *The cycles of theory building in management research. A working paper*. Cambridge, MA: Harvard Business School. Retrieved June 2011 from <http://hbswk.hbs.edu/item/5422.html>.
- Cela-Conde, C. J., Agnati, L., Huston, J. P., Mora, F., & Nadal, M. (2011). The neural foundations of aesthetic appreciation. *Progress in Neurobiology, 94*, 39-48.
- Chi, M. T. H. (2006). Two approaches to the study of experts' characteristics. In K.A. Ericsson, N. Charness, P. Feltovich, & R. Hoffman (Eds.), *Cambridge Handbook of Expertise and Expert Performance*. (pp. 121-30), Cambridge University Press.
- Clyde, J. A. (2003). Stepping inside the story world: The Subtext Strategy—A tool for connecting and comprehending. *Reading Teacher, 57*, 150-160.

- Coiro, J., & Dobler, E. (2007). Exploring the online reading comprehension strategies used by sixth-grade skilled readers to search for and locate information on the Internet. *Reading Research Quarterly*, 42, 214–257.
- Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (2008). Central issues in new literacies and new literacies research. In J. Coiro, M. Knobel, C. Lankshear, & D. J. Leu. (Eds.), *The handbook of research in new literacies* (pp. 1–22). Mahwah, NJ: Lawrence Erlbaum.
- Coleman, D. (2013). Guiding principles for the arts, grades K-12. New York State Education Department. Retrieved May 12, 2013 from <http://usny.nysed.gov/rttt/docs/guidingprinciples-arts.pdf>
- Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, 13, 3-21.
- Cornett, C. E. (2007). *Creating meaning through literature and the arts: An integration resource for classroom teachers*. (3rd ed.). Upper Saddle River, NJ: Pearson Education.
- Cote, N., Goldman, S. R., & Saul, E. U. (1998) Students making sense of informational text: Relations between processing and representation. *Discourse Processes*, 25, 1-53.
- Crocker, L. & Algina, J. (2006). *Introduction to classical and modern test theory*. Pacific Grove, CA: Wadsworth.
- Cromley, J. G. (2005). Reading comprehension component processes in early adolescence. Unpublished doctoral dissertation. University of Maryland, College Park.

- Cromley, J. G., & Azevedo, R. (2006). Self-report of reading comprehension strategies: What are we measuring? *Metacognition and Learning, 1*, 229-247.
- Cromley, J. G., Snyder-Hogan, L. E., & Luciw-Dubas, U. A. (2010). Cognitive activities in complex science text and diagrams. *Contemporary Educational Psychology, 35*, 59-74.
- Culler, J. (1994). Structuralism and literature. In D. Keeseey (Ed.) *Contexts for criticism* (pp. 280-289). London: Mayfield.
- Daly, A., & Unsworth, L. (2011). Analysis and comprehension of multimodal texts. *Australian Journal of Language and Literacy, 34*, 61-80
- Desmond, R. (1997). Media literacy in the home: Acquisition versus deficit models. In R. Kubey (Ed.), *Media literacy in the information age: Current perspectives* (pp. 323-343). New Brunswick, NJ: Transaction Publishers.
- Dinsmore, D. L., Alexander, P. A., & Loughlin, S. M. (2008). The impact of new learning environments in an engineering design course. [Special Issue on Effects of Constructivist Learning Environments.] *Instructional Science, 36*, 375-393.
- Earthman, E. A. (1992). Creating the visual work: Reader's processes in understanding literary texts. *Research in the Teaching of English, 26*, 351-384.
- Elgin, C. Z. (1993). Understanding: Art and science. *Synthese, 95*, 196-208.
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal, 50*, 25-32.
- Ericsson K. A., Simon H. A. (1993). *Protocol analysis: Verbal reports as data*. MIT Press, Cambridge, MA.

- Eva-Wood, A. L. (2004). Thinking and feeling poetry: Exploring meanings aloud. *Journal of Educational Psychology, 96*, 182-191.
- Feldman, E. (1970). *Becoming human through art*, Englewood Cliffs, New Jersey: Prentice Hall.
- Felini, D. (2008). Crossing the bridge: Literacy between school and contemporary culture. In J. Flood, S. B. Heath, & D. Lapp (Eds.), *Handbook of research on teaching literacy through visual and communicative arts, Volume II*. Newark, DE: International Reading Association.
- Fey, E. G. (1949). The bird poems of Jacques Prévert. *The Modern Language Journal, 33*, 450-457.
- Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*, 906 - 911.
- Fletcher, C. F., Lucas, S., & Baron, C. M. (1999). Comprehension of mathematical proofs. In S. R. Goldman, A. C. Graesser, & P. W. van den Broek (Eds.), *Narrative comprehension, causality, and coherence: Essays in honor of Tom Trabasso*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Flood, J., Heath, S. B., & Lapp, D. (2008). *Handbook of research on teaching literacy through visual and communicative arts, Volume II*. Newark, DE: International Reading Association.
- Fox, E. (2009). The role of reader characteristics in processing and learning from informational text. *Review of Educational Research, 79*, 197-261.
- Fox, E., Alexander, P. A., & Dinsmore, D. L. (2007). Situational success at reading challenging texts: Exposing the fragile understanding of college students. In P. A.

- Alexander (Chair) *Fragile understanding: When good ideas go bad*. Symposium presented at the annual meeting of the American Educational Research Association, Chicago, IL.
- Fox, E., Maggioni, L., Dinsmore, D. L., & Alexander, P. A. (2008). *The multi-layered reading goals of expert readers: Bridging between knowledge, interest, and strategy use*. Paper presented at the annual meeting of the American Educational Research Association, New York.
- Fox, E., Maggioni, L., & Riconscente, M. (2005). Exploring expertise in reading and with reading: Characteristics and methodological issues. In P. A. Alexander (Chair) *The road to domain expertise: Texts, situations, technology, and methodology*. Symposium presented at the annual meeting of the American Psychological Association, Washington, DC.
- Franklin, M. B., Becklin, R. C., & Doyle, C. L. (1993). The influence of titles on how paintings are seen. *Leonardo*, 26, 103-108.
- Freire, P. (1983). Importance of the act of reading. *Journal of Education*, 165, 5-11.
- Furnham, A., Christopher, A., Garwood, J., & Martin, N. G. (2008). Ability, demography, learning style, and personality trait correlates of student preference for assessment method. *Educational Psychology*, 28, 15-27.
- Gadzella, B. M., & Masten, W.G. (1998). Critical thinking and learning processes for students in two major fields. *Journal of Instructional Psychology*, 25(4), 256-261.
- Gee, J. P. (1996). *Social linguistics and literacies: Ideology in discourses* (2<sup>nd</sup> ed.). New York: Routledge & Elsevier.

- Geiger, F. J., & Millis, K. K. (2004). Assessing the impact of reading goals and text structures on comprehension. *Reading Psychology, 25*, 93-110.
- Gernsbacher, M.A. (1990). *Language comprehension as structure building*. Hillsdale NJ: Lawrence Erlbaum.
- Gernsbacher, M. A., Varner, K. R., & Faust, M. E. (1990). Investigating differences in general comprehension skill. *Journal of Experimental Psychology, 16*, 430-445.
- Goodman, N. (1976). *Languages of art: An approach to a theory of symbols*. Indianapolis/Cambridge: Hackett Publishing Company.
- Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and Special Education, 7*, 6-10.
- Graesser, A. C. (2007). An introduction to strategic reading comprehension. In D. S. McNamara (Ed.) *Reading comprehension strategies: Theories, interventions, and technologies*, (pp. 3-26). Mahwah, NJ: Lawrence Erlbaum Associates.
- Graesser, A.C. (2008). Advances in text comprehension: Commentary and final perspective. *Applied Cognitive Psychology, 22*, 425-429.
- Graesser, A. C., Gernsbacher, M. A., & Goldman, S. R. (1997). Cognition. In T. Van Dijk (Ed.), *Discourse: A multidisciplinary introduction* (pp. 292-319). London: Sage.
- Graesser, A.C., Singer, M., & Trabasso, T. (1994). Constructing inferences during narrative text comprehension. *Psychological Review, 101*, 371-395.
- Guthrie, J. T., Taboada, A., & Coddington, C. S. (2007). Engagement practices for strategy learning in Concept-Oriented Reading Instruction. In D. S. McNamara

- (Ed.) *Reading comprehension strategies: Theories, interventions, and technologies*, (pp. 397-420). Mahwah, NJ: Lawrence Erlbaum Associates.
- Guthrie, J. T., Wigfield, A., Barbosa, P., Perencevich, K. C., Taboada, A., Davis, M. H., Scafliddi, N. X., & Tonks, S. (2004). Increasing reading comprehension and engagement through concept-oriented reading instruction. *Journal of Educational Psychology*, *96*, 403-423.
- Hadwin, A., Winne, P., Stockley, D., Nesbit, J., & Woszczyzna, C. (2001). Context moderates students' self reports about how they study. *Journal of Educational Psychology*, *93*, 477-487.
- Hagtvedt, H., Hagtvedt, R., Patrick, V. M. (2008). The perception and evaluation of visual art. *Empirical Studies of the Arts*, *26*, 197-218.
- Hall, J. (1979). *Dictionary of subjects and symbols in art*. New York: Harper & Row.
- Halliday, M. A. K. (1975). *Learning how to mean*. London: Edward Arnold.
- Halliday, M. A. K. (1994). *An introduction to functional grammar*. (2nd ed). London: Edward Arnold.
- Halliday, M. A. K., & Hansan, R. (1985). *Language, context, and text: Aspects of language in a social-semiotic perspective*. Geelong, Australia: Deakin University Press.
- Hanauer, D. (1998). The genre-specific hypothesis of reading: Reading poetry and encyclopedic items. *Poetics*, *26*, 63-80.
- Harris, R. J. (1977). Comprehension of pragmatic implications in advertising. *Journal of Applied Psychology*, *62*, 603-608.

- Hellman, G. (1977). Symbol systems and artistic styles. *Journal of Aesthetics and Art Criticism*, 35, 279-292.
- Helmphill, L. (1999). Narrative style, social class, and response to poetry. *Research in the Teaching of English*, 33, 275-302.
- Hickman, R., & Huckstep, P. (2003). Art and mathematics in education. *Journal of Aesthetic Education*, 37, 1-12.
- Hidi, S. (1990). Interest and its contribution as a mental resource for learning. *Review of Educational Research*, 60, 549-571.
- Hidi, S. (2001). Interest, reading, and learning: Theoretical and practical considerations. *Educational Psychology Review*, 13, 191-209.
- Hillix, W. A., & L'Abate, L. (2012). Paradigms in science and theory construction. In L. L'Abate (Ed.), *Paradigms in theory construction*. New York: Springer.
- Hoffman, R. R. (1998). How can expertise be defined?: Implications of research from cognitive psychology. In R. Williams, W. Faulkner, & J. Fleck (Eds.), *Exploring expertise* (pp. 81-100). New York: Macmillan.
- Hunt, K. (1965). *Grammatical structures written at three grade levels. Research Report No. 3*. Urbana, IL: National Council of Teachers of English.
- Ishisaka, Y., & Takahashi, S. (Unknown). The effect of inaccurate perspective on impression of paintings: The protocol analysis of observers' free talking. *Proceedings of the First International Workshop on Kansei*. Retrieved December 2, 2011 from [http://www.psycho.hes.kyushu-u.ac.jp/~lab\\_miura/Kansei/Workshop/proceedings/P-102.pdf](http://www.psycho.hes.kyushu-u.ac.jp/~lab_miura/Kansei/Workshop/proceedings/P-102.pdf)

- James, W. (1890/1950). *The principles of psychology* (Vols. 1 & 2). New York: Literacy Classics of the United States. Retrieved September 11, 2013 from <http://www.emory.edu/EDUCATION/mfp/james.html>  
<http://psychclassics.yorku.ca/James/Principles/index.htm>
- Jolley, R. P., & Thomas, G. V. (1994). The development of sensitivity to metaphorical expression of mood in abstract art. *Educational Psychology, 14*, 437-450.
- Jones, J. P. (1934). *The Poet's Use of Color: A Study of Color as a Device for Teaching Interpretation*. Madison, WI: University of Wisconsin Press.
- Kaakinen, J.K. & Hyona, J. (2005). Perspective effects on expository text comprehension: Evidence from think-aloud protocols, eyetracking, and recall. *Discourse Processes, 40*(3), 239–257.
- Kamil, M. L., Afflerbach, P. P., Pearson, P. D., & Moje, E. B. (2011). Reading research in a changing era: An introduction to the Handbook of Reading Research, Volume IV. In M. L. Kamil, P. D. Pearson, E. B. Moje, & P. P. Afflerbach (Eds.), *Handbook of Reading Research, Volume IV*. New York: Routledge.
- Kamil, M. L., Intrator, S., & Kim, H. S. (2000). Effects of other technologies on literacy and literacy learning. In M. Kamil, P. Mosenthal, P. D. Pearson, & R Barr, (Eds.), *Handbook of reading research, Volume 3* (pp. 773–788). Mahwah, New Jersey: Erlbaum.
- Kaplan, J. (1980). Remedios Varo: Voyages and visions. *Woman's Art Journal, 1*, 13-18.
- Kendeou, P., Lynch, J. S., van den Broek, P., Espin, C. A., White, M. J., & Kremer, K. E. (2005). Developing successful readers: Building early comprehension skills

through television viewing and listening. *Early Childhood Education Journal*, 33, 91-98.

Kendeou, P., van den Broek, P., White, M. J., & Lynch, J. (2009). Predicting reading comprehension in early elementary school: The independent contributions of oral language and decoding skills. *Journal of Educational Psychology*, 101, 765-778.

Kiefer, B. (1995). *The potential of picture books: From visual literacy to aesthetic understanding*. Englewood Cliffs, NJ: Merrill/Prentice Hall.

Kim, J. (2003). Challenges to NLS: Response to “What’s ‘new’ in New Literacies Studies.” *Current Issues in Comparative Education*, 5, 118-121.

Kinneavy, J. E. (1971). *A theory of discourse: The aims of discourse*. Englewood Cliffs, NJ: Prentice-Hall.

Kinneavy, J. E. (1997). The basic aims of discourse. In V. Villanueva, Jr. (Ed.), *Cross-talk in comp theory* (pp.107-117). Urbana, IL: National Council of Teachers of English.

Kist, W. (2008). Film and video in the classroom: Back to the future. In J. Flood, S. B. Heath, & D. Lapp (Eds.), *Handbook of research on teaching literacy through visual and communicative arts, Volume II*. Newark, DE: International Reading Association.

Knobel, M., & Lankshear, C. (Eds.). (2007). *A new literacies sampler* (Vol. 29). New York: Peter Lang Publishing.

Koroscik, J. S. (1984). Cognition in viewing and talking about art. *Theory Into Practice*, 23, 330-334.

- Koroscik J. S., (1996). Who ever said studying art would be easy? The growing cognitive demands of understanding works of art in the information age. *Studies in Art Education*, 38, 4-20.
- Koroscik, J. S., Short, G., Stavropoulos, C., & Fortin, S. (1992). Framework for Understanding Art: The Function of Comparative Art Context and Verbal Cues. *Studies in Art Education*, 33, 154-164.
- Kress, G. R. (2003). *Literacy in the new media age*. New York: Routledge
- Kress, G. R. (2008). 'Literacy' in a multimodal environment of communication. In J. Flood, S. B. Heath, & D. Lapp (Eds.), *Handbook of research on teaching literacy through visual and communicative arts, Volume II*. Newark, DE: International Reading Association.
- Kress, G. R., & van Leeuwen, T. (1996). *Reading images: A grammar of visual design*. London: Routledge.
- Kress, G. R., & van Leeuwen, T. (2002). *Multimodal discourse: The modes and media of contemporary communication*. London: Edward Arnold.
- L'Abate, L. (2009). Paradigms, theories, and models: Two hierarchical frameworks. In L. L'Abate, P. De Giacomo, M. Capitelli, & S. Longo (Eds.), *Science, mind and creativity: The Bari symposium* (pp. 107-122). New York: Nova Science Publishers.
- Larsen, S. F., & Seilman, U. (1988). Personal reminding while reading literature. *Journal for the Study of Discourse*, 8, 411-430.

- Lau, S., Liem, A. D., & Nie, Y. (2008). Task- and self-related pathways to deep learning: The mediating role of achievement goals, classroom attentiveness, and group participation. *British Journal of Educational Psychology, 78*, 639-662.
- Leder, H., Belke, B., Oeberst, A., & Augustin, D. (2004). A model of aesthetic appreciation and aesthetic judgment. *British Journal of Psychology, 95*, 489-508.
- Leder, H., Carbon, C., & Ripsas, A. (2006) Entitling art: Influence of title information on understanding and appreciation of paintings. *Acta Psychologica, 12*, 176-198.
- Lenski, S. D. (1998). Intertextual intentions: Making connections across texts. *The Clearing House: A Journal of Educational Strategies, Issues, and Ideas, 72*, 74-80.
- Locher, P., Krupinski, E. A., & Mello-Thomas, C. (2008). Visual interest in pictorial art during an aesthetic experience. *Art and Perception: Toward a Visual Science of Art, 21*, 55-77.
- Locher, P., Smith, L. F., & Smith, J. K. (1999). Original paintings versus slide and computer reproductions: A comparison of viewer responses. *Empirical Studies of the Arts, 17*, 121-129.
- Loughlin, S. M. (under revision). Embracing the complexity and multi-symbolic nature of comprehension: Resolving the paradox of Bloom's Taxonomy.
- Loughlin, S. M., & Alexander, P.A. (2012). Explicating and exemplifying empiricist and cognitivist paradigms in the study of human learning. In L. L'Abate (Ed.), *The role of paradigms in model construction*. London: Springer-Verlag.

- Loughlin, S. M., Grossnickle, E. M., Dinsmore, D. L., & Alexander, P. A. (under revision). "Reading" paintings: Evidence for trans-symbolic and symbol-specific comprehension processes.
- Magliano, J. P., Miller, J., & Zwaan, R. A. (2001). Indexing space and time in film understanding. *Journal of Applied Cognitive Psychology, 15*, 533-545.
- Magliano, J. P., & Millis, K. K. (2010). Assessing reading skill with a think-aloud procedure and latent semantic analysis. *Discourse Processes, 21*, 251-283.
- Magliano, J. P., Trabasso, T., & Graesser, A. C. (1999). Strategic processes during comprehension. *Journal of Educational Psychology, 91*, 615–629.
- Mantione, R. D., & Smead, S. (2002). *Weaving through words: Using the arts to teach reading comprehension strategies*. Newark, DE: International Reading Association.
- Marton, F., & Säljö, R. (1976). On qualitative differences in learning: I-Outcome and process. *British Journal of Educational Psychology, 46*, 4-11.
- Marton, F., & Säljö, R. (1997) Approaches to learning. In Marton, F., Hounsell, D. and Entwistle, N., (Eds.) *The experience of learning: Implications for teaching and studying in higher education* (2<sup>nd</sup> edition, pp. 39-58). Edinburgh: Scottish Academic Press Limited.
- Marzano, R. J., & Kendall, J. S. (2006). *The new taxonomy of educational objectives*. Thousand Oaks, CA: Corwin Press.
- Matthews, R. J. (1977). Describing and interpreting a work of art. *The Journal of Aesthetics and Art Criticism, 36*, 5-14.
- Mayer, R. E. (2001). *Multimedia learning*. New York: Cambridge University Press.

- Mayer, R. E. (2003). *Learning and instruction*. Upper Saddle River, NJ: Merrill Prentice Hall.
- Mayer, R. E. (2005). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.), *Cambridge Handbook of Multimedia Learning* (pp. 31-48). Cambridge: Cambridge University Press.
- McCrudden, M. T., Trabasso, J. P., & Schraw, G. (2011). The effect of diagrams on online reading processes and memory. *Discourse Processes*, 48: 2, 69-92.
- Mead, G. H. (1912). The mechanism of social consciousness. *Journal of Philosophy, Psychology and Scientific Methods*, 9, 401-406.
- Mendelsohn, A. L. (2008). The construction of photographic meaning. In J. Flood, S. B. Heath, & D. Lapp (Eds.), *Handbook of research on teaching literacy through visual and communicative arts, Volume II*. Newark, DE: International Reading Association.
- Messaris, P. (1994). *Visual "literacy": Image, mind, and reality*. Boulder, CO: Westview Press.
- Michaud, J. (2006). *The waking hours: Poems and translations*. Stonington, ME: Eggemoggin Reach Review.
- Miller, S. R., & Hopper, P. F. (2010). Supporting reading goals through the visual arts. *Reading Improvement*, 47, 3-6.
- Millis, K., & Larson, M. (2008). Applying the Construction-Integration framework to aesthetic responses to representational artworks. *Discourse Processes*, 45, 263-287.

- Moje, E. B. (2008). Youth literacies, Identities, and cultures in and out of school. In J. Flood, S. B. Heath, & D. Lapp (Eds.), *Handbook of research on teaching literacy through visual and communicative arts, Volume II*. Newark, DE: International Reading Association.
- Mokhtari, K., & Reichard, C. A. (2002). Assessing students' metacognitive awareness of reading strategies. *Journal of Educational Psychology, 94*, 249–259.
- Moore, B. E. (1973). Description of children's verbal responses to works of art in selected grades one through twelve. *Studies in Art Education, 14*, 27-34.
- Mucherach, W., & Yoder, A. (2008). Motivation for reading and middle school students' performance on standardized testing in reading. *Reading Psychology, 29*, 214-235.
- Murphy, P. K., & Alexander, P. A. (2002). What counts? The predictive power of subject-matter knowledge, strategic processing, and interest in domain-specific performance. *Journal of Experimental Education, 70*, 197–214.
- Naghshineh, S., Hafler, J. P., Miller, A. R., Blanco, M. A., Lipsitz, S. R., Dubroff, R. P., Khoshbin, S., & Katz, J. T. (2008). Formal art training improves medical students visual diagnostic skills. *Journal of General Internal Medicine, 7*, 991-997.
- Nagy, W., Anderson, R., & Herman, P. (1987). Learning word meanings from context during normal reading. *American Educational Research Journal, 24*, 237-270.
- National Assessment Governing Board (2011). *Reading framework for the 2011 National Assessment of Education Progress*. Washington, DC: US Department of Education.

- National Council of Teachers of English (1996). *Position statement on multimodal literacies*. Retrieved September 11, 2013 from <http://www.ncte.org/positions/statements/multimodalliteracies>
- National Reading Panel. (2000, April). *Report of the National Reading Panel: Teaching children to read*. Washington, DC: National Institute of Child Health and Human Development, National Institutes of Health, U.S. Department of Health and Human Services
- Neisser, U. (1967). *Cognitive psychology*. New York: Appleton, Century, Crofts.
- New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, 66, 60–92.
- Newell, A. (1994). *Unified theories of cognition*. Cambridge, MA: Harvard University Press.
- Oddney, J. S. (2011). The impact of reading self-efficacy and task value on reading comprehension scores in different item formats. *Reading Psychology*, 32, 1-27.
- Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart, and Winston. (Reprinted 1979, Hillsdale, NJ: Lawrence Erlbaum Associates)
- Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian Journal of Psychology*, 45, 255-287.
- Palincsar, A.S., & Brown, A.L. (1984). Reciprocal teaching of comprehension- fostering and monitoring activities. *Cognition and Instruction*, 1, 117-175.
- Paris, A. H., & Paris, S. G. (2003). Assessing narrative comprehension in young children. *Reading Research Quarterly*, 38, 36–76.

Paris, S. G., Wasik, B. A., & Turner, J. C. (1991). The development of strategic readers.

In R. R. Barr, M. L. Kamil, P. Mosenthal, & P. D. Pearson (Eds.), *The handbook of reading research, Volume II*, (pp. 609-640). New York: Longman.

Park, O., & Hopkins, R. (1993). Instructional conditions for using dynamic visual displays. *Instructional Science, 21*, 427-449.

Parsons, M. J. (1987). *How we understand art*. New York: Cambridge University Press.

Parsons, M. J. (1998). Integrated curriculum and our paradigm of cognition in the arts. *Studies in Art Education, 39*, 103-116.

Pattison, P., & Robins, G. (2008). Probabilistic network analysis. In T. Rudas (Ed.), *Handbook of probability: Theory and applications*, (pp. 291-312). Thousand Oaks, CA: Sage Publications.

Pearson, P.D., & Dole, J.A. (1987). Explicit comprehension instruction: A review of research and a new conceptualization of instruction. *Elementary School Journal, 88*, 151-165.

Pearson, P. D., Roehler, L. R., Dole, J. A., & Duffy, G. G. (1992). Developing expertise in reading comprehension. In S. J. Samuels & A. E. Farstrup (Eds.) *What research has to say about reading instruction*. Newark, DE: International Reading Association.

Perkins, D. N. (1994). *The intelligent eye: Learning to think by looking at art. Occasional Paper 4*. Santa Monica, CA: The Getty Center for Education in the Arts.

Peskin, J. (1998). Constructing meaning when reading poetry: An expert-novice study. *Cognition and Instruction, 16*, 235-263.

- Peskin, J. (2010). The development of poetic literacy during the school years. *Discourse Processes, 47*, 77-103.
- Perry, N. E., & Winne, P. H. (2006). Learning from learning kits: Study traces of students' self-regulated engagements with computerized content. *Educational Psychology Review, 18*, 211-228.
- Phan, H. P. (2009). Exploring students' reflective thinking practice, deep processing strategies, effort, and achievement goal orientations. *Educational Psychology, 29*, 297-313.
- Pipes, A. (2003). *Foundations of art and design*. London: Laurence King Publishing.
- Pratt, F. (1984). A theoretical framework for thinking about depiction. In W.R. Cozier & A.J. Chapman (Eds.), *Cognitive Processes in the Perception of Art, Vol. 19*. Amsterdam: Elsevier Science Publishers.
- President's Committee on the Arts and Humanities (2011). *Reinvesting in arts education: Winning America's future through creative schools*. Washington, DC: Author.
- Pressley, M. (2000). What should comprehension instruction be the instruction of? In M.L. Kamil, P.B. Mosenthal, P.D. Pearson, & R. Barr (Eds.), *Handbook of reading research: Volume III* (pp. 545-561). Mahwah NJ: Erlbaum.
- Pressley, M. & Afflerbach, P. (1995). *Verbal protocols of reading: The nature of constructively responsive reading*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Pressley, M., El-Dinary, P. B., Gaskins, I., Schuder, T., Bergman, J., Almasi, L., & Brown, R. (1992). Beyond direct explanation: Transactional instruction of reading comprehension strategies. *Elementary School Journal, 92*, 511-554.
- Prévert, J. (1946). *Paroles*. Paris: Editions du Point du Jour.

- Ramachandran, V. S., & Hirstein, W. (1999). The science of art. *Journal of Consciousness Studies*, 6, 15-51.
- Rapp, D. N., & Mensink, M. (2011, in press). Focusing effects from online and offline reading tasks. In M. T. McCrudden, J. P. Magliano, & G. Schraw (Eds.), *Text relevance and learning from text*. Greenwich, CT: Information Age.
- Rapp, D. N., Culpepper, S. A., Kirby, K., & Morin, P. (2007). Fostering students' comprehension of topographic maps. *Journal of Geoscience Education*, 55, 5-16.
- Rayner, K., Foorman, B. F., Perfetti, C. A., Pesetsky, D., & Seidenberg, M. S. (2001). How psychological science informs the teaching of reading. *Psychological Science in the Public Interest*, 2, 31-74.
- Reed, S. K. (2006). Cognitive architectures for multimedia learning. *Educational Psychologist*, 41, 87-98.
- Reinking, D., McKenna, M. C., Labbo, L. D., & Kieffer, R. D. (1998). *Handbook of literacy and technology: Transformations in a post-typographic world*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Reynolds, R. E., & Sinatra, G. M. (2005). The cognitive revolution in scientific psychology: Epistemological roots and impact on reading research. In J. M. Royer (Ed.), *The cognitive revolution in educational psychology*. Charlotte, NC: Information Age Publishing.
- Romance, N. R., & Vitale, M. R. (2001). Implementing an in-depth expanded science model in elementary schools: Multi-year findings, research issues, and policy implications. *International Journal of Science Education*, 23, 373-404.
- Rosenblatt, L. (1938). *Literature as Exploration*. New York: Appleton-Century

- Sachs, J. (1995). *Aristotle's physics: A guided study*. New Brunswick, NJ: Rutgers University Press.
- Sadoski, M., & Paivio, A. (2001). *Imagery and text: A dual coding theory of reading and writing*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Sadoski, M. & Paivio, A. (2004). A dual coding theoretical model of reading. In R. B. Ruddell & N. J. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed.) (pp. 1329-1362). Newark, DE: International Reading Association.
- Salomon, G. (1997). *Distributed cognitions: Psychological and educational considerations*. Cambridge University Press
- Samuelstuen, M.S. & Braten, I. (2007). Examining the validity of self-reports on scales measuring students' strategic processing. *British Journal of Educational Psychology*, 77, 351-378.
- Samuelstuen, M.S., Braten, I., & Valas, H. (2007). Context effects in Norwegian 10<sup>th</sup>-grade students' reports on learning strategies using the Cross-Curricular Competencies instrument. *Scandinavian Journal of Educational Research*, 51, 511-529.
- Schmalhofer, F., & Glavanov, D. (1986). Three components of understanding a programmer's manual: Verbatim, propositional, and situational representations. *Journal of Memory and Language*, 25, 279-294.
- Schmidt, J. E., McLaughlin, J. P., & Leighton, P. (1989). Novice strategies for understanding paintings. *Applied Cognitive Psychology*, 3, 65-72.

- Schnotz, W. (2005). An integrated model of text and picture comprehension. In R.E. Mayer (Ed.), *The cambridge handbook of multimedia learning*. New York: Cambridge University Press.
- Schnotz, W., & Bannert, M. (2003). Construction and interference in learning from multiple representation. *Learning and Instruction*, 13, 141-156.
- Schraw, G. (2000). Reader beliefs and meaning construction in narrative text. *Journal of Educational Psychology*, 92, 96–106.
- Schunk, D. H., & Zimmerman, B. J. (1997). Developing self-efficacious readers and writers: The role of social and self-regulatory processes. In J. T. Guthrie & A. Wigfield (Eds.), *Reading engagement: Motivating readers through integrated instruction* (pp. 34–50). Newark, DE: International Reading Association.
- Shimron, J. (1980). Psychological processes behind the comprehension of a poetic text. *Instructional Science*, 9, 45-66.
- Silvia, P. J. (2005). Emotional responses to art: From collation and arousal to cognition and emotion. *Review of General Psychology*, 9, 342-357.
- Solso, R. L. (1999). *Cognition and the visual arts (3<sup>rd</sup> ed.)*. Cambridge, MA: MIT Press.
- Smith, G. (2002) Are there domain-specific thinking skills? *Journal of Philosophy of Education*, 36, 207-227.
- Smith, J. K., & Smith, L. F. (2001). Spending time on art. *Empirical Studies of the Arts*, 19, 229-236.
- Solheim, O. J. (2011). The impact of reading self-efficacy and task value on reading comprehension scores in different item formats. *Reading Psychology*, 32, 1-27.

- Steen, G. (1999). Genres of discourse and the definition of literature. *Discourse Processes*, 28, 109-120.
- Street, B. (1995). *Social literacies: Critical approaches to literacy in development, ethnography, and education*. New York: Longman.
- Street, B. (2003). What's new in new literacy studies? *Current Issues in Comparative Education*, 5(2), 1-14.
- Stout, C. E. (1995). Critical conversations about art: A description of higher-order thinking generated through the study of art criticism. *Studies in Art Education*, 36, 170-188.
- Suwa, M., & Tversky, B. (1997). What do architects and students perceive in their design sketches? A protocol analysis. *Design Studies*, 18, 385-403.
- Taraban, R., Rynearson, K., Kerr, M. (2000). College students' academic performance and self-reports of comprehension strategy use. *Reading Psychology*, 21, 283-308.
- Tierney, R. J. (1997). Learning with multiple symbol systems: Possibilities, realities, paradigm shifts and developmental considerations. In J. Flood, S.B. Heath, & D. Lapp (Eds.), *Handbook of research on teaching literacy through the communicative and visual arts* (pp. 286-298). New York: Macmillan.
- Tishman, S., & Palmer, P. (2006). *Artful thinking: Stronger thinking and learning through the power of art*. Final report to Traverse City Public Schools. Cambridge, MA: Project Zero, Harvard Graduate School of Education.
- Tishman, S., MacGillivray, D., & Palmer, P. (1999). *Investigating the educational impact and potential of the Museum of Modern Art's visual thinking curriculum: Final report*. New York: Museum of Modern Art.

- Tobias, S. (1994). Interest, prior knowledge, and learning. *Review of Educational Research, 64*, 37-54.
- Torff, B. (2003). Developmental changes in teachers' use of higher order thinking and content knowledge. *Journal of Educational Psychology, 95*, 563-569.
- United States Department of Education (2010). *Issue brief: Arts education through the U.S. Department of Education*. Washington, DC: Author. Retrieved May 12, 2013 from [http://www.artsusa.org/get\\_involved/advocacy/aad/issue\\_briefs/2007/advocacy\\_is\\_suebrief\\_004.asp#](http://www.artsusa.org/get_involved/advocacy/aad/issue_briefs/2007/advocacy_is_suebrief_004.asp#)
- Unsworth, L. (2001). *Teaching multiliteracies across the curriculum: Changing contexts of text and image in classroom practice*. Philadelphia: Open University Press.
- van den Broek, P. (1994). Comprehension and memory of narrative texts: Inferences and coherence. In M. A. Gernsbacher (Ed.), *Handbook of psycholinguistics*, pp. 539-588. San Diego, CA: Academic Press.
- van den Broek, P., Lorch, R.F., Jr., Linderholm, T., & Gustafson, M. (2002). The effects of readers' goals on inference generation and memory for text. *Memory & Cognition, 29*, 1081-1087.
- Van Dijk, T. A., & Kintsch, W. (1983). *Strategies of discourse comprehension*. New York: Academic Press.
- van Kraayenoord, C.E. & Paris, S.G. (2002). Reading objects. In S.G. Paris (Ed.) *Perspectives on object-centered learning in museums*. Mahwah, New Jersey: Lawrence Erlbaum.
- van Leeuwen, T. (1999). *Speech, music, sound*. London: Macmillan.

- Varo, R. (1957) *Creacion de las aves (The Creation of Birds)*. Location Unknown.
- Veenman, M. V. J. (2005). The assessment of metacognitive skills: What can be learned from multi-method designs? In B. Moschner & C. Artelt (Eds.), *Lernstrategien und Metakognition: Implikationen für Forschung und Praxis* (pp. 75–97). Berlin: Waxmann.
- Wakefield, D. V. (2000). Math as a second language. *The Educational Forum*, 64, 272-279.
- Watson, J. B. (1920). Is thinking merely the action of language mechanisms? *British Journal of Psychology*, 11, 87-104.
- Weinstein, C.E. & Palmer, D.R. (2002). Users' manual: Learning and Study Strategies Inventory (2<sup>nd</sup> Edition). Clearwater, FL: H & H Publishing.
- Williams, T. L. (2007). "Reading" the painting: Exploring visual literacy in the primary grades. *Reading Teacher*, 60, 636-642.
- Winner, E., & Hetland, L. (2000). The arts in education: Evaluating the evidence for a causal link. *Journal of Aesthetic Education*, 34, 3-10.
- Winner, E., & Hetland, L. (2001). Research in arts education: Directions for the future. In E. Winner & L. Hetland (Eds.). *Beyond the soundbite: Arts education and academic outcomes*. Los Angeles, CA: The Getty Center.
- Winner, E., Hetland, L., Veenema, S., Sheridan, K., & Palmer, P. (2006). Studio thinking: How visual arts teaching can promote disciplined habits of mind. In P. Locher, C. Martindale, L. Dorfman, & D. Leontiev (Eds.), *New Directions in Aesthetics, Creativity, and the Arts* (189-205). Amityville, New York: Baywood Publishing Company, 2006.

- Winston, A. S., & Cupchik, G. C. (1992). Evaluation of high art and popular art by naïve and experienced viewers. *Visual Arts Research, 18*, 1-14.
- Wolfe, M. B. W., & Woodwyk, J. M. (2010). Processing and memory of information presented in narrative or expository texts. *British Journal of Educational Psychology, 80*, 341-362.
- Wooding, D. S., Mugglestone, M. D., Purdy, K. J., & Gale, A. G. (2002). Eye movements of large populations: Implementation and performance of an autonomous eye tracker. *Behavior Research Methods, 34*, 509-517.
- Woody, R. H., & Burns, K. J. (2001). Predicting music appreciation with past emotional responses to music. *Journal of Research in Music Education, 49*, 14.
- Wyman, S. (2004). The poem in the painting: Roman Jakobson and the pictorial language of Paul Klee. *Word & Image, 20*, 138-154.
- Yenawine, P. (1997). Thoughts on visual literacy. In J. Flood, S. B. Heath, and D. Lapp (Eds.) *Handbook of research on teaching literacy through the communicative and visual arts, Volume 1*. New York: Simon & Schuster Macmillan.
- Zwaan, R.A. (1996). Towards a model of literary comprehension. In B.K. Britton & A.C. Graesser (Eds.), *Models of understanding text* (pp. 241-255). Hillsdale, NJ: Erlbaum.