

THE IMPACT OF A METACOGNITIVE REFLECTION COMPONENT IN A
IN A PROBLEM-BASED LEARNING UNIT

A Dissertation

by

KATHRYN ANN HAWKINS SEIFERT

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY

August 2008

Major Subject: Curriculum & Instruction

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ABSTRACT

The Impact of a Metacognitive Reflection Component in a Problem-Based Learning
Unit. (August 2008)

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This mixed methods dissertation explores the impact of metacognitive support (reflective journal entries and a think-aloud exercise) in a PBL (problem-based learning) unit. While students are developing a solution for a PBL unit they may become occupied solely in solving the problem or task and not take time to fully consider what and how they have learned. This study examined how a metacognitive reflective component in a problem-based learning curriculum aids the learning process. The problem explored in this dissertation is that though problem-based learning may engage students, it is not known to what extent reflection adds to learners' development and application of critical thinking skills such as problem solving.

The participant observer taught a problem-based learning unit concurrently with a poetry unit in three secondary senior-level English/language arts classrooms over a six weeks period. Four data sources were analyzed quantitatively: a pre-test and post-test on poetry terms, students' essay scores, and a survey. To determine differences between

groups ANCOVA (Analysis of Covariance) was used to analyze the results of the poetry terms pre-test and post-test of the two experimental groups and the control group.

MANCOVA (Multivariate Analysis of Covariance) was used to compare the results of the two experimental groups and the control group on the criteria of the essay.

MANCOVA was also conducted to compare survey results between the experimental groups and the control group. The ANCOVA and MANCOVA tests used SPSS software. Additionally, qualitative analysis used a constant comparison method to analyze students' journal entries and a think-aloud exercise to provide insights concerning the research questions.

The overall findings of this study fail to lend support for the intervention that was examined. The quantitative analysis results were not statistically significant between the two experimental groups and the control group. While the qualitative data sources provided some insights regarding how students learn, the data did not indicate that this type of metacognitive support greatly impacted student learning over the course of this study.

DEDICATION

This dissertation is dedicated to my husband, David E. Seifert, mother, Mrs. Barbara Hawkins, and in memory of my father, Harold L. Hawkins, Ph.D. (Professor Emeritus, Texas A&M University).

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I would like to thank my committee co-chairs, Dr. Cathleen Loving and Dr. Susan Pedersen and my committee members, Dr. Mark Sadoski and Dr. Zohreh Eslami for their guidance and support throughout the course of this research. Additionally, I am grateful for Dr. William Peters' support and guidance as I began this journey and for the sage advice of Dr. Victor Willson. I want to express appreciation to my friends, colleagues, department faculty and staff for their friendship and time. I am very grateful to all of those who participated in this study.

Furthermore, I wish to express my sincere gratitude to my wonderful husband, David, for all of his love, support, and understanding during this research process. Finally, thank you to my parents for their encouragement and patience. Unfortunately, my father, Harold L. Hawkins, died before I could see this research project through to completion. I will forever be grateful for the loving support of both of my parents.

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CHAPTER I
INTRODUCTION: METACOGNITIVE REFLECTION AND PROBLEM-BASED
LEARNING

Secondary students are frequently overheard bemoaning that instructional methods seem the same: lecture, listen (supposedly), and test. However, there are other instructional methods that are more learner-centered and experiential in their nature than traditional lecture formats. One such method is problem-based learning. Though implementing a novel instructional method may increase student motivation to some extent, the change in instructional method alone may or may not increase students' understanding of how they learn. Some student learners may be intrigued with the novelty or challenge of solving a complex problem, but may not take time to reflect on how participating in this type of instructional method has aided (or not aided) the learner's understanding of both the content and of the learning process. This study examined how a metacognitive reflective component in a problem-based learning curriculum aids the learning process.

Overview of Problem-Based Learning

Problem-based learning (PBL) is a process whereby learners examine various questions and uncertainties about a complex issue, dilemma, or phenomena (Evensen & Hmelo, 2000; Schwartz, Mennin, & Webb, 2001; Torp & Sage, 1998; Barrell, 1998).

This dissertation will follow the style of the *American Educational Research Journal*.

Consequently, problem-based learning (PBL) is an instructional strategy that may effectively increase learners' motivation and retention of information as they actively use critical thinking skills to solve problems (Schwartz et al., 2001).

Specifically, a problem is an uncertainty, doubt, issue, or question that needs to be resolved (Barrell, 1998). Typically, the problem is described as an ill-structured (or messy) problem since it is open-ended, and there is not solely one solution for the problem (Torp & Sage, 1998). Learners are encouraged to engage with problems as they seek the knowledge needed to develop a possible solution for a problem scenario. The problem does not simply focus on symptoms, since symptoms are caused by the problem and differ from the actual root of the problem, and problem-based learning involves an in-depth analysis of the problem (Dottin & Weiner, 2001).

Problem-based learning (PBL) is not a new concept for learning, yet modern academic interest stems primarily from Barrow's problem-based learning model. Barrows developed the most popularized model for the medical school program at McMaster University in the early 1970s, and it offered students a learner-centered opportunity for inquiry (Evensen & Hmelo, 2000; Barrows & Tamblyn, 1980). Barrows developed this model while attempting to research the reasoning abilities of medical students, as the students seemed to have difficulty applying what they learned in class to patients' diagnoses (Evensen & Hmelo; Barrows & Tamblyn). Therefore, Barrows created scenarios where students could apply skills to a real-life problem-solving situation.

Statement of the Problem

While problem-based learning may have the potential to increase students' critical thinking skills and motivate learning, some students may become involved in simply solving the problem or task at hand, and they may not take the time to internalize the learning process and critically examine what and how they have learned (Ngeow & Kong, 2001; Lovrich, 2004). Learners may or may not be able to accurately self-monitor and evaluate their problem-solving abilities, possibly because of an insufficient use of metacognitive skills (Ge & Land, 2004). The problem to be explored in this dissertation is that although problem-based learning may be able to engage students in the learning process, and even though many problem-based learning units may encourage learner reflection to various degrees, it is not clear to what degree learner reflection contributes to the learner's ability to develop and apply critical thinking skills such as problem solving (Kuiper & Pesut, 2004).

Purpose of the Study

The purpose of the study was to examine the impact of the addition of a reflection component in a problem-based learning curriculum. The study investigated the intervention of metacognitive support (reflective journal entries and a think-aloud exercise). The metacognitive support may elicit learner reflection and further learner metacognition. The two specific metacognitive supports examined in the study may allow time for reflection and provide students opportunities to think about how and what they are learning. It is hypothesized that the addition of a reflective component throughout the learning unit may assist students in the development of metacognitive

skills that may enhance students' learning (Ngeow & Kong, 2001; Dunlap, 2005). It is also hoped this research may assist educators in the selection and utilization of an instructional method and learning activities that will benefit student learners (Stotsky & Mall, 2003).

Research Questions

The primary research questions of this investigation are:

1. Does the inclusion of metacognitive support (reflective journal writing and a group think aloud exercise) enhance student learning outcomes of a PBL unit?
2. Do learners using metacognitive support believe that having opportunities to reflect is useful to their learning experiences?
3. What insights can an examination of student learners' journal entries provide regarding the overall impact of using metacognitive support in a PBL unit?

Significance of the Study

This study can potentially offer further insight into an instructional method, problem-based learning, and assist educators in understanding to what extent an emphasis on students' self-reflection can enhance the development and use of critical thinking skills, such as problem solving. By examining learners' beliefs concerning their own learning process and the role of reflection in solving a problem scenario, the study can provide educators more information when determining which types of instructional strategies to incorporate into their curriculum and provide guidance regarding the inclusion and emphasizing of a reflective component within a chosen instructional method.

Operational Definition of Terms

Critical thinking skills- These are cognitive thought processes that include the ability to purposefully evaluate, make inferences, and analyze concepts (Burbach, Matkin, & Fritz, 2004).

Learning- Learning can be described as a process whereby behavioral changes occur because of one's experiences (Merriam & Caffarella, 1999). In essence, learning becomes a sense of transformation that enables the learner to grow and change as new information is gained and processed (Davis & Samura, 2001; Aldridge, 1993).

Learning process- The learning process includes the cognitive and metacognitive processes that are used and negotiated by the learner in order to create meaning and understanding whereby the learner experiences growth and change (Merriam & Caffarella, 1999; Quicke, 1994).

Ill-structured problem- The problem is described as an ill-structured (or messy) problem since it is open-ended, and there is not solely one solution for the problem (Torp & Sage, 1998; Kain, 2003).

Metacognition- This is cognition or critical thought that reflects on how thinking takes place. It consists of how one knows and responds to one's ability to think and learn and in knowing what, when, and how to do a given task (Fonteyn & Cahill, 1998; Marchant, 1989; Marzano, 2003). It entails self-examination and self regulation (Quicke, 1994). In this study the term "metacognition" is a specific type of reflection where the learner is able to understand his/her learning process and what is needed to further understanding (Ngeow & Kong, 2001; Quintana, Zhang, & Krajcik, 2005).

Problem-Based Learning (PBL)- This type of instruction involves an inquiry process in order to address and attempt to resolve complex issues and dilemmas (Barell, 1998).

Reflection- This is a cognitive process whereby learners consider what has taken place during the learning process (Ngeow & Kong, 2001). Ngeow and Kong assert that there are two kinds of reflection activities: 1) the focus is on matters of content as the learner considers what he/she needs to know about a specific task or content area 2) the focus is on the learner's general learning process such as whether or not he/she is understanding the goals of the project. Spalding and Wilson (2002) maintain reflection begins with some doubt or issue to resolve and progresses to searching for a way to resolve the doubt. Dewey stipulated there are different levels of reflection as some reflection is more critical in its nature (Leung & Kember, 2003). During reflection, learners may become aware of how they learn and think about their thinking process (metacognition).

Self-regulated learning- This is when the learner is able to understand, plan, and adapt learning experiences to the learner's needs and goals (Whipp & Chiarelli, 2004).

Think-Aloud Strategy- Learners examine a problem on a step-by-step basis and explain to fellow group members what they are experiencing and thinking about the problem during each step (Beradi-Coletta, Dominowski, Buyer, & Relinger, 1995).

Theoretical Framework

Reflection as a Component That May Enhance Student Learning

It is during reflection that a given concept can be related to other pieces of knowledge, and it is also during the reflective process that personal meaning can be attached to the concept that is to be learned or understood (Leung & Kember, 2003).

Since reflection may enable learners to make meaning from information so that learning can be fully realized, it is a viable component to consider as an aspect of cognition to more fully examine in the development of instruction for increased student understanding (Grant & Branch, 2005).

Reflection is different than merely understanding a given concept, because reflection offers learners' opportunities where a concept can become integrated (Leung & Kember, 2003). Grant and Branch (2005) conclude in a study which examines project-based learning with eighth grade geography students that teachers should balance traditional instruction with methods that encourage learner inquiry and allow students to develop metacognitive skills in order to learn. Kirkwood (2000) also calls for teachers to address not just learning outcomes but how students actually approach learning. Furthermore, Joseph (2006) asserts the importance of self-reflective learning activities and claims metacognitive skills can be taught, and this type of learning will be a life-long practical skill for learners. The addition of a reflective component during instruction may enhance learners' abilities to make connections with the content of the unit and cultivate learners' self-understanding of their learning process and encourage further development of metacognitive skills (Joseph). Since reflection may allow learner's the possibility of increased metacognition and self-awareness, it can be incorporated into instructional methods that incorporate experiential learning and problem-solving in order to improve student learning.

Experiential Learning Experiences and Problem-Based Learning

Problem-based learning is now used in a multitude of classrooms at various grade levels (from elementary to college courses) to address a wide variety of “problems” in many content areas. Problem-based learning does not incorporate only one educational philosophy or learning theory. However, when one examines the development and use of problem-based learning it is apparent that it is based on learning philosophies and learning theories that assert the importance of experiential and active learning. PBL incorporates aspects of such theories and philosophies as Dewey’s thoughts concerning experiential learning and problem solving, the theories of cognitivism, situated cognitivism, and constructivism (Dottin & Weiner, 2001; Gijbels, Dochy, Van den Bossche, Segers, 2005). Furthermore, many of the philosophies and learning theories that appear to encourage such active and experiential learning activities for student learners also support the inclusion of “real-world” authentic learning experiences for students at all educational levels and for many content areas (Evensen & Hmelo, 2000). Since this study examined how such an experiential learning method is aided by reflection, experiential, authentic learning experiences and teaching methods were examined.

Selected Learning Theories and Philosophies Supporting the Inclusion of Reflection

Definitions of what constitutes learning and how learning is achieved have been changed and modified over time, and the educational community continues to search for understanding of how learning occurs. Traditional definitions of learning define learning as resultant in a change in a specific behavior because of a specified practice (Aldridge,

1993). Therefore, learning can be described as a process whereby behavioral changes occur because of one's experiences (Merriam & Caffarella, 1999). In essence, learning becomes a sense of transformation that enables the learner to grow and change as new information is gained and processed (Davis & Samura, 2001; Aldridge, 1993).

How students learn has been studied, historically, from many theoretical perspectives. However, since this study explores the impact of reflection on students' learning processes during a problem-based learning unit, specific learning theories that support experiential learning, problem-solving, and the development of metacognition and critical thinking skills will be examined. Such philosophies and theories as Dewey's pragmatic beliefs regarding experiential learning and the importance of problem-solving, cognitivism, situative cognitivism, and constructivism will be explored as theories that provide a supporting theoretical framework for the inclusion of reflection in a problem-based learning unit.

Dewey and the Importance of the Problem Solving Process in Learning

Problem-based learning can be one way that learners can gain knowledge in authentic learning situations, which, perhaps, may lead the learner to become transformed. For instance, John Dewey's pragmatic views of knowledge as a process and his emphasis of learning through experience emphasizes problem solving as a way to learn and gain knowledge and have led to continued interest in the educational community on instructional methods such as problem-based learning (Savin-Baden, 2000). Furthermore, Dewey contended that the learner gains knowledge through observation of a problem and in the process of developing a hypothesis as a solution to a

problem (Dottin & Weiner, 2001; Dewey, 1938/1970). According to Dewey, the school's main purpose was to produce students who could think, and the process of thinking primarily consists of solving problems and dilemmas (Power, 1996). The experience of solving problems is education and education is life. However, historically and philosophically education has varied in the amount and type of emphasis on experience and problem solving in the classroom.

Cognitivism

Cognitive theory asserts that the mind is much more complex than a simple stimuli and response mechanism, rather the mind interprets meaning using a variety of schemas (Merriam & Caffarella, 1999). Understanding the thoughts and thinking processes of the learner were of central interest in cognitive learning theory (Wittrock, 2003). A shift in understanding occurred as cognitive theories began to offer a different view of how we learn. Much of current learning theory examines learning from a cognitive perspective (Brown, 1994). Cognitivism claims that learning is more than merely changes in external behavior (Anglin, 1995). Primarily, cognitive learning theories held knowing involved how the mind manipulated symbols, and learning was viewed as the attainment of knowledge that could be useful in a various settings (Putnam & Borko, 2000).

Instead of relying on overt behavior, cognitivists advocated using gestalts (German for pattern or shape) to understand learning. Gestaltists suggest that the whole is examined instead of simply examining a portion of human behavior. Cognitivists incorporated several of Gestalt psychology's central tenants such as the importance of

understanding the concepts of perception and meaning. For cognitivists, learning takes place when events and experiences are organized in order to understand outside stimuli (Merriam & Caffarella, 1999).

A prominent cognitive psychologist who was influenced by both behaviorism and Gestalt psychology was Jean Piaget. Piaget focused primarily on examining the learner's internal cognitive processes (Merriam & Caffarella, 1999). Piaget declared that the human organism's cognitive structure could change because of interactions with environment and by numbers of experiences (Merriam & Caffarella).

Cognitive thought continues to influence education. Cognitivism asserts that cognitive plans or structures are the causes of changes in external behavior. For instance, cognitive thought led to important changes in the teaching of English, as increased emphasis was placed on the learner's comprehension and understanding of various texts and reading became a process of how the learner constructs meaning (Wittrock, 2003). Additionally, cognitivism offers a way for educators to perceive the way we learn as a process (Anglin, 1995). Educators continue to examine cognitive beliefs, yet other beliefs such as constructivism offer further understandings of how experiences impact learning.

Situative Cognitivism

Examining learning from a situative perspective is a relatively recent dimension of educational theory, yet the roots for this perspective are derived in the thoughts of such educators and psychologists as Dewey and Vygotsky (Putnam & Borko, 2000). Situated cognitivism stems from a growing reaction to the symbol-processing view of

knowledge construction. Those who stress the importance of symbol processing view the thinking process as a formal, computational process similar in function to a computer (Bredo, 1994). Situated cognitivists claim that instead of viewing knowledge as formal process it is better to recognize that knowledge construction occurs in everyday life or a “just plain folks” approach to learning (Bredo). Therefore, situated cognitivism stresses the importance of placing the problem in authentic real life situations in order to strengthen learning.

Constructivism

Constructivism challenged behaviorism and is a way of thinking that has been influenced by several modes of thought including pragmatism and existentialism. Constructivism maintains that reality is constructed, and it incorporates the work of Jean Piaget, Lev Vygotsky, Jerome Bruner, and Howard Gardner (Ozmon & Craver, 1999). Constructivists also borrow some theory from cognitivists and developmental psychology to explain learners’ development (Ozmon & Craver). However, constructivism is not a positivistic theory. Its primary aim is not to observe overt behavioral changes in the learner. Rather, constructivists seek to support active learning by understanding the way the learner constructs meaning. For instance, Goleman’s research (1995) claims the brain is more likely to make meaningful connections when learners are able to make personal connections to the content. In addition, Vygotsky (1978) maintains it is necessary to understand that language should be taught by constructing meaningful learning experiences.

Therefore, constructivism has incorporated active learning methodologies that encourage critical thinking and problem-solving processes to further learning (Levin, 2001). Constructivist orientations provide a framework for understanding how learners develop meaning (Applebee, 2003). Problem-based learning is an instructional strategy that may be for some learners an effective strategy for increasing learners' motivation and retention of information as they actively use critical thinking skills to solve problems (Schwartz et al., 2001; Torp & Sage, 1998). For these reasons, problem-based learning is an instructional approach used by proponents of constructivism as constructivist teaching encourages active learning as learners search for meaning by seeking knowledge (Levin).

Learning theory and practice have contributed to comprehending the processes of understanding (Applebee, 1999). For instance, Applebee (2003) asserts that there has been a shift in emphasis in English language arts classrooms from content that was often taught in an out of context manner to instruction that emphasizes active strategies and processes to create a curriculum where content is taught utilizing activities that engage students with meaningful issues and ideas. Problem-based learning may offer the learner ways to address important issues and ideas in the classroom. Additionally, learning theories that develop learners' critical thinking skills, also support opportunities for reflection and metacognition, which can be integral components leading to increased learner understanding (Levin, 2001).

CHAPTER II

REVIEW OF LITERATURE

PBL as a Way to Support Task Performance and Authentic Activity

The growing awareness of how we learn has also warranted the examination of the use of authentic activities in classroom environments. Authentic learning activities can help to develop critical thinking and problem-solving skills that are important to learners both in and out of the classroom environments (Putnam & Borko, 2000). Additionally, authentic activities offer learners opportunities to negotiate and appropriate meaning while engaged in authentic tasks (Pea, 1993). Gossman, Stewart, Jaspers, and Chapman (2007) report in their study of undergraduate students (n = 56) investigating the effectiveness of a PBL scenario delivered using web-based technologies, a paired t-test on pre and post online test scores was not statistically significant. However, Chi-square tests did show a significant relationship between certain items. Students in the Gossman et al. study were more engaged with the task because of the PBL scenario and it seemed to stimulate more thinking about the diagnostic process.

Problem-based learning can incorporate such authentic learning activities into its curriculum design (Dunlap, 2005). Furthermore, problem-based learning allows learners the possibility of becoming active participants in the learning process as they grapple to reach meaningful connections between the content and the problem scenario (Pedersen & Lieu, 2003). Moreover, problem-based learning may also offer opportunities for

learners to engage in exploration of solving problems and developing critical thinking skills (Smith & Stock, 2003; Applebee, 2003).

Overview of Reflection and Metacognition

The term “reflection” is most typically used to refer to thinking about an issue, problem, or doubt, and generally, a deep level of reflection or critical reflection is considered a high level of thought (Leung & Kember, 2003). Metacognition is a form of reflection whereby the learner is able to think about how they learn (Fonteyn & Cahill, 1998). Primarily, in this study “reflection” is thought of as critical reflection, but it may or may not be metacognitive in nature. Metacognition and metacognitive reflection are, therefore, considered to be constructs that enable the learner to think about his or her thinking, and this type of reflection may impact learning outcomes if encouraged and developed.

Metacognition and Problem-Based Learning

Metacognition is typically defined as one’s thinking about thinking (Fogarty, 1994). It is a construct that involves cognition or critical thought that reflects on how thinking takes place, and it consists of how one knows and responds to one’s ability to think and learn and in knowing what, when, and how to do a given task (Fonteyn & Cahill, 1998; Marchant, 1989; Marzano, 2003). When learners have a sense of what is or is not known they can take action in correcting the situation. Metacognition provides the awareness to control and affect one’s behavior (Fogarty).

Awareness of one's own thinking processes begins early in childhood; however, metacognitive skills may not develop to a high level (Kuhn & Dean, 2004). Even though an awareness of one's own thinking may occur early in life, this does not mean that metacognitive thoughts come from an external reality. Instead the source is linked to the individual's own interpretations of a given reality (Hacker, 1998).

Research into the concept of metacognition evolved with John Flavell's research on metamemory in the 1970s. Flavell's research on metamemory proposed metacognitive thought could be deliberately planned, and this type of thought could be used to enhance given tasks (Hacker, 1998). Moreover, Flavell categorized four basic areas of metacognition, which include the learner's metacognition (knowledge of their thinking process), goals, experiences, and strategies for learning (Fogarty, 1994).

Additionally, Feuerstein's research also provided insight into the concept of metacognition. Feuerstein examined students using cognitive mediation guides using self-monitoring activities. In the late 1970s, Feuerstein's work in cognitive mediation guided students through self-monitoring activities (Fogarty, 1994). Fogarty asserts Feuerstein was able to demonstrate that cognitive ability could be modified and changed not only with developmental changes due to age, but cognitive ability could also be changed with planned interventions and experiences (Fogarty).

Primarily, early research in metacognition was descriptive and attempted to describe how children develop knowledge about memory and how they store and retrieve data (Hacker, 1998). In time, research into the concept of metacognition has grown to include a variety of types of methodologies from descriptive to experimental to

qualitative (Hacker). An area of study on metacognition that has received growing attention is the area of self-regulation, whereby both the learner's process of monitoring and regulating learning are examined (Hacker).

Metacognition is an instrumental element in constructivist approaches to learning (Fogarty, 1994). For instance, when learners are constructing meaning they are using both cognitive and metacognitive strategies in order to make meaning (Fogarty). Additionally, Harmon (2002) supports a facilitative, contextualized approach to teaching word meaning as a way to support students' awareness of how they learn language skills. Kuhn and Dean (2004) explain that one source of metacognition is through the process of interiorization identified by both Vygotsky and Piaget, which is when the learner's way of understanding becomes internalized within the individual. Characteristically, learners might ask each other such questions as "How did you figure that out?" or "Why do you think that way? Whereas, when learners can ask themselves these types of questions they are able to interiorize (Kuhn & Dean). Additionally, metacognitive processes allow learners to monitor various solution strategies and adjust the solution of the problem solving process (Berardi-Coletta, Dominowski, Buyer & Relinger, 1995). However, metacognitive skills are not automatic: they are not necessarily easily stimulated in learners, and they may not directly lead to the solving of problems (Hacker & Dunlosky, 2003). What is more, metacognition depends upon what thoughts are being monitored/evaluated; the results of metacognition can be variable on the problem-solving process (Hacker & Dunlosky).

Metacognitive research describes three types of verbal report in attempting to categorize students' metacognitive processes while using verbalization: concurrent (involves students saying what they are thinking at the moment); retrospective (when students describe past experiences); and prospective (describe future performance) (Hacker & Dunlosky, 2003). In addition, Hacker and Dunlosky explain Ericsson and Simon stipulated three levels of verbalization. The levels of verbalization become increasingly more complex. For example, Level 1 verbalization occurs when the learner is merely stating thoughts that are already verbalized (for instance, talking about what one is thinking while reading a passage). Level 2 verbalization is when the learner can report thinking that is not in a verbal form, such as describing how the learner is solving a puzzle while working on it, and in Level 3 verbalization the learner can verbalize either verbal or nonverbal contents and explain the contents (Hacker & Dunlosky). In Level 3 concurrent verbalization learners must explain their problem solving process as it is occurring and justify their actions. Since this type of verbalization may lead to a more developed use of learners' metacognitive processes it may also lead to more effective problem solving (Hacker & Dunlosky). The act of describing how their thinking is generated and how they know and understand aspects of a certain problem, or how and why they made a certain decision may lead to high levels of performance (Hacker & Dunlosky).

While developing learners' metacognitive abilities may not guarantee increased problem-solving abilities, metacognition may offer learners increased understanding of their thought processes; however, it may be difficult to assist the learner to process the

learning in a such a manner where the learner will be able to use a given skill after initial instruction and transfer any knowledge gained to other situations (Kuhn & Dean, 2004). Learners cannot simply be told to use metacognition; rather they should receive guidance and opportunities for analysis and problem solving (Hacker & Dunlosky, 2003). One possible method to enable learners' metacognition is to support learners in reflecting and evaluating their experiences and learning activities (Kuhn & Dean). Kumar and Kogut's (2006) study of students' perceptions of problem-based learning noted that more self-directed learners preferred a problem-based learning curriculum. These students found that they were able to manage the goal setting and task monitoring involved in PBL better than students with less adept self-regulated learning skills.

Reflection and Its Role in Problem-Based Learning

Reflection is a cognitive process whereby learners consider what has taken place during the learning process (Ngeow & Kong, 2001). There are two kinds of reflection activities: 1) the focus is on matters of content as learner considers what he/she needs to know about a specific task or content area 2) the focus is on the learner's general learning process such as whether or not he/she is understanding the goals of the project (Ngeow & Kong). Reflection has been recognized as an important component in the understanding of learning, and much of this recognition stems from Dewey's work (Leung & Kember, 2003; McAlpine, Weston, Beauchamp, Wiseman & Beauchamp, 1999; Kuiper & Pesut, 2004). Reflection may be instrumental in reinforcing students' sense of accomplishment, and allows students opportunities to explore, develop, and improve possible solutions during problem-based learning experiences (Dunlap, 2005).

Many educators consider reflection a major component for understanding the relationships between a complex problem, acquired knowledge and how that knowledge is actually applied to real life dilemmas, and how research findings can be used in educational settings (Schön, 1987; Iran-Nejad & Gregg, 2001).

For instance, Sobral's (2000) study of 103 medical students documented students' self-assessments of self-regulation of their learning, how meaningful experiences were, and their diagnostic thinking process. Sobral reports that students with high reflection-in-learning scores at the end of the course also had higher grade point averages. Additionally, the level of students' reflection-in-learning was associated with students' levels of self-perceived competence in self-regulated learning and with the perception of the meaningfulness of a given learning experience. Generally, the results of the study indicate that reflection may contribute to a positive learning experience, and that reflection in learning is also related to the students' readiness for self-regulated learning experiences (Sobral).

During the PBL process students must both seek and learn to evaluate the problem; however, students frequently focus on simply completing a task, and they do not take time to reflect on what they have learned or how they have actually learned it (Ngeow & Kong, 2001). Leung and Kember (2003) report Dewey maintained that if a problem was not fully considered with sufficient reflection that incorrect solutions might be obtained. Gelter (2003) asserts, even though reflection may have the power to appreciably and positively impact learning, learners do not often set aside the time or effort to consciously reflect on their actions or dilemmas. It is significant to note that

reflection is a spontaneous action only when something has failed or learners are in crisis (Gelter). Gelter further explains that since reflection is not often an instinctual action, we need to request students to reflect on their learning experiences.

Problem-based learning is usually considered an active learning method that may enable learners to become more developed as self-directed learners (Ngeow & Kong, 2001; Dunlap & Grabinger, 2003). This possibility becomes especially important to consider since some students may have difficulty transforming from passive participants to becoming active participants in the learning process (Ngeow & Kong, 2001; Kain, 2003). Metacognitive skills are necessary to achieve self-directed learning (Dunlap & Grabinger, 2003). Metacognitively aware learners are able to perform such tasks as planning and selecting learning strategies, self-monitoring and self-assessment of learning, and are able to adjust learning strategies and behaviors (Dunlap & Grabinger). Learners should be encouraged to monitor their understanding (Snyder & Pressley, 1995). Consequently, one possible way to address the issue of learners who have difficulty transforming from passive learners to active participants in the learning process is to include a reflective component in the PBL unit of instruction as it may contribute to the learner's cognitive awareness (Dunlap & Grabinger).

If one objective of utilizing such methods as PBL in the classroom is to encourage a deep approach to learning then learners should be encouraged to reflectively think about the learning process (Leung & Kember, 2003). Additionally, Dunlap and Grabinger (2003) assert that learners with highly developed metacognitive skills are also able to effectively use problem solving and reasoning. Therefore, it seems relevant to

examine to what degree reflective activities are able to assist learners in using a deep approach in learning and to what degree learners are able to make connections between their reflective activities when they are involved in the problem-solving process.

Leung and Kember (2003) have developed a questionnaire based primarily from the work of Mezirow on reflective thinking, and the questionnaire uses Mezirow's identification of four different aspects of reflection: habitual action, understanding, reflection, and critical reflection. Habitual action is prior learning that because of frequent use can be conducted automatically. The understanding stage of the reflective thinking process is when there is understanding of a concept without the learner's relating this to other situations. The reflection stage of reflective thinking is when the learner carefully considers various beliefs and knowledge and can relate it to other information and background (Leung & Kember). The last stage of reflective thinking, critical reflection, is characterized as the highest stage, and it involves increased awareness of how and why the learner thinks, feels, and/or acts, and this stage of thinking also implies a sense of transformation (Leung & Kember, 2003; Mezirow, 1998).

Subsequently, if the learner is reflecting on such internal changes as how the learning process affects the individual, it may become possible to affect the learner's degree of ability to become a more self-directed, motivated learner (Hacker, 1998). Self-direction can be defined as any change that develops when the learner purposefully seeks that change or action (Rhee, 2003). Rhee contends that the process of becoming more self-directed begins as self-awareness increases. Marchant (1989) also supports the

necessity of developing students' metacognitive skills to become more self-directed learners.

Barron's et al. study (1998), which examined the designing and implementation of project- and problem-based curricula (with 5th grade students), identified students having opportunities for self-assessment throughout the curriculum as a factor that contributed to the overall success of the project-based or problem-based curriculum. Barron et al. purport that while project-based and problem-based learning is often centered on the question, task, or learning problem, too often attention is not given to ways to make stronger connections between activities in a given learning experience and the knowledge that learners are to gain from the experience.

Additionally, Albanese and Mitchell (1993) also contend that problem-based learning situations are enhanced when students have opportunities to elaborate by conducting such activities as critiquing, discussing, and asking questions. Furthermore, when verbalization or a "think aloud" [students are asked to verbalize their thinking process] of students' problem-solving process is conducted it is beneficial during the learning process and contributes to the transfer of learning to other tasks (Beradi-Coletta, et al., 1995). The act of verbalization may allow learners to stop and think and process their actions and reasoning (Beradi-Coletta et al.). Davidson and Sternberg (1998) also suggest that encouraging self-reflection may improve learners' problem-solving abilities. In Scardamalia, Bereiter, and Steinbach's (1984) study involving 6th graders, learners were able to show an increase in reflective thinking when instruction included the use of cues intended to elicit students to self-question during a planning process. Ge and Land

(2004) support the assumption that students may benefit from problem-based learning situations that offer ways to help students connect their experiences to knowledge that is gained in the learning process. Furthermore, they contend that it is important to support learners' metacognitive thought processes during the solving of an ill-structured dilemma. Critical reflection may be instrumental in facilitating learning beyond simply the memorization of data (Iran-Nejad & Gregg, 2001).

For instance, Ge and Land (2004) suggest that one way to encourage learners' metacognitive abilities is to incorporate elaboration prompts that specifically ask learners to explain the importance of, justify, and/or provide new examples for the content they are addressing. Fonteyn and Cahill (1998) also support developing students' metacognitive abilities by incorporating the writing of journal entries into the curriculum. Their study used clinical logs to assist nursing students in improving such metacognitive skills such as recognizing patterns, forming relationships, providing explanations, and drawing conclusions.

Developing Learners' Metacognitive Abilities

One way to provide scaffolding and support for learning and to improve students' metacognitive abilities is through the use of various learning strategies (Dunlap & Grabinger, 2003; Applebee, 2002). Marzano (2003) asserts strategies are metacognitive acts and may be called metastrategies or metacognitive strategies. For English language arts students, reflection activities may include journal writing and the writing of personal narrative or descriptive stories. Accordingly, Scardamalia et al., (1984) declare that primarily, in today's English/language arts classrooms most

approaches to the teaching of composition emphasize the use of a reflective writing process rather than a strictly linear approach to the teaching of writing. Smith and Stock (2003) assert that methods such as anecdotes, narrative, and story (which might result from the addition of a reflective component) may assist in portraying the complexities of teaching and learning. It is possible that such writing activities help foster self-reflection, critical thinking, and problem solving (Dunlap & Grabinger, 2003). Spalding and Wilson (2002) support journaling as a method to increase students' internal dialogue.

Dunlap (2005) asserts that students' reflective journals are powerful research tools as they provide a way to examine learners' thinking and learning process and any changes that may occur. However, it should be also noted that the act of recording behavior might contribute to changing the behavior, yet journal writing may contribute positively to students' self-efficacy and self-reflection (Dunlap). Guided journal writing may enable students to recognize personal strengths and weaknesses throughout the problem-solving experience (Dunlap).

Teachers have reported using narrative to understand how students understand their own worlds (Smith & Stock, 2003). However, it is necessary to note that the teaching of and utilization of strategies is not a sole factor in furthering the learner's knowledge. Snyder and Pressley (1995) stress instruction should address expanding the learner's knowledge base and provide a repertoire of strategies. Furthermore, Dominowski (1998) claims that when people are asked to focus on their problem solving this seems to lead to more effective problem solving.

Metacognitive Reflection and Contextual Learning in Problem-Based Learning

When students are able to learn information in a variety of contexts it is possible to facilitate learning (Dolmans, De Grave, Wolfhagen, & Van Der Vleuten, 2005). Dolmans et al. (2005) asserts learners should be able to examine content in different environments and be exposed to diverse viewpoints in order to more fully anchor learning experiences. Reflection activities may further learning as they offer learners opportunities to critique their learning process, as well as discuss and ask questions they may have regarding content and/or process matters. For instance, learners who struggle with word meaning can benefit from having opportunities to discuss words in context and they can then make meaning and further understanding (Harmon, 2002). Since, critical reflection and may contribute to learners' abilities to monitor and control their learning experiences; it may result in improved understanding of their problem solving abilities and experiences (Wetzstein & Hacker, 2004). Therefore, it is possible to surmise that the addition of a strong metacognitive reflection component in the design of a problem-based unit may assist learners in internalizing knowledge and understanding various learning experiences.

CHAPTER III

METHODOLOGY

Overview of Study

This mixed methodology study used both quantitative and qualitative research methods to examine data and describe observations to answer the following research questions (Gall, Gall, and Borg, 1999; Merriam, 2001; Creswell, 2003; Collins, Onwuegbuzie, & Sutton, 2006):

1. Does the inclusion of metacognitive support (reflective journal writing and a group think-aloud exercise) enhance student learning outcomes of a PBL unit?
2. Do learners using metacognitive support believe that having opportunities to reflect is useful to their learning experiences?
3. What insights can an examination of student learners' journal entries provide regarding the overall impact of using metacognitive support in a PBL unit?

Research was conducted in selected secondary level English/language arts classrooms. A fully mixed methods research design guided the study as both qualitative and quantitative research methods were used to collect and analyze various data sources (Collins et al., 2006). Both quantitative and qualitative data were collected and analyzed concurrently during the implementation of the PBL unit and its examination of poetry (Collins et al). The research design used both methodologies equally. A quantitative approach was employed to address whether or not the intervention of metacognitive support aided students in their knowledge and skills. A qualitative approach was used to

examine students' journal entries and a think- aloud exercise to provide insights into the impact of metacognitive support in students' learning process.

Researcher as Participant Observer

The researcher served as a participant observer and assisted the regular classroom teacher in the development and implementation of a problem-based learning unit to three separate classes of the same grade level (Senior English IV). The participant observer is a Caucasian female. She is a certified English and history secondary teacher with eleven years of teaching experience at the secondary level. In serving as a participant observer the researcher was able to interact with students frequently throughout the unit. The participant observer explained and defined problem-based learning, facilitated students' problem-based learning groups, and taught various poetry lessons.

Participants

The participants of this study were high school senior-level students in a (4A) public high school located in a mid-sized, rural central Texas town. The district had 4,956 students in October of 2006 (Texas Education Agency, 2007). There is one high school serving the district, which had 1,498 students as of October, 2006 (Texas Education Agency). The high school campus was rated as "academically acceptable" for the 2005 – 2006 school year (Texas Education Agency). The senior class consisted of 329 students. The high school ethnic demographics for the 2006 – 2007 school year are African American – 23% (340 students), Hispanic – 14% (215 students), Native American - .3% (4 students), Asian-Pacific Islander – 1.8% (27 students), White – 61% (912 students) of the total student population of 1,498 (Texas Education Agency).

Females constituted 49% of the student body (730 students), and males constituted 51% of the student body out of a total of 1,498 students for the 2006-2007 school year (Texas Education Agency).

The students were of various socio-cultural backgrounds, approximately reflecting the community demographically. Student participants were enrolled in a regular, non-advanced English/language arts placement class. This study used the members of three “regular” level, English/language arts classes of one teacher who agreed to participate in this study. Of the 57 students enrolled in the three participating classes 40 were White (70%), 13 students were African American (22%), three students were Hispanic (5%), and one student was of Asian ethnicity (2%). Three students were special education students and three students were ESL (English as a Second Language) learners. In one class of 15 students (at the beginning of the project) there were 12 females and three males. Another class of 19 students consisted of nine females and ten males. The third participating class of 23 students contained nine female students and 14 male students.

The three participating classes all received the basic curriculum and instruction used in this study. Students volunteered to participate in the study, and 51 students of the enrolled 57 students signed and returned the appropriate consent forms to participate in this study. Students’ ages ranged from 17 to 18; therefore, students under age 18 were provided assent forms and parental permission forms. N = 51 student participants, and of the three participating classes one class was designated as a control group (N = 21) class

and the other two classes were each designated as experimental groups (Experimental Group 1, N = 12; Experimental Group 2, N = 18).

Classroom Contexts

The classroom teacher is a certified secondary teacher with over fifteen years of teaching experience and has taught in this school district for the majority of that time. The teacher is a Caucasian female. She has taught several English/language arts courses, but has primarily taught British literature (12th grade/senior) courses designated “regular” level. She also serves as the AP (Advanced Placement) instructor for British literature.

The teacher was assigned to teach three “regular” level British literature classes, and the study was conducted in these “regular” level classes. The participating high school operated on a block schedule with an A and B day format (classes alternated between meeting two times or three times each week), and classes were 90 minutes each. Hence, lessons that would normally be planned for two days were completed in one class session. The study was conducted during a six week time period during the fall of 2006.

Description of the Instructional Program

This study included an instructional program that was administered by both the students’ regular English instructor and the researcher acting as a participant observer. A problem-based learning unit (PBL) ran concurrently with a study of British Romantic poetry and other selected poems with an emphasis on poetry terms related to poetry of all periods. The PBL prompt asked students to serve as publicity agents to promote the

appreciation of poetry in their community, because typically poetry is often derided (see Appendix A). Students worked in small groups of three to four to create a potential solution for the problem of poorly received poetry and examined ways to increase awareness and appreciation of poetry. Students had opportunities to research various forms of poetry, ways to generate publicity, and ways to persuade through the use of allotted library time for research and the use of print materials and online resources.

Students generated, as a group, a visual aid for use in a group presentation as they orally explained their publicity campaign. Students were evaluated by the instructor as a group for this portion of the assignment (all members received the same grade). Individually, students were required to write an in-class essay detailing a solution for the problem and provide a definition of poetry. The in-class essay was written before the students gave their group presentations. The students' essays were evaluated using a rubric by the instructor and the participant observer.

Students read, reviewed, and discussed various selected British Romantic poetry and conversed about modern poetry with similar themes. Students also had opportunities to discuss and write their own poems, which addressed similar themes as the poetry covered during various class sessions. Students received daily completion grades for any poetry related assignments and activities they completed during this unit. All students received and reviewed a basic poetry terms packet. A poetry terms test was given as a pre-test at the beginning of the unit (to all classes) before students received and reviewed the poetry terms packet, and the same instrument was given at the end of the unit as a post-test. All students received (post-instruction) a survey concerning perceptions of

reflection in their learning processes (“Survey Regarding Reflection and Its Role in the Learning Process”). See Appendix A for the assignment sheet distributed to students for both the group project presentation and the individually written class-essay.

The specific objectives for the instructional unit were:

- 1) Students will devise a realistic and achievable solution to a given problem related to the Poetry Publicity Project.
- (2) Students will create persuasive documents for a target audience related to their problem solution.
- (3) Students will define general poetic terms from a comprehensive packet of general poetic terminology.
- (4) Students will compare and contrast Romantic period poetry and modern day poetry. For instance, students will recognize thematic similarities such as love of nature in both Romantic period poetry and present day song lyrics.
- (5) Students will use the terminology taught in this unit to explain the themes of poems.
- (6) Students will identify the themes of Romantic period poetry, as well as recognize how description, symbolism, and emotion are portrayed in poetry of the Romantic era.

Rationale for Experimental Groups

At the time of the implementation of this study students were already in intact classrooms. One class was designated as a control class. The other classes were considered experimental classes. The two experimental classes could have been studied as one experimental group; however, in order to control for inherent differences in intact classrooms the researcher studied the two designated experimental groups as two

different groups rather than one collective experimental grouping. Kachigan (1991) maintains that it is difficult to determine the exact differences of intact groups.

Treatment Conditions

Experimental Groups

The experimental groups received support for metacognition through two types of activities: journaling and a think-aloud exercise. In this study, the researcher provided the journal prompts (see Appendix B) to the experimental classes. The journal entries were administered at the beginning of five class sessions during the unit. The participant observer stated expectations regarding the journal entries to each participating class. Students had at least ten minutes during class time to write in their journals, and they were encouraged to write at least one fully developed paragraph answering the journal prompt. The students' journal entries were turned in to the instructor by the end of the class session. The students received a completion grade by the instructor. The researcher received a copy of the journal entries and they were analyzed using a qualitative method approach to data analysis (constant-comparison) to examine emergent themes (Creswell, 2003). The students received feedback from the instructor when the journal entries were evaluated. These journal prompts were designed to offer students opportunities for self-reflection about their thinking and learning process during the problem-based learning unit.

The second type of metacognitive support activity, a think-aloud exercise, allows learners opportunities to verbalize their thinking process. This intervention incorporated the suggestions of Beradi-Coletta, et al (1995). The researcher modeled the think-aloud

strategy (see Appendix C). The think-aloud activity was implemented with the experimental groups mid-way through the instructional unit (see Appendix D). The activity took thirty minutes. The students explained their learning process to each other using the think-aloud worksheet in their PBL unit groups (see Appendix D). Students orally explained their thinking about the developing solution of the PBL unit. Students met in their PBL unit groups and took turns serving as the recorder for the group member that was the oral participant in the think-aloud activity. The participant had an opportunity to read and verify what the recorder wrote. Each student completed a think-aloud worksheet and turned in their responses to the instructor and the researcher. A completion grade was given by the instructor. During the activity the researcher and the regular classroom instructor monitored the groups, provided coaching, and guidance, but they did not offer solutions to the problem.

Control Group

Students in the control group wrote journal entries called a “writer’s notebook entries,” which focused on the content of a given unit rather than entries specifically developed to elicit reflection of the student’s learning process. Students in this particular English class typically addressed these types of prompts throughout the school year, and the prompts served primarily as a “warm-up” activity for students before their literature class started. The prompts for the entries focused on content rather than process. These particular writing prompts are based on similar prompts that have been used as writer’s notebook entries previously and/or were adapted from prompts suggested for teachers’ use in a schedule of assignments for the English department of this particular school.

A selected writing prompt was given to students at the beginning of this unit. Students were asked to write at least one paragraph to one page on the assigned writing prompt. Students had at least ten minutes during class time to write in their journals. The students' journal entries were turned in to the instructor by the end of the class session. The students received a completion grade by the instructor. The researcher received a copy of the journal entries and they were analyzed using qualitative analysis. See Appendix E for the control group's journal prompts.

Students in the control group did not receive the think-aloud intervention. The control group met with their PBL groups during this time for a regularly scheduled group work session.

Data Sources and Analysis

This study incorporated a variety of data sources to address the research questions of the study. Four data sources were analyzed quantitatively: a pre-test and post-test on poetry terms, students' essay scores, and a survey (administered post-intervention). In order to determine differences between groups ANCOVA (Analysis of Covariance) was used to analyze the results of the poetry terms pre-test and post-test of the two experimental groups and the control group. MANCOVA (Multivariate Analysis of Covariance) was used to compare the results of the two experimental groups and the control group on the criteria of the essay using the pre-test as a co-variable. An additional MANCOVA test was conducted to compare the results of the survey between the experimental groups and the control group, and the poetry terms pre-test was again used as a co-variable. The ANCOVA and MANCOVA statistical tests were conducted

using SPSS software. Two additional data sources were analyzed qualitatively: students' journal entries and the think-aloud exercise.

Rationale of Pre-Test on Poetry Terms Serving as a Co-variable

The pre-test on poetry terms was used as a co-variable in the ANCOVA analysis of the poetry terms test, the MANCOVA analysis of the individually written in-class essay, and the MANCOVA analysis of the "Survey Regarding Reflection and Its Role in the Learning Process." The pre-test was the only measure available to the researcher to compare groups from the beginning of the project. It was used as a co-variable to more fully control for differences in the three intact classrooms of the study.

Quantitative Data Sources

Pre-Test and Post-Test on Poetry Terms

One reason for the selection of the poetry terms test as a data source in this study was that it could be used as source to examine if students were able to contextualize the learning of poetry terms while undergoing a concurrent study of Romantic poetry and a problem-based learning unit that emphasized a problem concerning poetry. Rupley and Nichols (2005) maintain that while definitional knowledge of vocabulary is needed, contextual knowledge supports learning and helps learners make connections and form relationships between words. Harmon (2002) also, asserts that learners benefit from having opportunities to make connections with words in context. It was presumed that students would have opportunities to use poetry terminology while exploring the problem-based learning prompt about poetry.

The pre-test and post-test on poetry terms was administered to both of the experimental groups and the control group to address research question #1: Does the inclusion of metacognitive support (reflective journal writing and a group think-aloud exercise) enhance student learning outcomes of a PBL unit? The pre-test and post-test were constructed by the participant observer and approved by the teacher before the administration of the unit. Both tests contained the same twenty-five multiple-choice or true/false items on various poetry terms.

The pre-test on poetry terms served as a form of assessment to assist in quantifying students' basic knowledge of poetry knowledge prior to the implementation of the study. Students did not receive instruction on the terms in a poetry terms packet until after the administration of the pre-test (see Appendix G). During the instructional unit all students received instruction and reviewed terms in the poetry terms packet. Students were told at the beginning of the unit that they would receive a test over the terms packet at the end of the unit (see Appendix H). Students did not receive a major grade on the pre-test. The pre-tests were scored and the results were given to the researcher. Although both the pre-test and post-test contained the same items, since the post-test scores were graded and recorded as a major grade for class use by the students' teacher, a point value per item was provided on the post-test.

The pre-tests and post tests were analyzed quantitatively. The results of the pre-tests and post-tests were normally distributed. In order to determine differences between the two experimental groups and the control group, an ANCOVA (Analysis of Covariance) was conducted using SPSS software to attribute differences in student

performance to the independent variable being examined rather than to an extraneous variable (Sproull, 2002; Glass & Hopkins, 1996). The pre-test was the co-variable examined in order to determine any differences between the three participating classes.

Students' In-Class Essay Scores

The in-class essay scores addressed research question #1: Does the inclusion of metacognitive support (reflective journal writing and a group think-aloud exercise) enhance student learning outcomes of a PBL unit? The essay scores assisted in determining whether or not these interventions enhanced students' knowledge and use of poetry terms. Students were asked to explain a plan, in an individually written in-class essay, to increase awareness and appreciation of poetry. The essay was administered before the groups presented plans to their class, so that students were not influenced by ideas of other groups. Students received an assignment sheet regarding the Poetry Publicity Project (see Appendix A) that specified requirements for both the group presentation and the individually written, in-class essay. The essay was written in a computer-lab during one class session designated for this activity. Requirements for the essay specified that students should develop a detailed, realistic and achievable plan, which persuasively addressed the target audience. Additionally, students were to demonstrate an overall understanding of poetry terminology as the topic of poetry was addressed in the project. Students were also asked to provide a definition of poetry and state how the definition pertained to the publicity plan. The essay was evaluated using a rubric constructed by the participant observer specifically for this unit (see Appendix F).

The rubric was used to analyze criteria (see Appendix F) specified on the

assignment sheet for the in-class essay (see Appendix A). Quality, in this instance, was determined by evaluating if the plan/solution was achievable and realistic as well as to what degree the plan/solution addressed the target audience by devising a persuasive plan. Additionally, this rubric addressed the proper use and understanding of poetry terms. The rubric was used to examine the individually written essays by students in both the experimental and control groups, and the results were compared.

The in-class essay was scored by the teacher and the participant observer, and inter-rater reliability was established prior to the evaluation of the written in-class essay. The participant observer fully explained the criteria of the rubric for the essay to the teacher. Three randomly selected essays were scored by both the teacher and the participant observer. The rubric's scale consisted of an "Excellent" level 5 score (high) to a "Poor" level 1 (low) score. In all three essays originally used to establish inter-rater reliability the raters' scores evaluating the essays were within one criterion level of each other (see Table 1). After the implementation of the PBL unit, to more fully establish the inter-rater reliability of the rubric, seven randomly selected essays were re-assessed. Table 1 indicates the scores of the three essays evaluated during the first session (1 – 3) and the second session of essays (4 – 10). Essays evaluated in the second session were also very closely correlated, as all scores determined by both raters were within one criterion level of each other. A Pearson Correlation was conducted on the scores of the two raters on the essay: $r = .989$. The names of the participants are pseudonyms.

Table 1

Inter-Rater Reliability Comparison Chart

Essay #	Rater #1 Researcher Session 1	Rater #2 Teacher Session 2
Essay # 1 Bella T.	2/5	1.8/5
Essay # 2 Karrie K.	4.6/5	4.8/5
Essay # 3 Cathy H.	4.6/5	4.6/5
Essay #	Rater #1 Researcher Session 2	Rater #2 Teacher Session 2
Essay #4 Lisa S.	4.8/5	5/5
Essay #5 Carson H.	3.6/5	3.4/5
Essay #6 Jon M.	5/5	4.8/5
Essay #7 Carla K.	4.8/5	4.6/5
Essay #8 Jason L.	5/5	5/5
Essay #9 Randy H.	4.4/5	4.4/5
Essay #10 Sandra C.	4.2/5	4.2/5

Students' essay scores were analyzed quantitatively using MANCOVA (Multivariate Analysis of Covariance) to analyze two or more dependent variables using a covariant (Cohen, Cohen, West, & Aiken, 2003). The dependent variables examined were the five criteria of the essay's rubric. The co-variable was the poetry terms pre-test.

Survey Regarding Reflection and Its Role in the Learning Process

A post-intervention survey was administered to students in both the experimental and control groups to address research question #2: Do learners using metacognitive support believe that having opportunities to reflect is useful to their learning experiences? See Appendix I for the survey (“Survey Regarding Reflection and Its Role in the Learning Process”). The ten-item survey used a Likert scale to determine how learners perceived the overall usefulness of reflection and reflective activities in their learning process. The survey was also used to address research question #1: Does the inclusion of metacognitive support (reflective journal writing and a group think-aloud exercise) enhance student learning outcomes of a PBL unit?

The survey was developed by the researcher for this study and used questions and terminology that could be answered by members of both the experimental and control groups concerning their learning process. All student participants completed and turned in the survey. Several questions were included to ascertain whether or not these student participants felt that writing in journals, having opportunities to reflect on their learning, and having opportunities to verbalize their thinking assisted the learner in the self-understanding of their learning process. Additionally, the Beradi-Coletta, et al. (1995) study provided a model to develop questions which addressed participants’ understanding of their learning processes. Also, Sobral’s (2000) study which used a ten-item survey addressing reflection in learning for medical students served as guide in developing specific questions for the survey in this study.

The “Survey Regarding Reflection and Its Role in the Learning Process” was analyzed quantitatively using MANCOVA (Multivariate Analysis of Covariance) in order to analyze two or more dependent variables with a covariant (Cohen et al., 2003). The dependent variables examined were the ten items of the “Survey Regarding Reflection and Its Role in the Learning Process” in order to determine if there were any significant interactions between the groups and the various dependent variables. The covariable was the poetry terms pre-test.

Qualitative Data Sources

Journal Entries and Think-Aloud Activities

In order to address research question #3 (“What insights can an examination of student learners’ journal entries provide regarding the overall impact of using metacognitive support in a PBL unit?”) and describe emergent themes, qualitative analysis was used (Merriam, 2001; Creswell, 2003). Journal entries for the experimental groups were analyzed using constant comparison and the coding of the text (journal entries). Additionally, the artifacts (think-aloud worksheets) collected during the think-aloud exercise, administered only to the experimental groups, were also examined using qualitative analysis to address research question #3.

Summary of Procedures

A pre-test on poetry terms was administered to all students. The teacher conducted and scored this test and provided the results to the researcher. Journal entry prompts (reflective, process-oriented prompts for the experimental groups; content-

oriented prompts for the control group) were given to the experimental and control groups during five class sessions of the unit.

Mid-way through the unit, after students received the third writing prompt, the experimental groups participated in the think-aloud activity and turned in their worksheets to the teacher who then recorded a participation grade, and she provided the think-aloud worksheets to the researcher. Additionally, the teacher collected and evaluated students' journal entries and think-aloud responses and provided the entries to the researcher. Also, the teacher conducted, scored, and graded the poetry terms test (post-instruction) and provided the scores to the researcher. The students, as part of their final product of the PBL unit, wrote an individual, in-class essay explaining the results of their solution. The essay was conducted before the group presentations of the PBL unit. The teacher recorded a grade for students' products (the in-class essay and the group presentations) and provided the results to the researcher.

Both the teacher and the researcher completed the rubric evaluating various criteria of the individually written persuasive in-class essay. Criteria used on the rubric addressed the quality and detail of the student's final product (the in-class written essay) and evaluated the quality of the student's solution. After students completed the final products for the PBL unit, the "Survey Regarding Reflection and Its Role in the Learning Process" (see Appendix I) was administered to all students. The results from the experimental and control groups were analyzed.

CHAPTER IV

RESULTS

Assumptions, Limitations, and Delimitations

This chapter presents the assumptions, limitations, and delimitations of the study as well as an explanation of the organization of the various data sources used to address the study's research questions (see Table 2). The chapter examines both the quantitative and qualitative results of the study.

Assumptions

The following assumptions have been made in this study:

1. The researcher established a rapport with students, and this relationship did not have a reactive effect on the behavior observed during the study.
2. Participants attempted to comply with assessment procedures.

Limitations

1. This was a rather small study, and its findings may or may not be transferable to other educational settings, grade levels, or socio-cultural backgrounds.
2. Data sources for this study were designed specifically for this study.
3. Journaling was used with both the control group and the experimental groups, since all students regularly addressed journal prompts (content-oriented) prior to this study.

Delimitations

1. It is necessary to note that if PBL units are developed using basic inquiry as a guiding construct for their formation, they will inherently contain some degree of reflection of

the learner's thinking process. However, it is assumed that many PBL units will simply ask learners to reflect on their thinking in a generalized way concerning how they attempted to solve the dilemma, and guided metacognition may or may not be stressed throughout the unit.

Explanation of the Organization of Data Resources

Table 2 is an organizational chart of the various data sources for this study to address the research questions.

Table 2

Explanatory Chart of Data Sources

Dependent Variable/ Outcome Variable	The dependent variable is the impact of metacognition	
Independent Variable/ Treatment Variable	Metacognitive support (reflective journals and a group think-aloud exercise)	
Research Questions	Data Source	Form of Data Analysis
1. Does the inclusion of metacognitive support (reflective journal writing and a group think-aloud exercise) enhance student learning outcomes of a PBL unit?	Quantitative: <ul style="list-style-type: none"> Poetry terms pre-test and post test (experimental and control groups) “Survey Regarding Reflection and Its Role in Learning” (experimental and control groups) In-class essay (experimental and control groups) 	Quantitative: <ul style="list-style-type: none"> Post-test and pre-test analyzed with ANCOVA (Analysis of Covariance). “Survey Regarding Reflection and Its Role in Learning” analyzed with MANCOVA (Multivariate Analysis of Covariance). Rubric for written in-class essay analyzed with MANCOVA (and t-tests to determine which groups differed on various criteria)
2. Do learners using metacognitive support believe that having opportunities to reflect is useful to their learning experiences?	Quantitative: <ul style="list-style-type: none"> “Survey Regarding Reflection and Its Role in Learning” (experimental and control groups) Qualitative: <ul style="list-style-type: none"> Students' journal entries (experimental and control groups) Think-aloud exercise (only experimental groups) 	Quantitative: <ul style="list-style-type: none"> “Survey Regarding Reflection and Its Role in Learning” analyzed with MANCOVA. Qualitative: <ul style="list-style-type: none"> Constant-Comparison: selecting themes to examine from students' journals and think-aloud exercise
3. What insights can an examination of student learners' journal entries provide regarding the overall impact of using metacognitive support in a PBL unit?	Qualitative: <ul style="list-style-type: none"> Students' journal entries from all participants (both reflective and content-oriented entries). Think-aloud exercises 	Qualitative: <ul style="list-style-type: none"> Constant-Comparison: selecting themes to examine from students' journals and think-aloud exercise

Quantitative Data Analysis of Selected Sources

Results of Data Analysis of Pre-Test and Post-Test on Poetry Terms

The results of the experimental groups and the control group on the poetry terms pre-test and post-test were analyzed to assess if there was a difference between groups in the knowledge gained over the course of the intervention. ANCOVA (Analysis of Covariance) was conducted using SPSS software to analyze the results. One student in Experimental Group 1 did not turn in a post-test (it was taken in a separate ESL classroom and not returned to the teacher). The participants consisted of Experimental Group 1 (N = 11), Experimental Group 2 (N = 18), and Control Group 3 (N = 21); total N = 50. See Table 3 for descriptive statistics for each group on the poetry terms pre-test and post-test. The dependent variable was the post-test score on poetry terms. The covariable was the pre-test score.

Table 3

Descriptive Statistics: Pre-Test and Post-Test Scores of Poetry Terms Test

Group	N	Pre-Test Mean	Pre-Test Std. Dev.	Post-Test Mean	Post-Test Std. Dev.
Exp. 1	11	57.09	14.65	86.55	12.68
Exp. 2	18	49.33	12.27	83.56	12.42
Control 3	21	52.38	16.87	82.29	18.18
Total	50	52.32	14.85	83.68	14.96

Tests of between-subject groups with the pre-test on poetry terms as covariate indicated that differences between the three groups on the post-test were not statistically significant at .05 alpha level. $F(2, 46) = .4, p < .67$, partial Eta squared = .017.

Discussion of Results: Pre-test and Post-Test on Poetry Terms

ANCOVA was used to assess if there was a difference between the experimental groups and the control group in the knowledge gained over the course of the intervention. Whether or not students benefited from having an opportunity to contextualize poetry terms is not specifically known. However, although there was not a significant difference in the poetry terms post-test scores between the experimental groups and the control group, it should be noted that in the majority of cases student test scores in all groups increased. Nevertheless, the poetry test contained only multiple-choice and true/false items, and this particular instrument may not have been sensitive enough to fully capture students' nuanced understanding of terms.

PBL is a well-researched method of increasing engagement; therefore, it was anticipated that student understanding of the subject matter might increase (Schwartz, et al., 2001). This study examined how metacognitive support would provide additional benefits for students' learning processes, since PBL may increase student engagement without developing metacognitive skills. However, the results of the data analysis did not indicate that the intervention significantly impacted the test scores of the experimental groups when compared to the control group.

Results of Data Analysis of the Individually Written In-Class Essay Scores

The scores of the written essay were analyzed to assess the impact of the treatment (the use of reflective journal activities and a think-aloud activity) on students' development of a final product/solution to a specific problem-based learning prompt and knowledge gained about poetry terminology. Students' essay scores were analyzed using

MANCOVA (Multivariate Analysis of Covariance) to compare the results of the two experimental groups and the control group on the five criteria of the essay using the pre-test as a co-variable (Cohen et al., 2003). The statistical tests were conducted with SPSS software.

The rubric for the individually written essay used a scale of 5 (excellent) to 1 (poor). N = 48 for all items. Two students did not complete essays in the Experimental Group 1 class (N = 10). One student, an ESL student, wrote the essay in another room, and the essay was never returned to the classroom teacher. Another student was in ISS (in-school suspension) and did not receive the assignment. These two essays were not scored by the raters. All essays were received from the Experimental Group 2 class (N = 18). In the Control Group 3 class (N = 20) one student did not turn in an essay, and the exact reason is unknown. The student received a score of zero, since the student refused to complete the essay. It is recorded as missing data as the score does not reflect the student's ability. The means and standard deviations of the three groups on the five criteria of the rubric for the essay are reported in Table 4. The means consists of the average of both raters' scores of the student essays.

Table 4

Combined Results from Groups 1, 2, and 3: Essay Scores

Group Name	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5
Exp. Group 1 (N = 10)					
Mean	4.10	4.55	4.45	4.75	4.60
SD	1.25	1.25	1.65	.63	.66
Exp. Group 2 (N = 18)					
Mean	4.67	5.00	5.00	4.80	4.72
SD	.38	.00	.00	.30	.31
Control Group 3 (N = 20)					
Mean	4.83	5.00	5.00	4.90	4.73
SD	.34	.00	.00	.00	.30

A General Linear Model of analysis was employed using MANCOVA, and multivariate tests were conducted using SPSS software to determine whether or not significant differences were apparent in the scores of the three groups of students on their individually written essay. The pre-test on poetry terms was used as a co-variable, because it was administered to all groups before implementation of the poetry unit to any class, and therefore, it was used as a way to measure each class's baseline knowledge of poetry terms before any intervention took place. The MANCOVA indicated a significant difference in groups: $F(10, 80) = 3.61, p < .001$.

Table 5 provides the results of a statistical analysis of tests between subjects on students' essay scores. Each criterion of the essay's scoring rubric of each group was

examined. The pretest was the co-variable. “Tests of Between-Subject Effects” (conducted with SPSS software) examined group scores on the essay’s five criteria. There was a significant difference between groups on criterion 1: “Paper describes the plan in detail” (.007) and criterion 3: “The plan addresses the target audience with an idea(s) on how to generate an interest in poetry” (.007). However, a small effect size is indicated since the partial Eta squared is .2 for both criterion 1 and criterion 3.

Table 5

Tests of Between-Subjects Effects: Essay Scores

Source	Dependent Variable	Df	F	Error	Sig.	Partial Eta Squared
Group	Essay-C1	2	5.55	44	.007	.2
	Essay-C2	2	2.63	44	.08	.11
	Essay-C3	2	5.53	44	.007	.2
	Essay-C4	2	.63	44	.54	.03
	Essay-C5	2	.39	44	.68	.02

Since the results of the “Tests of Between-Subject Effects” (see Table 5) indicated that on two of the essay’s criteria there was a significant difference between groups, further analysis was necessary. Therefore, t-tests were conducted in order to examine which groups differed from each other (see Table 6). In order to control for Type I error adjusted $p < .0083$. A significant difference was indicated on criterion 1 (“Paper describes the plan in detail”) between Experimental Group 1 and Experimental Group 2 ($p = .002$). However, no significant difference was indicated on criterion 1 between Group 1 and Group 3 ($p = .012$) or between Experimental Group 2 and the

control group ($p = .183$). T-tests were also conducted to determine which groups differed on criterion 3 (“The plan addresses the target audience with an idea(s) on how to generate an interest in poetry”). No significant difference between groups was indicated. Note that a t-test on criterion 3 between Experimental Group 2 and the control group (Group 3) could not be computed as the mean of the two groups was the same; therefore, the standard deviation was .00, and the t-statistic could not be computed.

Table 6

Results of T-Tests on Criteria 1 & 3 Essay Scores

Criterion 1:						
Group	N	Mean	SD	T	Df	Sig. (2-tailed)
Exp. 1	10	4.10	1.13	-3.45	26	.002
Exp. 2	18	5.00	.00			
Criterion 1:						
Group	N	Mean	SD	T	Df	Sig. (2-tailed)
Exp. 1	10	4.10	1.13	-2.70	28	.012
Control 3	20	4.83	.34			
Criterion 1:						
Group	N	Mean	SD	T	Df	Sig. (2-tailed)
Exp. 2	18	4.67	.38	-1.36	36	.183
Control 3	20	4.83	.34			
Criterion 3:						
Group	N	Mean	SD	T	Df	Sig. (2-tailed)
Exp. 1	10	4.45	1.07	-2.22	26	.04
Exp. 2	18	5.00	.00			
Criterion 3:						
Group	N	Mean	SD	T	Df	Sig. (2-tailed)
Exp. 1	10	4.45	1.06	-2.35	28	.026
Control 3	20	5.00	.00			
Criterion 3:						
Group	N	Mean	SD	T	Df	Sig. (2-tailed)
Exp. 2	18	5.00	.00	Cannot compute		
Control 3	20	5.00	.00			

Note: adjusted $p < .0083$.

Discussion of Results: Individually-Written Essay

The individually written essay was evaluated in order to determine whether or not students who had participated in a group project were also able to apply what was learned both during the PBL group experience and in regular classroom sessions about poetry. The essay was assigned to the experimental groups and the control group. In most instances students in both experimental and control groups were able to successfully meet the criteria of the essay's scoring rubric. The majority of students in all groups were able to use poetry terms successfully and develop a definition of poetry. Moreover, students in the experimental and control groups were able to explain a plan for solving the dilemma of the PBL. However, most students chose to write about a plan that was actually developed in a group setting (although they had an option to develop a wholly different plan for the written essay, if they wished).

As mentioned previously, MANCOVA analysis indicated students differed on criterion 1 of the essay regarding whether the plan was described in detail and criterion 3 whether or not the plan addressed the target audience of the essay. T-tests indicated a significant difference between the two experimental groups on criterion 1. None of the groups were statistically different from each other on criterion 3. Furthermore, the fact that a t-statistic could not be computed between the Experimental Group 2 and the control group (Group 3) on criterion 3 raises speculation as to why students in these two groups received such similar scores by the two raters. It is possible that criterion 3: "The plan addresses the target audience with an idea(s) on how to generate an interest in poetry" was not challenging enough for students in these two particular classes;

however, this criterion does address a major objective of the unit, and it was expected that students should be able to devise a plan that addressed the needs of the target audience. Since there was not a significant difference between both of the experimental groups and the control group on either criterion 1 or criterion 3, it remains difficult to determine to what extent the intervention of metacognitive support contributed to students' scores on the essay prompt.

Results of Data Analysis of “Survey Regarding Reflection and Its Role in the Learning Process”

The results of the “Survey Regarding Reflection and Its Role in the Learning Process,” were also analyzed using MANCOVA (Multivariate Analysis of Covariance) in order to analyze two or more dependent variables with a covariant (Cohen et al., 2003). All items on the survey were ranked using a Likert scale (5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree). N = 49, as one student in Experimental Group 1 did not complete the survey, and one student in the control group also did not complete the survey. See Table 7 for the descriptive results of the “Survey Regarding Reflection and Its Role in the Learning Process.”

Table 7

Descriptive Statistics: Survey Regarding Reflection and Its Role in the Learning Process

	Group	Mean	Std. Deviation	N
Survey Q1	1.00	3.18	.87	11
	2.00	3.50	.71	18
	3.00	2.85	1.04	20
	Total	3.16	.92	49
Survey Q2	1.00	3.55	.93	11
	2.00	3.50	.62	18
	3.00	3.45	.83	20
	Total	3.49	.77	49
Survey Q3	1.00	2.64	1.43	11
	2.00	2.89	.96	18
	3.00	2.70	1.17	20
	Total	2.76	1.15	49
Survey Q4	1.00	3.73	.90	11
	2.00	3.78	.55	18
	3.00	3.30	.92	20
	Total	3.57	.82	49
Survey Q5	1.00	3.00	1.00	11
	2.00	2.83	.92	18
	3.00	2.30	.92	20
	Total	2.65	.97	49
Survey Q6	1.00	3.36	1.36	11
	2.00	3.50	.62	18
	3.00	3.05	1.10	20
	Total	3.29	1.02	49
Survey Q7	1.00	3.00	1.67	11
	2.00	3.61	.85	18
	3.00	2.85	.88	20
	Total	3.16	1.12	49
Survey Q8	1.00	3.27	1.19	11
	2.00	3.50	1.15	18
	3.00	3.00	1.03	20
	Total	3.24	1.11	49
Survey Q9	1.00	2.91	1.30	11
	2.00	3.28	.75	18
	3.00	2.75	1.07	20
	Total	2.98	1.03	49
Survey Q10	1.00	3.09	1.38	11
	2.00	3.39	.70	18
	3.00	2.65	.75	20
	Total	3.02	.95	49

Multivariate Tests on the “Survey Regarding Reflection and Its Role in the Learning Process”) were conducted, and the result was not significant: $F(20, 72) = .78$, $p < .731$.

Discussion of Results: “Survey Regarding Reflection and Its Role in the Learning Process”

MANCOVA (Multivariate Analysis of Covariance) conducted on the survey items was not statistically significant. Since multivariate tests did not indicate significant differences between groups, further univariate tests were not reported. However, an examination of the total means of the three groups on individual survey items merits discussion. Total mean scores for the ten items of the survey were above 2.5 out of 5 possible points on the Likert scale of the survey. Question 5: “Reflecting on my thinking processes using a journal format while completing a project helps me understand the way I learn,” received the lowest total mean (2.65). However, Question 8: “Writing about my thinking process assists me in organizing my thoughts,” received a total mean of 3.24. Question 4: “I feel I am capable of reflecting clearly on issues and problems,” received the highest total mean (3.57) of the survey. The majority of the students in this study seem to identify satisfaction in their problem solving abilities. However, the extent writing (whether in journal entries or in some other form) assists students’ problem solving or in the understanding of content is not known.

Qualitative Analysis of Journal Entries and Think-Aloud Activity

Students’ journal entries (from both the experimental and control groups) were examined qualitatively using a constant comparative method for emergent themes

(Merriam, 2001; Creswell, 2003). The participant-observer was given the hand-written journal entries after each class session and transcribed the student participants' entries. Then the entries were scanned for emergent themes and coded to categorize the content of the journal entries. Figure 1 contains graphic cognitive maps illustrating the journal entries of the experimental group that received "reflective" prompts for their journal entries, and the journal entries of the control group that had writing prompts relating to the poetry lessons taught throughout the unit are illustrated in Figure 2. The journal entries of the control group were also examined, because even though the entries did not specifically address topics related to students' learning processes it was still possible the journal entries could offer information regarding how students process information learned in a specific problem-based learning unit.

Students ranged in age from 17 to 18 years old and signed either a consent form or returned an assent form and a parental permission form to participate in this study. All

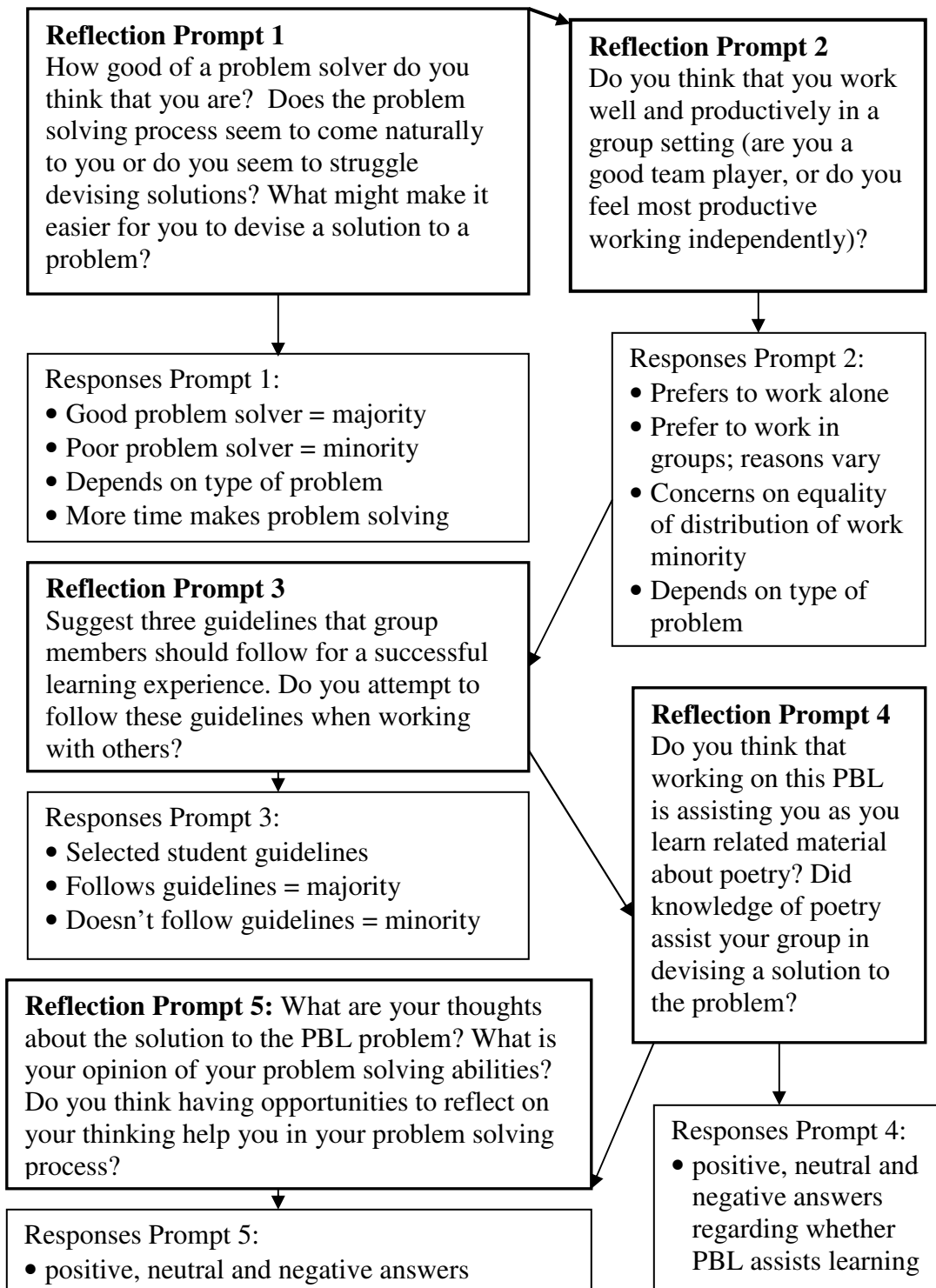


Figure 1. Cognitive Map: Thematic Qualitative Graphic Analysis of Journal Responses of the Experimental Groups' Reflective Journal Entries

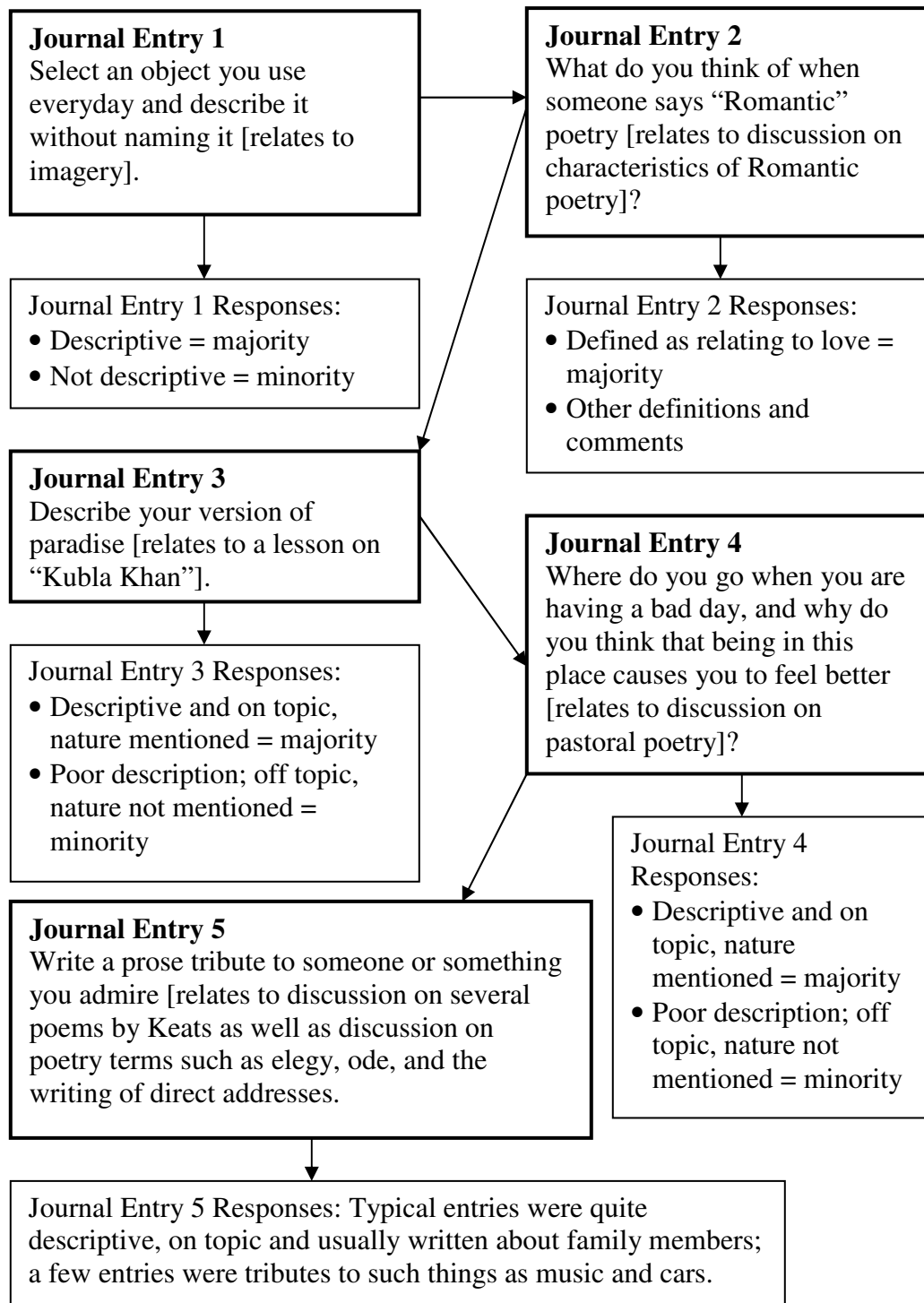


Figure 2. Cognitive Map: Thematic Qualitative Graphic Analysis of Journal Responses of the Control Group’s Journal Entries

of the consent forms stipulated that the student participant's name or other identifying information would not be included in any sort of report that might be published.

Therefore, the student participants' names have been changed for the following discussions concerning students' journal entries and the think-aloud exercise.

An Examination of the Experimental Groups' Reflective Journal Entries

The experimental groups' reflections regarding their problem solving process (Prompt 1) revealed that the majority of students thought they were good problem solvers. However, several admitted that they perceived problem solving as an area of personal weakness. In addressing the portion of Prompt 1 that asks what might make it easier for you to devise a solution to the problem some students mentioned that more time might make it easier to devise a solution to a problem. Several students mentioned that their abilities to solve a problem really depended on the type of problem to be solved. In these instances, most students felt that they could help others solve personal problems, but if the student participant perceived "problem solving" as related to math or science, answers would vary depending on student perception of his or her mathematical and/or scientific reasoning abilities. A minority of students thought that they also had difficulty solving problems (personal or academic) on their own and thought they would work better in a group setting. One student, Larry E., said he could solve small problems well but felt overwhelmed with large problems. Another student, Daniel M., expressed much confidence in his problem solving skills and that he felt he could solve complex problems but not simple problems. The student mentioned if the goal is clear he can more easily come up with a probable solution.

Students' reflections on their most productive environment (Prompt 2) seemed to indicate that the majority felt they worked best as independent learners. Students were asked to identify their most productive environment and examine why they might have a preference for working independently or in a group setting. The preference for working independently or in a group setting might impact students' perceptions of their abilities and how they learn. Additionally, how students work with groups is a concern of facilitators and can impact the success of the PBL (Schwartz et al., 2001). This item seemed to elicit self-reflection concerning the circumstances individual students felt was optimal for learning. Several students mentioned that they liked working with others, especially listening to others and exchanging ideas, but a clear majority of students were concerned about the grading of an activity. Students were fearful that they would "get stuck" with the majority of work on a given project. Another concern of some students about working in a group setting was that "sometimes you don't get your ideas out." Andrea H. exclaimed, "Well, the thought of working in a team is nice, but when it comes down to it, me working with other people is a train wreck waiting to happen. I get distracted very easily . . ." Larry E. admitted that he is sometimes difficult to motivate, and if he is working on a team, "it is good to have someone there to push me and make sure that I'm getting my work done." This student and a few others indicated that their involvement in sports really helped to form their sense of being a part of a team, and they felt, subsequently, that they were good team players. Additionally, Rhonda D. declared that she liked teamwork more now that she has started working, and "If it wasn't for team work, then everything would be a total disaster." Rhonda explained that

this is “because one person can’t just do everything by himself [or] herself [;] there would just be no way.”

Students were asked for suggestions for a successful group learning experience and whether or not they attempted to follow these guidelines (Prompt 3). Most students attempted to provide guidelines that would assist others. Beth B. suggested the following: “1. Do the work that you agreed to do. 2. Respect everyone in the group including their ideas. 3. Give everyone a chance to say their point of view.” Most students claimed that they attempted to follow the guidelines they offered. However, several stated that they “tried” to follow the guidelines they developed, but that they had some difficulty doing so. Students provided such explanations for not following their guidelines as that they sometimes became distracted in a group setting or that work or other obligations prevented them from fully participating in a group project.

Students’ reflections concerning whether or not working on this PBL unit assisted their learning about poetry and if knowledge of poetry aided the group in devising a solution (Prompt 4) revealed that most students did not really know if working on the PBL unit assisted their learning about poetry. Two students expressed frustration that they either did not like the PBL project or did not like poetry, and they admitted this influenced their thoughts on this question. Also Andrea H. felt she did not understand the question at all, but then stated, “but it is kinda [sic] making me look at poetry at a different angle.” Another student, Cathy H., claimed that she felt that she was learning about poetry; however, she did not feel like she knew much before. She was not

sure if her group members were learning much about poetry, so she was not sure how much knowledge about poetry was helping the group.

The students' thoughts concerning their group's solution to the PBL and their opinions on their individual problem solving process (prompt 5) were varied. Most felt their group was making progress toward a solution to the problem and described the plan they were devising. However, Karrie K. noted, "I think it [problem solving] is something we learn as we grow up, not something that someone can try and teach." Another student, Angie P., asserted, "No matter what you do you cannot make someone like poetry." Yet, Jon M. stated, "The reflection process has helped us find kinks in our solution." Students' opinions on opportunities to reflect on their thinking and problem solving (also in prompt 5) were divided on whether this influenced their learning. Beth B. expressed that while she already had pretty good problem solving skills and having opportunities to reflect helped her, she thought it helped the most when she was thinking with her group, and "We do really well comparing and contrasting ideas." Larry E. stated, "Yes, I think that reflecting on your thinking always helps your problem solving. It takes practice to be good at anything, including problem solving."

Control Group's Journal Entries (Content-Oriented Prompts)

The control group wrote on writing prompts that were content-oriented and were of a type that were familiar to these students. The prompts were related to the unit's curriculum content of Romantic poetry and basic poetry terms. Typically, the entries were devised to elicit student writing and thought on a selected topic.

Journal Entry 1 asked students to select an object used every day and describe it without naming it. The entry related to a lesson on imagery and how it is created by poets. Most students were able to write a detailed, descriptive paragraph about the assigned topic. All entries were on topic entries.

Journal Entry 2 asked students what they think of when someone says the term, “Romantic poetry.” This entry directly related to a discussion on the characteristics of Romantic poetry and was provided to students before the class discussion. Although most students attempted to answer this prompt, and their responses could be considered to be on topic entries, they defined “Romantic” poetry as having to do with love (20/21 entries). Only one student, Jason L., offered a different definition: “I think about a form of poetry that is romantic in a sense the Spanish language is a ‘Romantic’ language, derived from Rome and sort of rolls off the tongue.” None of the students offered a definition of “Romantic poetry,” which mentioned the Romantic era or described characteristics of poetry written during that era.

Journal Entry 3 asked students to describe their version of paradise and was directly related to a discussion of Samuel Taylor Coleridge’s poem, “Kubla Khan.” Most entries were descriptive and on topic. Many entries mentioned nature; many expressed paradise as time on a beach. However, a few students preferred cooler climates for skiing and other related activities, and some students mentioned travel to Paris or other destinations. Several students offered descriptions of paradise unrelated to nature such as George G.’s description of having a motocross truck and enough money to have servants and a personal chef. Angie W. notes, “Thanksgiving is paradise to me.” She provided a

detailed entry describing a typical holiday for her family, and “The best part is that I’m surrounded by my favorite people in the world.”

In Journal Entry 4 students wrote about where they go to when they have a bad day and they were asked to think about why this place caused them to feel better. The writing prompt related to a discussion on pastoral poetry. The majority of entries were descriptive and on topic. Most students wrote of a place in nature and how the particular place changed their mood or feelings. A few students wrote they would drive to a friend’s or a family member’s residence or that they would just get in a vehicle and drive.

Journal entry 5 asked students to write a prose tribute to someone or something that they admired. This prompt related to a discussion on several poems by Keats as well as discussion on poetry forms such as elegy, ode, and direct address. Typical entries were quite descriptive and on topic. Most entries were tributes to family members or members of the opposite sex. In several of the entries a direct address form was employed; however, the name (or subject) was not provided. A few entries were tributes to objects or abstract concepts such as cars and music.

Students in both the experimental and control groups generally followed directions for the prompts regarding guidelines for the length of the individual entries, and few students strayed off-topic. While several students had some grammatical and spelling errors in the hand-written journal entries, most were legible.

Discussion Think-aloud Strategy

Students in the experimental classes participated in a think-aloud exercise with a

partner who was in their assigned PBL group. Students were allotted at least 30 minutes for this activity. The participant observer modeled the expected format using a different problem scenario. One student acted as the participant and the other student served as the recorder. Students were asked to read what was recorded and to initial the worksheet if the transcript was suitable. Roles were then reversed. Student groups were able to successfully complete the exercise.

Participants were asked to describe the problem out loud and also describe the initial solution to the problem. Students' answers were succinct. Another question on the worksheet asked students to state a question about the problem. One student asked, "Why are we doing this?" Daniel M. raised the concern, "If you don't like poetry, how will a small group of high school students make a difference?" Students were also asked to state what they thought would need to be addressed to devise a solution to the problem. This portion of the think-aloud exercise seemed to elicit responses that summarized student participants' thoughts regarding the goals of the PBL project. For instance, Angie P. declared, "[T]he general public's feeling[s] about poetry" needed to be addressed. The majority of students answered all of the questions on the think-aloud worksheet, and although most answers were not highly descriptive, the answers to the think-aloud exercise were direct and clear. Since students' answers to the exercise were not particularly descriptive or complex the participant observer was not able to discern to what extent the think-aloud exercise impacted students' thinking process and metacognitive skills.

Discussion of Findings Regarding Student Participants' Journal Entries and a Think-Aloud Exercise and Their Role in Metacognition

Most students in both the experimental and control groups, regardless of the type of writing prompt they were provided for their journal entries, fulfilled general expectations regarding the writing of journal entries, as most entries were on topic and of the suggested length. The process-oriented prompts (see Appendix B) of the journal entries of the experimental group seemed to elicit some self-reflection concerning students' thought processes and reflection on the participants' personal strengths and weaknesses as learners. However, since the study was only conducted over the course of one six-week period and was not a longitudinal study it is difficult to ascertain whether or not this particular intervention will be of long-term assistance to student learners.

The content-oriented prompts (see Appendix C) of the journal entries of the control group often seemed to elicit more developed answers. As mentioned previously, students regularly addressed this type of writing prompt, which was typically based on the general content of the upcoming lesson or the unit being currently covered in class. Writing seemed to be more detailed when addressing this type of journal prompt. Occasionally, when students would write entries, which contained content of a personal nature, it usually also addressed the content of the writing prompt. It is not clear from this study whether the act of writing on a topic related to the upcoming lesson may have enhanced students' interest and motivation to learn about a certain topic.

Participating students were able to accomplish the required task of the think-aloud exercise. The think-aloud exercise was only conducted with students in the two

experimental classes. Students seemed to have little difficulty following directions. Although answers were often succinct, they were on topic. Even though the think-aloud exercise was analyzed using the constant-comparison method, since it did not seemingly provide detailed information about students' thoughts regarding their learning process, the exact impact of this particular aspect of the intervention was not determined.

Discussion of Findings: Research Question 1

1. Does the inclusion of metacognitive support (reflective journal writing and a group think-aloud exercise) enhance student learning outcomes of a PBL unit?

Overall, the research findings of this study fail to lend support for the particular intervention examined as metacognitive support to enhance student learning outcomes during a PBL unit. The primary hypothesis of this study was that the addition of a reflective component throughout the learning unit might assist students in the development of metacognitive skills and enhance learning outcomes (Ngeow & Kong, 2001; Dunlap, 2005). Further exploration of this hypothesis may offer educators more information on how to support learners' metacognitive skills. Since research on metacognition used in problem-based learning indicated that metacognitive support would be beneficial for student learning (Ge & Land, 2004; Fonteyn & Cahill, 1998), it is possible that the specific journal writing prompts and think-aloud exercises need to be either re-structured to more explicitly elicit student reflection and/or the amount of writing prompts increased. Additionally, it is also possible that a PBL prompt that students perceived as being more directly tied to a real-world situation may have resulted in a more discernible impact of the use of metacognitive support in this type of

instruction (Kumar & Kogut, 2006). Nonetheless, it is hoped that additional research will continue to investigate metacognitive support in the classroom, as thinking about one's thinking process may improve student learning (Ge & Land, 2004).

Discussion of Findings: Research Question 2

2. Do learners using metacognitive support believe that having opportunities to reflect is useful to their learning experiences?

The participants in this study varied regarding whether or not having opportunities to reflect was useful. The results of student surveys (analyzed using MANCOVA) did not indicate a significant difference between the experimental and control groups regarding learners' beliefs concerning whether or not having opportunities to reflect was useful for their learning process. Also, students in both experimental groups were asked (as part of one of the journal prompts): "Do you think having opportunities to reflect on your thinking help you in your problem solving process?" Students gave a wide range of responses to this question, with several students indicating that reflection was useful to them personally.

Differences in how students enjoy writing may have influenced student responses concerning whether or not opportunities for reflection was useful to their learning experience. Also, the analysis of students' individually written essay (analyzed using MANCOVA) indicated differences between the two experimental groups on criterion 1, which measured whether or not the student's paper described the plan in detail. Differences in the experimental classes may point toward students' differences in writing enjoyment and writing abilities.

Perhaps, future studies, which incorporate writing as an intervention, could directly address students' level of ability and enjoyment of writing as a part of the study. Since individual learners' needs vary, educators may consider offering students opportunities to reflect using reflective journal entries and a think-aloud exercise, as this type of metacognitive support may assist some learners in developing a deeper understanding of their needs (Ge & Land, 2004; Snyder & Pressley, 1995).

Discussion of Findings: Research Question 3

3. What insights can an examination of student learners' journal entries provide regarding the overall impact of using metacognitive support in a PBL unit?

Students who wrote entries reflecting on their thought process (the two experimental classes) did not seem to feel that having opportunities to reflect was particularly influential in helping to solve the group project about a topic related to poetry. However, some students did indicate that having opportunities to reflect was useful to them, personally. Students reflected on their learning process and how they learned and whether they were more comfortable working individually on a project or more comfortable in a group setting. A number of students indicated concern throughout several of the journal entries about having to do the majority of work on a group project and about a lack of control regarding the grade they might receive on a group project. Even so, many student entries also indicated that they benefited from having opportunities to interact with other group members, and through interactions with a group they were also able to develop ideas (and solutions) to a given problem. Yet, students were concerned that in some group settings their voices were not heard, and

they did not feel able to contribute to a group, and therefore, they did not feel a group setting was especially beneficial for their learning experience. Issues concerning cooperative learning and the assessment of group learning may have indirectly impacted students' thoughts and concerns regarding this project and influenced the impact of using metacognitive support in a problem-based learning unit with a group project (Papinczak, T., Young, L., & Groves, M., 2007).

CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter presents a brief summary of the study and also offers reflections of the participant observer. General conclusions regarding the impact of the study are examined and suggestions for further research are provided.

Summary of the Study

This study analyzed whether providing learners with metacognitive support via reflective journal entries and a think-aloud exercise enhanced participants' learning during a problem-based poetry unit, implemented in a secondary English/language arts classroom. The results of the data analysis of the quantitative data sources of this study comparing the two experimental groups and the control group were not statistically significant. However, the qualitative analysis of students' journal entries in the two experimental groups that received the reflection prompts, suggests that the inclusion and implementation of similar metacognitive support in a problem-based learning curriculum may assist some learners. Nevertheless, the study did not provide statistical evidence that the intervention significantly impacted student learning outcomes. The researcher will reflect on and discuss the overall implementation of this study and examine possible reasons why the intervention did not appreciably impact student learning.

Reflections of the Participant Observer

The participant observer was able to conduct this study with students who willingly let her come to their classroom to facilitate a major project. Most students

seemed to amiably take on the project. The researcher worked with three different classes with quite different “personalities.” Although each class completed the same PBL unit, each class seemed to respond differently to the project.

Commentary on Group 1

One class in particular was challenging. It was the smallest of the three classes (N = 12), and it was the last class of the day for students; whereas, the other two classes were held before lunch. The class contained students who were absent due to in-class suspension more frequently than the two other classes, and students were often more off-task and talkative. This class was designated as an “experimental class” for this particular project. Some few students in the other classes would occasionally be negative about either working in groups or having to complete another project; for the most part students did what they were asked to do for the project. However, this wasn’t the case with Group 1. In this class, students often had difficulty just getting seated. Getting group work started with students working somewhat cooperatively seemed to take much more of the instructor’s time. However, it seemed apparent from listening to conversations in this class that some of the PBL groups had more enthusiasm for the project than in the other two classes.

Although Group 1 students had difficulty getting started writing in their journals, they did write and turn in the entries [this class received the reflective journal prompts]. As mentioned previously, the entries were usually not highly detailed; however, most entries did seem to honestly answer the questions asked in the prompts as students wrote about how they think and learn. Also, students seemed to candidly address their

strengths and weaknesses as learners. Additionally, as one of the designated experimental groups, this class took part in the think-aloud exercise (mid-way through the study). The teacher and researcher initially, anticipated some difficulty in having students in this class complete the think-aloud exercise. Yet, this was not the case for this particular activity; once students were paired with a partner they were able to stay on task and complete the activity without difficulty.

Transitioning from journal writing time to class discussion or class activity was sometimes difficult (this was a small but highly talkative and energetic class). However, once attention was obtained, class conversations about poetry were often insightful and humorous (at least for the participant observer). Perhaps, the class had three or four “closet” poetry lovers: students who actually like/love poetry, but do not want peers to know that they do.

Even though students’ individual essays and test scores in this study may not have indicated a strong difference between groups, this smaller, more “problematic” class, in terms of discipline, ultimately crafted group PBL projects that were considerably more interesting and creative than students in the other two classes. For instance, one group created a PowerPoint presentation that contained student-made video clips of images related to their interpretation of the poetry PBL project. Two other groups did humorous skits and another group did an informational PowerPoint presentation. The presentations were engaging and demonstrated an effort to meet a primary objective of the PBL prompt: to create a way for others in the community to appreciate poetry.

Commentary on Group 2

Students in Group 2 complied with the requirements of the problem-based learning unit. This class was also designated as an experimental class for this study (N = 18). They were generally well-mannered, and student behavior and classroom management concerns were not an issue in the implementation of the problem-based unit or in the writing of the reflective journal entries. This class was held mid-morning. The expectations for all of the classes were that students come in and begin writing, and students in this class, typically, had little difficulty staying on task. When students were asked to complete the think-aloud activity as part of the intervention they were able to form pairs and complete the think-aloud exercise without any behavioral difficulties. Usually, class discussions were somewhat difficult to generate; however, students would ask and answer questions politely. Perhaps, the class was not as a whole highly interested in poetry.

This second group also contained at least two or three students who seemed to enjoy reading and discussing poetry. The majority of the PBL groups in this class seemed to enjoy group time and use the class time allotted to work on the PBL project. As was the case with all of the classes, two or three individual students expressed some dismay that they had to do a project or group work, but usually students worked well with each other in order to complete the task. Their group presentations were quite acceptable and included skits, posters, and PowerPoint presentations. One student sang part of the group's presentation and used the vocal performance to help stress

connections between music lyrics and poetry. Students all complied with the PBL project's requirements and created a plan to make poetry popular.

Commentary on Group 3

Students in Group 3 also complied with the study's requirements. This class was designated as the control class (N = 21), and it was held late morning. Most students were well-behaved during the implementation of this project. They came into class and began addressing the writing prompts (content-oriented journal prompts) as expected. However, this class contained one student who stated several times that he hated poetry and who was often listless and off task; that was not the case with the majority of the class. Most students participated in class discussion and worked well with each other during group time. This class also contained at least two students who seemed to really enjoy reading and discussing poetry in class discussion.

Group presentations for this class also included skits, posters, and PowerPoint presentations. Students' group presentations were adequate as they addressed the PBL prompt and created a plan to make poetry popular. However, both the observer and the teacher commented that the majority of the group projects from this class, while complying with the PBL requirements, seemed to lack effort, detail, and creativity in comparison to the products of the other two classes.

General Remarks on the Implementation of the Study

Even though students did not typically complete problem-based learning units in their language arts class, students participated in the requested components of the unit, and the researcher, acting as a participant observer, had few difficulties implementing

the various components of the project with participants from all three groups. While students in the two experimental classes were not used to writing to the reflective prompts most students did so without apparent difficulty. At the beginning of the project a few students in the two experimental groups asked for clarification concerning why their writing prompts were different than the regular content-oriented type of journal prompt they normally received, yet all students wrote to the assigned prompts. Students in the two experimental classes did not question the concept of the think-aloud activity, and the activity was easily implemented with the experimental classes (Group 1 and Group 2). The students in the in the control group (Group 3) did not receive the intervention and the content-oriented journal prompts were a part of their regular class routine.

Though the results of the study were not statistically significant regarding the impact of metacognitive support in a PBL unit, students successfully addressed the PBL prompt. Many of the group products fulfilled, if not exceeded, the teacher's and the participant observer's expectations. The majority of students developed suitable plans to make poetry popular as evidenced in students' individually written essays and in the group presentations. A more complete measurement of the overall success of this particular problem-based learning unit may be at sometime in the future when former students can reflect on their learning experiences and appreciate poetry and the power of words to evoke feelings and images.

An Examination of the Research Design of This Study

This study addressed metacognition in a PBL unit in the hope that incorporating an intervention, which utilized reflective journal prompts and a think-aloud exercise, to develop students' metacognitive skills would directly impact student learning. The results were not as anticipated. Therefore, if the researcher conducts a similar investigation in the future, she would incorporate various design changes to the study.

Discussion of Journal Entries as Both Treatment and Dependent Variable

A fundamental weakness in this particular study is that students' journal entries were employed as both a treatment and as a dependent variable. The journal entries were examined as part of the qualitative analysis of data in order to more fully determine whether or not an examination of the journal entries could provide further insights regarding the overall impact of using metacognitive support in a PBL unit. However, the use of the journal entries as a dependent variable ultimately led to difficulty in interpreting the data. There was not a way to compare the experimental groups and the control group, since only the experimental classes received the reflective journal prompts. According to Kachigan (1991) one central purpose of data analysis is to determine relationships in sets of observations. It was not possible to determine the relationship between the experimental and control groups, since the control group was not given an opportunity to write about similar questions regarding their learning process, and an analysis of the two different types of entries cannot adequately address the research questions examined in this study.

Discussion of the Use of Two Experimental Groups

Another design consideration to explore if this study was replicated is the matter of comparing two experimental groups with one control group. The researcher initially determined the use of two experimental groups and one control group would provide a way to more easily implement the intervention in the three intact classrooms participating in the study. In the quantitative analysis of data, an effort was made to control for the use of intact groups by using the pretest on poetry terms as a co-variable. This did not eliminate issues regarding the interpretation of the results of the study, which resulted from the designation of three classes into two experimental groups and one control group. It was difficult to determine what, if any, effect the intervention may have had upon any of the groups. For instance, when examining the results of the individually written in-class essay, initially, a difference between groups was indicated on two criteria of the essay; however, t-tests needed to be conducted to determine which groups differed. In this particular instance there was only a significant difference between the two experimental groups on one criterion. This result did not indicate the reason why students in these groups differed from each other, since both groups received the same intervention. Any difference the two experimental groups may or may not have had on a given instrument cannot be attributed to only the intervention. The researcher considered combining the groups and analyzing the data. However, during the course of this study she became interested in the differences in all three participating classes, and she wished to explore if there were significant differences in student outcomes between the three groups. However, in analyzing the quantitative data sources it became apparent

that even if a statistically significant difference was indicated on a given instrument it would not be possible to attribute the reason for the difference to the intervention, alone. For this reason, in a future study the researcher suggests that the treatment be administered differently and only one experimental group and one control group be examined.

The researcher suggests that students be randomly assigned from all participating classes to either an experimental or control group, and the experimental and control group each receive some sort of writing exercise. This is because most students would be distressed if they perceived that they were doing more work than other students. However, the control group could be given an entirely different activity such as a worksheet about a specific poem or another content related topic. The activity for the control group should be completed in same amount of time provided for journal writing. In the ten minutes allotted for journal writing students in the experimental group would receive the treatment prompt (copied in advance and distributed individually), and the control group would receive the activity worksheet (also copied in advance and distributed individually). An activity worksheet would, perhaps, control for the issue that even the content-oriented prompts that the control group received in this study inherently contained some degree of reflection in order to address the writing prompt.

Discussion of Instruments and Data Sources

In order to improve the overall design of this study, the researcher suggests that it may be necessary to improve the instruments and data sources employed in this study. For instance, the pre-test and post-test were both designed by the researcher specifically

for this study, and the content reliability and validity were not previously tested. Additionally, the pre-test and post-test contained only multiple-choice and true-false items: the test essentially measured students' comprehension and recall (lower level thinking skills) concerning poetry terms; whereas, one goal of the study was to measure and observe students' critical thinking and problem-solving abilities, which are higher level skills (Kellough & Kellough, 2007).

The individually written in-class essay was utilized as a data source because it was thought that this instrument would provide one way to examine student outcomes of the PBL unit. The essay was selected for use in the study because it was a unit product that could be examined in order to assess individual students. However, while the essay was written by individual students the PBL solution/plan was developed by students as a group. It was especially problematic to analyze two criteria on the essay's rubric concerning whether or not students had a detailed, persuasive plan that addressed the target audience. Since, students could write about the plan they developed with a group in their essay it was difficult to measure to what extent and how individual students were able to use such skills as problem solving in devising a solution/plan.

It was not possible to determine with the individually written essay to what extent a given plan was actually devised by a student. While an examination of students' individually written essays provided some information on student learning outcomes, if this type of product were used again in a similar study, the researcher suggests the group and individual products in a study not overlap in describing the plan or solution. PBL groups could write their solution to the PBL problem, and those explanations or essays

could be another data source to examine the outcome of the groups' problem-solving efforts. An individually written essay prompt could focus primarily on what individual students learned about poetry, and learner outcomes regarding content knowledge of the experimental and control groups could be compared.

The "Survey Regarding Reflection and Its Role in the Learning Process," was also designed by the researcher specifically for this study. The survey was implemented as a data source in order to assess students' opinions regarding whether or not learners believed that having opportunities to reflect was useful to their learning experiences. However, this measure was only given to students post intervention. It might have served as a more useful measure of student opinion if it were used as both a pre and post measure. The survey could then provide a way to examine whether or not the treatment changed student opinion regarding the usefulness of having opportunities to reflect. Improvements to this measure might include developing more items concerning students' assessment of their metacognitive and self-regulation abilities (Schraw & Dennison, 1994).

As mentioned earlier, student journal entries served as both a qualitative data source and as part of the intervention. This led to difficulty interpreting the data because students did not address the same questions. The journal entries were selected as a data source to provide information to examine the impact of using metacognitive support. However, if the researcher implements a similar study she would eliminate the journal entries as a data source, and instead, consider other sources to assess the use of metacognitive support in the learning process.

Consideration of the Treatment and PBL Prompt

The use of the particular treatment in this study may need to be modified in order to be more effective in supporting learners' metacognitive awareness. While the researcher supports further exploration of the use of reflective journal prompts as a way to encourage students' metacognition and self-regulation of learning, changes in this aspect of the treatment might improve the metacognitive support used as a part of the intervention in this study. For instance, learners could be provided with similar metacognitive reflection journal prompts, but the journal prompts may be offered more frequently and over a longer period of time as some learners, especially adolescent learners, may need repeated opportunities to develop metacognition (Joseph, 2006).

Furthermore, the researcher suggests that the think-aloud exercise be conducted at least twice during the course of the PBL because learners may have needed a more sustained intervention, and conducting the exercise twice may allow researchers to observe how learners' problem solving strategies develop (Kirkwood, 2000). Another suggestion to improve a treatment using think-aloud exercises is to audio-tape and transcribe the exercises as a way to more fully understand learners' metacognitive processes, and consider offering the tapes to learners to use as a form of self-observation as part an intervention designed to elicit learners' metacognition (Hacker & Dunlosky, 2003).

The use of this particular PBL prompt is another area to consider in the implementation of a similar study. While the researcher asserts that the PBL prompt used in this study seemed to address a problem all students were capable of addressing,

it is possible that if the PBL prompt was more complex and challenging some students may have been able to achieve greater metacognition as metacognitive awareness may be greater during complex tasks (Schraw & Dennison, 1994). For example, the PBL could have been centered on solving a mystery or a life or death situation.

Conclusions

The researcher initially began to explore problem-based learning because it was a constructivist approach to learning, which utilized an interactive teaching method that could be implemented in all classrooms to increase student involvement and engagement (Schwartz et al., 2001). After exploring aspects of reflection and metacognition the researcher concluded that one way teachers could improve instruction was to provide scaffolding and support for learning through a type of strategy to increase metacognition (Dunlap & Grabinger, 2003; Applebee, 2002). In attempting to measure the impact of metacognitive support and its role in a problem-based learning unit, the researcher maintains that metacognition remains an important, yet nebulous construct to assess (Sigler & Tallent-Runnels, 2006; Snyder & Pressley, 1995; Corliss, 2006). Although there are many definitions, interpretations, and numerous aspects of metacognition to consider, there is the potential of developing learners' thinking processes (Sigler & Tallent-Runnels, 2006). The search for understanding how to support and assess learner metacognition continues.

Suggestions for Further Research

There are several aspects of this study that merit future investigation and research. For instance, this study did not examine the final group products in detail, as

individual learning outcomes were examined rather than outcomes of student groups. This is unfortunate in some ways as there were projects in all classes that offered unique or inventive ways to solve the task of the PBL. A future study may choose to examine both individual and group products to more completely assess the student learning outcomes of this type of unit and its intervention.

Also, future research may choose to explore additional research questions. For instance, the participant observer still wonders how the smaller, more problematic class ultimately seemed more engaged with the problem-based learning task. Are there connections between group dynamics and creativity that need to be explored, and can metacognitive support aid student creativity? These were not the questions explored in this research study, but they are areas that might be of interest to future researchers.

Another area for future research is to investigate connections between metacognition, PBL, and cooperative learning. Even though, problem-based learning is often conducted in cooperative learning groups, PBL does not require working in groups. Student opinions expressed in this study indicated that participants were aware of both the possible benefits and the negative consequences of participating in a group project. While not the focus of this particular study, the study raised questions as to how educators can structure group projects to encourage all students to participate equally in a project and respect each other's opinions and ideas.

Though this study employed several data sources in an attempt to more fully explore the research questions, some alternate data sources were not implemented that may offer more information to future researchers. For instance, an audit trail written by

the participant observer or student interviews could have provided further insights regarding the impact of using this type of metacognitive support in a secondary classroom. An audit trail might allow a participant observer to capture in greater detail student interactions and discussion during the group problem solving process. Furthermore, an audit trail could aid the researcher in the detailed report of questions, difficulties, and other comments students may have regarding the implementation of the PBL unit. This type of data may contribute a more vivid assessment of student learning outcomes (Bogdan & Biklen, 1998). Student interviews might allow the researcher to probe students' responses to questions regarding their perceptions about having opportunities to reflect more than simply using a written survey to assess student opinion (Bogdan, & Biklen). Students could be selected using purposeful sampling in order to study students from a variety of backgrounds and abilities.

Audio-taping or video-taping students during small group discussion might have yielded richer data concerning students' developing thinking processes on the problem-based learning task. Audio taping student discussions while they are actually addressing the PBL task may provide future researchers information about how students developed a solution to the problem and where difficulties or problems may or may not have occurred.

Another data source to consider in future research of this topic is the inclusion of a metacognitive skills inventory such as Schraw and Dennison's 52-item (self-reported) inventory. This instrument attempts to assess the metacognitive awareness of adults, and it might be adapted for adolescents. In this particular instrument students answered items

on metacognition and self-regulation of learning (Schraw & Dennison, 1994; Corliss, 2006). A similar metacognitive skills inventory could provide a measure of students' opinions regarding their metacognitive and self-regulatory skills pre and post intervention.

There are other factors that could also be examined regarding the impact of a metacognitive support to assist learners. For instance, whether or not students enjoy writing is a factor that may impact whether or not this type of intervention is successful. Another consideration may be whether or not students are used to interacting, sharing their thoughts with others, and working collaboratively, since this may change how they approach the curriculum and the impact of metacognitive support that is used within a group setting (Corliss, 2006).

There is still a need for research that explores the use of interactive, inquiry-based curricula for all content areas (Levin, 2001). Learners in all content areas and at all educational levels should be encouraged to develop metacognitive skills and reflect on how they learn. Furthermore, Snyder and Pressley (1995) assert that learners must be given information about metacognitive strategies and when to use them to improve their learning. Studies which specifically address connections between learners' metacognition and the actual content learned are needed. Metacognition has the potential to offer students ways to optimize learning experiences, and for this reason it continues to be an important area to explore.

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APPENDIX A

POETRY PUBLICITY PROJECT ASSIGNMENT SHEET (GROUP PRESENTATION
& IN-CLASS ESSAY)

Your team of advertising executives has recently been hired by a local radio station to develop a public service campaign to publicize poetry. Poetry has often received a bad “rap,” and your team should devise a way for others within your community to have a greater appreciation for poetry (of any period). Your primary target audience is teenagers 13-19 years old.

Group Assignment: (Students will receive the same grade for the development of this portion of the project). Due date: _____

Your team will need to present your findings to executives from the radio station (your instructor and peers) in an oral presentation.

- Create a visual aid for use in the presentation.

Individual Assignment: (Individually written in-class essay). Due date: _____

Before the oral, group presentation, you will write a paper explaining your plan to publicize poetry. This will be written in-class. Suggested length = two – four hand-written pages, or one – three typed pages if the essay is written in a computer lab.

- Your paper should describe your plan in detail, and it should be realistic and achievable (given the resources and budget of the advertising company).
- Your essay should demonstrate an overall understanding of poetry terminology as the topic of poetry is addressed in the project. **Discuss** in your essay how your

plan will persuade the target audience to be more interested in poetry. Include your definition of poetry and how this pertains to your publicity plan.

APPENDIX B
EXPERIMENTAL GROUPS' JOURNAL PROMPTS TO EMPHASIZE
METACOGNITION

Reflection Prompt 1

How good of a problem solver do you think that you are? Does the problem solving process seem to come naturally to you or do you seem to struggle devising solutions? What might make it easier for you to devise a solution to a problem?

Reflection Prompt 2

Do you think that you work well and productively in a group setting (are you a good team player), or do you feel most productive working independently? Please, explain your answer.

Reflection Prompt 3

Suggest three guidelines that group members should follow for a successful learning experience. Do you attempt to follow these guidelines when working with others?

Reflection Prompt 4

Do you think that working on this PBL unit is assisting you as you learn related material [about poetry]? Please, explain why you think this may or may not be the case. Did knowledge about poetry assist your group in devising a solution to the problem?

Reflection Prompt 5

What are your general thoughts about the solution to the problem? What is your opinion of your problem solving abilities? Do you think that having opportunities to reflect on your thinking helped you in your problem solving process?

APPENDIX C
RESEARCHER/PARTICIPANT-OBSERVER'S MODEL OF THE THINK-
ALOUND PROCESS

Sample Problem: *The problem is to convince the school board to fund an after-school activity room.*

1. Describe the problem out loud.

The problem is to convince the school board to fund the after-school activity room idea that our group develops. We need to figure out what the children need and want.

2. Please, state your initial solution.

My initial reaction is that I will first have to have more information about the why the after-school activity room is needed and what benefits can come from this.

3. What do you need to do to generate answers for this problem?

I need to brainstorm. . . .

4. Please, state a question you have about the problem.

What kind of information does this the target audience need in order to make an informed decision?

5. State what you think will need to be addressed to devise a solution to the problem.

I think that we should research various ways to appeal to our target audience and then incorporate those results into our presentation to the school board.

6. Describe a potential solution to the problem.

I think one potential solution to this problem is to develop a presentation that appeals to the

APPENDIX D
GUIDED THINK-ALoud WORKSHEET

Verbal Participant: _____

Recorder: _____

Initials of Verbal Participant to Verify Accuracy: _____

Directions: Please, answer the following questions out loud. You will meet in your unit groups, and you will take turns serving as the recorder for the group member who is orally participating in the think-aloud activity. You will have an opportunity to read and verify what the recorder has written.

1. Describe the problem out loud.
2. Please, state your initial solution.
3. What do you need to do to generate answers?
4. Please, state a question you have about the problem.
5. State what you think will need to be addressed to devise a solution to the problem.
6. Describe a potential solution to the problem.

APPENDIX E

CONTROL GROUP WRITER'S NOTEBOOK/JOURNAL ENTRY PROMPTS

Journal Entry 1

Select an object you use everyday and describe it without naming it.

[This prompt relates to discussion on imagery].

Journal Entry 2

What do you think of when someone says “Romantic” poetry?

[This prompt relates to a discussion of the characteristics of Romantic poetry].

Journal Entry 3

Describe your version of paradise.

[This prompt relates to a lesson on the poem, “Kubla Khan”].

Journal Entry 4

Where do you go when you are having a bad day, and why do you think that being in this place causes you to feel better?

[This prompt relates to a discussion on pastoral poetry].

Journal Entry 5

Write a prose tribute to someone or something you admire.

[This prompt relates to discussion on several poems by Keats as well as discussion on poetry terms such as elegy, ode, and the writing of direct addresses].

APPENDIX F

RUBRIC TO EVALUATE INDIVIDUALLY WRITTEN PERSUASIVE

ESSAY OF PBL UNIT

Level	Criterion	Level 5:	Level 4	Level 3	Level 2	Level 1
		Excellent		Good		Poor
_____	1. Paper describes the plan in detail	Contains a detailed description of the plan, which is very well-expressed.		Plan is somewhat described, but it lacks detail.		Little or no description of the plan is provided or it is off topic.
_____	2. The plan is realistic and achievable	Plan is very realistic and achievable.		Plan may be realistic and achievable.		Plan does not seem realistic or achievable.
_____	3. The plan addresses the target audience with an idea(s) on how to generate an interest in poetry	The plan is highly persuasive and addresses the target audience. It proposes a well-developed idea (or ideas) to generate interest in poetry.		The plan is somewhat persuasive and appears to address the target audience. It presents an idea to generate an interest in poetry.		The plan is off topic and does not address the target audience.
_____	4. Paper demonstrates an understanding of poetry terms	Poetry terms are used correctly when used in the paper with 100% accuracy.		Some poetry terms may be used in the paper correctly, but there are some errors in their use.		No poetry terms are used in the paper.
_____	5. Includes student's definition of poetry	Definition is clear and very well explained.		Definition is provided but is not developed.		Definition is off topic or not provided.

Group/and Class: _____ Experimental or Control Class: _____

APPENDIX G

ROMANTIC POETRY UNIT PRE-TEST ON POETRY TERMS

Romantic Poetry Unit Assessment***Pre-Test on Poetry Terms***

Directions: You may write on this test form unless instructed otherwise.

Multiple-Choice Questions/True & False: Please, place the letter of the best answer on the blank that is provided.

- _____ 1. It is commonly accepted that each poem has rhythm, melody, and . . .
a. flaws b. truth c. vision d. imagery
- _____ 2. Free verse does not have an established metric pattern.
a. true b. false
- _____ 3. . . . is when the accent syllable falls at regular intervals that causes a beat.
a. metric pattern b. monometer c. imagery d. scansion
- _____ 4. The marking of poetic lines to show how the accent syllable falls and causes the beat is called.
a. metric pattern b. monometer c. imagery d. scansion
- _____ 5. . . . is when words begin with the same consonant sound.
a. alliteration b. onomatopoeia c. rhyme d. rhythm
- _____ 6. . . . is when words sound like their meanings.
a. alliteration b. onomatopoeia c. rhyme d. rhythm
- _____ 7. Slipping/dripping is an example of . . .
a. single rhyme b. double rhyme c. triple rhyme d. none of these
- _____ 8. A direct comparison of unlike things that does not use like or as is . . .
a. apostrophe b. metaphor c. personification d. simile
- _____ 9. The giving of human qualities to things is . . .
a. apostrophe b. metaphor c. personification d. simile
- _____ 10. The comparison of unlike things that uses like or as is . . .
a. apostrophe b. metaphor c. personification d. simile

- _____ 11. . . . is saying more than is true.
a. apostrophe b. allusion c. hyperbole d. irony
- _____ 12. . . . is the addressing of an abstract object.
a. apostrophe b. allusion c. hyperbole d. irony
- _____ 13. The arrangement of rhymes in a poem or stanza, which is indicated by the use of a letter to indicate a different sound is called . . .
a. structure b. rhyme scheme c. metric pattern d. scansion
- _____ 14. A . . . consists of four lines of any rhyme scheme and of any length or meter.
a. octave b. Octava Rima c. blank verse d. quatrain
- _____ 15. A form of poetry that contains 3 quatrains plus a couplet
a. ballad quatrain b. Spenserian Stanza c. sonnet d. none of these
- _____ 16. A form of poetry that usually uses iambic pentameter and was used in Shakespeare's plays is . . .
a. Octava Rima b. blank verse c. free verse d. none of these
- _____ 17. A long poem typically about a hero is
a. ballad b. epic c. fable d. lyric
- _____ 18. A poem that is praise of someone or something is called . . .
a. an elegy b. an ode c. a pastoral poem d. a sonnet
- _____ 19. A poem that deals with country life is . . .
a. an elegy b. an ode c. a pastoral poem d. a sonnet
- _____ 20. A poem that laments or is in memory of someone or something is . . .
a. an elegy b. an ode c. a pastoral poem d. a sonnet
- _____ 21. The words "buzz" and "honk" are examples of . . .
a. alliteration b. onomatopoeia c. rhyme d. rhythm
- _____ 22. The phrase "Sally sells seashells by the seashore" is an example of . . .
a. alliteration b. onomatopoeia c. rhyme d. rhythm
- _____ 23. The poetic line, "She walks in beauty, like the night [Lord Byron]," is an example of . . .
a. apostrophe b. metaphor c. personification d. simile
- _____ 24. The phrase "the cloud is a marshmallow" is an example of . . .
a. apostrophe b. metaphor c. personification d. simile

_____ 25. If “the hair is screaming furiously” this would be an example of . . .
a. apostrophe b. metaphor c. personification d. simile

APPENDIX H

ROMANTIC POETRY UNIT ASSESSMENT POST-TEST ON POETRY TERMS

Romantic Poetry Unit Assessment***Post-Test on Poetry Terms***

Directions: You may write on this test form unless instructed otherwise.

Multiple-Choice Questions/True & False: Please, place the letter of the best answer on the blank that is provided. Point value for each item = 4 points.

- _____ 1. It is commonly accepted that each poem has rhythm, melody, and . . .
a. flaws b. truth c. vision d. imagery
- _____ 2. Free verse does not have an established metric pattern.
a. true b. false
- _____ 3. . . . is when the accent syllable falls at regular intervals that causes a beat.
a. metric pattern b. monometer c. imagery d. scansion
- _____ 4. The marking of poetic lines to show how the accent syllable falls and causes the beat is called.
a. metric pattern b. monometer c. imagery d. scansion
- _____ 5. . . . is when words begin with the same consonant sound.
a. alliteration b. onomatopoeia c. rhyme d. rhythm
- _____ 6. . . . is when words sound like their meanings.
a. alliteration b. onomatopoeia c. rhyme d. rhythm
- _____ 7. Slipping/dripping is an example of . . .
a. single rhyme b. double rhyme c. triple rhyme d. none of these
- _____ 8. A direct comparison of unlike things that does not use like or as is . . .
a. apostrophe b. metaphor c. personification d. simile
- _____ 9. The giving of human qualities to things is . . .
a. apostrophe b. metaphor c. personification d. simile
- _____ 10. The comparison of unlike things that uses like or as is . . .
a. apostrophe b. metaphor c. personification d. simile

- _____ 11. . . . is saying more than is true.
a. apostrophe b. allusion c. hyperbole d. irony
- _____ 12. . . . is the addressing of an abstract object.
a. apostrophe b. allusion c. hyperbole d. irony
- _____ 13. The arrangement of rhymes in a poem or stanza, which is indicated by the use of a letter to indicate a different sound is called . . .
a. structure b. rhyme scheme c. metric pattern d. scansion
- _____ 14. A . . . consists of four lines of any rhyme scheme and of any length or meter.
a. octave b. Octava Rima c. blank verse d. quatrain
- _____ 15. A form of poetry that contains 3 quatrains plus a couplet
a. ballad quatrain b. Spenserian Stanza c. sonnet d. none of these
- _____ 16. A form of poetry that usually uses iambic pentameter and was used in Shakespeare's plays is . . .
a. Octava Rima b. blank verse c. free verse d. none of these
- _____ 17. A long poem typically about a hero is
a. ballad b. epic c. fable d. lyric
- _____ 18. A poem that is praise of someone or something is called . . .
a. an elegy b. an ode c. a pastoral poem d. a sonnet
- _____ 19. A poem that deals with country life is . . .
a. an elegy b. an ode c. a pastoral poem d. a sonnet
- _____ 20. A poem that laments or is in memory of someone or something is . . .
a. an elegy b. an ode c. a pastoral poem d. a sonnet
- _____ 21. The words "buzz" and "honk" are examples of . . .
a. alliteration b. onomatopoeia c. rhyme d. rhythm
- _____ 22. The phrase "Sally sells seashells by the seashore" is an example of . . .
a. alliteration b. onomatopoeia c. rhyme d. rhythm
- _____ 23. The poetic line, "She walks in beauty, like the night [Lord Byron]," is an example of . . .
a. apostrophe b. metaphor c. personification d. simile
- _____ 24. The phrase "the cloud is a marshmallow" is an example of . . .
a. apostrophe b. metaphor c. personification d. simile

_____ 25. If “the hair is screaming furiously” this would be an example of . . .
a. apostrophe b. metaphor c. personification d. simile

APPENDIX I
SURVEY REGARDING REFLECTION AND ITS ROLE IN THE LEARNING
PROCESS

Directions: Please, respond to the following items. Place the number that indicates your level of agreement in the blank provided. The results of this survey will be confidential and survey will not be used for grading purposes of any type.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 1. I enjoy writing my thoughts in a journal format.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 2. When I really want to come up with a solution to a problem I can easily do so.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 3. When I have a problem to solve it helps me to write down my thoughts in a journal format.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 4. I feel I am capable of reflecting clearly on issues and problems.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 5. Reflecting on my thinking processes using a journal format while completing a project helps me understand the way I learn.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 6. Stating the steps of a problem to a peer is helpful as I develop a solution to a problem.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 7. Discussing my learning process with others contributes to my learning process.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 8. Writing about my thinking process assists me in organizing my thoughts.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 9. I feel it is beneficial to my learning process to write my thoughts in a journal.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

_____ 10. I feel it is beneficial to me to discuss my learning process with others.

5 = strongly agree; 4 = agree; 3 = somewhat agree; 2 = disagree; 1 = strongly disagree

Your Name: _____

To be completed by the researcher:

Experimental or Control Class: _____

Code: _____ of Participant

VITA

Kathryn Ann Hawkins Seifert received her Bachelor of Arts degree in secondary education from Houston Baptist University in 1989 in Houston, Texas. She obtained secondary teacher certifications in English and history from the state of Texas. She taught English and history courses at the secondary level for eleven years, and she completed her Master of Education degree from Texas A&M University in December of 2000. Upon completion of her Master of Education degree she entered the doctoral program at Texas A&M University in 2001. During the course of her doctoral study she had the opportunity to work as a Graduate Assistant for an Assistant Dean in the College of Education and Human Development (CEHD). She subsequently became an Assistant Lecturer in the Teaching and Learning Department of CEHD, and she taught several undergraduate courses to pre-service teachers. She obtained her Ph.D. in Curriculum and Instruction at Texas A&M University in August of 2008. Her research interests include teacher education, interactive curriculum in the secondary schools, and metacognition. She plans to publish articles on these topics and continue her work with pre-service educators.

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