TEACHER’S USE OF REFLECTIVE THINKING

Kathleen M. Hill

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TEACHER’S USE OF REFLECTIVE THINKING

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Dissertation

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This qualitative case study examined how teachers use reflective thinking. Teachers participating in a professional development course designed to increase knowledge and understanding of reflective thinking were investigated. Two of those teachers were looked at in depth. Data was collected and organized on four teacher practices: planning, implementation, questioning, and professional reflection. Based on the findings, teachers use reflective thinking for lesson planning, interacting with students, and for personal and professional growth. Lasting impacts on professional reflection were evident for one participant after ten months. This study tells the story of two teacher’s understanding and use of reflective thinking.
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Chapter I

Learning to Think and Thinking to Learn

Learning without thinking is labor lost; thinking without learning is perilous
(Confucius, as cited in Shea & Shun, 2008, p. 22)

Thinking has been studied, discussed, practiced and hypothesized about for thousands of years. Many historical figures have talked about thinking such as Socrates, King Solomon, and Descartes. In the last one hundred years, educators have also researched thinking. The writings of Dewey (1910) were foundational. The taxonomy that Bloom et al. (1956) created became a part of pre-service teacher training. Flavell (1979) coined the term metacognition which soon became trendy in classrooms. And after the turn of the millennium neuroscientists began explaining what happens in the brain when we think and learn.

Reflection

Reflection, an aspect of thinking, permeates almost every aspect of our lives. For example, if I touch a hot stove, I burn my hand and the reflection that happens in the brain is almost instantaneous. However, if I drive too fast in bad weather and end up in the ditch, the lesson I learn is dependent on the reflective thinking I do. Reflection is an activity that is used in all walks of life for many different purposes. Consider a person trying to lose weight. He uses a form of reflective observation by writing down everything eaten. A doctor that needs to make a difficult diagnosis needs to reflect on the research. Business owners make decisions about profits and investments based on reflective thinking. Reflective thinking is everywhere in an adult’s life and it should have value in the educational system.

The history of reflective thinking in education began with Dewey (1910). He defines reflective thinking as, “Active, persistent, and careful consideration of any belief or supposed
form of knowledge in the light of the grounds that support it, and the further conclusions to
which it tends, constitutes reflective thought….It is a conscious and voluntary effort to establish
belief upon a firm basis of reasons” (Dewey, 1910, p. 5). Reflection is a meaning-making
process. It happens in your brain as you actively and persistently consider new information and
try to make sense of it. The new information makes connections with established knowledge
during reflection. For example, fifth graders in my classroom used fraction strips to add and
subtract fractions with unlike denominators. Two students have made the leap to writing
common denominators to solve; one student does everything mentally; a fourth student changes
the fractions to one-half \(1/2 + 7/8 = 1/2 + 4/8 + 3/8 = 1 3/8\) because she is comfortable working
with one-half. Finally, one student is only able to solve the problems using the fraction strips.
Concrete experiences often lead to making sense. Did these experiences help him make sense?
A week later the students are asked to write how they would add fractions with unlike
denominators. There were many misconceptions on his paper (see Appendix A). It was obvious,
he needed more concrete experience.

Making sense or understanding are cornerstones of learning. However, many students do
not know how to make sense of what they are learning, and many teachers do not take the time
or have the time to help them.

For example, several years ago I asked my sixth-grade students, “What did you learn in
Math class today?” These are a few of the responses:

- “What we did was made corrections D2-D13, but we did not finish so our
  homework is D2-D11.”

- “We corrected 2-11. We switched papers with our partners and have to do our
  corrections tonight.”
• “Today we corrected 1-13 but we corrected someone else’s. It was fun to me, and our homework is to correct my mistakes.”

• “We started to correct part D and we made it from problem 2 all the way to problem 11. Our homework is correct our papers.”

There is no indication in their responses that they made sense of problems 2 through 11. Their responses could have been related to Social Studies class. These students were learning about double number lines – a fairly complex ratio concept, but none of them even mentioned the term double number line. They were caught up in the cycle of doing homework, correcting homework, making corrections, and doing more homework. I assumed that making sense was happening somewhere in that cycle. I believe this assumption is not uncommon.

Meaning making or making sense are constructivist terms that refer to what happens in your brain as you encounter new experiences. Reflection supports meaning making.

Reflection occurs when you consciously think about your experiences. It means turning ideas over in your head, thinking about things from different points of view, stepping back to look at things again, consciously thinking about what you are doing and why you are doing it. All of these activities have great potential for recognizing and building relationships between ideas or facts or procedures. In other words, stopping to think carefully about things, to reflect, is almost sure to result in establishing new relationships and checking old ones. It is almost sure to increase understanding. (Hiebert, Carpenter, Fennema et al., 1997, p. 5)

**My Road**

My road to educational reflection began long before I started my studies at the University of Montana. During the last 20 years, I have encountered the need for professional reflection
many times. I worked for Math Solutions facilitating professional development all over the country for several summers. Each session ended with a reflection question. When I was pressed for time, I was tempted to skip it, but I began to see the value in asking the question and listening to participants’ responses. Then I began to observe my own students and realized that there was a correlation between the students who naturally reflected and students with good grades. So, I began asking reflection questions at the end of lessons. I hypothesized that there is a relationship between making sense and reflection and that is when I became more interested in reflection in education. However, I realized that few of my colleagues used reflective thinking in any form in their classrooms or their professional lives.

**Teacher Quality**

According to Sutton and Krueger (2002), “One of the strongest predictors of students’ success is the quality of their teacher” (p. 84). Reflective thinking is an important characteristic of quality teachers. “A true mark of professionalism is a teacher’s ability to reflect on his or her teaching” (NCSM, 2014, p. 32). Fischer (2017) suggested that teachers who were considered successful used reflective practices and the study conducted by Stronge, Ward, and Grant (2011) found that the critical difference between more effective and less effective teachers included two things: their ability to connect with students and their reflective practice.

**Professional Development**

Reflective thinking is important for students’ meaning making and quality teaching, but also is an attribute of good professional development. “The five major purposes of professional development are: “(1) developing awareness, (2) building knowledge, (3) translating knowledge into practice, (4) practice teaching, and (5) reflection” (Sutton & Krueger, 2002, p. 31). The core and structural features of effective professional development include collective participation of
teachers from the same school, the same grade or the same subject, a focus on content, opportunity for active learning, and duration of the activity including the number of contact hours and the span of time involved (Garet, Porter, Desimone, Birman, & Yoon, 2001). “Professional development can create contexts for teacher collaboration, provide a focus for the collaboration, and provide a common frame for interacting with other teachers around common problems” (National Research Council, 2001, p. 397).

**Research Question**

The purpose of this study was to provide teachers with professional development that developed their awareness and built their knowledge of reflective thinking, metacognition, and experiential learning so that they could translate that knowledge into their practice and reflect on the results. Therefore, the research question for this study was: In what ways did workshop participants use reflective thinking?

Taking into consideration today’s educational climate, the above Confucius quote might be a challenge to teachers. “Learning [through the K-12+ educational system] without thinking [making meaning and understanding so that one can think critically] is labor lost [a waste of time]; thinking [incompetent, unreflective, egocentric thinking] without learning [knowledge gained through understanding] is perilous [perhaps even catastrophic]” (Confucius, as cited in Shea & Shun, 2008, p. 22 with added explanations within brackets).

Because reflective thinking does have value, the next chapter looks at the many attempts to define it as well as the related construct of metacognition. Experiential learning, an educational theory which has reflective thinking as one of its components, is also discussed. Both quantitative and qualitative educational research with reflective thinking or metacognition as variables will also be explored.
Chapter II

Literature Review

This review is based upon the theoretical foundations of experiential learning theory and metacognition and how they relate to reflective thinking. Experiential learning is a product of constructivism and its contribution to this study includes the experiential learning cycle. Metacognition is thinking about your thinking and is informed by reflective thinking. Reflection has a long history of significance in psychological, philosophical, and educational consideration.

This chapter will explore experiential learning theory and metacognition along with literature related to reflective thinking. The first section will describe experiential learning including its theoretical basis in constructivism and will also look at what neuroscientists say about learning. Next, appropriate literature will be identified to further define metacognition. Empirical studies using metacognition as a construct will be described. The last section will explore the many definitions and characteristics of reflective thinking. A representative sample of empirical studies describing a range of grade and age levels will be investigated.

This literature review was conducted using Google Scholar, ERIC, and the University of Montana’s digital library’s collection of databases. Each database was searched by utilizing these search terms in various combinations: reflection, reflective thinking, reflective practice, metacognition, experiential learning, learning, teaching, middle school, secondary school, and primary school. Articles and texts published in the last 25 years were given first priority, but works by seminal authors were also considered. The bibliographies of applicable articles were searched for works that would inform the current study.

The purpose of this review is to explore the impact of metacognition and reflection on learning. The goals of this review are to share prior research as well as establish the
relationships between experiential learning, reflective thinking and metacognition while offering evidence to educators about the importance of reflection and metacognition on understanding.

**Theoretical Framework**

My study was guided by experiential learning theory (Kolb, 2015; Zull, 2002). This theory comprises a learning cycle and reflective thinking/metacognition (see Figure 1). The learning cycle includes concrete experience, reflective observation, abstract hypothesis and active testing. Reflective thinking of classroom teachers was explored in depth as well as reflection’s relationship to metacognition.

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**Figure 1.** Theoretical Framework.

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**Experiential Learning Theory**

Experiential learning relates to constructivism and has its foundations in the research and theories postulated by such notable scholars as Dewey (1910), James (1890), Piaget (1952), and Vygotsky (1978). In 1984, Kolb built his theories using the research from these scholars (Kolb, 2015). This led him to propose several characteristics on experiential learning theory. First, learning is a process not an outcome. This is counter to behaviorist theories that consider learning to be an observable behavior prompted by repetition and reinforcement. This learning process is continuous, grounded in experience, and tension-filled. Learning requires abilities that
are opposites. Students must continually engage in being either an actor or observer and decide to what degree of involvement from specific to general they will bring to any learning situation. Since learning is considered a major process of human adaptation to the world (Kolb & Kolb, 2017), the four approaches recognized by experiential learning theory – concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE) – are important in all human settings and at all life stages. According to Kolb (2015), learning is defined as “the process whereby knowledge is created through the transformation of experience” (p. 49).

Learning Cycle

What makes experiential learning unique is the learning cycle. The learning cycle is driven by the dual dialectics of experience/abstraction and action/reflection. It begins where students take in knowledge with either concrete experiences or abstract hypotheses. From there, students will interpret and act on that knowledge using either reflection or experimentation. However, deep learning usually occurs when all four modes – experiencing, reflecting, thinking, and acting – are used in the cycle (Kolb & Kolb, 2017).

The Learning Cycle and the Brain

According to Zull (2002), the learning cycle arises naturally from the structure of the brain (see Figure 2). The sensory brain or those places that first receive input from one of the senses, is where concrete experience is recorded. This is typically where students enter the learning cycle. In addition to being sent to the sensory cortex, experiences are concurrently sent to the amygdala to screen for emotional content. From there positive content moves to the back integrative cortex where sensory information becomes images and meaning (Zull, 2002). In mathematics class when students are asked to estimate an answer or understand the meaning of
the answer, they are thinking about where the answer is in relationship to what they already know. As the student reflects, the signals from the experience bounce around in the back cortex looking for connections and as the connections are found, the brain changes. Networks of past experiences are integrated with the present experience.

Thinking, the next stage in the experiential learning cycle, happens in the integrative front cortex. The working memory within this part of the brain uses the images and meanings developed during reflection to create ideas and solve problems. Although the working memory can only hold about seven isolated items, it is the constant influx of information that allows learners to be creative. This conscious rearranging of information in the working memory is what is called thinking and it is what creates new knowledge (Zull, 2002).

Knowledge created through the integrative front cortex, but not tested with action, will not last. Active testing must occur for lasting learning. Testing takes many forms such as reading, talking to someone, writing, drawing, and acting. Physical movement takes the abstract
notions and links them to new concrete experiences and thus begins the learning cycle again (Zull, 2002).

**Expanded Learning Cycle**

The experiential learning cycle has its foundations in the dual-knowledge theory that came from James (1890) and his philosophy of radical empiricism. His philosophy was based on two coequal and dialectically related ways of knowing – “knowledge of acquaintance” and “knowledge about.” According to Kolb (2015), “knowledge of acquaintance” relates to concrete knowing or apprehension – “reliance on the tangible, felt qualities of immediate experience” such as when a student touches and investigates the edges and faces of a cube. “Knowledge about” is abstract knowing or comprehension – “reliance on conceptual interpretation and symbolic representation” (Kolb, 2015, p. 67). For example, a student sees a picture of an icosahedron and knows that it has 20 faces and 30 edges.

Knowledge that is grasped either through experience or abstraction is then transformed through either extension (active testing) or intention (observational reflection). “Learning, the creation of knowledge and meaning, occurs through the active extension and grounding of ideas and experiences in the external world and through internal reflection about the attributes of these experiences and ideas” (Kolb, 2015, p. 78).

With the expansion of the learning cycle other dual dialectics are recognized – accommodating/assimilating and converging/diverging. When learners encounter something new, a tension-filled state called disequilibrium stimulates learners to either accommodate or assimilate. According to Piaget (as cited in Elliott, Kratochwill, Cook, & Travers, 2000), assimilation is where learners incorporate new learning into their existing mental models whereas accommodation occurs when learners change the ideas in their head to fit the new
learning. Guilford (1967) coined convergent and divergent thinking to describe two intellectual processes (as cited in Kolb, 2015). Convergent was defined as the process of deducing a single solution to a problem. Divergent was defined as the process of generating a multitude of solutions to a problem. A convergent thinker’s strengths are in his ability to come to one solution such as in a conventional intelligence test. A divergent thinker’s strength is to be able to view a problem from many perspectives and find multiple solutions, sometimes called creativity. These four dual dialectics are summarized in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Experience Grasped</th>
<th>Transformed</th>
<th>Kind of Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprehension (CE)</td>
<td>Intention (RO)</td>
<td>= Divergent</td>
</tr>
<tr>
<td>Comprehension (AC)</td>
<td>Intention (RO)</td>
<td>= Assimilative</td>
</tr>
<tr>
<td>Comprehension (AC)</td>
<td>Extension (AE)</td>
<td>= Convergent</td>
</tr>
<tr>
<td>Apprehension (CE)</td>
<td>Extension (AE)</td>
<td>= Accommodative</td>
</tr>
</tbody>
</table>

Note. Adapted from Experiential learning: Experience as the source of learning and development (2nd ed.) by D.A. Kolb, 2015, pp. 68, 114.

Metacognition

Relatively speaking, metacognition is a fairly new construct. Flavell (1979) posited the term metacognition which has been investigated consistently in the psychological and educational communities. The skills developed during metacognition inform reflective observation and abstract hypothesis within the experiential learning cycle. This section will define metacognition and report on applicable studies.

Some simplistically define metacognition as thinking about your thinking (Hartman, 2001). Schoenfeld (1987) suggested that metacognition includes three distinct categories: your knowledge about your own thought processes (metacognitive knowledge), self-regulation of your own thought processes (metacognitive regulation), and your beliefs about your thought processes.
**Metacognitive Regulation**

Metacognitive regulation involves activities that ensure a cognitive goal is met. These activities can include planning, monitoring, and evaluating. For example, when a relatively difficult mathematics problem is presented, strategies for solving it should include reading, analyzing, exploring, planning, implementing, and verifying. Students with little metacognitive regulation spend most of their time exploring and often end up on a *wild goose chase* and have extremely high failure rates. On the other hand, experts with metacognitive skills spend the vast majority of their time thinking rather than doing. They go back and forth between analyzing and planning to implementing and then back to analyzing, exploring, and planning, then implementing and finally verifying (Schoenfeld, 1987).

**Metacognitive Knowledge**

Metacognitive knowledge is thinking about your thinking and knowing what you are thinking. According to Flavell (1979), “Metacognitive knowledge consists primarily of knowledge or beliefs about what factors or variables act and interact in what ways to affect the course and outcome of cognitive enterprises” (p. 4). Within metacognitive knowledge, there are three categories of variables: person, task, and strategy. Person variables are typically about you – what you would recognize about your strengths and weaknesses in learning. For example, a person may know that they learn better from listening than from reading. Task variables are what one knows or can figure out about the nature of a task and the processing demands required to complete the task, e.g., a person may choose to use a list of directions to a location rather than a map if they are spatially challenged. Strategy variables refer to the strategies a person has available to apply in a flexible way to successfully accomplish a task. An example that uses all of them would be: a student knows that she (person variable) struggles with word problems (task
variable) so she answers the computational problems first and saves the word problems for last (strategy variable).

Metacognition enhances learning in a multitude of ways. When comparing high achieving and low achieving students, the high achievers possessed more metacognitive awareness (Hartman, 2001). Metacognition is considered by many researchers an important and necessary contributor to successful problem solving, essential to learning, vital to cognitive effectiveness, a characteristic of developing expertise, and the driving force in intellectual activity (Gourgey, 2001; Hartman, 2001; Schraw, 2001; Silver as cited in Garofalo & Lester, 1985; Star & Verschaffel, 2017; Sternberg, 2001). Metacognition is important because it leads to independent learning (Papaleontiou-Louca, 2008) and the development of life-long learning skills (Zimmerman, 2002).

**Metacognition Empirical Studies**

Metacognition has been the focus of many research projects over the years with varying methods and results. Baird (1986) conducted a classroom-based action research project in 9th grade and 11th grade science classes. Students were trained in metacognition through a question-asking checklist, an evaluation notebook (journal-like), and a techniques workbook (used mainly for concept maps). Baird concluded that students did gain a greater sense of control over their learning. However, there were classroom factors that hindered academic improvement such as classroom management, teacher expectations, and a pre-determined syllabus.

Lester, Garofalo, and Kroll (1989) attempted to determine the influence of metacognition on mathematical problem solving with seventh graders. The study took place comparing one regular mathematics class with an advanced mathematics class for approximately 12 weeks using routine and nonroutine problems. The teacher’s actions during the lessons were explicitly
described as monitoring, facilitating, or modeling. Because of some unplanned events (e.g., school-wide testing and also the need to scaffold skills in the regular classroom), the researchers did not observe that awareness of thinking was directly related to problem solving success. However, they did make the following conclusions based on this project as well as other research conducted by them:

1. An individual’s beliefs about self, mathematics, and problem solving play a dominant, often overpowering role in his or her problem-solving behavior.

2. Effective monitoring requires knowing not only what and when to monitor, but also how to do so.

3. Metacognition training is likely to be most effective when it takes place in the context of learning specific mathematical concepts and skills. (Lester, Garofalo, & Kroll, 1989, pp. 116-117)

In the early 2000s several research projects used innovative data collection techniques. Wilson and Clarke (2004) used action cards with sixth grade students to identify metacognitive thinking coded as awareness, evaluation, or regulation. Students solved numerical, logical, or visual mathematical tasks and then used the cards to report their thinking. Metacognitive and cognitive sequences were analyzed concluding that the consistency in those sequences could result in improved teacher understanding of student learning as well as the development of a metacognitive curriculum.

Wall (2007) conducted a qualitative study with four through 11-year-olds using pupil view templates. Template drawings depicted a classroom setting with speech and thought bubbles emanating from students. Students in the study added dialogue to the bubbles. The researcher coded the bubble dialogues by cognitive skill (information gathering, building
understanding, or productive thinking) and metacognitive thinking (knowledge or skillfulness). Results indicated that students as young as four and five displayed metacognitive knowledge and skillfulness.

Ritchhart, Turner, and Hadar (2008) used concept maps as the data-gathering tool in a 5-year professional development study. Teachers learned how to shape the culture of their classrooms using concept maps to uncover the students’ thinking (n=239) from grades 3 through 11. Researchers concluded that thinking does improve with age, but it is more likely to be developed in a classroom environment where thinking is modeled and valued.

More recent studies uncovered important aspects of metacognitive learning. Zhang (2014) analyzed many metacognitive behaviors utilized by students when solving non-routine mathematics problems. The researcher discovered potential behaviors that triggered shifts in a geometric learning progression. Boyer (2014) investigated the effect of learner reflection on metacognitive awareness when the instructional design followed the Stripling Model of Inquiry. Boyer found no statistically significant differences between control and treatment groups when using the Metacognitive Awareness Inventory (self-report survey), but the treatment group demonstrated deeper levels of reflection and more engagement in the inquiry process that showed that the prompts mattered. A third study explored how an instructional intervention that was designed to increase students’ metacognitive knowledge and skills affected motivational constructs as well as learning and transfer (Zepeda, Richey, Ronevich, & Nokes-Malach, 2015). The researchers found that metacognitive training can improve both metacognitive and motivational aspects of learning. Smith and Mancy (2018) explored the relationship between metacognitive talk and collaborative talk during group problem solving sessions. Their research resulted in a definition that states that collaborative metacognition is metacognition which
contributes to participation in collaborative activity and metacognition as a result of participation in collaborative activity. This takes metacognition from strictly an individual activity to a group activity. The next section explores the relationship between metacognition and reflective thinking.

**Reflective Thinking**

Some researchers and educators use the terms metacognition and reflection interchangeably (Hartman, 2001); some think that reflection is a subset of metacognition (Tarricone, 2011) and some theorize that metacognition is a subset of reflection (Denton, 2011). Regardless there is no doubt that a connection between the two exists. This section explores the different definitions and characteristics of reflection as well as considers research at various grade levels.

**Metacognition as Subset of Reflection**

Denton (2011) listed one of the characteristics of reflection as metacognition. His list included 1) broad range of instructional practices, 2) depth of understanding, 3) metacognition, and 4) formative assessment. Considering characteristics 1 and 2, Denton referred to Gustafson and Bennett (2002) who defined reflection as “thinking for an extended time about a set of recent experiences looking for commonalities, differences, and interrelations beyond superficial elements” (Gustafson & Bennett, 2002, p. 1). Time and a thorough exploration suggest the application of a broad range of instructional practices as well as the development of depth of understanding. Dewey (1910) defined reflection as “active, persistent, and careful consideration of any belief or supposed form of knowledge” (p. 5) which supports the notion that reflection is an essential factor in determining the content of student thinking and the progress toward achieving learning goals or formative assessment (characteristic 4). Locke (1690/1975)
postulated that “all ideas come from sensation or reflection” (p. 90). He defines reflection as “the awareness the mind has of its own operations, and their distinct qualities” (p. 91) which means thinking about one’s own thinking, i.e., metacognition.

**Reflection as a Subset of Metacognition**

Tarricone (2011) presents the connection between metacognition and reflection as self-knowledge. “Self-knowledge is identified as the core foundation of metacognition. It is argued that self-knowledge is developed through the interaction between reflection, introspection, and consciousness and is essential for metacognitive processes to occur” (p. 52). According to the developed taxonomy, reflection is a key element of metacognitive knowledge. In the category of person variable under declarative metacognitive knowledge, elements that are listed include reflective thinking, purposeful reflection, higher-order reasoning, critical reflection, critical thinking, and reflective judgments.

**Definitions and Characteristics of Reflection**

Whether reflection is defined as metacognition or as a subset of metacognition, it has a long history of significance in psychological, philosophical, and educational consideration. Definitions include mental consideration (Mezirow, 1990), the process of making sense (Rodgers, 2002), conscious effort to think deeply (Julien, 2016), mental process that incorporates critical thought (Quinton & Smallbone, 2010), and interaction of introspection and consciousness (Tarricone, 2011). Reflection is the brain’s search for connections (Zull, 2002) that leads to new understandings and appreciations (Boud, Keogh, & Walker, 1985). Reflection begins with a state of doubt and moves through the act of searching to find material that will resolve or clarify the doubt (Spalding & Wilson, 2002). Yet Dewey (1910) is still a relevant framework for looking at the definition of reflection.
Dewey (1910) defined reflection which can be characterized using these four criteria as cited in Rodgers (2002): 1) a meaning-making process, 2) a rigorous way of thinking with its roots in the scientific method, 3) community-based, and 4) a set of attitudes. A meaning-making process, the first criteria, begins with experience that involves interactions with the world which then leads to the concept of continuity shared by Dewey (1910). “What [an individual] has learned in the way of knowledge and skill in one situation becomes an instrument of understanding and dealing effectively with the situations which follow. The process goes on as long as life and learning continue” (Dewey, 1933, p. 44). This beginning experience may create what Piaget calls disequilibrium (as cited in Elliott, Kratochwill, Cook, & Travers, 2000).

According to neuroscientists, the brain wants to find balance so through the process of reflection the brain makes meaning. This Ah ha! type of meaning can happen in the left frontal lobe (Jensen, 2008). However, there is no one single place in the brain where meaning occurs, so it is more helpful to look at the factors that trigger a sense of meaning including relevance and emotion. Relevance allows neurons to connect to nearby neurons. The more connections there are the more an experience is woven neurologically (Jensen, 2008). Emotions release chemicals that signal the brain to pay attention. There is a critical link between emotions and the cognitive patterning needed for learning. This fourth criteria ‘reflection as a set of attitudes’ relates to this brain link (Dewey, 1910). Attitudes that are considered essential for readiness to engage in reflection are open-mindedness, responsibility, directness, and whole-heartedness. Dewey recognized that the attitudes and emotions on the act of reflection could either open the way or block it.

According to Dewey (1910) reflection can be broken down into phases that look remarkably like the scientific method. First, an experience takes place and then is described and
analyzed. A hypothesis is formed and is tested through experimentation. This experimentation might bring about a resolution to the disequilibrium, but if not, the cycle continues. Dewey’s second criterion, ‘reflection as a rigorous way of thinking’, mirrors the scientific method and the scientific method resembles the experiential learning cycle.

Dewey (1910) knew that thinking without communicating was incomplete hence the third criterion ‘reflection in community’ (Rodgers, 2002). Vygotsky (1978) also believed that the social context of learning was important. “All higher order cognitive skills originate in and develop by the internalization of individuals’ interaction with others” (as cited in Schoenfeld, 1987, p. 210). This idea developed into the Zone of Proximal Development. First learning occurs on the inter-psychological plane (in community). Then as individuals process this information for their own use, learning occurs on an intra-psychological plane. Socrates also used social interaction through dialogue as a form of reflective inquiry. “According to Socrates, learning was a form of recollection, which meant that the knower gathered memories and ideas together, reconnecting them to form continuous thought. Mostly, recollection was the result of discussion, specifically, the asking and answering of many questions” (Denton, 2010, p. 29).

The Socratic method is a pedagogical format that emphasizes collaborative inquiry-based dialogue (Chesters, 2012). Similar to Vygotsky’s social interaction and Socrates’ dialogues, Cobb, Boufi, McClain, and Whitenack (1997) attempted to analyze the sociological construct of reflective discourse and its relationship to mathematical development. They studied videotapes of a first-grade class discussing various topics. Their analysis concluded that “participation in reflective discourse supports and enables individual reflection” (p. 266).

Other researchers have used different criteria to define reflection. Griffiths and Tann (1992) applied the work of Schön (1983), reflection-in-action (thinking about what you are
doing), and reflection-on-action (thinking about what you already did), to categorize five levels of reflection as rapid, repair, review, research, and reformulation. Rapid reflection is usually immediate or instinctive and repair reflection is usually on the spot like when a teacher adjusts a lesson plan based on students’ reactions. The first two levels are reflection-in-action where the last three are reflection-on-action. Review can happen at any time, but often happens at the end of the day or at the end of the week. When reflection begins to change the person then it becomes reformulation. “At any one time the focus may be on one or another of them, but it is vital that each reflective practitioner should follow all of them at some time (Griffiths & Tann, 1992, p. 79).

Boud, Keogh, and Walker (1985) described the process of reflection in consecutive stages: 1) returning to experience, 2) attending to feelings, and 3) re-evaluating experience. Returning to the experience involves replaying the event exactly as it occurred without making judgment. Feelings either create a barrier to learning or are a significant source of learning. According to recent research, emotions are affected by the construct of mindset. If a student believes that their basic abilities, intelligence, and talents are fixed, then they may fear looking dumb and may not learn. While students with a growth mindset feel confident in their efforts regardless of the outcome of the experience (Dweck, 2006).

After returning to the experience and attending to feelings one would re-evaluate the experience (Boud, Keogh, & Walker, 1985). Re-evaluating the experience involves the following four elements: association, integration, validation, and appropriation. Association brings in prior knowledge by connecting the ideas and feelings from the experience to existing knowledge and attitudes. To make associations meaningful and useful, students need to integrate them. To be able to synthesize these bits of information, tools such as concept maps, Venn
diagrams, analogies, similes, and metaphors are helpful. In validation, a student is testing for internal consistency between what they have started to integrate and their existing knowledge or for the consistency between their new knowledge and parallel information from others. For some learning these final stage components of association, integration and validation are enough but for other experiences a further element is necessary. Appropriation happens when a learning experience becomes “so related to the self that it enters into our sense of identity and can have a considerable importance and become a significant force in our lives” (Boud, Keogh, & Walker, 1985, p. 33). The stages of reflection are rarely an end but usually are linked to some kind of action that may or may not be observed by others. Relating this process to the experiential learning cycle would indicate that both reflective observation and abstract hypothesis are part of reflection.

**Reflective Thinking Empirical Studies**

**College Level**

It is generally accepted that reflective thinking also enhances learning. There are many studies that research the effects of reflective thinking with college level students at different levels and with different subject areas. Two studies that specifically used reflection as an assessment tool include using feedback for formative assessment (Quinton & Smallbone, 2010) and reflective writing as summative assessment (YuekMing & Manaf, 2014). Quinton and Smallbone used a reflection sheet with the following questions: 1) What do I feel about this feedback? 2) What do I think about this feedback? 3) Based on this feedback what actions could I take to improve my work for another assignment? Students were given class time to consider their responses to these questions. In general, results from completed responses indicated that students were able to vent their emotions in response to question 1; they were able to distance
themselves from their work and reflect on feedback based on responses from question 2; and most students were able to demonstrate a degree of self-reflection and active learning based on question 3. The authors concluded by saying, “Reflection is central to learning from experience, and encouraging and practicing reflection should be part of routine teaching” (Quinton & Smallbone, 2010, p. 132).

YuekMing and Manaf (2014) used reflective writing in an environmental management course. Reflective notes were taken throughout the course and at the completion of the course, students wrote a reflective paper. The analysis of the writing was based upon the four levels of reflective writing from Hatton and Smith (1995): 1) descriptive writing (reporting – not really reflective), 2) descriptive reflection (providing reason based on personal judgment), 3) dialogic reflection (form of personal discourse exploring possible reasons), and 4) critical reflection (involving reasons that take into account the historical, social, or political contexts). Reflective essays were coded to match the course objectives. Results indicated that 29% of the students met the cognitive domain learning outcomes and 80% met the affective domain outcomes and so the researchers concluded that reflective writing could be used as a valuable alternative assessment tool to evaluate learning outcomes.

**High School**

For high school students, there is considerable research on the construct of critical thinking. However, there is a lack of research on reflective thinking even though it is considered a precursor to critical thinking (Choy & Oo, 2012). Two quantitative studies that did investigate aspects of reflective thinking include comparing the use of reflective portfolios in science class (Greenwood, 2010), and looking at the effect of reflective practice on critical and reflective thinking (Murphy, 2014). Greenwood used reflective portfolios in an experimental group to
assess whether their use would engage students in self-regulatory skills including reflection. The researcher used the self-report Motivated Strategies for Learning Questionnaire and found no significant differences in the skills of metacognition self-regulation, effort regulation, time and study environment, rehearsal, elaboration, and organization. However, they did find statistically significant gains in students’ rubric scores over time that suggested that students did benefit from structured goal setting, revision, and reflection. Murphy used a reflection treatment program that included a weekly written reflection, a twice-weekly reflective exit ticket and verbal class reflection. Data was collected using the Reflective Thinking Questionnaire and the California Measure of Mental Motivation. The treatment group scored significantly higher than the control group which suggests that students who engage in reflective practice in science class will have higher levels of reflection which could predict critical thinking dispositions.

**Middle School**

For studies involving middle school students, researchers have used the content areas of social studies, science, and mathematics. Rowicki (2001) investigated the relationship between reflective writing in science journals and the students’ ability to think critically. Using a rubric to score the reflective writing and the Test of Integrated Process Skills to assess critical thinking, the researcher found no numerical relationship between the ability to write reflectively and to think critically. However, after the intervention, the researcher reported a 24% decrease in the number of students at the pre-reflective level and every low critical thinker elevated their reflective writing to semi-reflective. Similarly, in a sixth-grade mathematics class, results were mixed. McCallie (2016) wanted to know if a student’s ability to reflect impacted their academic achievement, mathematical attitude, self-efficacy, and awareness of learning. The limitations of this study including the use of the statewide academic achievement test and the intervention
(only carried out seven times) contributed to the study having no statistically important results. In the recommendations for further study, the researcher suggested daily reflection discussion sessions, think-a-louds, and the use of an instrument that would better analyze the impact of reflection strategies. Another researcher, Denton (2010), also wanted to know if seventh graders’ achievement would increase if they engaged in instructional practices characteristic of reflective thinking within a social studies class. The intervention that lasted 23 days consisted of a prompt that students could respond to in writing or drawing. Students shared their responses with each other by reading aloud and teachers gave written feedback. The researcher found that the treatment group had similar achievement using a content specific test to the comparison group that used the extra 10 minutes for additional practice. However, interviews with participants did indicate that feedback on reflective communication was perceived as helpful.

**Elementary School**

It has been suggested that elementary students cannot be studied in regard to reflective thinking because of their developmental readiness. However, three studies in the content areas of reading, mathematics, and science were conducted with first, second, third, and fourth graders. Collier (1998) taught remedial reading students self-talk strategies in order to develop self-reliance, reflective skills, and independent reading strategies. The factors that impacted the study included: the relatively short period of time (10 weeks), wide range of abilities and maturation of the students, lack of training in behavioral self-talk, and personality of students including introversion and social maturity. The researcher concluded that students in this study went from modeled self-talk to guided self-talk to in some instances independent self-talk. In another study researchers used reflective discourse in a first-grade mathematics classroom (Cobb, Boufi, McClain, & Whitenack, 1997). Reflective discourse began when the teacher presented a
problem. In the ensuing dialogue, students would share their thinking that then became a part of collective reflection. Through analysis of students written work, the researchers concluded that participation in reflective discourse supported and enabled individual reflection and the development of mathematical concepts. Moore (2010) investigated mediated reflection in a 4th grade science class. The mediated reflection group received explicit instruction in reflection, oral and written reflection tasks for each lesson, and teacher feedback. The other two groups were a comparison group and a non-mediated reflection group. All three groups received the same instruction (8 lessons on plant growth) and a researcher-designed test. The researcher observed the instruction four times and interviewed eight students and two teachers. From this data the researcher concluded that although there was no statistically important differences between the achievements of the three groups, there was qualitative evidence that students did perceive a benefit from mediated reflection.

Teachers

Several studies have shown a link between a teacher’s reflective practice and their student’s reflective thinking (Choy & Oo, 2012). Fischer (2017) used a qualitative case study approach to look for a relationship between fourth-grade mathematics teacher’s reflective practice and the student’s exemplary performance on the statewide achievement test. The reflective methods, strategies, and practices that she uncovered include: support for professional learning in reflection, collaboration opportunities, methods for reflection-in-the-moment (note taking, highlighting, taking pictures), methods for reflection-after-the-moment (review and rework of past lessons, use of exit slips), cultivating a positive attitude, and understanding and caring for their students. “From the study’s results, it can be concluded that fourth grade mathematics teachers who use reflection may improve their teaching and subsequently their
students’ levels of learning and achievement” (p. 190). Posthuma (2012) studied reflective practice within the context of adapted lesson study with five secondary mathematics teachers. The lesson study cycle she used included collaborative planning, teaching, and then reflective evaluation. “The teachers who participated in this study reflected communally, supported each other during feedback sessions but also critically considered the effects of their own and their colleagues’ classroom practice on their learners’ mathematical growth and well-being” (p. 6).

Valli (1997) identified five types of reflection in teaching student teachers to reflect (see Table 2). The different types of reflection included technical reflection, reflection in/on action, deliberate reflection, personalistic reflection, and critical reflection. Technical reflection

Table 2

Types of Reflection in Teacher Preparation

<table>
<thead>
<tr>
<th>Type</th>
<th>Content for Reflection</th>
<th>Quality of Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical reflection</td>
<td>General instruction and management behaviors that are based on research on teaching</td>
<td>Matching one’s own performance to external guidelines</td>
</tr>
<tr>
<td>Reflection in/on action</td>
<td>One’s own personal teaching performance</td>
<td>Basing decisions on one’s own unique situation</td>
</tr>
<tr>
<td>Deliberate reflection</td>
<td>A whole range of teaching concerns, including students, the curriculum, instructional strategies, the rules and organization of the classroom</td>
<td>Weighing competing viewpoints and research findings</td>
</tr>
<tr>
<td>Personalistic reflection</td>
<td>One’s own personal growth and relationships with students</td>
<td>Listening to and trusting one’s own inner voice and the voice of others</td>
</tr>
<tr>
<td>Critical reflection</td>
<td>The social, moral, and political dimensions of schooling</td>
<td>Judging the goals and purposes of schooling in light of ethical criteria such as social justice and equality of opportunity</td>
</tr>
</tbody>
</table>

Note. Table 1 in Valli (1997, p. 75).

addressed basic teacher skills and how well a teacher’s performance matched the expectations. Reflection in/on action referred to two different time frames. Reflection in action happened
during the act of teaching and reflection on action happened after a lesson was complete. Deliberate reflection encompassed many competing views on students, curriculum, instructional strategies and a range of other teaching concerns. Personalistic reflection allowed teachers to listen to their own inner voice. Valli described personalistic reflection:

Personal growth and relational issues are most central to this mode of reflection….Teachers reflecting in a personal way would consciously link their personal and professional lives. They would think about what type of person they want to be and how being a teacher helps them accomplish their life goals. (Valli, 1997, p. 78).

Critical reflection involved teachers judging the purposes of their career in light of social, moral and ethical issues.

Spalding and Wilson (2002) used the framework of Valli (1997) to focus on strategies that helped students write and think more reflectively. The researchers assigned and graded weekly journals. Feedback was given as well as peer sharing sessions. Sometimes in the feedback the researchers identified the levels of reflection and other times they asked the students to identify the level. Looking for growth the researchers identified the following criteria: 1) increasing ability to distinguish between narration and reflection, 2) increasing ability to write all four types of reflection, 3) increasing ability to link course reading and discussion to observation and experience. The researchers concluded, “Devoting teaching time to definitions, discussion, and models can improve the quality of preservice teachers’ reflection” (Spalding & Wilson, 2002, p. 1413).

Hatton and Smith (1995) also investigated reflective thinking with student teachers during the students’ college preparation. They characterized year 3 and year 4 students’ essays as descriptive writing, descriptive reflection, dialogic reflection, or critical reflection.
Descriptive writing was not reflection but only described events or reported on literature. Descriptive reflection was reflection because it attempted to provide reasons or justifications for events but did it in a descriptive way. Dialogic reflection or talking to oneself was looking at events or actions and hypothesizing. Critical reflection looked at events based on historical and socio-political contexts. They found “the most common type of reflection was descriptive, although it should be noted that there was a reasonably high incidence (nearly 50%) of multiple perspectives evident” (p. 41). Furthermore, oftentimes descriptive led to dialogic reflection. Their study also included a collaborative component that showed enhancement of individual reflection.

Chapter Summary

Experiential learning theory is a general concept found in research literature and forms the theoretical foundation guiding this review. Experiential learning, a subset of constructivism and conceptual understanding, is best achieved through constructivism (Crain, 2005). The experiential learning cycle uses reflective thinking, and metacognition is a natural extension of the skills needed to travel around the cycle. Brain research has informed both the experiential learning cycle and metacognition.

Metacognition can be defined as thinking about your thinking and requires skillfulness and awareness. Metacognition supports a learner’s journey around the experiential learning cycle. Metacognitive awareness (knowledge including person, task, and strategy) and metacognitive skills (regulation including planning, monitoring, and evaluating) enhance a learner’s procedural fluency and conceptual understanding (Hartman, 2001). Metacognition is most effective when taught in context and modeled (Lester, Garofalo, & Kroll, 1989; Ritchhart, Turner, & Hadar, 2008).
Researchers have defined the characteristics, processes, and levels of reflective thinking in similar ways. Denton (2010), Rodger (2002), and Dewey (1910) define reflective thinking as a meaning-making process. Boud, Keogh, and Walker (1985) described the process of reflection as including the final stage of associating, integrating, validating, and appropriating an experience. These thought patterns happen in what Dewey would call a “rigorous way of thinking” (Rodgers, 2002, p. 849) and Denton (2011) would call “promoting depth of understanding” (p. 840). Hatton and Smith (1995) and Valli (1997) considered types of reflective thinking that are not necessarily consecutive. Hatton and Smith described writing that they consider not really reflective as corresponding to Valli’s technical reflection. The explanations for descriptive reflection and deliberate reflection are also similar. Dialogic reflection that is a form of personal discourse resembles personalistic reflection that involves listening to and trusting one’s own inner voice. Griffiths and Tann (1992) used reflection-in-action and reflection-on-action (Schön, 1983) to describe their process of rapid, repair, review, research, and reformulation. Rapid and repair correspond to the first two steps of returning to the experience and attending to feelings (Boud, Keogh, & Walker, 1985). Review and research are comparable to the third step of re-evaluating the experience. Reformulation is the stage where the experience changes the person, or appropriation (Boud, Keogh, & Walker, 1985). In this study, reflective thinking will be described as a meaning-making process with different levels.

The empirical studies considered in this review suggest that reflection can be successfully used at both the college level and the K-12 education level. Studies that used quantitative methods, especially those using self-report surveys in general, did not show any statistically significant results. However, all studies concluded some positive relationship between reflection and an aspect of learning. For example, Greenwood (2010) concluded that
students benefited from structured goal setting, revision, and reflection; Murphy (2014) determined that higher levels of reflection could predict critical thinking dispositions; Cobb, Boufi, McClain, and Whitenack (1997) found that participation in reflective discourse supported and enabled individual reflection; and Fischer (2017) stated, “teachers who use reflection may improve their teaching and subsequently their students’ levels of learning and achievement” (p. 190).

There are several possible reasons why the empirical research yielded mixed results especially those on academic achievement. Gustafson and Bennett (2002) suggested a thorough exploration of the construct of reflection is time-dependent. The studies covered in this report used fairly short time frames ranging from 2 weeks to 30 weeks covering either a unit of study or a semester. Data collection techniques also affected results. Several studies used self-report surveys that made data fully dependent on the accuracy and honesty of the participants. Other reports that used content specific tests, including statewide assessment tests, assumed that reflective thinking would impact that kind of test. Rubric-scored writing and portfolios were the most successful at quantifying reflective thinking. Qualitative results were the most positive and consistent. Data was collected through video observations, interviews, analysis of reflection journals, reflective essays, student written work, and field notes. In general, theoretical foundations suggest that reflection is critical to learning, but empirical studies have had difficulty supporting reflective thinking’s connection to academic results.
Chapter III

Methodology

This study investigated the research question, “In what ways did workshop participants use reflective thinking?” This chapter outlined the research methodology used to answer this question. It includes the rationale for the use of a qualitative study as well as a description of the participants, the intervention, and the data collection techniques. Data was compiled through classroom observations, interviews, journal entries and pre/posttests.

Research Design

In general, quantitative studies that incorporated the use and understanding of reflective thinking as an independent variable did not show a corresponding change. For example, Greenwood (2010), McCallie (2016), Denton (2010), and Moore (2010) used reflective portfolios, self-reflection, writing/drawing prompts, and explicit instruction in reflection as interventions, but did not find any significant statistical difference between control and treatment groups. In contrast, studies that used qualitative methods such as Quinton and Smallbone (2010), Fischer (2017), Spalding and Wilson (2002), Posthuma (2012), and Cobb, Boufi, McClain and Whitenack (1997) investigating reflections on written feedback, a teacher’s reflective practice, student teacher’s levels of reflection, reflections during lesson study and reflective discourse, concluded that reflective thinking had positive influence on some aspect of teaching and learning. Also, theoretical foundations suggest the critical need for reflection in learning (Boud, Keogh, & Walker, 1985; Dewey, 1933; Kolb & Kolb, 2017; Mezirow, 1990; Schön, 1983; Zull, 2002). In order to explore and understand reflective thinking’s influence on workshop participants, this study used a case study qualitative research design (Hancock & Algozzine, 2017).
There are several key characteristics of qualitative research design. They include natural settings, use of open-ended questions, multiple forms of data collection, inductive data analysis, multiple perspectives from participants, emergent design based on changing circumstances, and the desire for a holistic account. In qualitative research, words are collected, analyzed to identify complex interactions and then rearranged to report on a topic. Reality is subjective and multiple as seen by the participants. The intent of this case study design was to understand the ways workshop participants use reflective thinking (Hancock & Algozzine, 2017). In this multi-case design, the format included a thematic analysis across the cases followed by an interpretation of the meanings of the cases. This involved studying a real-life, contemporary context and setting that was bounded within a time or place (Creswell, 2013).

A qualitative descriptive case study approach was used for this project. This type of design typically answers the question how? or what is going on? “Descriptive designs are used to illustrate or explain key features of a phenomenon within its context” (Hancock & Algozzine, 2017, p. 39). Understanding the stories of participants provided a rich description of the successes and frustrations teachers experienced using reflection. This approach allowed the researcher to gather data from multiple participants bounded within a professional development workshop on reflective thinking.

Research Questions

The central research question for this study was: In what ways did workshop participants use reflective thinking? Reflective thinking was defined as a meaning making process where the main ideas or summary of a presented concept was put in a participant’s own words along with connections to their own life experiences. The behaviors that were examined are those related to
the experiential learning cycle, questioning techniques, planning methods, use of metacognition and use of reflective thinking.

**Conceptual Framework**

According to Miles, Huberman, and Saldana (2014), the conceptual framework explains the things to be studied such as the variables, constructs, and the interrelationships among them. The following exploratory design adapted from Miles, Huberman, and Saldana hypothesized the relationship between constructs and the variables that are measured within those constructs. This conceptual framework (Figure 3) hypothesized that a teacher’s planning and implementation

![Figure 3. Conceptual Framework that shows the relationships between constructs.](image)

will be influenced by experiential learning theory such that their personal reflection (what did I learn?) and professional reflection (why does this learning matter?) will result in action (in what ways will I use this learning?). Factors that affected planning and implementation included time spent, curriculum, school environment, and age of students.
Participants

For this study, the population included teachers who participated in a four-month, one credit professional development workshop “The ABC’s and 123’s of using Reflection in Your Classroom” written by the researcher and taught by an experienced professional development facilitator and classroom teacher. A sample of two participants were selected from the population based on the following criteria: willingness to participate in this study (attending the workshop, completing the journal entries, and being observed while teaching), grade level taught, and school administration approval as required by the Institutional Review Board (IRB) approved study for Human Subjects. Each participant was assigned an alias to protect their privacy and school affiliation. Teachers were recruited through the Educational Cooperative located in the Rocky Mountain West and through flyers sent directly to regional K-8 schools.

Limitations and Delimitations

Delimitations are the choices that the researcher makes. Participants that were chosen included current 3rd – 5th grade teachers that signed up for the reflection workshop. They taught mathematics and had the approval of their administrator. Teacher practices that were investigated within the data collection included those related to the experiential learning cycle, questioning strategies, and planning methods.

Limitations are influences that the researcher cannot control that might affect the outcome. The professional development workshop written by the researcher was taught by an experienced facilitator with her own perspectives and sense of timing. The location of the workshop was dependent on the Cooperative’s schedule and the number of attendees at each workshop affected the atmosphere. The location and time of the classroom observations were
dependent on the school’s schedule. The researcher had no control over the student’s participation or the content taught during the individual observations.

**Description of Workshop Content**

To increase the teacher’s understanding of reflective thinking, metacognition, and experiential learning, they attended a workshop entitled “The ABC’s and 123’s of using Reflection in Your Classroom.” Appendix B contains an in-depth description of the workshop content. The following objectives were used to plan the workshop outcomes. Teachers will:

- show understanding of the experiential learning cycle by integrating it into their lesson planning.
- understand how brain research supports the use of reflective thinking in the classroom,
- use metacognition skills and knowledge instruction to support student understanding,
- show understanding of reflective thinking by applying it to personal and professional planning
- create developmentally appropriate opportunities for students to use reflective thinking.

The following sections describe the focus of each of the four course sessions.

**Session 1: Experiential Learning and Brain Research**

In this session, the experiential learning cycle was introduced. The four approaches to the cycle – concrete experience, reflective observation, abstract conceptualization, active experimentation – was introduced and expounded on. Activities that allow participants to relate these concepts to their personal learning as well as their classroom was emphasized including the Lemon Experience (Kolb & Kolb, 2017, pp. 460-463) which allows them to see the difference
between concrete experience and abstract conceptualization. In addition, brain research was related to the learning cycle (Zull, 2002).

Session 2: Metacognition

The three categories of metacognition – knowledge, self-regulation, and mindset – were introduced. Participants took the Metacognition Awareness Inventory (MAI) so that they could be aware of their own metacognitive abilities (Appendix C), but those inventories were not collected. Activities that could be adapted to their classrooms were practiced such as think alouds, templates, concept maps, and action cards. Various readings that support the teachers’ understanding were addressed.

Session 3 and 4: Reflective Thinking

In these two sessions, reflective thinking was addressed starting with how metacognition and reflective thinking are different and how metacognition can support reflective thinking (Denton, 2011, Hartman, 2001, & Tarricone, 2011). Readings and activities emphasized how learning is a process and that reflective thinking is the meaning-making part of that process. Activities that are taken from various contents including mathematics, science and reading were conducted. Time was given for teachers to create strategies for implementing reflective thinking into their classrooms.

Data Collection

In qualitative research, data collection involves multiple methods. This study used interviews, classroom observations, and journal entries to collect data. Interviews were audio-taped and observations as well as the workshop sessions were video-taped. Classroom observations of the sample of participants took place prior to the first workshop and after each of the four workshop sessions, with individual interviews following each observation. Journal
entries were assigned at the completion of each workshop session and sent to the researcher through Google docs. In addition, the Reflective Thinking Questionnaire (Appendix D) and an open-ended test (Appendix E) were given to the two sample participants at the beginning and at the end of the data collection period.

Classroom observations of 30-40 minutes took place before the first workshop, after each workshop, and during the fall of the next school year and were videotaped for a total of six observations. The observer specifically looked for the use of any of the components of the learning cycle including a concrete experience that used the senses, opportunity to reflect on the experience, and whether students are thinking, abstracting, generalizing or experimenting with their ideas. A personal interview took place after each classroom observation. Each interview was audio-taped and transcribed by the interviewer or reviewed to confirm and expand the interviewer’s notes. Specifically, participants were asked to describe their own use of reflection in their professional and/or personal life.

Participants were asked to complete three weekly journal entries after each time the workshop met. In general, participants were asked to reflect on their own learning and how it affected their students. Entries followed the what? so what? now what? format. The week after a session, participants were asked, “what did you learn?” The next week they were asked, “why does this learning matter?” And finally, in the third week, they were asked, “In what ways will you use this learning?”

Near the beginning of the workshop, the Reflective Thinking Questionnaire (RTQ) was given to the participants (Appendix D). This version is a minor alteration of the original (Kember et al, 2000) that changed the word “course” to “workshop” and the word “lecturer” to “teacher.” The RTQ is a four-scale instrument that measures the constructs of habitual action (HA),
understanding (U), reflection (R) and critical reflection (CR). Habitual action is behavior that is usually performed without much conscious thought (Kember et al., 2000). It relates to the work of Schön (1983) regarding knowing-in-action. Another word for understanding is comprehension and is described as understanding without relating to other situations.

Definitions of reflection and critical reflection are consistent with the work of Mezirow (1990). “Reflection enables us to correct distortions in our beliefs” whereas critical reflection “involves a critique of the presuppositions on which our beliefs have been built” (Mezirow, 1990, p. 1). This instrument was shown to be valid by confirmatory factor analysis and each factor had an acceptable Cronbach alpha when used with 303 health science students. Lucas and Tan (2006) used the RTQ with business and accounting students and found similar Cronbach alpha numbers and concluded that the RTQ “operates as expected in terms of internal consistency and reliability particularly so far as the Reflection and Critical Reflection scales are concerned” (p. 15).

In order to show that participants progressed in their understanding and use of reflective thinking during the workshop intervention, a pre- and posttest were given. The open-ended questions were scored with a rubric that is based on the workshop’s objectives (Appendix E).

Pilot test. A pilot test was given by the researcher to four teachers in order to evaluate whether the questions corresponded to the rubric. It was expected that the teachers who participated in the pilot would receive at least a novice score considering they each had more than 10 years of experience. One teacher received less than a novice score because although she used many buzzwords such as remembering, thinking, and understanding, there was no indication from her response that she knew what those words meant. A second teacher somewhat successfully defined a learning cycle, metacognition and reflection but her approach to teaching was very traditional as indicated by her list of components, “introduction, modeling,
practice together, practice independently.” A third teacher seemed to generally understand the concepts but did not give any specific answers that justified a higher score. The fourth teacher had strong novice answers as well as a developing answer. Her answers indicated that she was only missing small aspects of each concept to be considered proficient.

After reading the pilot answers, the questions were reworded so that the potential answers would show growth in understanding and implementation as indicated by the rubric. For question one, “define” became “describe.” Participants can score novice by describing any aspects of the three words. In question two, “describe the components of a lesson or unit…” became “describe a specific lesson or unit…” to get at more details and specifics instead of general answers. Question three – “How do you know your students understand?” and question four – “How do your students know that they understand?” from the pilot, were combined to ask about strategies that are used. Question five stayed generally the same except “describe a time” became “describe a specific event.” Question six from the pilot stayed the same. The rubric was also minimally revised in order to be used for scoring classroom observations, interviews, and journal entries.

In order to organize all the data collected to help answer the research question, Table 3 or a similar table was completed.

Table 3

<table>
<thead>
<tr>
<th>In what ways will you use this learning?</th>
<th>Participant 1</th>
<th>Participant 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month 1</td>
<td></td>
<td></td>
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<tr>
<td>Month 2</td>
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<tr>
<td>Month 3</td>
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<tr>
<td>Month 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Analysis

The analysis followed the process in Figure 4. Field notes consisted of lesson plans provided by the teachers in which the observer took notes as well as any other notes written during the observations and interviews. Write-ups took place after each observation, interview, workshop, and journal entry. They consisted of general impressions and summary statements written by the researchers. The video analysis preceded as follows: view entire video; describe data factually; identify critical events; code descriptively. Descriptive coding lead to pattern coding and then the data was organized into tables.

![Analysis Process Diagram](image)

Figure 4. Analysis Process

Trustworthiness

According to Guba, (as cited in Shenton, 2004), four criteria should be considered when completing a qualitative study. They are credibility, transferability, dependability, and confirmability (Shenton, 2004).

Credibility relates to validity which attempts to assess the accuracy of the findings (Creswell, 2013). Strategies employed in this research are triangulation, prolonged engagement, peer scrutiny, reflective commentary, member checks, and thick description.

- In triangulation, a researcher must use multiple and different methods to provide corroborating evidence (Baxter & Jack, 2008). This study used pre/posttests, interviews, classroom and workshop observations, and journal entries to triangulate data.
• Prolonged engagement in the field builds trust with participants (Baxter & Jack, 2008).

The workshop took place once a month for four months. Interviews and classroom observations took place before the workshop beginnings, after each workshop, and the following fall. Monthly journal entries were acknowledged with comments and/or feedback.

• Opportunities for scrutiny of the project from the dissertation chair and committee as well as the professional development facilitator was sought out and welcomed.

• During the write-up part of the analysis process, the researcher recorded initial impressions (reflective commentary) of each data collection session.

• In member checking, participant’s views are solicited. After the observation during the interview, the researcher asked the participant to give feedback or comments (Hancock & Algozzine, 2017). In addition, during the analysis process, participants were asked to comment on emerging theories.

• It has been the goal of this study to include abundant, interconnected details through a rich, thick description. A thick description includes not only observation and description but also interpretation and analysis of the situation. “Thick description is not simply a matter of amassing relevant detail. Rather to thickly describe social action is actually to begin to interpret it by recording the circumstances, meanings, intentions, strategies, motivations, and so on that characterize a particular episode. It is this interpretative characteristic of description rather than detail per se that makes it thick.” (Schwandt, 2001, p. 255).

Transferability which relates to external validity is one of the hardest criteria to plan for in qualitative research. However, if enough description and detail are included to allow a
reader proper understanding, they can compare their situation to the report. Therefore, the boundaries of the research including a detailed description of the participants as well as any other restrictions or issues that may have impacted any of the data collection were included.

Dependability relates to credibility and transferability in that the processes within the study should be in such detail as to enable any future researchers to repeat the work. Appendices include all information from the professional development workshops.

Confirmability is comparable to objectivity. Triangulation helps, but admitting bias and ongoing reflective commentary should be done. The researcher’s bias is definitely towards the use of reflective thinking having a critical impact workshop participants. However, the workshop was taught by a third party and structured so that multiple opinions and interpretations were honored and recorded.

**Summary**

This qualitative study supplied insights into ways workshop participants used reflective thinking. It also shared the stories of two teachers as they incorporated reflective thinking within their professional lives. The teachers were selected based on their willingness to fully participate in the workshop “The ABC’s and 123’s of Using Reflection in Your Classroom.” Information was collected through pre/post-tests, surveys, interviews, classroom observations, and journal entries. Data was organized into tables, patterns were noted, and themes were inductively identified. After the data was collected, thick descriptions were created that told the story of teacher’s understanding and use of reflective thinking.
**Chapter IV**

**Results**

This chapter describes and organizes the data collected in order to answer the question, *in what ways did workshop participants use reflective thinking?* Three teacher practices were investigated. They included planning, implementation of the experiential learning cycle, and questioning. The conceptual framework was used to connect the teacher practices to ways teachers used reflection via observations and interviews of participants.

Data collection began in mid-December with a pre-workshop classroom observation and interview of a fifth-grade teacher and a fourth-grade teacher. The first workshop was held January 16\(^{th}\) and was attended by seven participants. The second workshop on February 13\(^{th}\) was attended by thirteen participants and the third workshop, March 12\(^{th}\), had nine participants. The participants completed journal entries for three weeks following each of the workshops. Data was collected during 11 observations and 11 hours of interviews. Immediately following the third workshop, schools were closed due to COVID-19 so the remainder of the data collection in the spring was done online through the video conferencing platform Zoom. Fall data collection occurred in person. The data shared in this chapter resulted from classroom observations, interviews, journal entries, zoom lessons, and zoom interviews.

**Workshop Participants**

There were a total of 14 workshop participants from 11 different schools. The grade level span included a kindergarten teacher through a high school teacher. Four teachers participated in all five sessions including the two zoom sessions and eight teachers participated in at least three sessions. One teacher joined us for the two zoom sessions and two teachers dropped out at the zoom sessions.
Two participants volunteered for in depth study from all those participating in the workshops. Sam, a fourth-grade teacher at a rural school in Northwest Montana, was in her seventh year of teaching and her third school. She has always worked within the third through sixth grade band in a self-contained classroom. Jo, a fifth-grade teacher at a rural school in Northwest Montana, was in her 12th year of teaching and her third school. She has worked with grades pre-K through sixth, but only taught in a self-contained classroom for the last two years.

**Data Collection**

Data collection began in December with a pre-workshop classroom observation and interview. There were three in-person observations per participant and three workshops before quarantine online teaching began. The workshop facilitator was also able to observe one of Jo’s classes in late February. Jo turned in one Zoom classroom lesson and Sam turned in two. There was one classroom observation and two interviews in the fall. Table 4 summarizes the timeline.

Table 4

**Timeline of Data Collection Events**

<table>
<thead>
<tr>
<th>Date</th>
<th>Item</th>
<th>Sam</th>
<th>Jo</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/11/19</td>
<td>Classroom Observation</td>
<td>Introduce remainders</td>
<td>Division with double digit divisors</td>
</tr>
<tr>
<td>12/12/19</td>
<td>Interview</td>
<td>Shared her daily reflection journal</td>
<td>Verbal reflection of lesson components.</td>
</tr>
<tr>
<td>12/12/19</td>
<td>Pre-test</td>
<td>Developing ideas</td>
<td>Some novice understanding</td>
</tr>
<tr>
<td>1/16/20</td>
<td>Workshop Experiential Learning</td>
<td>Enthusiastic and willing to share</td>
<td>Quiet during sharing.</td>
</tr>
<tr>
<td>1/20/20</td>
<td>Journal – What did you learn?</td>
<td>Summarized her learning</td>
<td>Learning not related to the workshop.</td>
</tr>
<tr>
<td>2/3/20</td>
<td>Journal – How will you use this learning?</td>
<td>Wants to use the learning cycle in her planning</td>
<td>Did not mention the learning cycle</td>
</tr>
<tr>
<td>2/4/20</td>
<td>Classroom Observation</td>
<td>Multiply 2-digit by 2-digit numbers using the area model</td>
<td>Model decimal addition</td>
</tr>
<tr>
<td>2/5/20</td>
<td>Interview</td>
<td>She acknowledged the issues in the lesson and what she did to complete the learning cycle.</td>
<td>Verbal reflection from questions</td>
</tr>
<tr>
<td>2/13/20</td>
<td>Workshop Metacognition</td>
<td>Participated fully.</td>
<td>Participated but did not share out reflectively.</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>2/24/20</td>
<td>Journal – Why does this learning matter?</td>
<td>Needs to build these skills with her students.</td>
<td></td>
</tr>
<tr>
<td>2/25/20</td>
<td>Classroom Observation</td>
<td>Comparing fractions using $\frac{1}{2}$ as a benchmark</td>
<td></td>
</tr>
<tr>
<td>2/27/20</td>
<td>Interview</td>
<td>Mostly about individual students</td>
<td></td>
</tr>
<tr>
<td>2/28/20</td>
<td>Classroom Observation – Sue</td>
<td>KWL chart</td>
<td></td>
</tr>
<tr>
<td>3/2/20</td>
<td>Journal – How will you use this learning?</td>
<td>Mostly about planning</td>
<td></td>
</tr>
<tr>
<td>3/12/20</td>
<td>Workshop Reflective Thinking</td>
<td>Working with students to get them to ask themselves questions</td>
<td></td>
</tr>
<tr>
<td>3/16/20</td>
<td>Journal – What did you learn?</td>
<td>Participated in all aspects of the class.</td>
<td></td>
</tr>
<tr>
<td>3/19/20</td>
<td>Journal – What did you learn?</td>
<td>Time to think important.</td>
<td></td>
</tr>
<tr>
<td>3/30/20</td>
<td>Journal – Why does this learning matter?</td>
<td>Students need to take responsibility for their learning.</td>
<td></td>
</tr>
<tr>
<td>4/6/20</td>
<td>Journal – How will you use this learning?</td>
<td>List of “I will” statements</td>
<td></td>
</tr>
<tr>
<td>4/15/20</td>
<td>Zoom lesson</td>
<td>KWL</td>
<td></td>
</tr>
<tr>
<td>4/16/20</td>
<td>Zoom Workshop Reflective thinking</td>
<td>Comfortable in the Zoom platform</td>
<td></td>
</tr>
<tr>
<td>4/19/20</td>
<td>Journal – All questions</td>
<td>Plans to build reflection questions into her instruction.</td>
<td></td>
</tr>
<tr>
<td>4/23/20</td>
<td>Zoom Workshop Reflective thinking</td>
<td>Shared transformed lesson.</td>
<td></td>
</tr>
<tr>
<td>4/23/20</td>
<td>Journal – All questions</td>
<td>Participated fully</td>
<td></td>
</tr>
<tr>
<td>5/13/20</td>
<td>Zoom interview</td>
<td>Good grasp of what reflection is and why it is important</td>
<td></td>
</tr>
<tr>
<td>5/28/20</td>
<td>Zoom lesson</td>
<td>Now aware of her own reflecting.</td>
<td></td>
</tr>
<tr>
<td>5/28/20</td>
<td>Zoom Interview</td>
<td>Explained how she added reflection questions in the lessons and her use of exit tickets</td>
<td></td>
</tr>
<tr>
<td>7/15/20</td>
<td>Interview about 2/25/20 observation</td>
<td>Began a tutoring job and is excited about using what she learned with her students. We talked about the questions she could ask.</td>
<td></td>
</tr>
<tr>
<td>9/17/20</td>
<td>Interview</td>
<td>Using reflection in writing, science as well as math.</td>
<td></td>
</tr>
<tr>
<td>9/28/20</td>
<td>Classroom Observation</td>
<td>Renaming Using Place Value Blocks</td>
<td></td>
</tr>
<tr>
<td>10/1/20</td>
<td>Interview</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sam had a professional journal habit so each time we met for an interview she had already thought about the lesson. Her sharing was insightful and enthusiastic. Sometimes she talked about how the lesson went and what she did next and other times she talked about her students. She had an improvement and success attitude. If things did not go well, she looked at how to improve and if things went right, she celebrated. She found many things to incorporate into her classroom routine such as graphic organizers, think-a-louds, inside/outside circle strategy, and questioning strategies. In her last lesson during the spring, she played a game with her students where her main objective was to teach them reflective thinking. She used many questions and techniques to help her students learn to reflect.

From the beginning, Jo was more hesitant to incorporate what she was learning into her classroom routine. She struggled with classroom management and behavior issues and used excuses for her students’ lack of ability to reflect. She resisted the suggestions to write down her own reflections. By the end of the final workshop, Jo seemed to have a good grasp on what reflection is and why it is important. She committed to giving time for it and writing it in her lesson plans. However, even though she shared that she was now aware of her own reflecting and using it to make personal decisions, she was still not writing anything down.

**Types of Reflection**

In an effort to understand the ways that teachers used reflective thinking, journal entries from workshop participants were categorized according to the type of reflection they used. Overall reflection is defined as a meaning making process. The type of reflection done by workshop participants would include the main idea or a summary of the presented concepts put in their own words with connections to their own life experiences. Categories of reflection were loosely based on the work of Valli (1997) and Hatton and Smith (1995) and were identified as a
result of organizing the journal entries that answered the specific workshop questions. They included descriptive narration, practical, inferential, and personalistic reflections (see Table 5)

Table 5

Criteria for the Recognition of Evidence for Different Types of Reflective Thinking

<table>
<thead>
<tr>
<th>Descriptive Narration</th>
<th>Practical</th>
<th>Inferential</th>
<th>Personalistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>- retelling of events/reporting information</td>
<td>- a decision or connection has been made</td>
<td>- analysis of learning</td>
<td>- explanation of personal growth</td>
</tr>
<tr>
<td>- not reflective but could be pre-reflective</td>
<td>- typically about basic skills or behaviors</td>
<td>- reasoning to a conclusion that was not specifically stated</td>
<td>- explanation link between personal and professional experiences</td>
</tr>
<tr>
<td>- oftentimes comes before other levels of reflection</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Descriptive Narration

The first category, descriptive narration, is a retelling of events or reporting of information. I found that oftentimes a descriptive narration entry would come before other types of reflection and therefore could best be referred to as pre-reflective. For example, “I learned about the physiology of learning with regard to the brain. Learning itself is a science, making it achievable for every individual. There are different strategies to engage different parts of the brain. Activating all of them ensures real, lasting learning” (Workshop participant journal entry, 20 January, 2020). This entry shares a participant’s own recollection of her experiences. A followed-up entry proceeded to reflect on how her learning was going to drive her lesson plans thus allowing her to make a connection to her professional life.

Sam had three descriptive narration entries. They were all in response to the journal prompt What did you learn? Here is an example, “Understanding and learning the parts of the learning cycle and how they connect with the function of the brain can help build a foundation
for learning. The building blocks are experiencing, reflecting, hypothesizing, and active testing. When all parts of the cycle are utilized and the cortex functions are engaged true learning happens” (Sam, 20 January 2020).

Jo had four descriptive narration entries. In response to *Why does this learning matter?* she wrote “Metacognition, thinking about your thinking, is important to internalize and reflect on what you have learned and how” (Jo, 24 February 2020). Also, in response to *In what ways will you use this learning?* she wrote, “Lessons need to build on prior learning and continually spiral back to reinforce what they have learned in earlier lessons” (Jo, 3 February 2020).

**Practical Reflection**

Practical reflection is when a teacher has indicated that a decision or connection has been made about basic skills or behaviors. For example, “I learned how to reframe questions to make them open ended. I was reminded of the levels in Bloom’s Taxonomy. I also learned how to use place value to solve double digit multiplication. The videos on number talks and exit tickets reminded me of the value of these tools for getting students to explain their learning” (Workshop participant journal entry, 16 April 2020). And here is another example where a teacher took what she learned and connected it to her students, “I believe learning about reflection and being given some tools and strategies for reflective thinking and collaborative reflection matters because I am a teacher who wants to build these skills with my students” (Workshop participant journal entry, 26 March 2020). The line between descriptive narration and practical reflection was sometimes difficult to find. In that case I asked, “Did they make a decision or a connection from their learning to their personal or professional life?”

Sam and Jo each made six practical reflection entries and they answered all three questions. Here are some examples, “I’ve realized that I often don’t give kids an opportunity to
express what they know about a subject before I start teaching a new lesson. I also need to share
more when introducing a new tool for them to use if they have no or limited knowledge about the
tool” (Jo, 24 February 2020). Sam demonstrated the connections she was making in this
practical reflection entry:

In the last class, we learned more about reflection, specifically we reviewed collaborative
reflection and discussed independent reflection. I learned that reflective thinking happens
naturally and is used frequently in our adult lives. Reflection support meaning making
and permeate all aspects of life. Therefore, students need to be taught how to reflect and
be given opportunity and chance to reflect so they can make meaning and form
connections. (Sam, 19 April 2020)

**Inferential Reflection**

Most difficult to categorize were inferential reflections. If a teacher examined and
analyzed their learning, the journal entry was coded as inferential. For example, “As I develop
lesson plans and strategies to teach developing readers, I am going to keep these statements in
mind: the real world doesn’t have answer keys; the goal of the classroom is to create better
citizens; learners need to constantly think about what they are doing and why” (Workshop
participant journal entry, 16 April 2020). These were not statements that were given at the
workshop. This participant took their learning, analyzed it and came up with these as a result of
thinking, reflecting and making meaning. Another example where the teacher analyzed the
learning and came up with understandings that were not specifically stated in the workshop,

As we saw in reflecting about our own thinking doing the various math tasks during our
meeting, the learning cycle is occurring constantly, even as I write this response. I am
currently recalling how to write a response from previous learnings (8th/9th grade
English); how to structure it, how to provide organization, opening sentences, conclusive closings and how these memories/understanding serve me in this current task. Given the ever constant learning cycle in all our experiences, I envision countless opportunities and situations where teaching reflective learning is valuable. (Workshop participant journal entry, 2 March, 2020)

Sam and Jo did not write any inferential entries. Some participants were more apt to make inferences based on their learning. For example, one participant had 60% of her entries that were inferential reflections.

Another thing I learned was that reflection takes stamina. It is easy to move on to the next task without much consideration for the time it takes to reflect deeply…. In order to build deeper student reflection, teachers have to be willing to adapt their plans for the time to reflect regularly on various levels to increase their stamina. (Workshop participant, 20 January 2020)

Another participant analyzed their learning and came up with an unexpected understanding.

The learning matters because it is a psychological need that I didn’t realize I needed to fill. I am aware of Maslow’s Hierarchy of Needs, but I think I have frequently glossed over the psychological need of belongingness and love from a social perspective. If I have an issue not being able to communicate with peers on a level of social comfort that allows me to move on to the task at hand, surely, I have many students who feel the same way in a regular school setting. (Workshop participant, 16 April 2020)

**Personalistic Reflection**

Finally, there is personalistic reflection. This type of reflection involves participants explaining their personal growth or illustrating the link between personal and professional
experiences. Of the eleven participants that turned in journal entries, all were able to write at least one personalistic reflection. One workshop participant wrote eight personalistic reflections out of her eleven reflections. Here is an example,

I learned about the relationship between the learning cycle and the biological natural learning cycle within the brain. I am not a particularly mathematical or scientifically inclined individual, so seeing the diagram of the learning cycle overtop the brain functioning was intriguing. I would like to read more about the way the brain works. I also learned that reflection is an integral, though frequently underused or ignored, part of learning. I have not been one to spend much time formally reflecting. It has always seemed like that thing for which there is never enough time. I have noticed, however, that requiring reflection from my students gives me a better picture of their learning or lack thereof. I would like to think that it also gives them an idea of their own learning, but I suspect that might not be the case right now. (Workshop participant journal entry, 20 January 2020)

Another example of a personalistic reflection that includes the phrase ‘I now know’, “One of the things I wrote in my KWL was how to get students to be more specific in their responses. I now know that it really comes down to how you ask the questions. I need to become more intentional in asking open ended questions” (Workshop participant journal entry, 6 April 2020).

Sam and Jo each wrote three personalistic reflections. Jo wrote about what she needed to do in this example, “Students require time to think. Often, we are so focused on the outcome that we skip over the reflection and process of learning. Over the next couple of weeks, I will be doing a lot of thinking and reflection on how well my remote lessons are going” (Jo, 20 March
2020). Sam did more than just connect understandings from the workshop, but she personalized what she needed to do.

“I decided that my goal was to try to incorporate more reflection opportunities in my classes. I did this in the last two weeks in both writing, math and science. I was impressed and satisfied with my student’s responses and how it seemed to help with application of the learned material later. I also believe after class I had a stronger understanding of reflection and that stage of the cycle and so I found it somewhat easier to naturally build into my class and lesson structure.” (Sam, 20 January 2020)

Of the 91 journal paragraphs investigated, 31% were descriptive narration (Table 6). Forty-six percent of those were a precursor to other categories of reflection. Only five of the eleven participants wrote the 28 descriptive narration journal entries. Written pre-reflective thinking seems to be a requirement for some teachers and not others, or perhaps everyone does pre-reflective thinking but only some write it down.

Table 6

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive Narration</td>
<td>15</td>
<td>7</td>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td>Practical</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td>Inferential</td>
<td>3</td>
<td>8</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Personalistic</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>25</td>
</tr>
</tbody>
</table>

In what ways did the workshop participants engage in reflective thinking? Sixty nine percent of the journal entries were coded as practical, inferential, or personalistic reflection. Teachers used the journal entries to make sense of the concepts presented at the workshop by making connections to their classrooms. They also documented their personal and professional growth. Finally, they analyzed and made inferences about their learning.
Personal and Professional Reflection

Journal entries were also categorized as either personal reflections or professional reflections based on the content of the writing. Those entries that talked about the participant were coded as personal and those entries that talked about the participant’s students or classroom were coded as professional. An overwhelming majority of responses from workshop participants were professional – ninety-two professional responses versus eighteen personal responses as shown in Table 7. Paragraphs that spoke about a participant’s personal learning were coded personal. For example, “They showed that I am very aware of my thoughts as they pertain to my actions, but I am more impulsive than apprehensive with certain types of tasks” (Workshop participant journal entry, 17 February 2020). Paragraphs that mentioned their classroom or students were coded professional. For example, “My ultimate purpose is to get my students thinking and if I don’t give them ample time in class they will eventually stop trying” (Workshop participant journal entry, 19 April 2020).

In order to further classify personal and professional reflections, paragraphs were then coded as written in first person, second person, or third person. In first person reflections

Table 7

Workshop Participants Journal Entries – Reflection

<table>
<thead>
<tr>
<th>What did I learn?</th>
<th>First Person Response</th>
<th>Second Person Response</th>
<th>Third Person Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Singular</td>
<td>Plural</td>
<td>Singular</td>
</tr>
<tr>
<td>Personal</td>
<td>18</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Professional</td>
<td>53</td>
<td>11</td>
<td>9</td>
</tr>
</tbody>
</table>

participants talked about themselves. The majority of responses fit in this category. A second person point of view used the key words “you” and “your.” An example would be “The concept of metacognition helps you go beyond being the gatherer of information” (Workshop participant
journal entry, 24 February 2020). There were only nine second person responses. A third person response happened when the writer talked about someone or something. Third person singular talked about a concept such as metacognition and third person plural talked about the teacher’s students. The most interesting responses were the first-person plural responses. These responses talked about the writer but as a member of a group. They almost felt like a call to action. For example, “As teachers, we need to understand ways we can purposefully add reflective thinking into our curriculum and we also need to be able to teach our students how to apply reflective thinking even when we aren’t explicitly calling on them to do so” (Workshop participant journal entry, 26 March 2020).

Sam and Jo also wrote journal entries, and they were 97% professional. Sam’s entries were 80% written in first person with one-fourth of them being plural. Those written in first person plural used “our” and “we” to make a point. Sam only talked about her students in third person once. Jo used first person point of view 58% of the time with the majority of it being first person singular. One-third of the time Jo used second person point of view. For these entries it seemed like Jo was writing a report instead of a reflection. For example, “Metacognition, thinking about your thinking, is important to internalize and reflect on what you have learned and how” (Jo, 24 February 2020).

After each observation, Sam and Jo participated in an interview which was in essence a verbal reflection. These interviews were professional reflections since they were focused on watching the observation and talking about their classrooms. Both Sam and Jo had a near even split of first person and third person reflections as shown in Table 8. Both of them had a small percentage of second person reflections that occurred when they were recalling questions or statements that they did ask their students or would ask their students.
Table 8

*Interview Reflections*

<table>
<thead>
<tr>
<th></th>
<th>First person</th>
<th>Second person</th>
<th>Third person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sam</td>
<td>50%</td>
<td>4%</td>
<td>46%</td>
</tr>
<tr>
<td>Jo</td>
<td>53%</td>
<td>4%</td>
<td>43%</td>
</tr>
</tbody>
</table>

These verbal interview reflections were also examined based on a taxonomy of reflection which is a model (see Figure 5) that was developed by Pappas (2010) and shared in the workshop.

---

**Figure 5.** A taxonomy of lower to higher order reflection (Pappas, 2010).

---

Sam’s verbal reflections centered mostly on evaluating the lesson which included how she did, and how the students performed. The first two reflections had some remembering of what happened next and how that contributed to the lesson. The second lesson did not go as planned and she shared her process for trying to understand what happened. In all interviews, she reflected on what she would do next (creating). In the last interview of the school year she answered, what did I learn (remembering), why was this important (understanding), how can I use this (applying), and what will I do next year (creating). Sam said,
I took the class and was excited about it to apply it to my personal teaching and to get my students to use it. I use reflecting a lot as an educator since student teaching but never really intentionally put it into my classroom or my routine. Now, I can take the time and I have the resources to give my kids the opportunity to reflect which I think will deepen their understanding of the concepts that I’m teaching. (Sam, 28 May 2020)

Jo’s verbal reflections were mostly remembering. These were centered on what happened before or after the lesson. During one interview the conversation was mostly about planning. Because reflection is the process of making sense, several times I had a hard time deciding whether her statements were reflections or comments. Once she was prompted to evaluate by answering, **what is one thing that went well and what is one thing that you would do differently.** She was not able to answer this question. She used a lot of seemingly justifiable excuses for her class which led me to believe that she was analyzing, but I never saw or heard her come up with solutions.

**Teacher Practices**

**Planning**

Most teachers engage in some version of planning their lessons and nearly all write something down. A few might even reflect at the end of the day and that might affect their planning. It wasn’t much of a stretch to hypothesizes that reflective thinking would be used for planning. With this in mind, workshop participants were asked to report on how they would use what they learned in the workshop.

It was the third question and the most skipped by participants. Of the 32 possible responses based on attendance, there were 24 responses as shown in Table 9. The responses can be split into two groups based on the content of the answer. Answers were either specific talking
about strategies/examples, or they were more generalized. A generalized response that only restated what was shared in the workshop used words such as hypothesis, active testing, concrete experiences. A couple of the generalized entries were considered reflections because they met the criteria of making sense by connecting to their professional experiences, but the participant did not relate to the content of the workshop such as, “Lessons need to build on prior learning and continually spiral back to reinforce what they have learned in earlier lessons” (Jo, 3 February 2020). Several of the journal entries contained generalized responses but contained wording that suggested the participant understood the content such that they could use it in their planning. For example, one participant talked about designing curriculum and another wanted to use the learning to plan out class time accordingly.

Table 9

Planning – Now what?

<table>
<thead>
<tr>
<th>In what ways will you use this learning?</th>
<th>Generalized</th>
<th>Specific</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Restates</td>
<td>Strategies</td>
</tr>
<tr>
<td>Experiential Learning</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Metacognition</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Reflective thinking</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Sam and Jo each wrote three planning journal entries, but they also turned in lesson plans for each of the in-person observations. Jo used the teacher’s edition of the mathematics textbook to plan her lessons. She reported that she went through the student pages to understand what would be expected of the students. Sam used the mathematics standards to plan. She used the curriculum that the district provided as well as other supplemental resources. Both of them reported that they added to their planning as a result of the workshop. Jo included a reflection
question and Sam looked for opportunities for collaborative and independent reflection within the lesson.

In the last workshop session, participants were asked to create or transform a lesson using what they learned. Jo created a science lesson about the phases of the moon and the tides. At the conclusion of the activity, she asked the following questions: *What did you learn in this activity? Where can you use this information in real life?* Sam transformed and added to a lesson on adding fractions that she had previously taught. After working with fraction strips and solving problems in groups she would ask the collaborative reflection question, *what is something we do every time we solved?* Next year she plans to conclude the lesson with this independent reflection question, *what is the most important thing you learned about adding fractions with unlike denominators?*

**Implementation of the Experiential Learning Cycle**

In the first workshop, participants discussed the Experiential Learning Cycle. If a teacher reflects at the end of the day that would be considered reflection-on-action according to Schön (1983) but if a teacher is using reflection with students, they are possibly implementing the experiential learning cycle.

During observations, I looked for components of the learning cycle. In addition, I asked about what happened before and after the lesson that I observed to see if all parts of the learning cycle might be included. Table 10 summarizes the lessons and interview for Jo and Table 11 summarizes the lessons and interviews for Sam.

Table 10

**Experiential Learning Cycle – Jo**

<table>
<thead>
<tr>
<th>Jo</th>
<th>Concrete Experience</th>
<th>Reflective Observation</th>
<th>Abstract Hypothesis</th>
<th>Active Testing</th>
</tr>
</thead>
</table>
Two-digit divisor division 12/11/19 | Base ten blocks | Next day asked some “why” questions | Turning blocks into drawings | Practice pages but students “don’t know how to struggle…”

Decimal Addition 2/4/20 | Students encouraged to make drawings | Not evident | Teacher (not students) compared to whole number addition | Worksheet pages “Complete the quick pictures to find the sum”

Decimal Multiplication 2/25/20 | Drawings (but did not have them use color which could have supported understanding) | Why is the part of the model representing the product less than either factor? | Practice problems “Solve using model”

KWL Iditarod 2/28/20 | Day before teacher read informational book to students | “What do you know” could be a reflective question. It all depends how it is set up. | “What do you want to know” could be hypothesizing. | Following weeks of research

KWL Galapagos Islands 4/13/20 | Did animal reports in Language class | Could be | Maybe | Watched a video

a A reflective question but the lesson was not set up so that students would notice this, reflect on it and then make a hypothesis.

Table 11

**Experiential Learning Cycle – Sam**

<table>
<thead>
<tr>
<th>Sam</th>
<th>Concrete Experience</th>
<th>Reflective Observation</th>
<th>Abstract Hypothesis</th>
<th>Active Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remainders 12/11/19</td>
<td>Read book “Remainder of One”; students used blocks to make arrays</td>
<td>What is a remainder and how does it connect to division?</td>
<td>Red group – Student conjecture odd ÷ even has a remainder of 1</td>
<td>Worksheet and word problems</td>
</tr>
<tr>
<td>Multiplication Area Model 2/4/20</td>
<td>Cut large grid into smaller rectangles to find total area</td>
<td>Teacher reflection: Should have asked “How would what we just did help you solve the area of the big rectangle?”</td>
<td>Concrete experience took entire class period.a</td>
<td>Continued another day</td>
</tr>
<tr>
<td>Comparing Fractions 2/25/20</td>
<td>Warm-up Shake a day</td>
<td>Another day – math journal page when to use ½ as a benchmark and how to use it</td>
<td>Another day – Fraction war game</td>
<td>Practice sheet</td>
</tr>
<tr>
<td>Improper Fractions 4/15/20</td>
<td>Previous experience with improper fractions including pictures, paper models and number lines</td>
<td>What do you notice?</td>
<td>What do we know that is going to help us solve these?</td>
<td>Work in partners in breakout room.</td>
</tr>
</tbody>
</table>
Questioning

Teachers ask many questions. “In fact, something like 60 percent of the things said by teachers are questions and most of these are not planned” (Sullivan & Lilburn, 2002, p. 1). Jo had on average 1.7 questions every minute and Sam had on average 1.9 questions every minute. The majority of these questions were closed questions. The closed questions they asked included “How many do you have leftover?” (Jo, 12 December 2019) which requires a single number answer and “What is the equal sign telling us? (Sam, 25 February 2020) which requires a definition phrase. These questions and other closed questions were useful especially for scaffolding, but they required less thinking. The open questions including reflective thinking, on the other hand, required higher order thinking skills. All reflective thinking questions are open but not all open questions require reflective thinking. For example, open questions that were asked included “What do we know about 3/8? (Sam, 25 February 2020) which required the students to remember and analyze but not necessarily reflect, and “How would you draw it?” (Jo, 25 February 2020).
4 February 2020) required students to apply what they learned. Reflection questions required a student to make sense. See Table 12 and Table 13 for examples of reflection questions.

Table 12

**Questioning – Jo**

<table>
<thead>
<tr>
<th>Jo</th>
<th>Total Questions</th>
<th>Length of lesson (minutes)</th>
<th>Ratio</th>
<th>Kind of Question</th>
<th>Reflection Questions&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-digit divisors</td>
<td>65</td>
<td>36</td>
<td>1.8</td>
<td>0.6</td>
<td>Why do you still need to make groups of 12? Does Robyn’s work make sense?</td>
</tr>
<tr>
<td>Add decimals</td>
<td>60</td>
<td>32.5</td>
<td>1.8</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Multiply decimals</td>
<td>87</td>
<td>50</td>
<td>1.7</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>KWL Iditarod</td>
<td>13</td>
<td>8</td>
<td>1.6</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>KWL Galapagos Islands</td>
<td>34</td>
<td>18</td>
<td>1.8</td>
<td>0.5</td>
<td>What did you learn?</td>
</tr>
</tbody>
</table>

<sup>a</sup> Reflection question defined as a question that would require a student to make sense.

<sup>b</sup> Closed question defined as a question with only 1 right answer usually one word, number or a phrase; could also be a yes or no answer.

<sup>c</sup> Open question defined as a question with multiple answers, strategies, or opinions.

Table 13

**Questioning – Sam**

<table>
<thead>
<tr>
<th>Sam</th>
<th>Total Questions</th>
<th>Length of lesson (minutes)</th>
<th>Ratio</th>
<th>Kind of Question</th>
<th>Reflection Questions&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remainders</td>
<td>121</td>
<td>61</td>
<td>2</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>2-digit x 2-digit</td>
<td>87</td>
<td>54</td>
<td>1.6</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Compare Fractions</td>
<td>72</td>
<td>34</td>
<td>2.1</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Reflection question defined as a question that would require a student to make sense.

<sup>b</sup> Closed question defined as a question with only 1 right answer usually one word, number or a phrase; could also be a yes or no answer.

<sup>c</sup> Open question defined as a question with multiple answers, strategies, or opinions.
Reflection question defined as a question that would require a student to make sense.
Closed question defined as a question with only 1 right answer usually one word, number or a phrase; could also be a yes or no answer.
Open question defined as a question with multiple answers, strategies, or opinions.

Sam asked more questions in a minute than Jo and had less wait time, but her percentage of open questions went from a low of 7% in early February to a high of 53% in May. Sam seemed to be more aware of the need for reflective questioning because she went from 20% reflective to 62.5% reflective. During the observations, Jo only asked three reflective questions and one of those was part of independent work included in the textbook. She reported that she occasionally used exit tickets as part of the lesson sequence.

**Fall Post Workshop Interviews**

**Jo.** On September 17th, I interviewed Jo to see if what she learned had any lasting impact on her personal or professional life. Although Jo did not have a classroom for the 2020-2021 school year, she was excited about two tutoring jobs that had come up. We talked about how she would use what she learned. She talked about questioning strategies using *how* and *why* to encourage her students to think and reflect. I asked her if she was using reflective thinking in her personal life and her response was, “a bit.” She shared that most of her reflection happened in the middle of the night. She said that she was not writing anything down, but once she starts tutoring, she might start taking notes.
Jo retook the Reflective Thinking Questionnaire (Appendix D) and I compared it to her answers from January 16\textsuperscript{th} (see Table 14). Each “definitely agree” answer received 5 points, “agree with reservation” received 4 points, “only to be used if a definite answer is not possible” received 3 points, “disagree with reservation” received 2 points, and “definitely disagree” was 1 point.

Table 14

*Reflective Thinking Questionnaire Results*

<table>
<thead>
<tr>
<th></th>
<th>Habitual Action</th>
<th>Understanding</th>
<th>Reflection</th>
<th>Critical Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January 16</td>
<td>16</td>
<td>18</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>September 17</td>
<td>15</td>
<td>19</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Sam</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January 16</td>
<td>8</td>
<td>16</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>October 1</td>
<td>10</td>
<td>16</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

The RTQ measures four constructs: habitual action, understanding, reflection, and critical reflection. The construct with the most increase was reflection. Through these statements Jo acknowledged that she was internally examining or exploring a concept. For example, in September, Jo agreed with the following statement, “I often reflect on my actions to see whether I could have improved on what I did.” Critical reflection, a more profound form of reflection, only had two points increase but the statements that she agreed with are significant. Jo went from agreeing with reservation to definitely agreeing on the following two statements: “As a result of this workshop I have changed the way I look at myself.” and “As a result of this workshop I have changed my normal way of doing things.” Even though Jo’s scores on the RTQ did not change much these two statements are qualitatively significant.

Jo retook the post-test and I compared her answers to the rubric (Appendix E) as well as to her answers from December 12\textsuperscript{th}. Her posttest was very difficult to score because even though the questions asked for specifics, most of her answers were very general. Her answers to Q1
were not descriptive even though it asked for her to describe the words. Her answer to Q2 was almost identical to the pre-test. Question three asked for strategies and she wrote, “I will have them think/talk about why/how something works.” This was a very general response to explaining how, but it could be considered a ‘developing’ answer. For Q4 and Q5, again she did not answer with any specifics even though her generalized answers could be considered correct. In conclusion, I would say that Jo went from Novice to Developing (see Appendix E).

Sam. Sam’s fall interview took place on October 1st, three days after her last observation. We talked about the lesson as well as her current teaching situation and how it affected her classroom routines. Sam had 20 fourth graders that were attending school on an A-B schedule where she sees half the class on Monday/Wednesday and the other half of the class on Tuesday/Thursday. Her classroom was also set-up for social distancing. Each group had a different learning personality, and she discovered that she used reflection to change components of her lesson for the second group. For example, she changed the questions or the prompts for application problems. Specifically, she reported using a picture with blanks because the previous day’s students struggled to start solving the problem on their own. She also shared that she used student reflections to pinpoint misunderstandings that she addressed with the second group like when multiplying by ten you just add a zero. She commented, “My reflections and student reflections really guide my teacher table or small group time during workshop. For example, after reflections from day one, I might choose to do a whole group lesson instead of a more focused small group lesson or the opposite.” Through using reflection, she has discovered that for one group she was able to use more collaborative discussion and the other group needed more scaffolding. This has created some angst because she believed that both groups were not getting
the same level of education. However, she expressed that she was thankful for having many resources for reflective thinking to accommodate both groups.

Sam reported that she now knows she instinctively used student reflection in her best lessons even though she did not know it was reflection. She became more aware of using it across every lesson. She used it in science as an ‘I learned’ page and she also had students fill out a reflective page in their reading journal. She still worried about having enough time but felt confident that even though her students were not reflecting every day, she fit it in for every concept.

Sam took the Reflective Thinking Questionnaire survey again and her results are in Table 14. Her scores for reflection and critical reflection went up slightly due to many answers that went from “agree with reservation” to “definitely agree.” The one score that was surprising was the increase in the habitual action category. Question number one states, “When I am working on some activities, I can do them without thinking about what I am doing.” She scored it as ‘definitely disagree’ in January and ‘definitely agree’ in October. She explained that she was thinking about her use of routines in her classroom and her desire to make reflective thinking a habit for herself and her students.

Sam took the posttest on October 1st. I compared her answers to the rubric (Appendix E) as well as her answers from December 12th. Her answers all represented outstanding or proficient understanding of the experiential learning cycle and reflective thinking. She described in detail lessons that she used with her students that incorporated components of the experiential learning cycle. Her answers showed a recognition of the importance of reflection. Her pretest answers showed a developing understanding of the concepts and through the posttest she has shown that she now has a complete understanding.
Narration

Jo’s Story.

Jo is a person who likes to learn. I have participated in professional development situations with her, so I was not surprised when she volunteered to participate in my study. I had observed her to be an enthusiastic, self-motivated learner.

Jo’s teaching career has been diverse. She has taught everything from physical education to middle school science to Title Reading. She recently taught a specially funded preschool program and then spent a year as a full-time self-contained fifth grade classroom teacher. Our story began in that fifth-grade classroom.

I immediately observed that Jo is a very traditional teacher. Her students sat in rows and she taught from the textbook. She stood at the front of the classroom and went through the teacher’s edition. When she asked questions, there were only a couple of raised hands and she called on the same students. When she made the assignment, she walked around the room starting at one side and continued to the other side. Students were not encouraged to help each other or work together.

Jo had classroom management issues and so her class was split in two for mathematics and writing. Jo did not use this opportunity to change the configuration of the classroom or how she taught a lesson. However, she was now more aware of who she called on, who was paying attention and what questions she asked. She was teaching the mathematics lesson twice but did not acknowledge that she changed anything for the second group.

Meanwhile, Jo’s participation in the workshops was exemplary. She learned about the importance of concrete experiences, reflection, activities for metacognition, and how to develop collaborative reflection. She emphasized the concrete experience more but did not include
reflection time except as an occasional exit ticket. She used a KWL (know, want to know, learned chart) in science class to encourage metacognition but did not encourage collaboration in her students.

Jo appeared to have learned a great deal during the workshops. She knew that reflective thinking was good for students and admitted to personally reflecting but did not write her reflections down. Jo was not rehired for her position for the following year. She talked about being put in a difficult teaching position but after doing some reflective thinking over the summer, she now has a good idea of her strengths and weaknesses. She shared that she is not good at classroom management but said that small groups are where she is happiest. She has taken two tutoring jobs and is looking forward to using what she has learned.

Sam’s story.

Sam is a young, enthusiastic, and creative teacher. While recruiting her colleagues to participate in the workshop, she volunteered to be a part of the study. Sam has been a teacher in the upper elementary grades for seven years. She has mostly taught in combination classrooms in small rural schools including a year in an Alaskan village, but this year she had eight fourth graders in a self-contained classroom.

Sam’s first observed lesson was a nearly perfect experiential learning cycle lesson. She had a concrete experience (blocks that represented the ants marching in different formations); a reflective question (What is a remainder and how does it connect to division?); abstract hypothesis (during group time a student came up with this conjecture – an odd number divided by an even number has a remainder of one); and active testing (a worksheet with word problems). After learning about the experiential learning cycle, she admitted that her strongest lessons naturally contain these components. During the year she tried to incorporate the
components into all her lessons but realized that sometimes you cannot fit all of the learning cycle components in during the same day. She commented that, “Sometimes I don’t think a 30-minute lesson is going to cut it. Maybe Monday is when you’re only going to give the concrete experience to fill in that schema for the next day to reflect and hypothesize and maybe the next day after that apply your reflection/hypothesis activity” (Sam, 5 February 2020).

Sam continued to incorporate what she was learning into her lessons. She used metacognition strategies during her read-aloud and incorporated collaborative reflection during number talks. In her final spring lesson while on Zoom, she taught her students how to do reflective thinking during a mathematical game. She continued to see the value of reflective thinking in the classroom in the fall because she has incorporated it into her mathematics lessons, science lessons, and reading lessons. She has successfully introduced reflective thinking because her students ask to do ‘I learned’ pages (See Appendix E).

Sam began this study with a reflective journal practice that she started while she was student teaching. Most days after school she wrote down notes about lessons and students. Sometimes she used those notes to plan for the next year. This year with her class split into two with one group attending school on Monday/Wednesday and the other group attending school Tuesday/Thursday, her reflective journaling habit has become even more important to help her improve her lessons. Sam has taken her personal reflective journaling habit and incorporated it into her classroom.

Chapter Summary

This chapter presented the data gathered from December 12th until October 1st in order to answer the question, in what ways did workshop participants use reflective thinking? It includes eleven classroom observations, eleven interviews, three in-person workshops, two Zoom
workshops, and 91 paragraph journal entries from the workshop participants. Two classroom teachers were chosen for in-depth study based on their willingness to participate, their administrator’s approval, and the grade-level they teach. In the next chapter, I will discuss teacher usage of reflective thinking, limitations of the study, and make suggestions for further study.
Chapter V

Conclusion

Reflective thinking is a meaning-making process (Rodgers, 2002) with different levels (Schön, 1983). Reflection can be personal – *what do I now understand?* or professional – *how can I use my learning to help my students understand?* Theoretical foundations suggest that reflection has value in the classroom (Hiebert et al., 1997) and that reflective thinking is an important characteristic of quality teachers (NCSM, 2014).

The purpose of this study was to identify ways teachers used reflective thinking. Fourteen teachers attended a workshop that was designed to increase their knowledge and understanding of reflective thinking and two teachers were followed to see how that knowledge translated into their personal and professional lives. Data was gathered through classroom observations, interviews, journal entries, and pre/post tests.

Teacher practices that were investigated included planning, implementation, and questioning. This chapter discusses impacts on teacher’s professional practices as well as the participants use of reflective thinking. Limitations of the study will also be addressed.

Analysis

Teacher Use of Reflective Thinking

In what ways did workshop participants use reflective thinking? According to the conceptual framework (Figure 3), I hypothesized that a teacher’s planning and implementation would be influenced by their understanding about experiential learning such that they would use personal and professional reflection in their lives. The following section discusses the results according to the data collected.
For Planning. Reported planning included lesson plans, developed lesson from the workshop, and workshop journal entry for *In what way will you use what you learned?* Jo reported that she added exit tickets to her classroom practice, and in the lesson that she shared at the end of the workshop, she explained about the reflective questioning she would do about the moon and the tides. Sam used her reflective journal in which she included how to use and where to use the aspects of experiential learning. In 62.5% of the responses to journal question number three, workshop participants included specific strategies or examples of planning to use experiential learning, metacognition, or reflective thinking. For Jo, Sam, and the workshop participants, reflective thinking was used significantly in their planning.

With Students. For implementation, I looked for Sam’s and Jo’s use of the experiential learning cycle which included concrete experience, reflective observation, abstract hypothesis, and active testing (Kolb & Kolb, 2017). Jo’s concrete experiences for mathematics were mostly drawings and once she used place value blocks. She only asked two reflection question, but they were not executed in a way that encouraged students to make sense. She asked and then moved on without pressing her students for responses. For the active testing part of the lesson Jo used the assigned workbook pages. Sam used all parts of the experiential learning cycle. Her concrete experiences included blocks, grids, number lines, dice, and game boards. Her reflection questions happened twice during the concrete experiences, twice after the concrete experiences, and twice on the following day. Abstracting was verbal in Sam’s classroom. It was either during a class/group discussion or during a game. Finally, active testing was in the form of written independent or group work. Jo and Sam were both exposed to the experiential learning cycle, but only Sam used it substantially in her classroom.
For questioning, I looked at the kinds of questions that Sam and Jo asked during their classroom observations. Jo asked questions 56% of the time and on average 91% of them were closed questions (see Table 10). During in person observations, she went from 5% open to 8% open. Open questions include reflection questions but are not limited to reflection questions. Sam asked questions 60% of the time and on average 75% of them were closed questions. She went from 8% open to 25% open during in person observations (see Table 11). Reflective thinking was used to impact their questioning strategies. It was minimal impact for Jo but significant impact for Sam.

**For Personal and Professional Growth and Understanding.** Workshop participants wrote mostly professional reflections. Eighty-four percent of the responses were professional which showed that they were thinking about their classroom and students. Of those professional responses, 58% were written in first person singular using the pronoun “I.” This means that they were personalizing their learning which is what I expected. Twenty-one percent of the responses were in third person where participants were talking about their students or concepts. Twelve percent of the professional responses were first person plural that used the pronoun “we” and sounded like a call to action. I expected more personal responses. However, more than half of the professional responses were personalized through the use of the pronoun “I.” This means that their learning had personal impact as well as professional impact.

**Definition of Reflection.** In this study reflective thinking was defined as a meaning-making process. Characteristics of a reflection would include the main idea or summary of the presented concepts written in the participants own words with connections to their life experiences. Four types of reflection emerged. Thirty-one percent of the journal paragraphs were categorized as descriptive narration or pre-reflective because they often times lead to reflective
thinking. Sixty-nine percent of participant’s journal entries were further categorized as practical, inferential or personalistic.

Jo and Sam also participated in verbal reflections during the interviews. Jo’s reflections were mostly remembering which is on the lowest level of ‘The Taxonomy of Reflection’ (see Figure 5). Jo did not progress in her ability to reflect on different levels of reflection. Sam’s reflections were on all five levels – remembering, understanding, applying, analyzing, evaluating, and creating. During the last interview, she spent most of her reflection on evaluating and creating.

Jo did use reflection according to an ‘aha’ moment she had during one of our conversations. She also shared within the RTQ that as a result of the workshop she changed the way she looked at herself and how she did things. Her classroom impacts were minimal and not readily apparent, but her professional life was affected by the personal nature of her reflections. I would need to return in a year or so to see if reflective thinking had any lasting impacts.

Sam began with a reflective journaling habit but according to her own admission did not consistently include reflection with her students. Sam embraced the experiential learning cycle and early on made the missing component of reflective thinking within her classroom a priority. Ten months later Sam had created routines that incorporate reflection into mathematics, science and reading.

By the end of the study, both Sam and Jo used reflective thinking for personal and professional growth.

**Relationship to Other Studies**

This study looked for the use of reflective thinking by teachers participating in a workshop entitled “The ABC’s and 123’s of Using Reflection in your Classroom.” This
included both what the teacher did, for example the professional reflection that would affect planning, and what the teacher had students do, including components of the experiential learning cycle. Other studies reported that students used reflective writing (Rowicki, 2001), reflective portfolios (Greenwood, 2010), exit tickets (Murphy, 2014), reflective discourse (Cobb, Boufi, McClain, & Whitenack, 1997), and drawings (Denton, 2010). All studies showed some qualitative evidence that students did perceive a benefit from reflection. This study did not focus on students therefore there is no straight forward evidence of benefit to students, but it does imply a benefit if classroom practices especially those related to the experiential learning cycle were impacted by a teacher’s use of reflective thinking.

Other studies focused on types or levels of reflections. Jo’s reflections were what Spalding and Wilson (2002) would consider technical reflection. Whereas Sam’s reflections were technical, deliberate, and personalistic (see Table 2). The consecutive stages of reflection include returning to the experience, attending to feelings, and re-evaluating the experience (Boud, Keogh & Walker, 1985). The journal prompt what did you learn? corresponds to returning to the experience. The journal prompt of why does this learning matter? corresponds to re-evaluating the experience and more specifically associating the new learning with prior knowledge as well as validating it. Finally, how will you use this learning? asked participants to integrate their learning into their classroom and 62.5% of the journal entries had responses that included use of specific strategies in their planning. Griffiths and Tann (1992) categorized five levels of reflection as rapid, repair, review, research, and reformulation. When reflection becomes more systematic and focused it begins to change the person, just as it has for me throughout this dissertation process.
Limitations

In addition to the limitations mentioned in Chapter Three, there were several other influences that affected the outcome. Attendance at the four workshop sessions was low and sporadic. This affected the learning because each month’s content built on the previous month’s content and the workshop was designed around group work and cooperative learning. The first workshop was attended by seven participants even though 23 had signed up. There were thirteen at the second workshop and several of them reluctantly participated in the activities. A couple of the nine participants in the third workshop were not feeling well so the energy level was low even though we had planned several group activities. The fourth in-person workshop had to be replaced with a virtual Zoom workshop because of the COVID-19 pandemic. The workshop was revised to accommodate the new platform, however, the fifth objective, create developmentally appropriate opportunities for students to use reflective thinking, was not met.

The closure of schools due to the COVID-19 pandemic created other unanticipated limitations. I was only able to give the Reflective Thinking Questionnaire posttest to Sam and Jo instead of all the workshop participants. On site classroom observations and in person interviews stopped. Jo’s students were not required to attend Zoom meetings and did their mathematics as worksheets. Therefore, she did a few science Zoom sessions and recorded one of them. Sam’s students were required to attend the Zoom sessions and she attempted to make them as normal as possible, but attention span and student follow through was sporadic. Even though the fall observation was in-person, with masks and social distancing, and only half of Sam’s class was in attendance, it was not a normal classroom setting which created another unanticipated limitation.
The limitation that had the most influence on the data collection and the conclusion is the idea that reflection is time dependent (Gustafson & Bennett, 2002). Using reflection is a habit that develops over time so knowing this at the beginning, follow-up fall observations were planned to investigate whether there were any lasting impacts to the participant’s use of reflective thinking. However, with a nearly six-month break between the closing of school in the spring and the return in the fall, reflective thinking could have taken a back seat in each participant’s mind. Again, this break in the study time-line due to COVID-19 created an unanticipated limitation that made it difficult to thoroughly observe the use of reflective thinking within the participant’s professional life. If I were to do this study again in a normal year, I would start with a pre-observation in September and workshops in October, November, January and February and then additional observations in March, April and May. Reflective thinking is a fragile construct and needs time to develop.

**Study Summary**

Even though there were obstacles and limitations, the results of this study show that workshop participants did use reflective thinking for personal and professional growth and understanding. It is generally believed by researchers that reflective thinking is a useful tool for learning (Cobb, Boufi, McClain, & Whitenack, 1997; Fischer, 2017; Greenwood, 2010; Murphy, 2014). Professional development that highlights and encourages reflective thinking does impact a teacher’s planning and implementation strategies. Regardless of the number of participants, this study brought together teachers to consider the impact reflective thinking would have on their personal and professional lives. Participants personally reflected by answering *what did I learn?* and professionally reflected by answering *how will I use what I learned?* All fourteen
participants practiced reflecting and learned tools to help themselves and their students use reflective thinking to make sense.

Reflective thinking was used in classroom practices. Workshop participants used reflective thinking when planning. Of the two participants that were looked at in depth, reflective thinking was used significantly during implementation and questioning for one of them while the other participant used reflective thinking minimally. Because only one of the two participants showed evidence of lasting impact, a follow-up study should include a multi-year cohort. Other variables such as the impact of feedback, written vs. oral reflection, group vs. individual reflection, reflection prompts, and student achievement would also be interesting to study.

Reflection supports meaning making and is an important characteristic of quality teachers. Therefore, it is a valuable part of a student’s and teacher’s classroom experience. Learning how to reflect takes time and practice. Over two thousand years ago, Confucius (as cited in Shea & Shun, 2008, p. 22) said, “Learning without thinking is labor lost; thinking without learning is perilous.” Today that might be translated as “learning without making meaning so that one can think critically is a waste of time; unreflective thinking without knowledge gained through understanding is perhaps catastrophic.”
References


NCSM. (2014). *It’s TIME: Themes and imperatives for mathematics education*. Bloomington, IN: Solution Tree


http://dx.doi.org/10.4102/pythagoras.v33i3.140


Appendix A

Student Explanation of Adding Two Fractions with Different Denominators

Describe in words how you would add two fractions with unlike denominators. Then show your strategy with numbers.

\[ \frac{2}{3} + \frac{2}{6} = \frac{7}{6} - \frac{2}{6} \]

So what you do is find the common denominator which in this is 6. Then you look how many times does three go in to six which in this case is two so then you do on the other one is same so it = three, six or two sixth. So that for three, and two sixth or three and two sixth. This is my description.
Appendix B

Workshop Content

Session 1 – Experiential Learning

Objective:
- show understanding of the experiential learning cycle by integrating it into their lesson planning
- understand how brain research supports the use of reflective thinking in the classroom.

Quote of the month: “Learning is the process whereby knowledge is created through the transformation of experience” (Kolb, 2015, p. 49).

1. Introductions
2. Pre-test (about 30 minutes)

4. Reading protocol – Jigsaw
   - Read assigned section and discuss main ideas in section group.
     o Section 1: page 13 – 17
     o Section 2: page 17 – 22
     o Section 3: page 22 – 28
   - New groups with participants from each section group sharing their main ideas.

5. Lemon Activity (Kolb & Kolb, 2017)
   Objective: To heighten participants awareness of their own experiencing and thinking process.
   - Hold up a lemon and ask the group, “What is this?” Then, “What do you know about lemons?” Scribe on chart paper.
   - Give each participant their own personal lemon and tell them to get to know their lemon carefully (about 1 minute). They can think of a story about their lemon and even give it a name if they want to.
   - Collect lemons in a box and mix them up.
   - Place the box in the center of the room and ask participants to pick their lemon out.
   - Go around the room and ask the participants how they identified their lemon. Scribe a list of characteristics.
   - Compare the two lists. “What is the difference between these two lists?”
     (Response should include: the first list is general and the second is unique; the first is based on prior knowledge versus based on personal experience; the first comes from thinking and the second comes from the senses.
   - Introduce dual-knowledge theory. “We all know the world in two ways – through experiencing and through thinking and it is through integrating these two ways through the transformation of action and reflection, that we learn and create” (Kolb & Kolb, 2017, p. 462).
   - Group discussion. Post the following questions for groups to discuss.
     o Which mode was easier for you to get into?
What techniques did you use to get into the modes?
Are you able to toggle between modes in your daily life or do you get stuck in one?
What are the pluses and minuses of each mode for learning?

6. Analyze and transform a lesson.
   • Get into groups of grade level bands and transform a traditional lesson into one that uses the entire cycle. Present to the whole group.
     o K-2 Adding using ten combinations
     o 3-5 Introduce division
     o 6-8 Introduce proportions

7. Reflective Thinking Questionnaire (Kember et al., 2000)

8. Journal requirements

Session 2 – Metacognition

Objective: use metacognition skills and knowledge instruction to support student understanding

Quote of the month: Student problem solving is recognized as a complex interplay between cognition and metacognition (Wilson & Clarke, 2004, p. 39).

1. Ice-breaker for metacognitive skills
   • Pass out non-routine problem: Eight pennies are arranged in a row on a table. Every other coin is replaced with a nickel. Then every third coin is replaced with a dime. Finally, every fourth coin is replaced with a quarter. What is the total value of the coins on the table?
   • “What is the answer?” Record answers on chart paper.
   • Discussion – ask:
     • “Before you began to solve the problem, what did you do?” Record. Possible answers: I read the problem more than once. I asked myself, “Do I understand what is being asked? I thought to myself, is there information in this problem that I don’t need?
     • “As you worked the problem, what did you do?” Record. Possible answers: I kept looking back at the problem as I worked it. I checked my work step by step. I drew a picture.
     • “How did you check that your answer was correct?” Record.
     • Have someone explain their thinking through the process of answering the question.

2. Video: “What is metacognition”

3. Action cards activity (Wilson, 1999)
   • Pass out (a) logic task, (b) number task, and (c) spatial task cards. Remind participants to keep track of their thinking (see Figure 5).
   • Pass out metacognitive action cards (awareness, evaluation, and regulation), cognitive action cards and blank cards. Have participants place the cards in the order in which they did them. Remove any cards not used and use the blank cards for extra cognitive thinking.
Figure 6. Action card activity task cards. This figure includes a. logic task, b. number task, c. spatial task. Adapted from Wilson (1999).

Cards:

Awareness:
- I thought about what I already know
- I tried to remember if I had ever done a problem like this before.
- I thought about something I had done another time that had been helpful
- I thought ‘I know what to do’
- I thought ‘I know this sort of problem’

Evaluation:
- I thought about how I was going
- I thought about whether what I was doing was working
- I checked my answer as I was working
- I thought ‘Is this right?’
- I thought ‘I can’t do it’

Regulation:
- I made a plan to work it out
- I thought about a different way to solve the problem
- I thought about what I would do next
- I changed the way I was working

Cognitive:
- I asked for help
- I drew a diagram
- I read the question again
- I added
- I subtracted
- I multiplied
- I divided
- I counted
- I tried to see if a shape would fit
- I moved a shape around
- I turned a shape over
- I tried a different shape

- Label each card as awareness (A), evaluation (E), regulation (R), and cognition (C). Compare your sequence with a partner’s sequence. What do you notice?
- Class discussion. Possible ideas:
During problem solving students start at awareness, then either evaluate or regulate their thinking. They finish with evaluative action. Cognitive actions will intersperse metacognitive sequences. Successful problem solving is not characterized by the use of any particular metacognitive sequence. Some students use a consistent way of working metacognitively which could be called metacognitive style (Frequent use of Regulation, The Evaluative student, Revisiting awareness, other).

4. Metacognitive Awareness Inventory (Schraw & Dennison, 1994), (Appendix C)
5. PowerPoint – What is metacognition
6. Menu Activity – assign each person an activity to share at the end of choice time
   - Graphic organizers (Concept maps, flow charts, compare/contrast diagrams)
   - Think aloud (short video then practice)
   - Questioning strategies (fill in table)
   - Using Literature – “Turkey Trouble” by Wendi Silvano (Plan-Do-Review)
   - Five-minute lesson on Metacognition (teacher modeling)
7. Journal comments

Session 3 – Reflective Thinking
Objective: show understanding of reflective thinking by applying it to personal and professional planning
Quote of the month: Active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further consideration to which it tends, constitutes reflective thought. (Dewey, 1910, p. 5)

1. Prior knowledge: What is reflective thinking? Have participants write what they think.
2. Read “Waiting for Unity: Helping People Comprehend Their Experience” from The Art of Changing the Brain (Zull, 2002).

Reading protocol – Jigsaw
- Read assigned section and discuss main ideas in section group.
  - Section 1: page 153 - 159
  - Section 2: page 159 - 167
  - Section 3: page 167 - 174

- New groups with participants from each section group sharing their main ideas.
3. Collaborative reflections: Reflection snowballs, debrief circles, group critique, number talk (video)
4. Paper and pencil reflections: templates, exit ticket, reflect and sketch, How is your thinking shaping up? Sentence starters
5. Journal comments

Session 4 – Reflective Thinking continued
Objectives:
- show understanding of reflective thinking by applying it to personal and professional planning
- create developmentally appropriate opportunities for students to use reflective thinking to make meaning.
Quote: Reflection is a search for connections. (Zull, 2002, p. 164).
1. Literature – “High Tide in Tucson” by Barbara Kingsolver
   • Read and highlight passages considered to be reflective.
   • Group sharing. Whole class sharing.
2. Input – process and characteristics of reflective thinking.
3. Analyze student reflections
4. Create a unit plan: Individually or in a group create a unit plan for something the
   participants teach. Include objectives, proposed activities, reflection opportunities and
   how students will show their understanding. Share.
5. Post-test
6. Reflective thinking questionnaire
7. Workshop evaluation
## Appendix C

**Metacognitive Awareness Inventory**

Table 15

*Metacognitive Awareness Inventory* (Schraw & Dennison, 1994)

<table>
<thead>
<tr>
<th></th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I ask myself periodically if I am meeting my goals.</td>
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<tr>
<td>2. I consider several alternatives to a problem before I answer.</td>
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<tr>
<td>3. I try to use strategies that have worked in the past.</td>
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<tr>
<td>4. I pace myself while learning in order to have enough time.</td>
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<tr>
<td>5. I understand my intellectual strengths and weaknesses.</td>
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<tr>
<td>6. I think about what I really need to learn before I begin a task</td>
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<tr>
<td>7. I know how well I did once I finish a test.</td>
<td></td>
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<tr>
<td>8. I set specific goals before I begin a task.</td>
<td></td>
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<tr>
<td>9. I slow down when I encounter important information.</td>
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<tr>
<td>10. I know what kind of information is most important to learn.</td>
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<tr>
<td>11. I ask myself if I have considered all options when solving a problem.</td>
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<td></td>
</tr>
<tr>
<td>12. I am good at organizing information.</td>
<td></td>
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<tr>
<td>13. I consciously focus my attention on important information.</td>
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<tr>
<td>14. I have a specific purpose for each strategy I use.</td>
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<td></td>
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<tr>
<td>15. I learn best when I know something about the topic.</td>
<td></td>
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<tr>
<td>16. I know what the teacher expects me to learn.</td>
<td></td>
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<tr>
<td>17. I am good at remembering information.</td>
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<td></td>
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<tr>
<td>18. I use different learning strategies depending on the situation.</td>
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<tr>
<td>19. I ask myself if there was an easier way to do things after I finish a task.</td>
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<tr>
<td>20. I have control over how well I learn.</td>
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<tr>
<td>21. I periodically review to help me understand important relationships.</td>
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<td></td>
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<tr>
<td>22. I ask myself questions about the material before I begin.</td>
<td></td>
<td></td>
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<tr>
<td>23. I think of several ways to solve a problem and choose the best one.</td>
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<tr>
<td>25. I ask others for help when I don’t understand something.</td>
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<td></td>
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<tr>
<td>26. I can motivate myself to learn when I need to.</td>
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<td></td>
</tr>
<tr>
<td>27. I am aware of what strategies I use when I study.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. I find myself analyzing the usefulness of strategies while I study.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. I use my intellectual strengths to compensate for my weaknesses.</td>
<td></td>
<td></td>
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<tr>
<td>30. I focus on the meaning and significance of new information.</td>
<td></td>
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<tr>
<td>31. I create my own examples to make information more meaningful.</td>
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<tr>
<td>32. I am a good judge of how well I understand something.</td>
<td></td>
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<tr>
<td>33. I find myself using helpful learning strategies automatically.</td>
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<tr>
<td>34. I find myself pausing regularly to check my comprehension.</td>
<td></td>
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<tr>
<td>35. I know when each strategy I use will be most effective.</td>
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<tr>
<td>36.</td>
<td>I ask myself how well I accomplish my goals once I’m finished.</td>
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<tr>
<td>37.</td>
<td>I draw pictures or diagrams to help me understand while learning.</td>
<td></td>
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<tr>
<td>38.</td>
<td>I ask myself if I have considered all options after I solve a problem.</td>
<td></td>
</tr>
<tr>
<td>39.</td>
<td>I try to translate new information into my own words.</td>
<td></td>
</tr>
<tr>
<td>40.</td>
<td>I change strategies when I fail to understand.</td>
<td></td>
</tr>
<tr>
<td>41.</td>
<td>I use the organizational structure of the text to help me learn.</td>
<td></td>
</tr>
<tr>
<td>42.</td>
<td>I read instructions carefully before I begin a task.</td>
<td></td>
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<tr>
<td>43.</td>
<td>I ask myself if what I’m reading is related to what I already know.</td>
<td></td>
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<tr>
<td>44.</td>
<td>I reevaluate my assumptions when I get confused.</td>
<td></td>
</tr>
<tr>
<td>45.</td>
<td>I organize my time to best accomplish my goals.</td>
<td></td>
</tr>
<tr>
<td>46.</td>
<td>I learn more when I am interested in the topic.</td>
<td></td>
</tr>
<tr>
<td>47.</td>
<td>I try to break studying down into smaller steps.</td>
<td></td>
</tr>
<tr>
<td>48.</td>
<td>I focus on overall meaning rather than specifics.</td>
<td></td>
</tr>
<tr>
<td>49.</td>
<td>I ask myself questions about how well I am doing while I am learning something new.</td>
<td></td>
</tr>
<tr>
<td>50.</td>
<td>I ask myself if I learned as much as I could have once I finish a task.</td>
<td></td>
</tr>
<tr>
<td>51.</td>
<td>I stop and go back over new information that is not clear.</td>
<td></td>
</tr>
<tr>
<td>52.</td>
<td>I stop and reread when I get confused.</td>
<td></td>
</tr>
</tbody>
</table>
This is not a test. There are no right or wrong responses to the statements that follow. A response is only ‘right’ if it reflects your personal reaction, and the strength of your reaction, as accurately as possible.

Please circle the appropriate letter to indicate the level of your agreement with statements about your actions and thinking in the workshop so far.

A – definitely agree  
B – agree with reservation  
C – only to be used if a definite answer is not possible  
D – disagree with reservation  
E – definitely disagree

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. When I am working on some activities, I can do them without thinking about what I am doing.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>2. This workshop requires us to understand concepts taught by the facilitator.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>3. I sometimes question the way others do something and try to think of a better way.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>4. As a result of this workshop I have changed the way I look at myself.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>5. In this workshop we do things so many times that I started doing them without thinking about it.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>6. To pass this workshop you need to understand the content.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>7. I like to think over what I have been doing and consider alternative ways of doing it.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>8. This workshop has challenged some of my firmly held ideas.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>9. As long as I can remember handout material for examinations, I don’t have to think too much.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>10. I need to understand the material taught by the teacher in order to perform practical tasks.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>11. I often reflect on my actions to see whether I could have improved on what I did.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>12. As a result of this workshop I have changed my normal way of doing things.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>13. If I follow what the teacher says, I do not have to think too much on this course.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>14. In this workshop you have to continually think about the material you are being taught.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>15. I often re-appraise my experience so I can learn from it and improve for my next performance.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>16. During this workshop I discovered faults in what I had previously believed to be right.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>
### Appendix E

**Pre/Post Test**

Q1. Describe:
- experiential learning cycle
- metacognition
- reflective thinking

Q2. Describe a specific lesson or unit where you know your students had success.

Q3. What strategies do you use to help your students develop procedural and/or conceptual understanding?

Q4. What does it mean to “make meaning”? Describe a specific event when you personally made meaning or when you observed a student make meaning.

Q5. What are the most important learning components of a unit/topic?

---

**Table 16**

*Rubric for Scoring Pre/Post Test*

<table>
<thead>
<tr>
<th></th>
<th>Outstanding</th>
<th>Proficient</th>
<th>Developing</th>
<th>Novice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiential Learning</td>
<td>Analyze</td>
<td>Show understanding of the</td>
<td>Explain at least 2 aspects</td>
<td>Describe any cyclical learning process (Q1)</td>
</tr>
<tr>
<td>Cycle</td>
<td>lessons/units to recognize and integrate characteristics of the learning cycle (Q2)</td>
<td>learning cycle by applying it to lesson and/or unit planning (Q3,5)</td>
<td>the experiential learning cycle (Q1)</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Metacognition</td>
<td>Create</td>
<td>Apply metacognitive knowledge and skills in the classroom (Q3)</td>
<td>Explain how to use metacognition in the classroom (Q3)</td>
<td>Describe one or more aspects of metacognition (Q1)</td>
</tr>
<tr>
<td></td>
<td>lessons/units that incorporate metacognition (Q2,3,4,5)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Reflective Thinking</td>
<td>Create</td>
<td>Show understanding of</td>
<td>Explain how to use</td>
<td>Describe reflective thinking (Q1)</td>
</tr>
<tr>
<td></td>
<td>opportunities in the classroom for students to use reflective thinking to make meaning (Q2,3,4,5)</td>
<td>reflective thinking by applying it to personal and/or professional planning (Q4)</td>
<td>reflective thinking (Q3)</td>
<td></td>
</tr>
</tbody>
</table>
Descriptors for completing the rubric scoring:

1. any cyclical learning process (Q1)
2. metacognitive knowledge (person- what a person knows about their own strengths and weaknesses, task- what a person knows about the requirements to complete a task, strategy- the strategies a person has available to complete a task) or metacognitive regulation (planning, monitoring, evaluating) (Q1)
3. characteristics that might be included: thinking about experience, making sense, mental process, interaction of introspection and consciousness, brains search for connections, leads to new understandings, careful consideration, linking prior knowledge with new (Q1)
4. concrete experience where you take in knowledge by receiving input from the senses; reflective observation where you interpret or act on knowledge and make meaning; abstract conceptualization taking in knowledge by forming theories and ideas; active experimentation where theories/ideas are tested with action (Q1, 2, 3, 5)
5. Possible tools: checklist, journal, concept maps, action cards, think-a-louds, exit tickets, templates, number talks, graphic organizers, error analysis (Q2, 3)
6. Description or observation of students having the opportunity for concrete experience, reflection, abstracting, and experimenting with their theories. (Q2, 3, 5 and/or classroom observation)
7. See #2 (Q3 and/or journal entries)
8. Being able to answer the questions: What? (What did I learn?); So what? (Why does this learning matter?); Now what? (In what ways will I use this learning?) (Q2, 4 and/or journal entries)
9. Classroom observations and interviews
Appendix F

Fourth Grade ‘I learned’ Reflections
(Sam’s students, Fall 2020)

Mathematics

I learned when you multiply by tens you move up a place and place a zero

64 x 10 = 640

I learned what you do when you expand a number. Expanding a number is breaking a part a number like this:

M HTh TH Th H
2,000,000 200,000 20,000 5,000 500

You keep the original piece and everything else becomes zero.

Expanded
Science

There are a few reasons we know the Earth is round. One way we know is you can see the Earth's shadow on the Moon. Another reason is, also the time of day from different countries and how different the time of the day was. Also when you see a ship you see the bottom deeper than the top does and it kinda looks like it's going down in a round shape.

Language Arts

What did you learn today about paragraphs? I learned that a paragraph has 3 parts. These main parts are explanation, details, and topic sentence. The details are of the main topic. The explanation gives facts of the details.