ELEMENTARY PRESERVICE TEACHERS PERCEPTIONS OF CONCEPT MAPPING

Logan Renee Caldwell

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ELEMENTARY PRESERVICE TEACHERS’ PERCEPTIONS OF CONCEPT MAPPING

by

Logan Caldwell

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Education

Major: Instruction and Curriculum Leadership

The University of Memphis

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Dedication

“Never say never.”

~ Charles Dickens
Acknowledgement

I would like to thank my parents, James and Diana, for always supporting and believing in me, and my siblings, Lucas, Adrienne, and Stephen, for your constant encouragement. Thank you to my nephews, Wyatt, Henry, and Simon, for making me laugh. I appreciate my AR, NC, and TN friends for their cheerleading efforts and allowing me to be selfish for my education.

A huge thank-you goes out to my adviser, Dr. Clif Mims, for always pushing me and keeping me on my toes. Thank you to my committee, Drs. Craig Shepherd, DeAnna Owens-Mosby, and Annette Cornelius, for their time, knowledge, and support. Additionally, I would like to extend gratitude to my professor, Dr. Amanda Rockinson-Szpakiw, for helping improve my research and writing skills. To all of you, thank you for extending your expertise and demonstrating what effective instructional design and teaching look like.
Abstract

Utilizing Joseph Novak’s instructional strategy of concept mapping with Meaningful Learning Theory has been widely accepted by researchers because it is a tool that can systematically depict the learners’ previous knowledge while exposing misconceptions; however, research has found that novice teachers do not have specific instructional strategies intended for targeting student preconceptions and misconceptions, and, when asked to construct concept maps, the majority of elementary preservice teachers possess inadequate skills to do so. The purpose of this basic qualitative study was to describe the experiences and perceptions of concept mapping utilization during instruction with undergraduate, elementary preservice teachers at a four-year public university in the Mid-South region of the United States to reveal insights on these gaps in knowledge. Non-probability, convenience, and homogeneous sampling techniques were utilized. Participants participated in one-to-one interviews and a focus group interview. The research questions for this study are:

Research Question 1. What are elementary education preservice teachers’ experiences with concept mapping?

Research Question 2. What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction?

The findings from this study determined that preservice teachers can describe the purpose of and find educational value in concept mapping that align with the theoretical framework of this study and concept mapping. However, preservice teachers’ lack of exposure and explicit teaching of this tool impacted self-efficacy of current and future implementation of this tool. Providing more purposeful learning experiences and explicit instruction on how to implement concept maps in elementary school could potentially raise self-efficacy and overcome the perceived barriers of implementation.
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List of Abbreviations

American College Testing (ACT)
Analysis, Design, Development, Implementation, and Evaluation (ADDIE)
Council for the Accreditation of Educator Preparation (CAEP)
Grade-Point Average (GPA)
English Language Arts (ELA)
Institutional Review Board (IRB)
Instructional Design (ID)
Kindergarten (K)
National Council of Accreditation of Teacher Education (NCATE)
National Research Council (NRC)
Professional Development (PD)
Scholastic Aptitude Test (SAT)
United States (U.S.)
United States Department of Education (USDE)
Zone of Proximal Development (ZPD)
Chapter One: Introduction

Studies report that young children can reason and think abstractly and, at a very early age, begin to develop their understanding of the natural world (National Science Teachers Association, 2003, Inhelder & Piaget, 1958; Schaffer, 1986; Siegler & Richards, 1979). Young children begin forming visual models of their surroundings, and, when not addressed early, these models can lead to misconceptions about concepts (Duschl, Schwingruber, & Shouse, 2007). Integrating concept mapping practices into instruction uncovers student misconceptions and assists learners in developing their previous thinking by connecting it to new knowledge (Ajaja, 2013; Asan, 2007; Bramwell-Lalor & Rainford, 2014; Hwang, Wu, & Ke, 2011; Jaafarpour, Aazami, & Mozafari, 2016; Jang, 2010; Koponen & Nousiainen, 2013; Snead & Young, 2003; Novak & Cañas, 2006; Novak & Gowin, 1984; Wang, Huang, & Hwang, 2016). Concept mapping “facilitates students to integrate new information into their knowledge framework, helps them visualize their understandings more readily, and informs teachers of the structural dimension of students’ understanding” (Won, Krabbe, Ley, Treagust, & Fischer, 2017, p. 96). Concept maps differ from the instructional strategy of mind maps because concept maps are hierarchical by including general concepts at the top of the map while specific and focused ideas are organized below the more inclusive concepts and are linked through lines and propositions (Novak & Gowin, 1984). Propositions are defined as the descriptive word that declares the relationship between the two concepts that are linked (Novak & Gowin, 1984). Mind maps, on the other hand, are nonlinear, with the broad idea centered on the page. In addition, mind maps do not use propositions to define the relationship between ideas (Buzan & Buzan, 2010).

Though concept mapping techniques yield positive academic results in elementary-aged (K-5) learning in instruction (Asan, 2007; Hwang et al., 2011; Jang, 2010) and are reported as
useful instructional design tools for teachers in assessing students’ misconceptions to inform instructional choices (Bramwell-Lalor & Rainford, 2014; Novak & Cañas, 2006; Novak & Gowin, 1984), research has also identified that most elementary preservice teachers do not have an understanding of how to construct an effective concept map (Subramaniam & Esprívalo Harrell, 2015). Furthermore, many novice teachers report being unaware of instructional strategies utilized to involve student preconceptions and detect student misconceptions (Cox, Steegen, & De Cock, 2016; Gomez-Zwiep, 2008; Seo, Park, & Choi, 2017).

Ausubel’s (1968) meaningful learning theory states learning must be connected to previous understandings, or schemata, to make learning more relevant. Reflective practices such as concept mapping have been shown to assist learners in utilizing their schema while connecting it to new knowledge. Elementary education teacher preparation programs are positioned to address the problems of a lack of concept mapping construction knowledge and low awareness of strategies to incorporate student preconceptions and uncover student misconceptions for novice teachers. To combat this issue, one must look at elementary education teacher preparation programs and how we are preparing our future elementary teachers.

Problem of Practice Statement

Teachers have trouble identifying instructional strategies to address students’ preconceptions and misconceptions (Cox et al., 2016; Gomez-Zwiep, 2008; Halim & Meerah, 2002; Meyer, 2004; Sadler et al., 2010; Seo et al., 2017). Instructional practices that engage students in explaining their thinking versus recalling factual content is described as more powerful and more likely to induce shifts in conceptual change in the learner’s understandings (Akerson, Carter, Pongsanon, & Nargund-Joshi, 2019; Aydeniz & Brown, 2017; Novak & Gowin, 1984). These thinking routines are categorized as tools that enact reflective thinking.
Reflective thinking is described by Novak and Gowin (1984) as “controlled doing, involving a pushing and pulling of concepts, putting them together and separating them again” (p. 19). For this study, reflective practices refer to instructional tools that engage the learner in reviewing and revising one’s previous thinking with new learning through links, connections, and/or modifications of previous understandings to the new knowledge (Novak & Gowin, 1984).

Concept mapping is an effective instructional methodology focusing on uncovering students’ previous knowledge and helping identify their current misconceptions (Bramwell-Lalor & Rainford, 2014; Novak & Cañas, 2006; Novak & Gowin, 1984). Hattie’s (2012) meta-analysis of 349 concept mapping studies demonstrated concept mapping almost always has a positive impact on student learning and a high effectiveness rate. However, Subramaniam and Espriávalo Harrell’s (2015) study found almost every elementary preservice teacher in their 200-person study was categorized as possessing inadequate skills to construct concept maps.

Researchers found that “further research is necessary to understand what methods can improve a teacher’s ability to deal with student misconceptions” (Gomez-Zwiep, 2008, p. 453), and “there remains a gap in the literature that specifically investigates prospective teachers’ knowledge about constructing concept maps” (Subramaniam & Espriávalo Harrell, 2015, p. 218). Elementary education teacher preparation programs are situated to address this cycle of the exclusion of reflective practices in elementary classrooms. By modeling proper construction of concept mapping and tackling awareness of such instructional strategies as concept mapping, teacher preparation programs could influence the instructional design approach to instruction in elementary schools. It is important to understand the perceptions and experiences of preservice teachers in relation to concept mapping to guide instructional design.
Purpose Statement

The purpose of this basic qualitative study is to describe the experiences and perceptions of concept mapping utilization during instruction with undergraduate, elementary preservice teachers at a four-year public university in the Mid-South region of the United States (U.S.). A concept map is defined as a visual representation that organizes labeled concepts hierarchically with general concepts at the top of the map and more specific, focused ideas organized below. These concepts are linked through lines and propositions. Propositions are defined as the descriptive word that declares the relationship between the two concepts that are linked (Novak & Gowin, 1984).

The theory guiding this study is Ausubel’s (1968) Theory of Meaningful Learning, which states that learning connected to prior knowledge is more meaningful to the learner. He proposed organizing new knowledge purposefully to help students link it to their current thinking (Ausubel, Novak, & Hanesian, 1978). Concept mapping is a tool linking the abstract to the concrete through methodical nodal connections called propositions (Novak & Gowin, 1984). Utilizing the instructional strategy of concept mapping with Ausubel’s theory has been widely accepted because it can systematically depict the learners’ previous knowledge while exposing misconceptions. However, research has found that elementary preservice teachers do not have specific instructional strategies intended for targeting student preconceptions and misconceptions (Cox et al., 2016; Gomez-Zwiep, 2008), and when asked to construct concept maps, the majority possess inadequate skills to do so (Subramaniam & Esprívalo Harrell, 2015). Thus, I plan to conduct a study that examines preservice teachers’ experiences and perceptions with concept mapping usage during instruction to reveal insights on these gaps in knowledge.
Theoretical Framework

Schema is considered important in educational and instructional situations because it is a mental structure of the data of one’s learning events or past experiences (Piaget, 1923). It is believed that when a learner makes connections between these mental structures, learning is at its optimal rate (Ausubel, 1968). Also, people use these mental structures to understand the world. Consequently, when new information or situations arise, it can cause intrinsic strife because the schema is not there to make sense of the situation. Another concern with schema is it typically is not swayed, even if contradictory, factual information is presented to the learner. It can be extremely challenging to change one’s schemata, but it can be done through repeated exposure to correct information (Piaget, 1923).

Ausubel’s Theory of Meaningful Learning states learning that is connected to prior knowledge, or one’s schema, is more meaningful to the learner. Further, he argues that making learning relevant to the learner is more effective than rote learning. He proposed organizing the new knowledge purposefully to help students link to their current thinking (Ausubel et al., 1978). He believed learning is hierarchical and that instruction presented in a well-organized manner highlighting relationships will cause learners to be more successful in transferring the knowledge to their long-term memory. Specifically, the general topic or main idea would appear at the top of the concept map and branch out into more specific concepts as the concept map moves downward, while also providing lines and propositions to specifically indicate the relationship between the topics (Ausubel, 1968).

The process of simplifying concepts and arranging them hierarchically on a page forces the learner to think about what concept is most important (Ausubel et al., 1978). It helps to clarify one’s thoughts and understanding, making learning more meaningful. A concept map can
be a heuristic device, serving as a process in which learners can make discoveries and uncover meanings through repeated revisions as new learning occurs (Ajaja, 2013). It helps in the development of critical thinking skills, the conscious effort to think about thinking (Ajaja, 2013). The steps recommended to construct concept maps include: (1) write or type the identified central concept at the top of the page; (2) brainstorm related concepts and record them on the page near the central concept; (3) link related concepts with lines; (4) write a proposition that describes the relationship of linked concepts; (5) continue revisiting the concept map and modifying the amount of concepts and the descriptions of the relationships, or propositions, as new learning is constructed (Croasdell, Freeman, & Urbaczewski, 2003; Novak & Cañas, 2006; Simon, 2007).

Concept mapping is a tool linking the abstract to the concrete through methodical nodal connections, allowing educators to get a glimpse of their learners’ thinking (Novak & Gowin, 1984). Concept maps create networks and communicate conceptual understanding or misunderstandings (Kinchin, Hay, & Adams, 2000; Koponen & Nousiainen, 2013; Ruiz-Primo & Shavelson, 1996).

When we make thinking visible, we get not only a window into what students understand but also how they are understanding it. Uncovering students’ thinking gives us evidence of students’ insights as well as their misconceptions. We need to make thinking visible because it provides us with the information we as teachers need to plan opportunities that will take students’ learning to the next level and enable continued engagement with the ideas being explored. It is only when we understand what our students are thinking, feeling, and attending to that we can use that knowledge to further engage and support them in the process of understanding. Thus, making students’ thinking visible becomes
an ongoing component of effective teaching. (Ritchhart, Church, & Morrison, 2011, p. 27)

Preservice teachers need to be exposed to methodologies that will allow them to connect student prior knowledge and identify misconceptions in K-5 content to increase awareness of this metacognitive process. Teacher preparation programs should use this theoretical framework when designing instruction for preservice teachers. Learning must be connected to prior knowledge, include the learners’ experiences, and be meaningful to ensure instructional design is effective. Thus, the Theory of Meaningful Learning provides an appropriate theoretical foundation to examine methodologies to make instruction more meaningful to elementary preservice teachers.

**Questions**

The research questions for this study are:

1. What are elementary education preservice teachers’ experiences with concept mapping?
   
   1a. What are their prior experiences before being accepted to Residency?
   
   1b. What are their experiences during Residency?
   
2. What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction?
   
   2a. What is their perception of their knowledge of concept mapping?
   
   2b. What do they perceive are the barriers and benefits of concept mapping?
   
   2c. How confident are elementary education preservice teachers in implementing concept mapping into their own classroom?
   
   2d. How do they perceive they would, if at all, implement it in their future classroom?
Definitions

Concept
A consistency in events or objects with a label (Novak & Gowin, 1984).

Concept Map
A linear, hierarchical matrix of nodes that represent concepts that are linked with meaningful propositions that note the relationship between the pair of concepts that can be used during learning and assessment (Novak & Gowin, 1984; Novak, 1990).

Critical Thinking Skills
The complex process of solving problems, making decisions, creating, generating ideas, and analyzing information (Robinson & Knight, 2019).

Meaningful Learning Theory
A learning theory that states learning that is connected to prior knowledge is more meaningful to the learner (Ausubel, 1968).

Mind Map
An instructional instrument that allows the learner to make their thinking visual by organizing their knowledge about a topic or word. A non-linear representation is created when connecting ideas are linked to the centered, broad topic. Mind maps do not utilize propositions (Buzan & Buzan, 2010).

Misconception

Nodal Connection
Two relating points linked together (Novak & Gowin, 1984).
**Novice Teacher**

Licensed teachers new to the profession of teaching (Robinson & Knight, 2019).

**Preconception**


**Preservice Teacher**

Students enrolled in a teacher preparation program aspiring and training to be professional classroom teachers (Robinson & Knight, 2019).

**Proposition**

Linking words identifying the relationships between two or more labeled concepts (Novak & Gowin, 1984).

**Reflective Practices**

Engaging in reviewing and revising one’s own learning once new learning has taken place to connect to and/or modify previous learning (Novak & Gowin, 1984).

**Schema (plural Schemata)**

Unit(s) of knowledge developed by experiences and stored and organized in the owner’s memory (Piaget, 1923).
Chapter Two: Review of the Literature

Introduction

Much research has been conducted on the effectiveness of utilizing concept mapping instruction, from kindergarten-aged students to college attendees to practicing in-service teachers (Cox et al., 2016; Czerniak, & Haney, 1998; Huang et al., 2017; Jaafarpour et al., 2016; Jin & Wong, 2015; Martin, Martin, & Southworth, 2015; Niemelä, Mikkolainen, & Vuorinen, 2018; Seo et al., 2017). Concept maps are used multifacetedly as an instructional tool and an assessment instrument. “Concept mapping is in itself a cognitive strategy that students can learn and employ to enhance their own learning by providing visual representation of information” (Stevenson, Hartmeyer, & Bentsen, 2017, p. 4). Examples of concept maps can be found in Figures 1 and 2. Ausubel’s (1968) Meaningful Learning Theory, which states learning must be connected to previous understandings, or schemata, to make learning more relevant to the learner, supports using reflective practices such as concept mapping as a tool for learning because it has been shown to assist learners in utilizing schema while connecting it to new knowledge (Jin & Wong, 2015; Tripto, Ben-Zvi Assaraf, Snapir, & Amit, 2017; Yue, Zhang, Zhang, & Jin, 2017).

While more studies exist that examine the effect of concept mapping on learning outcomes for K-12 students (Cui & Yu, 2019; Huang et al., 2017; Hwang, Kuo, Chen, & Ho, 2014; Jin & Wong, 2015; Sun & Chen, 2016), only five studies were found that center around elementary education preservice teachers and concept mapping utilization (Czerniak, & Haney, 1998; Esprívalo Harrell & Subramaniam, 2014; Koponen & Nousiainen, 2013; Subramaniam & Esprívalo Harrell, 2013; Subramaniam & Esprívalo Harrell, 2015). The foci of these few studies are identifying deficiencies in preservice teachers’ competency on constructing concept maps or
determining proficiency with science content assessed with a concept map. There are no known studies attempting to uncover elementary preservice teachers’ past experiences with and perceptions of concept mapping, though previous researchers recommended that “teacher educators should take into account the tenacity and strong role of student prior knowledge as they design learning experiences” (Esprívalo Harrell & Subramaniam, 2014, p. 18). The purpose of this study, grounded in meaningful learning theory, is to attend to this research gap and attempt to uncover preservice teachers’ background knowledge of concept mapping use during instruction. This will help teacher preparation programs to better understand their experiences in order to design more effective instruction.

The theory guiding this study, Ausubel’s (1968) Theory of Meaningful Learning, asserts learning connected to prior knowledge is more meaningful and making learning relevant to the learner is more effective than rote learning. Ausubel believed learning is hierarchical and advised organizing new knowledge purposefully to help students link it to their current thinking (Ausubel et al., 1978). Therefore, information presented in a well-organized manner that emphasizes relationships will be more effective in transferring new knowledge to long-term memory (Ausubel, 1968). This theory has been applied and used in multiple ways in studies with the same population as this study (Efendioğlu & Yelken, 2010; Efendioğlu, 2012; Odom & Bell, 2017; Rezende & de Souza Barros, 2008; Sailin & Mahmor, 2019). Thus, the cognitive approach of meaningful learning theory provides an appropriate theoretical foundation to examine methodologies to make instruction more meaningful to elementary preservice teachers and their future students.
Current Characteristics of Elementary Preservice Teachers

It is important to note the current demographic trends for elementary education majors in the United States. In 2017, the most current data accessible, bachelor’s degrees were most commonly awarded to elementary education majors at 74.4%, with master’s degrees comprising 19.3% of elementary education majors. Around 91% of elementary education majors are female and 9.4% male. Seventy-four percent identify as White, 9.06% identify as Latino, 5.78% identify as Black, 4.02% are unknown, 2.25% are multi-racial, 2.05% identify as Asian, 0.855% identify as American Indian or Alaskan Native, 0.73% are classified as a non-resident alien, and 0.26% identify as Native Hawaiian or Pacific Islanders. Going deeper into the data, White females represent 71.6% of the earners of bachelor’s degrees in elementary education, 8.37% were Latino females, 3.84% Black females, 6.31% white males, 0.823% Latino males, and 0.552% Black males (“Teacher Education at Specific Levels…,” 2017).

The national trends closely mimic the 2019-2020 elementary education majors’ characteristics at the university that this study takes place in: 78% of enrolled students identify as White, 14% identify as Black, and 9% identify as Latino, Multiracial, American Indian, or did not specify a race. Ninety-two percent are female, leaving 8% identifying as male (Hall, 2019).

Theoretical Context

Cognitivism

Cognitivist theorists, like meaningful learning theorists, argue that learning is based on external and internal factors (Ausubel, 1968; Gagné & Briggs, 1974; Piaget, 1953; Vygotsky, 1980). They believe that environmental influences and prior experiences shape a person’s understanding of the world. In addition, understanding and knowledge can be changed based on these occurrences (Driscoll, 2014). As schema learning and meaningful learning theories rely
heavily on the idea that one’s environment and exposure to information directly affects their learning, memory, and perception, they are categorized as cognitive approaches.

Therefore, before discussing schema learning and meaningful learning theories specifically, an overview of cognitive developmental psychologists and the theories associated with their work is necessary. Cognitivists focus on how one remembers, interprets, thinks, talks, approaches problems, and develops as he or she ages (Driscoll, 2014; Gagné & Briggs, 1974; Schuck, 2004; Piaget, 1953). Additionally, they take unobservable, internal traits like motivation, beliefs, desire, and ideals into account. Cognitive theories speak to how a learner attends to new information by labeling, translating, and connecting it to past experiences. Then, they categorize it and retrieve or forget it. Cognition relies on working memory and long-term memory. A limited amount of information can be stored in our working memory at any one time. Conversely, our long-term memory has infinite space, and, thus, it is more advantageous for a learner to find ways via repetition, rehearsal, or mnemonics to store information here. Cognitive theorists argue that meaningful connections with new information must be made to increase the success of recovery of that learning (Ausubel, 1968; Driscoll, 2014; Gagné & Briggs, 1974; Schuck, 2004). Developmental learning theories focus on the change in a learner over a long period of time (i.e., birth through adulthood). These developmental theories state that as humans maneuver through distinct stages in life, based on age, there is a specific beginning and end to each stage. In addition, learning is gradual and ongoing throughout one’s life (Driscoll, 2014; Piaget, 1953; Schuck, 2004; Vygotsky, 1980).

One of the key players in cognitive development theories is Jean Piaget (1932, 1953) because he introduced developmental stage theories into educational research in the early 1900s. These stages are branded by differences in children’s behavior as they age. Piaget focused on
three different processes: assimilation, accommodation, and equilibration. Assimilation describes merging new knowledge with previously learned knowledge. For example, a child seeing a zebra for the first time may call the zebra a horse. This is an example of assimilation. Accommodation describes changing one’s existing understanding of the world after being exposed to new information. Accommodation is when one’s understanding is reformed entirely. Consider the same child being told that the zebra is not a horse but a mammal called a zebra. If the child retains this new information, this would be an example of accommodation, because their schema has been modified to accurately categorize a zebra. If the child can accurately recall and identify a zebra, this means that the bit of information (or schema) was logically stored in the child’s long-term memory. Piaget believed it is imperative for learners to negotiate a balance between assimilation and accommodation; he coined this balance “equilibration.” Equilibration is balanced when the learner’s notions, grounded in prior knowledge, correspond with the new knowledge. Piaget is credited with introducing the term “schema” to psychology. He stated that schema is how one groups knowledge, as well as how one secures knowledge. If learning is structured with schema in mind, new schemata can be established or old schemata can be revised (Piaget, 1953). Piaget’s theory and educational psychology impacts the way parents raise their children and the approach educators take with their students (Driscoll, 2014). Inhelder and Piaget (1958) coined the “formal operational stage,” which expanded on Piaget’s original learning theory to include adolescents and extend into adulthood. Through research, they found that children around the age of 12 begin to think abstractly versus concretely and can be more inventive, think creatively, notice relationships between things, and be critical problem-solvers (Inhelder & Piaget, 1958; Schaffer, 1986; Siegler & Richards, 1979).
Another key player in cognitive learning theories is Lev Vygotsky. Beginning in the 1930s, Vygotsky (1978, 1980) challenged that social interactions, culture, and inherited traits are and can be part of a person’s learning experiences; everything is connected. One of his contributions, salient to this study, is the zone of proximal development (ZPD). ZPD explains how one obtains and retains information during specific developmental stages. Each learner has an actual developmental level, ZPD, and distal zone for all content and/or learning situations. The actual developmental level is what one is able to do or understand on one’s own. The ZPD refers to what one is unable do by oneself but can do successfully with assistance from another source (person, textbook, visuals, etc.). The distal zone refers to what one is unable to do even with support (Schunk, 2004; Vygotsky, 1978, 1980). Since this study is framed in meaningful learning theory, ZPD is important because it notes the importance of assessing where a learner currently is in his or her knowledge development of a specific concept and how that knowledge structure can be influenced with information from another source.

Another pioneer of cognitive development theory is Jerome Bruner. Bruner’s (1966) work began in the 1930s and 1940s studying reaction times of children with various socioeconomic statuses. He concluded that internal factors and experience influenced reaction times. He challenged his colleagues to investigate internal processes and interpretation instead of solely observable behaviors. Near the 1970s, Bruner began to focus his research on scaffolding. Realizing that students built on what they already knew, he concluded that a learner of any age could maintain new information if the information was organized in a meaningful way (Bruner, 1966; Driscoll, 2014), setting up the foundation for social learning theory that learning is meaningful when organized purposefully.
After discussing cognitive development theories and theorists, moving the discussion to schema learning theory is logical, since all the previous theories include considering a person’s background knowledge and/or current ability to achieve a goal. Although concepts behind schema are linked to cognitive psychologists’ works, it is still its own entity. Schema learning theory encompasses multifaceted layers and is a mixture of previous understandings and novel understandings. The brain must make connections with these understandings to increase retention. Once the brain has made connections, it is more likely to systemically store the information in a manner that allows information to be pulled out when needed from one’s long-term memory. In other words, schema is all about perception and the encounters one has during his or her lifetime. The brain’s ability to store and create mental models of this knowledge is directly dependent on what type of information it can recall. As Kuklinski, Luskin, and Bolland (1991) stated:

We are likeliest to notice stimuli that are relevant to (though necessarily consistent with) our schemas and to give deeper attention to those that are flagrantly enough at variance with them. Once perceived, a schema-relevant stimulus activates the schema, which then channels the way the information in the stimulus is processed. We tend to see, understand, and remember things the way we expect them to be, that is, in conformity with our schemas. Similarly, we tend to draw schema-consistent inferences, filling in the lacunae in the information we actually have with the properties we expect. The upshot is much obliviousness, misconstruction, and misrecollection, as well as much perspicuity, insight, and accurate recall. (p. 1342)
The key tenets of schema include a combination of old experiences, new experiences, connections to those experiences, and deciding the level of importance of those experiences and/or parts of experiences. Furthermore, schema theory states that all one’s knowledge is organized into slot or units. Schemata is stored within these slots. In other words, schema refers to the way one perceives the outside world based on one’s perception and encounters and how one creates a mental representation of this knowledge. As Gureckis and Goldstone (2010) state, Schemas provide the framework for rapidly processing information in our environment. For example, each time we enter a classroom, we do not have to consider each element in the room individually (e.g. chair, table, chalkboard). Instead, our schemas “fill in” what we naturally expect to be present, helping to reduce cognitive load. Similarly, schemas also allow us to predict or infer unknown information in completely new situations. (p. 725)

Because of these factors, schema is created and guides choices and behavior, assists in recalling information, and helps predict the future based on past experiences.

There are two processes, described by Piaget (1961), believed to help develop schema: assimilation and accommodation. Assimilation describes the progression of blending new information into one’s already existing schema. Accommodation designates adapting or altering our existing schema after being introduced to new information or new experiences. During accommodation, new schemata may be developed. For example, an elementary preservice teacher who initially categorizes lesson extensions as unnecessary may accommodate this notion after completing a lesson early with students and not having a backup plan for the extra time available. Accommodation is when one’s schema is completely altered or changed (Piaget, 1961). A child who has only seen dogs assimilates that all furry animals with four legs are called
dogs. When the child is corrected and accurately applies the label “cat” to one, that is deemed accommodation.

**Meaningful Learning Theory**

Though there are many cognitive approaches, one learning theory that builds on schema learning theory is David Ausubel’s (1968) meaningful learning theory. His theory relies on the notion that knowledge is formed from what one already knows and that for one to learn, he or she must relate new knowledge to prior knowledge. Meaningful learning allows learners to organize information based on the conceived relationships that exist, allowing the learner to understand better by making those connections. This also allows for facts to be remembered in groups instead of individually. Recalling or activating one of these facts will aid the learner in recalling the related information. Ausubel was the first to methodically research and experientially test his theory, which still influences education in the 21st century. He stressed that making learning relevant to the learner is more effective than rote learning. He believed that the effectiveness of transferring knowledge to one’s long-term memory completely corresponded with the link and connections the learner made with the new knowledge. Furthermore, he believed learning is hierarchical and that instruction presented in a well-organized manner while highlighting relationships will cause the learner to be more successful in transferring the knowledge to long-term memory. When information is presented in this logical manner, with more inclusive concepts at the top and more specific concepts at the bottom of the page, the brain assigns more meaning to the material (Ausubel, 1968).

Since meaningful learning theory features a heavy reliance on connecting new knowledge to a learner’s prior experience and background knowledge, it is important in this study to gain an understanding of preservice teachers’ perceptions of an instructional tool that is geared toward
uncovering a learner’s prior knowledge while organizing and connecting new knowledge. This prior knowledge plays a large role in what the learner takes away; however, the organization of the knowledge and connections made is almost equally important for recall or analysis (Driscoll, 2014).

With Ausubel’s work being studied, many researchers such as Brewer and Treyens (1981) tried small studies to test participants’ memory and found that previous knowledge seemed to play a large role in the success of the subject. For this reason, meaningful learning theory components play a huge role in most instructional design (ID) models. For instance, ADDIE, developed in the 1970s, trains instructional designers to analyze participants prior to developing instruction. Dick, Carey, and Carey (1978, 2009) recommend the instructional designer analyze the learners and contexts for previous understandings, once again prior to developing any instruction. Gerlach, Ely, and Melnick (1971) suggest educators assess entering behaviors of their learners before planning the lesson. Most, if not all, ID models require the instructional designer to consider what the learner already knows and then determine the best mode of instruction for the incoming audience (Driscoll, 2014).

Incorporating the key tenets of Ausubel’s meaning learning theory by connecting the new learning with old ideas and making the learning relevant to the learner assists in transferring knowledge to long-term memory.

In conclusion, an instructional designer should revisit and have the learner make accurate connections to their experiences in order to assimilate or accommodate their existing schema and organize the learning in a meaningful manner that highlights relationships between new and old schema, creating an optimal environment for meaningful learning to take place. Educators must have an appreciation “of how learners acquire, assimilate, retain,
and recall information” (DeChenne, 1993, p. 177). This is important to this study, which aims to uncover what aspiring teachers’ perceptions are about an instructional tool, concept mapping, to connect new knowledge to previous notions in an organized and hierarchical manner.

**Joseph Novak’s Contribution**

In 1972, Joseph Novak used Ausubel’s meaningful learning theory to create a hierarchical concept mapping methodology to serve as a scaffold to help organize and structure knowledge (Novak & Musonda, 1991). He further built upon Ausubel’s work in 1978 when he coauthored the second edition of Ausubel’s book *Educational Psychology*, titled *Educational Psychology: A Cognitive View* (Ausubel, Novak, & Hanesian, 1978). “Concept mapping is an educational tool; it has been developed specifically to tap into a learner’s cognitive structure and to externalize, for both the learner and the teacher, to see what the learner already knows” (Novak & Gowin, 1984, p. 40). See Figures 1 and 2 for examples.

Concept maps can be used as an instructional tool and as an assessment instrument. “Concept mapping is in itself a cognitive strategy that students can learn and employ to enhance their own learning by providing visual representation of information” (Stevenson, Hartmeyer, & Bentsen, 2017, p. 4). Concept mapping is a technique that was designed to answer, “How can we help individuals to reflect upon their experience and to construct new, more powerful meanings?” (Novak & Gowin, 1984, p. xi). Just as Ausubel’s meaningful learning theory proposed organizing new knowledge purposefully to help learners link to their current thinking (Ausubel et al., 1978), Novak created a tool that has the learner simplifying concepts and arranging them hierarchically on a page to force the learner to think about which concept is most important. This instructional instrument helps clarify one’s thought and understanding and makes
Figure 1

Figure 2
Concept Map on Concept Maps (Novak & Cañas, 2006, p. 2).
learning more meaningful. As Novak and Gowin (1984) stated, “When students learn about learning in the way we recommend, they take charge of their own learning” (p. xii).

Novak’s framework best aligns with the intentions of this study’s research questions because his tool was specifically designed to elicit meaningful learning opportunities for learners, so it is important to understand educators’ perceptions of this instrument. Furthermore, Novak’s concept mapping methodology was devised to extract preconceptions and identify misconceptions held by the learner, two areas in which novice teachers report being unaware of instructional strategies to accomplish those goals (Cox et al., 2016; Gomez-Zwiep, 2008; Seo et al., 2017). Novak’s work with concept mapping will be described in further detail in the next section.

**Concept Mapping**

**Introduction**

Reflective practices can be utilized to determine preconceptions and misconceptions of the learner, provide an opportunity for students to develop critical thinking skills, and create gains in student achievement across varied content areas and age groups (Cox et al., 2016; Huang et al., 2017; Jaafarpour et al., 2016; Jin & Wong, 2015; Martin et al., 2015; Seo et al., 2017; Sundararajan, Adesope, & Cavagnetto, 2018). The National Research Council (NRC) (2012) maintains that “knowledge is characterized by a rich, conceptually organized, well-connected, and fluently integrated set of representations” (p. 117). Furthermore, when reflection provides an opportunity for learners to “link their prior knowledge of concrete examples with new knowledge of conceptual relationships … greater improvements in structural knowledge [are exhibited]” (Sarwar & Trumpower, 2015, p. 197). Utilizing the visual technique of concept mapping that was derived from Ausubel’s theory has been widely accepted because it is a tool
that can systematically depict the learner’s current schemata while exposing misconceptions and promoting reflection (Ausubel et al., 1978; Beyerbach & Smith, 1990; Cañas & Novak, 2006; Novak & Cañas, 2006; Novak & Gowin, 1984; Seo et al., 2017).

**Joseph Novak and Concept Mapping**

Concept mapping is a tool that promotes meaningful learning by schematically demonstrating learners’ knowledge of the components of a concept and the interdependencies between those components (Novak, 1990; Novak & Cañas, 2006). The concept map construction process includes: (a) defining the topic; (b) listing the most important concepts; (c) arranging concepts hierarchically with the more general and inclusive topics at the top and the more specific concepts arranged below; (d) adding links or lines; (e) adding linking phrases or propositions; (f) adding any cross links; and (g) reviewing and revising the map as new knowledge is constructed (Novak & Gowin, 1984). Refer to Figure 2 for an example of a concept map on concept maps.

Concept mapping is recommended for use with students as young as 6 years old through adulthood. In addition, its suggested usages are multifaceted, including as an instructional device, an assessment for all academic subjects, and a tool that aids in designing and planning curriculum (Novak & Gowin, 1984; Novak, 1990). The invention of concept mapping grew from Novak’s extensive research on exploring assessment strategies to gauge students’ understandings of basic scientific concepts (Novak, 2018). During a domestic, 12-year longitudinal study assessing the changes in students’ conceptual understanding of science from first through twelfth grades, Novak and his research team discovered “concept maps are not only reliable and valid but also measure aptitudes not commonly assessed by typical objective tests” (Novak & Musonda, 1991, p. 134).
Multiple age-appropriate strategies for implementing concept maps are outlined for students from Grade 1 through college, including a scoring criterion in the researchers’ book *Learning How to Learn* (Novak & Gowin, 1984). For example, with Grades 1-3, the researchers recommend starting with students “clos[ing] their eyes and ask[ing] them if they see a picture in their mind when you recite familiar words, e.g., dog, chair, and grass. Use ‘object’ words at first” (Novak & Gowin, 1984, p. 25). For Grade 7 through college, the researchers recommend starting students with “mak[ing] two lists of words on the blackboard using a list of familiar words for objects and another list for events ... ask[ing] the students if they can describe how the two lists differ ... try[ing] to help them recognize that the first list is things or objects and the second list is happening or events, and label[ing] the two lists” (Novak & Gowin, 1984, p. 32). The scoring criteria include evidence of the following characteristics: propositions, hierarchy, and cross links.

A multitude of research has been conducted on the effectiveness of incorporating concept mapping into instruction for students from kindergarten through college as well as for practicing in-service teachers to see if it assists learners in utilizing their schema while connecting it to new knowledge. This literature review notes the previous studies that involved concept mapping with a variety of learners; however, no such research exists in attempting to understand preservice teachers’ experiences and perceptions with this tool. Much of the research conducted is with K-12 students or used to discuss content competency in adult learners. In addition, many of the studies found were conducted in international settings. After this review, it will be clear that concept mapping is an effective instructional tool, yet a gap in literature involving U.S. elementary preservice teachers’ constructed understanding of concept mapping and its purposes is present.
Experiences with Concept Mapping

Misconceptions. Identifying misconceptions early allows educators to plan effectively for students. Muthersbaugh, Kern, and Charvoz (2014) implied that students who reveal misconceptions earlier, allowing teachers to adjust instruction accordingly, exhibit increased self-confidence of their work. They were also able to think more critically when images were used as a tool to convey meaning in instruction. “If teacher educators do not understand their learners’ needs, then their instructional approaches will be hit-or-miss” (Davis, Petish, & Smithey, 2006, p. 608). Positive concept mapping results in this area have been observed internationally. One study, set in an algebra course involving eighth-graders from China, found gaps and misconceptions in students’ understanding once the students displayed their knowledge structure about algebraic concepts in the form of a concept map. The researchers suggested that future math educators modify the current instructional design practices to attend to these gaps (Jin & Wong, 2015). A mixed-methods study examined the use of concept mapping versus traditional methods of teaching and learning at a Jamaican university in a biology course. They found that the teachers using concept maps reported they could see misconceptions with their students’ thinking more efficiently and were able to modify instruction quickly to address these errors (Bramwell-Lalor & Rainford, 2014). Moreover, students and teachers involved in the qualitative portion of this study expressed positive experiences with concept mapping (Bramwell-Lalor & Rainford, 2014).

Student Achievement. Another important finding of Jin and Wong’s (2015) and Bramwell-Lalor’s (2014) studies is that student learning gains did increase significantly in the experimental groups compared with the control groups. Concept mapping continues to yield positive results regarding student achievement in a variety of content areas with various age
groups. A literature review involving 55 previous studies involving concept mapping and student achievement found that “the majority of learners (regardless of grade levels or age) have experienced significant academic achievement benefits from [concept map] use” (Martin et al., 2015, p. 41). One specific study investigated the integration of concept maps with fifth-graders to determine whether there was an impact on students’ learning achievement in an internet safety course. The research indicates that during instruction, students’ achievement level was significantly raised when using concept mapping versus traditional image and text (Sun & Chen, 2016). Similarly, a nursing college assessed nursing students’ learning with either a concept map or a traditional quiz after each class session for 14 weeks. Those participating in the construction of concept mapping each class period revealed higher learning gains (Jaafarpour et al., 2016). Another nursing study involving first-year nursing students studying CPR mirrors these results. Researchers in that study compared concept map-based teaching methods to a lecture-based approach and found that students in the concept map-based methodology performed higher when practicing CPR techniques (Pishgooie, Abdi, Mazhari, & Nazari, 2019). Another study involving Taiwanese sixth-graders in a social studies course had students work on problem-solving while searching the Web for information. These students were split between a control group that used a conventional approach of summarizing the information found on the Internet and a treatment group that used an incomplete concept map provided by the instructor to fill in the missing nodes. This fill-in-the-blank map allowed the treatment group’s information to be organized in a meaningful way. The treatment group’s academic performance was significantly positively impacted by the concept mapping treatment compared with its counterparts. The incomplete maps “played the role of helping the students organize the searched information and their prior
knowledge during the learning activity, which could help them clarify possible misconceptions” (Hwang et al., 2014, p. 83).

Numerous studies have been performed utilizing concept mapping procedures during high school science classes, and each study found favorable results. These studies found that student achievement was higher when students interacted with their science content with concept maps. In addition, the secondary students that utilized this tactic were more likely to retain the information longer. Subjects reported that the mapping helped them link their ideas and make connections to the concepts, which compounded their ability to think critically and deeper (Ajaja 2013; Kinchin, 2000). These studies implied that concept mapping in science enables meaningful learning and echoes the recommendations from another study that involved nursing students: “With respect to the major benefits of concept maps in improving academic achievement, it is essential to adequately train and encourage students on using concept maps as a learning strategy” (Jaafarpour et al., 2016, p. 132).

**Critical Thinking Skills.** In addition to identifying misconceptions and student achievement gains, concept mapping has been shown to produce favorable results in developing students’ critical thinking skills in a variety of subject areas among an assortment of ages. Research involving fifth-graders participating in physical education sought to identify the effects of concept mapping on these elementary school students’ critical thinking. The study found that the students in the treatment group developed more sophisticated critical thinking skills in a physical education setting than their peers in the control group (Huang et al., 2017). Research found a significant increase in kindergarteners’ critical thinking skills when engaged in collaborative concept mapping techniques (Sundararajan, et al., 2018). Echoing the findings of another study, “concept maps can be employed not just as a means of gathering data, but also as
a useful teaching tool with which to help students make connections between elements of system knowledge that they have encountered in different contexts and at different times” (Tripto et al., 2017, p. 94). Researchers conducted a systematic meta-analysis of research involving the impact of concept mapping techniques on critical thinking in nursing education and reported that their analysis on the previous literature supported that concept mapping methodology improves critical thinking abilities with nursing students (Yue et al., 2017).

**Delivery Mediums Available.** Concept mapping can be executed successfully by traditional paper/pencil methods or using a computer-based software program. Flanagan and Bouck (2015) compared a group of high school students’ writing after utilization of concept maps as an instructional strategy. Students were placed in either a paper/pencil concept map group or a computer-based program to create concept maps. The researchers found that even though students may prefer computer-based programs, “both forms of concept mapping supported students equally” (p. 250). Stevenson et al. (2017) performed a literature review focused on concept mapping technologies in science education in primary and secondary school settings. They reported, in terms of cognition, that concept mapping provides many benefits, including serving as a strategy for organizing learning, a visualization tool that improves achievement, and a promotion of problem-solving “regardless of technology” (p. 9). One study with medical students compared the traditional text format of notetaking with a computer-based concept mapping approach that allowed the learners to present their map visually. The researchers found that those in the concept mapping treatment group showed improved learning through problem-solving. Further, their study deems reflection important in learning, but novices have difficulty “elicit[ing] complex ideas in a meaningful way,” and this struggle is “often underestimated by instructors” (Wang, Wu, Kirschner, & Spector, 2018, p. 457).
Preservice Teachers’ Knowledge of Concept Maps. The research is limited when discussing the use of concept mapping practices with elementary preservice teachers. Only one study was found targeting elementary preservice teachers; however, it analyzed competency in a physics course. The researchers collected concept maps from preservice teachers and concluded that concept mapping is beneficial for deeper learning for this group of learners (Koponen & Nousiainen, 2012).

Hattie’s (2012) meta-analysis of 349 concept mapping studies demonstrated that concept mapping almost always has a positive impact on student learning. However, only 53% of elementary preservice educators self-reported concept mapping in their personal elementary/secondary science schooling in Subramaniam and Esprívalo Harrell’s (2015) study. Also revealing, almost everyone in their 200-person study was categorized as possessing inadequate skills to construct concept maps, whether they had been exposed to concept maps previously or not (Subramaniam & Esprívalo Harrell, 2015): “There remains a gap in the literature that specifically investigates prospective teachers’ knowledge about constructing concept maps” (p. 218).

Perceptions with Concept Mapping

It has also been documented that novice in-service teachers struggle to identify instructional strategies that inform them of students’ preconceptions and misconceptions. Through focus group interviews, Cox et al. (2016) reported that even though secondary astronomy teachers knew the importance of incorporating students’ schemata into lessons, it was done at the surface level, if at all. Cox et al. also noted it is “important to increase the teachers’ awareness of student ideas and provide them with strategies to cope with the problem ... this topic could be more emphasized in teacher training programs for pre-service teachers” (2016, p.
Reiterating this finding, Seo et al. (2017) worked with secondary in-service teachers on misconceptions in photosynthesis: “It is interesting to note that while teachers’ perceptions of student misconceptions arise mostly from students’ knowledge construction process, teachers intend to implement instructional strategies with a focus on the content rather than the students who are constructing the knowledge around the topic” (p. 288). Once again, teachers’ approaches to tackling student misconceptions were found not to be based in a theoretical framework.

Utilization of concept mapping as an assessment tool “help[s] educators to understand whether students grasp the course material and can form meaningful connections” (Bauman, 2018, p. 219). Furthermore, when gaps in students’ knowledge are identified early, “professors can revise their lesson plans and lectures to ensure that either the sequence of presenting concepts or the depth of coverage is suitable to maximize students’ learning” (Bauman, 2018, p. 219).

One mixed-methods study involving high school students’ achievement in biology found that all the students interviewed in the concept mapping classroom perceived that concept maps helped them not only in the determination of the relationships among the concepts but also shaped their understanding of the concepts and increased their critical thinking (Ajaja, 2013).

**Summary**

Ausubel’s Theory of Meaningful Learning (1968) states that learning that is connected to prior knowledge is more meaningful to the learner and that learning is hierarchically involved. This theoretical framework coupled with the foundation of schema learning theory is used to analyze how concept mapping experiences influence preservice teachers’ construction of their perceptions with this instructional tool. “When we make the thinking that happens in classrooms visible, it become more concrete and real. It becomes something we can talk about and explore, push around, challenge, and learn from” (Ritchhart et al., 2011, p. 30). Research has shown that
past experiences and people’s support (or lack thereof) influence teacher candidates’ beliefs on teaching and learning. The greatest influences that shaped their ideals were from the people in their lives and their life experiences (Gilewski, 2016).

Utilizing concept mapping techniques may provide more connections to their lives and show the learners misconceptions they may possess from previous learning. The relationship between reflective practices and Ausubel’s meaningful learning theory is apparent through the definition of concept maps. “Concept maps are hierarchical, with broader, more general items at the top and more specific topics arranged in a cascade below them” (Ajaja, 2013, p. 6).

Furthermore, when reflective practices are utilized, the way our learners interact with content will change by changing behaviors and increasing learners’ metacognitive thinking. Once these strategies are implemented, “learning then becomes about connecting new ideas to one’s own thinking” (Ritchhart et al., 2011, p. 49).

As indicated by others, there is an extensive gap in the research:

Professional training for teachers in the use of concept maps is rarely mentioned in literature. This is an important area where teacher educators can make significant contributions by incorporating concept mapping into teacher education courses. These efforts could strengthen conceptual understanding among students to overcome the unfortunate common perception that mathematics is only about practicing skills in isolation. (Jin & Wong, 2015, p. 701)

Furthermore, “we suggest that in order to help students succeed both as learners and in life, teachers must provide explicit teaching for specific ideas that encourage students to engage in metacognitive thinking processes” (Tripto et al., 2017, p. 94).
Therefore, engaging in meaningful reflective practices such as concept mapping during teacher preparation courses in teacher education preparation programs will raise preservice teachers’ awareness of tools to incorporate student prior knowledge, provide a methodology for identifying their future students’ misconceptions, and aid in attending to the gap in knowledge of proper construction of concept maps to maximize the impact of this learning tool. This, in turn, could raise teacher effectiveness and future student achievement.
Chapter Three: Methodology

Teachers struggle to identify instructional strategies that address students’ preconceptions and misconceptions (Cox et al., 2016; Gomez-Zwiep, 2008; Halim & Meerah, 2002; Meyer, 2004; Sadler et al., 2010; Seo et al., 2017). Instructional practices that engage learners in an explanation of their thinking instead of recall of factual content is described as more effective and is more likely to induce shifts in conceptual change in the learner’s construction of knowledge (Akerson et al., 2019; Aydeniz & Brown, 2017; Novak & Gowin, 1984). Concept mapping has been shown as an effective instructional methodology that focuses on uncovering students’ preconceptions and helps identify their misconceptions (Bramwell-Lalor & Rainford, 2014; Novak & Cañas, 2006; Novak & Gowin, 1984), and a meta-analysis of 349 concept mapping studies demonstrated that concept mapping almost always has a positive influence on student learning (Hattie, 2012). It is important to understand the concept mapping experiences and perceptions of preservice teachers about concept mapping in order to guide instructional design for teacher preparation programs.

The purpose of this basic qualitative study is to describe the experiences and perceptions of concept mapping utilization during instruction with undergraduate, elementary preservice teachers. The theory guiding this study is Ausubel’s (1968) Theory of Meaningful Learning, which states learning that is connected to prior knowledge is more meaningful to the learner. He proposed organizing the new knowledge purposefully to help students link it to their current thinking (Ausubel et al., 1978). Concept mapping is a tool that links the abstract to the concrete through the methodical nodal connections (Novak & Gowin, 1984). Utilizing the instructional strategy of concept mapping with Ausubel’s theory has been widely accepted by researchers because it is a tool that can systematically depict the learners’ previous knowledge while
exposing misconceptions (Bauman, 2018; Cañas & Novak, 2006; Chiou, Tien, & Lee, 2015; Novak & Cañas, 2006; Novak & Gowin, 1984; Roessger, Daley, & Hafez, 2018; Yelich Biniecki & Conceição, 2016); however, research has found that novice teachers do not have specific instructional strategies intended for targeting student preconceptions and misconceptions (Cox et al., 2016; Gomez-Zwiep, 2008), and, when asked to construct concept maps, the majority of elementary preservice teachers possess inadequate skills to do so (Subramaniam & Esprívalo Harrell, 2015). Thus, I conducted a study that examines elementary preservice teachers’ experiences and perceptions with concept mapping usage during instruction to reveal insights on these gaps in knowledge. This study was guided by the following research questions:

1. What are elementary education preservice teachers’ experiences with concept mapping?
   1a. What are their prior experiences before being accepted to Residency?
   1b. What are their experiences during Residency?

2. What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction?
   2a. What is their perception of their knowledge of concept mapping?
   2b. What do they perceive are the barriers and benefits of concept mapping?
   2c. How confident are elementary education preservice teachers in implementing concept mapping into their own classroom?
   2d. How do they perceive they would, if at all, implement it in their future classroom?

The Investigation Plan

A qualitative approach was used for this study because I was interested in understanding the construction of participants’ experiences and perceptions of concept mapping. This study’s
goals align with Merriam and Tisdell’s (2016) definition of qualitative research as “understanding the meaning people have constructed” (p. 15). Qualitative research’s origins date back many centuries but really began evolving around the 1900s to address explorations of experiences that did not innately have a single correct answer, could be evolving, could be messy, and deal with human complexity (Savin-Baden & Howell Major, 2013). Qualitative research is described as having an emic perspective, describing behaviors that have meaning to the subject, which this study attempts to uncover with its participants. In the 1920s and 1930s, limitations of quantitative approaches were being discussed, noting that one’s experiences can form opinions and influence behaviors. By the 1960s, academics began pursuing novel approaches to conducting social research that accentuated the subjectivity of knowledge. “Researchers saw that individuals were aware of themselves and their relationship to others. They also believed that people made deliberate choices about how to behave in different situations” (Savin-Baden & Howell Major, 2013, p. 6). Since this study does not test connections between an action and a reaction, a qualitative approach was chosen because it does not test for cause-and-effect relationships. However, qualitative research can address questions related to one’s viewpoints and perceptions while situated within a philosophy, as is this study’s intended purpose. Some other features of qualitative research and this study are:

- The researcher is the primary data collector.
- Research examines the phenomena in a natural setting.
- Multiple constructed perceptions are acknowledged.
- Since the researcher has direct contact with the participants, he or she must exhibit respect and is bound by ethical practices of the field.
This study and qualitative research focus on understanding people and how they make meaning. The guiding philosophy of qualitative research is positivistic and focuses on multiple realities, whereas quantitative has several philosophical options and focuses on a single reality. Researchers must make choices when conducting qualitative research and embed a philosophical position to frame the phenomenon of their research. Qualitative research must likewise choose a theoretical framework, methodology, research approach, and instrument(s) of measure. Individuals are the most common phenomenon of qualitative research because researchers most often investigate people’s beliefs, perceptions, and opinions (Merriam & Tisdell, 2016; Savin-Baden & Howell Major, 2013). This study possessed all the required components of a qualitative approach.

A basic qualitative design was chosen since this study’s purpose is to gain an understanding of preservice teachers’ perceptions of concept mapping usage, and basic qualitative studies focus on “how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences” (Merriam & Tisdell, 2016, p. 24). A basic qualitative study was more appropriate than other qualitative designs because this study aimed to find a comprehensive understanding of an educational process, whereas narrative, grounded theory and phenomenological studies are not designed to examine a process. Case studies examine a particular bounded case or situation, which does not describe the design of this study, as it is interested in “understanding the meaning a phenomenon has for those involved” and “to understand how people make sense of their lives and experiences” (Merriam & Tisdell, 2016, p. 24). This study aimed to understand the experiences and perceptions of individuals as a group and does not position itself to solve a problem, since action research studies “engage in problem solving through a cyclical process of thinking, acting, data gathering, and reflection”
(Savin-Baden & Howell Major, 2013, p. 245). Further attesting to the appropriateness of this study’s design, basic qualitative studies are most common in educational fields (Merriam & Tisdell, 2016), and other educational research specifically examining preservice teachers’ perceptions has utilized this basic qualitative design (Mims, 2004; Sherwood & Reifel, 2010; Seung, Park, & Jung, 2014; Smith, 2018; Somers, 2009).

Although there are many studies addressing concept mapping in education, many are quantitative studies that address teaching science topics through concept mapping techniques (Çelik & Pektaş, 2017; Czerniak & Haney, 1998; Martinez-Borreguero, Pérez-Rodríguez, Suero-López, & Pardo-Fernández, 2013; Safar, Jafer, & Alqadiri, 2014) or are focused on K-12 student achievement when concept mapping is utilized (Balım, 2013; Bourke, Buskist, & LoBello, 2013). Quantitative or mixed-methods studies have been conducted that address using concept maps as an assessment tool in science education (Cavlazoglu & Stuessy, 2017; Lopez, Shavelson, Nandagopal, Szu, & Penn, 2014; Won et. al, 2017), but they do not attempt to understand one’s prior experiences or perceptions of concept mapping in education. Their focus instead is on how concept mapping was used as an assessment tool to examine the learners’ conceptual knowledge. Qualitatively, research has been conducted to study preservice teachers’ perception in a variety of education-related topics (Chung-Parsons & Bailey, 2019; Kazempour, 2018; Yukselturk & Altıok, 2017; Ulukök, Bayram, & Selvi, 2015; Underwood & Mensah, 2018), but these do not focus on preservice teachers’ perceptions or experiences with concept mapping. Based on my review of the current published literature, the only previous qualitative research that has been conducted with preservice teachers and concept mapping experiences focused on preservice teachers’ usage of concept mapping in relation to their conceptual understanding of a given scientific topic (Subramaniam & Esprívalo Harrell, 2013; Subramaniam
& Esprívalo Harrell, 2015; Tuttle et al., 2016), not their previous concept mapping experiences or perceptions of concept mapping. While quantitative and qualitative studies exist that discuss implementation of concept mapping with preservice educators in various forms, they are sparse. A gap exists in the current literature in understanding preservice elementary teachers’ constructions of perceptions of concept mapping and experiences with concept mapping techniques in instruction and delivery. This further establishes the suitability of the design selection for this study.

There are no ethical or financial conflicts of interest for this study; however, some limitations should be noted. This study focused on the experiences of preservice teachers at one university and did not include the general population, which should be considered a limitation. Increasing the number of teacher preparation programs would increase the credibility and generalizability of this study. Furthermore, since this study is qualitative and the participants self-reported their experiences, it would be virtually impossible to independently verify information conveyed during interviews. Member checking and triangulation with a focus group were utilized to help verify as much data as possible; however, inaccurate self-reporting may occur in the form of selective memory, remembering an accurate event but on an inaccurate timeline, crediting positive experiences to oneself and negative experiences to an outside source, and/or embellishment. Another important limitation to note is that the interview protocols were designed specifically for this study. Using interview protocols that were previously vetted and credible would further increase the trustworthiness of this study.

My motivations for completing this study are to assist in improving my own processes as a teacher educator. I currently teach elementary methods courses at a local public university and am constantly reviewing my own practices to help ensure my teaching methodologies are
relevant and effective. The use of concept mapping as an instructional tool is a new methodology for me as an instructor. In the past, I only briefly mentioned this tool as a resource and assigned reading associated with the background information on concept maps. I had not formally and explicitly taught my students about this tool and how to use it prior to my research because I assumed students had previous experience with concept mapping. As recommended by Merriam and Tisdell (2016) to mitigate my own biases in this study, I triangulated the data by using more than one source of data to cross-check information obtained from the individual interviews’ data analysis. I had participants review the results of the individual interview data analysis in a follow-up focus group that was held at a different time and place than the individual interviews. Furthermore, using Lichtman’s (2012) criteria, I have been clear, comprehensive, and transparent about my role as the researcher, my existing relationships with the participants, and the procedures of the study. Finally, since I am a beginning researcher, a more experienced researcher may have been able to more fluidly create supplemental questioning based on the interviewees’ responses.

Participants

Non-probability, convenience, and homogeneous sampling techniques were utilized to select participants for this study. First, participants were chosen by convenience, since the target population for this study is a teacher preparation program that I, as the researcher, had access to, and the first participants that responded were included in the study. Then, homogenous sampling, a purposive sampling technique, was used since potential participants from the university were invited to participate that were: (a) over the age of 18; (b) categorized as being a first-semester senior from an undergraduate, elementary teacher preparation program; (c) had completed their required general education and teacher preparation courses, which exposed them to concept
mapping as an instructional strategy; and (d) had only had a residency seminar course and a
yearlong residency of student teaching to complete before graduation. Selection concluded when
seven preservice teachers opted in. Table 1 displays participants’ demographics.

Table 1
Self-Reported Demographics of Participants

<table>
<thead>
<tr>
<th>Gender</th>
<th>Race</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>White</td>
<td>21</td>
</tr>
<tr>
<td>Male</td>
<td>Black</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23</td>
</tr>
</tbody>
</table>

Recommended sample sizes in qualitative studies vary and can be justified by different
methodologists, precedent of previous research, and internal justification by the researcher
(Marshall, Cardon, Poddar, & Fontenot, 2013). Although methodologists differ on their
recommended sample size from qualitative research, it ranges from three to 50 (Marshall et al.,
2013; Savin-Baden & Howell-Major, 2013). This study’s sample size of seven complies with
other qualitative studies that conducted one-to-one interviews of preservice teachers about their
perceptions. These previous studies have sample sizes that range from five to eight (Cetinkaya,
2019; Hite et al., 2019; Mims, 2004; Smith, 2017). Finally, since the researchers’ time is another
factor in determining sample sizes for qualitative research (Creswell, 2015; Savin-Baden &
Howell Major, 2013), this study was limited to two weeks for data collection due to the time
constraints of the program and the Institutional Review Board (IRB) approval process. The
sample size and number of interviews, one-to-one and focus group-wise, were appropriate r
because they provided sufficient coverage in understanding experiences and the purpose of the
qualitative study (Merriam & Tisdell, 2016; Creswell, 2015; Gall, Gall, & Borg, 2007).

Setting

This study was conducted at a state-accredited, public four-year university in an urban
area of the Mid-South region of the U.S. The undergraduate teacher preparation program of this
university meets the U.S. Department of Education’s (USDE, 2016) existing definition for identifying a teacher preparation program as “a program, whether traditional or alternative route, offered by a teacher preparation entity that leads to initial State teacher certification or licensure in a specific field” (p. 75,616) and on in which the state “assess[es] and report[s] on the performance of individual teacher preparation programs” (p. 75,496). The university is accredited by the Southern Association of Colleges and Schools Commission on Colleges, which is recognized as a regional accreditation organization by the USDE and Council for Higher Education Accreditation and accredits public and private educational institutions from preschool to higher education in the Southern region of the U.S. (“Accreditations,” 2019; “Commission on Colleges,” 2006). The College of Education at this site is accredited every five years through a rigorous outside assessment using given standards of the Council for the Accreditation of Educator Preparation (CAEP), which is recognized by the USDE and National Council of Accreditation of Teacher Education (NCATE) (“Accreditations,” 2019; “CAEP,” 2015). Concept mapping is introduced to elementary preservice teachers in their second semester of junior year during science methods and used more in-depth during an assessment course taken during first semester senior year. This public four-year university was chosen for this project because I, the researcher, had access to these students based on place of employment.

The data collection was held in two different settings: The one-to-one interviews were conducted in a quiet and private office at the public university; the focus group interview was conducted at the university in a private and reserved conference room.

**Data Collection Methods**

I obtained IRB permission for each of the participants from the proper board associated with the sample of participants used in this study (see Appendix A). Through approved IRB
protocol that protects human subjects, I formally requested the names of learners that met the initial criteria (undergraduate, senior, elementary education major, and admitted into Residency I). I individually emailed potential participants that met the criteria above, and I provided them an overview of the study, time commitments, and consent letter (see Appendix B and Appendix C). Each participant had the opportunity to decline or accept participation via email without consequence or reward. Once they offered their consent, participants emailed me a time that they would be able to be individually interviewed. The first respondents were accepted into the study. Saturation of the data was reached after the seventh interview, so the first seven respondents were included in this study. Before the start of the individual interview, each participant was provided again with an overview of the research project and an opportunity to provide or decline consent through a letter. There were no physical risks associated with this research, and participants were advised there would not be any consequences if consent was not afforded. The focus group interview was decided based on availability. I emailed a Doodle poll to all participants to determine the most convenient time for as many as possible (see Appendix D). Four participants were able to make one of the times. The focus group interview involved these four participants and was held on the university’s campus in a quiet, private conference room.

One-to-one interviews and a focus group interview were used in the research portion of this study. The one-to-one interview is an integral part of qualitative research and takes place between two people. For this study, semi-structured one-to-one interviews, which follow a set of questions but also add additional questions depending on where the conversation is going, were used for the first round of data collection. One-to-one interviews were chosen for the first round of data collection instead of focus groups to help eliminate any influence from outside sources (Savin-Baden & Howell Major, 2013). These semi-structured interviews were audio-recorded
using the password-protected app Otter.ia with a password-protected iPad, and I took written notes to supplement the interviews (Savin-Baden & Howell Major, 2013). Figure 3 is a screenshot of one of the audio recordings. The one-to-one interviews were planned to last around 60 minutes, which is within the recommended timeframe for qualitative studies. Interviews lasting 60 to 90 minutes potentially avoid questions that are over-empathetic, manipulative, or leading (Savin-Baden & Howell Major, 2013). However, none of the interviewees had an experience to report, which encompassed questions 4, 5 and 6 in the individual interview protocol, so the individual interviews lasted on average 30 minutes. I created the interview questions and an interview protocol to best serve the purpose of this study and offered mostly open-ended questions to elicit rich responses (see Appendix E). The interview protocol included
a header, script, question set, and closing. Table 2 demonstrates how each interview question related to this study’s research questions.

Demographic information was collected at the end of each individual interview. This data collection round of semi-structured interviews involved initial and in-depth questions. During the interviews, I used the member check technique, or “verification of interpretation,” to improve the credibility and trustworthiness of the data by restating or summarizing an answer to verify the validity and accuracy of given answers (Savin-Baden & Howell, 2013, p. 477). These techniques align with Lincoln and Guba’s (1985) criteria for establishing credibility. After the conclusion of each interview, I transcribed the interviews within 24 hours, coded them based on responses, and organized the codes into themes.

After all individual interviews were conducted, I led a focus group interview using a protocol with four of the participants to determine whether the participants remembered any other experiences since the first interview and to ask any clarifying follow-up questions that

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Individual Interview Items Correspondence with Research Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview Question</td>
<td>Research Question Addressed</td>
</tr>
<tr>
<td>Describe concept mapping.</td>
<td>2a, 2b</td>
</tr>
<tr>
<td>Is concept mapping important? Why or Why not?</td>
<td>2a, 2b</td>
</tr>
<tr>
<td>When could/should concept mapping be used?</td>
<td>2a, 2b, 2d</td>
</tr>
<tr>
<td>In what capacity have you used concept mapping before Residency?</td>
<td>1a</td>
</tr>
<tr>
<td>Describe your experiences with concept mapping before Residency.</td>
<td>1a</td>
</tr>
<tr>
<td>Why do you think your instructor used concept mapping during your experiences?</td>
<td>1a, 2a, 2b</td>
</tr>
<tr>
<td>When, if at all, have you utilized concept mapping during Residency?</td>
<td>1b</td>
</tr>
<tr>
<td>Describe your experiences with concept mapping during Residency.</td>
<td>1b</td>
</tr>
<tr>
<td>Why did you use concept mapping in that capacity?</td>
<td>1b, 2a, 2b</td>
</tr>
<tr>
<td>How comfortable do you feel implementing concept mapping? Why?</td>
<td>2b, 2c</td>
</tr>
<tr>
<td>How, if at all, did utilizing concept mapping influence your self-confidence in teaching?</td>
<td>2a, 2b, 2c</td>
</tr>
<tr>
<td>How, if at all, do you plan on utilizing concept mapping in your future classroom?</td>
<td>2a, 2b, 2c, 2d</td>
</tr>
</tbody>
</table>
other experiences since the first interview and to ask any clarifying follow-up questions that emerged from the initial data collection and coding of themes (see Appendix F). Furthermore, I used the member check strategy to verify the themes that emerged by presenting and discussing them with the focus group participants for accuracy and to correct any misinterpretation on my part. Table 3 demonstrates how each focus group question related to this study’s research questions. One participant arrived 23 minutes late. All participants stayed until the end. It lasted 59 minutes. The focus group interview was recorded and reviewed for keywords and phrases. Focus group interview sizes are recommended to range from four to twelve participants (Creswell, 2015; Savin-Baden & Howell Major, 2013). This study complies with this recommendation since four of the seven initial participants were available to participate. Focus group interviews were utilized instead of surveys because this tactic allows researchers “to collect shared understanding from several individuals” and allowed me to triangulate the data received from one-to-one interviews (Creswell, 2015, p. 504). The focus group interview was recorded, and memos were noted during the interview. After the interview, I listened to the audio recording four times for keywords and noted participants’ behaviors to the written memos. (For example, I noted areas in which participants laughed after their comment or another participant’s comment.) Qualitative data can be organized in many ways, including arranging the emerged themes from most common to least common (Sandelowski, 2000). Using this methodology, the codes were organized into common themes and sorted from most prevalent to least prevalent.

My relationships to the participants volunteering for this study were varied. However, regardless of which participants had opted in, there would have been similar previous relationships for all eligible potential participants that met the criteria of this study. I was the instructor for all participants for two courses during their teacher preparation program. One
course took place during the second semester of their junior year, and one course took place during the first semester of their senior year. One participant was a prior student of mine for an additional class when she was a second-semester sophomore. For five of the participants, during their junior-year clinical placement, I served as site coordinator, a liaison for the university and local school system, for one semester. For one participant, I was her site coordinator for both

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Focus Group Interview Items Correspondence with Research Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview Question</td>
<td>Research Question Addressing</td>
</tr>
<tr>
<td>As a group, define/contribute concept mapping.</td>
<td>2a</td>
</tr>
<tr>
<td>Since we last spoke, does anyone have anything new they remembered about concept mapping?</td>
<td>1a, 1b, 2a, 2b</td>
</tr>
<tr>
<td>Since we last spoke, does anyone have anything new they experienced regarding concept mapping?</td>
<td>1b</td>
</tr>
<tr>
<td>Show the focus group the themes that emerged from the individual interviews for each research subquestion, and ask:</td>
<td>Member check/triangulation for 1a, 1b, 2a, 2b, 2c, 2d</td>
</tr>
<tr>
<td>• Are there any questions about the organization of the themes?</td>
<td></td>
</tr>
<tr>
<td>• Are there any concerns about the organization of the themes?</td>
<td></td>
</tr>
<tr>
<td>• Is there anything that is out of place or missing?</td>
<td></td>
</tr>
<tr>
<td>• Is there anything to add?</td>
<td></td>
</tr>
<tr>
<td>• Are there any comments about the themes?</td>
<td></td>
</tr>
<tr>
<td>• Are there any other ways the themes could be arranged?</td>
<td></td>
</tr>
<tr>
<td>Here is an example of some exposure you may have gotten before your Residency year. Does this trigger any new experiences or memories? [Researcher showed students readings from their junior year science methods course that discuss concept mapping in science.]</td>
<td>1a</td>
</tr>
<tr>
<td>Here is some of the work each of you described as an experience you had after entering Residency. Does this trigger any new experiences or memories? [Researcher gave each attendee the concept maps they worked on during a course on assessments in their first semester of their Residency year.]</td>
<td>1b</td>
</tr>
</tbody>
</table>
junior semesters. For one participant I was not her site coordinator at all in her junior year clinical placement. I also served as site coordinator for all seven participants for one semester in their senior year. Participants were reminded and informed at every contact point that they could decline to participate at any time and any decision or answers would not affect their relationship with the researcher nor would their participation or lack thereof affect anything relating to their Residency placement.

As the primary researcher, I must self-reflect and analyze my personal stances, beliefs, and perspectives because, if I am oblivious to those beliefs, this research may be affected and skewed. Personal stances may influence actual decisions about how to conduct the research or the choice to conduct it at all. Reflexivity “helps researchers to consider their position and influence during the study, and it also helps them to know how they have constructed and even sometimes imposed meanings on the research process” (Savin-Baden & Howell Major, 2013, p. 76). In order to maintain reflexivity in this study, I kept a reflective journal, making entries during the research process that noted systematic and logistical choices and rationales behind them (Savin-Baden & Howell Major, 2013).

Ethical considerations have been identified and controlled throughout this study. Participants were not subjected to any physical or mental harm. All participants had the opportunity to provide consent without any consequences for declining. Data collection information was stored in a locked filing cabinet in a locked office to ensure confidentiality. Pseudonyms have been used to guarantee anonymity.

Creditability and Trustworthiness

As described throughout the chapter, the following techniques were used to build credibility and trustworthiness:
Analysis

Many coding approaches exist in qualitative research; however, for this study, King and Horrocks’ (2010) three-stage thematic analysis method was utilized to analyze the interviews while simultaneously using the constant comparison method. The three-stage analysis approach involves conducting descriptive coding and interpretive coding and then pinpointing comprehensive themes. The constant comparison approach was originally generated with grounded theory qualitative studies but has been adapted for many qualitative approaches and “is one of the most frequently used analytical methods of qualitative data analysis” (Savin-Baden & Howell Major, 2013, p. 437.) The primary process for constant comparison includes: (a) identifying categories; (b) open coding; (c) constantly comparing those codes to find cohesion or irregularities in the data; (d) investigating patterns to uncover other codes; (e) continuing until saturation is reached; and (f) determining the axial coding (Miles & Huberman, 1994; Savin-Baden & Howell, 2013). Further attesting to the appropriateness of this analytical method for this study, Merriam and Tisdell (2016) state, “The majority of qualitative theses and dissertations use the constant comparative method” (p. 297). For my preliminary analysis, I transcribed each individual interview within 24 hours and listened to the audio recordings multiple times. Then, I
began King and Horrocks’ (2010) Stage 1 for the individual interviews. I felt saturation of the data occurred after interviewing the seventh participant and using the constant comparison method because no new themes were being exposed (Miles & Huberman, 1994; Savin-Baden & Howell Major, 2013).

**Stage 1 — Descriptive Coding**

Descriptive coding was utilized in the study because the purpose is to describe the participants’ experiences. Since data analysis’ objective is to divide data into meaningful chunks for the purpose of investigating them, coding was chosen because it “makes it easier to search data, make comparisons and identify patterns worthy of further investigation” (Savin-Baden & Howell Major, 2013, p. 422). The first step of this data analysis involved open coding procedures and a keyword/phrase analysis with me highlighting important keywords and phrases as I read through the transcripts. A descriptive label, usually in the form of a noun, was determined for the data set that included aspects that emerged such as behaviors, experiences, patterns, relationships, etc. Single words or phrases were sought by exploring terms that were frequently repeated, terms that were used in an unusual manner, and the contextual words surrounding identified keywords. After manually highlighting keywords and phrases, I created an Excel spreadsheet by copying and pasting all the highlighted words and phrases relevant to this study and separated the data by research question and individual participant. See Figure 4 for an example of “Jean’s” keywords from the individual interview questions that correlated with Research Question 1.
<table>
<thead>
<tr>
<th>Name: Jean</th>
<th>Highlighted Keywords/Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research Question 1.</strong> What are elementary education preservice teachers' experiences?</td>
<td>I really don't know if I have prior experiences before being accepted to Residency?</td>
</tr>
</tbody>
</table>

1a. What are their prior experiences before being accepted to Residency?

<table>
<thead>
<tr>
<th>RQ 1a</th>
<th>Interview Question:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What are their prior experiences before being accepted to Residency?</td>
<td>experiences?</td>
</tr>
<tr>
<td>I really don't know if I have prior experiences before being accepted to Residency?</td>
<td></td>
</tr>
</tbody>
</table>

1b. What are their experiences after being accepted to Residency?

<table>
<thead>
<tr>
<th>RQ 1b</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1b. What are their experiences after being accepted to Residency?</td>
<td>experiences?</td>
</tr>
<tr>
<td>coursework</td>
<td></td>
</tr>
<tr>
<td>strategies</td>
<td></td>
</tr>
<tr>
<td>individualized</td>
<td></td>
</tr>
<tr>
<td>personal life</td>
<td></td>
</tr>
<tr>
<td>outline</td>
<td></td>
</tr>
<tr>
<td>routine</td>
<td></td>
</tr>
<tr>
<td>graphic organizer</td>
<td></td>
</tr>
<tr>
<td>personal life</td>
<td></td>
</tr>
<tr>
<td>Yea</td>
<td></td>
</tr>
<tr>
<td>meaningful</td>
<td></td>
</tr>
</tbody>
</table>

See Figures 5, 6, and 7 for examples of the word cloud for Research Question 1b using 10 keywords, 15 keywords, and 20 keywords respectively.

Figure 4
Example of Stage 1 Coding with Jean’s Individual Interview.

Then, I used TagCrowd’s word cloud technology to provide a visual of each participant’s transcripts individually, a combination of all the transcripts together, and each research subquestion. Additionally, I created a visual that had 10 keywords, 15 keywords, and 20 keywords for each. See Figures 5, 6, and 7 for examples of the word cloud for Research Question 1b using 10 keywords, 15 keywords, and 20 keywords respectively.
In current research, a word cloud is described as a tool that could be used as “an initial step in homing in on the important concepts identified” by participants because “the researcher would already have an idea of which terms or ideas are most common and would therefore warrant closer investigation” (DePaolo & Wilkinson, 2014, p. 42). Since word cloud methodology is only recommended as an initial tool for quickly identifying keywords for
analyzing qualitative research, I then reviewed the highlighted words from the transcripts to compare with the visual created with TagCrowd to ensure I did not exclude any keywords and to determine the relevance of the words that emerged as the most common (Savin-Baden & Howell Major, 2013).

**Stage 2 — Interpretive Coding**

In the second cycle of coding, axial coding procedures were utilized to make connections to the initial coding categories. As codes emerged in the compiled Excel keyword document, I organized them into a different Excel document that was categorized by research question, not participant, as shown in Figure 8. Then, I color-coded like ideas into categories, which moved the individual codes into more general patterns within the codes constructed (Savin-Baden & Howell Major, 2013). My goal was to reduce the initial list of codes to around 25 to 30 for each research question, as recommended by Creswell (2015), and I achieved this.

**Stage 3 — Themes**

In the final stage of analysis, six total themes were identified from the interpretive codes to provide a structural overview of the information uncovered in the interviews. Creswell (2015) recommended finding five to seven themes to uncover and report the most frequent, unique, expected, and/or most evidence-backed ideas. During the coding, categorization, and theme development, I kept a code list of the meanings of the codes and categories found to continue to best organize the data set, as depicted in Figure 9 (Savin-Baden & Howell Major, 2013). These themes were presented to the focus group to member check the data and determine accuracy of grouping the interpretive codes under the created themes (see Figures 12 and 15 in Chapter 4). I listened to the focus group’s audio multiple times to ensure I was capturing the data accurately. I also kept a researcher journal to document my thought process through each stage of coding.
As Figure 10 notes, I changed some verbiage of the emerged themes and subthemes throughout and noted why. For example, as Figure 10 notes, I initially had a subtheme for Research Question 1 that was described as “Connections,” but after reviewing the interviews again, I realized it was more accurate to label the subtheme “Making Connections” because participants were identifying the connections made with the concepts as important, not the actual lines connecting concepts. The following chapter describes each of the themes in further detail.
### 1b. What are their experiences after being accepted to Residency?

<table>
<thead>
<tr>
<th>Theme: Past Experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breaking Down Ideas</strong></td>
</tr>
<tr>
<td>Sub-Themes Emerged (Stage 3)</td>
</tr>
<tr>
<td>Broken down</td>
</tr>
<tr>
<td>Big ideas</td>
</tr>
<tr>
<td>scaffold</td>
</tr>
<tr>
<td>specific</td>
</tr>
<tr>
<td>start off general</td>
</tr>
<tr>
<td>big topic</td>
</tr>
<tr>
<td>foundation</td>
</tr>
<tr>
<td>big ideas</td>
</tr>
<tr>
<td>broken down</td>
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<tr>
<td>scaffolding</td>
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<td>scaffold</td>
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<td>broken down</td>
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<tr>
<td>broken down</td>
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<tr>
<td>chunk</td>
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<tr>
<td>broaden</td>
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<tr>
<td>break it down</td>
</tr>
<tr>
<td>big Ideas</td>
</tr>
<tr>
<td>modeling</td>
</tr>
<tr>
<td>broke it down</td>
</tr>
<tr>
<td>specific</td>
</tr>
<tr>
<td>start</td>
</tr>
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</tr>
<tr>
<td>Connections</td>
</tr>
<tr>
<td>related</td>
</tr>
<tr>
<td>misconception</td>
</tr>
</tbody>
</table>

*Figure 9*

Example of Stage 3 Coding with RQ1b.
Excerpt from Researcher’s Journal Explaining How RQ1b’s Subtheme Went from “Connections” to “Making Connections.”
Chapter Four: Results

The purpose of this study was to examine elementary preservice teachers’ experiences and perceptions of the usage of concept mapping as a tool in instruction. For the purpose of this research, concept maps are defined as a visual representation that organizes labeled concepts hierarchically to include general concepts at the top of the map, while specific and focused ideas are organized below the inclusive concepts. These concepts are linked through lines and propositions. A proposition is defined as a descriptive word that declares the relationship between two concepts that are linked (Novak & Gowin, 1984). Specifically, the research questions for this study were:

1. What are elementary education preservice teachers’ experiences with concept mapping?
   1a. What are their prior experiences before being accepted to Residency?
   1b. What are their experiences during Residency?

2. What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction?
   2a. What is their perception of their knowledge of concept mapping?
   2b. What do they perceive are the barriers and benefits of concept mapping?
   2c. How confident are elementary education preservice teachers in implementing concept mapping into their own classroom?
   2d. How do they perceive they would, if at all, implement it in their future classroom?

Seven semi-structured individual interviews and a semi-structured focus group interview with four attendees were used to collect data for these research questions. The quotes from each participant are reported as they were spoken with the removal of “um,” excessive usage of the
word “like,” and the repetition of “you know” to help with readability. See Table 4 for a chart of the demographic make-up of the participants.

Table 4
Self-Reported Demographics of Participants as a Group

<table>
<thead>
<tr>
<th>Number of Participants</th>
<th>Age</th>
<th>Number of Participants</th>
<th>Race</th>
<th>Number of Participants</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>21</td>
<td>2</td>
<td>Black</td>
<td>7</td>
<td>Female</td>
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<tr>
<td>3</td>
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<td>1</td>
<td>23</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

The participants’ pseudonyms are not associated with their self-reporting demographical information, as this could be an identifier, since only one participant is of a certain age. This was done to protect the confidentiality of each participant. This chapter outlines the findings from the study, and the following chapter provides an interpretive analysis and discussion of these findings. This study’s purpose was to examine a small sample of elementary preservice teachers from one location and was not intended to report findings that apply to all elementary preservice teachers.

This chapter is organized by the research questions and six themes that emerged: (1) past experiences; (2) definition of concept mapping; (3) perceived educational value; (4) perceived barriers in implementation; (5) preservice teachers’ self-efficacy; and (6) perceived future implementation. There is some data that transcends themes, which is not uncommon in qualitative research. The final section details a summary of the findings.

Results

Theme 1 — Past Experiences

This theme is associated with the first research question: What are elementary education preservice teachers’ experiences with concept mapping?
1a. What are their prior experiences before being accepted to Residency?

1b. What are their experiences during Residency?

This question relied solely on participants’ prior experience with concept mapping before the last year of their undergraduate career and during their last semesters as an undergraduate. Resulting data was organized into five subthemes that participants used to describe their experience with concept mapping: (1) no experience before Residency; (2) breaking down ideas; (3) making connections; (4) meaningfulness; and (5) ongoing.

**No Experience Before Residency.** None of the participants had had a memory or experience before Residency with concept mapping as defined in this research. This time period included any K-12 experiences and collegiate experiences. A few participants reported working with graphic organizers similar to concept mapping, but none of these experiences used linking words, or propositions, to describe the relationships. Also, many of these graphic organizers used prior to Residency didn’t require the information to be presented hierarchically. For example:

Susan (individual interview): “I didn’t even know what a concept map was. I don’t think we ever used it [before Residency]. The closest thing to concept mapping would probably just be typical graphic organizers, so maybe like a bubble map that just breaks off into different circles, but that was it. We never went any deeper than that.”

During the focus group interview, the participants were asked whether they had remembered anything since their individual interviews on using concept mapping prior to Residency. All attendees responded “no.” Later in the focus group, participants were presented with a reading that was assigned from their junior year science methods textbook on concept mapping usage in science to see whether anyone remembered this activity. Participants did not explicitly remember being exposed to this reading. The following quotes were extracted from the focus group after reviewing the reading from their junior year coursework:
Marylynn (focus group): “I feel like I vaguely remember this a little, but, again, going back to our propositions, I don’t remember that necessarily. And, when I originally looked at this, I think my first thought was ‘Oh, that’s just a complicated bubble map’, [Marylynn and all three other participants laugh] if I’m being quite honest, and that’s how I perceived it until classes later, but before then, I think the way I looked at it was just looking at a very complicated bubble map. [laughs] ... I understood that it had its main ideas and it had all the different things, but going back to the propositions, I didn’t understand that it was tiering...”

Karen revealed she was a former biology major before switching to elementary education as her major, so this triggered a memory of using something similar, but she still reported:

Karen (focus group): “So, this reminds me of the dichotomous key. It kind of looks like that ... I don’t really remember anything else. I just had never seen the propositions. I don’t remember ever seeing them ... [The dichotomous key in biology had] all of the connections ... [but] it didn’t identify the relationship part.”

**Past Experiences During Residency**

All the participants of this study reported using concept mapping in a course on assessments that took place during the first semester of their senior year. They reported creating a concept map on the process of teaching. An example is provided in Figure 11. Here is a description about that assignment from one of the participants when asked to describe any experiences with concept mapping after being accepted into her Residency year:

Adrienne (individual interview): “I want to say it was the process of teaching. At the end of class, we would do it independently, reflect on our knowledge of teaching and being in the classroom and then our new knowledge of concept mapping, and we would do that almost every class up until the end [of the semester], and you could see our growth and how we put everything together and how the concept map grew.”

During the individual interviews, Adrienne also remembered an introductory activity in that same course where she had to create a concept map with a partner about their similarities and differences. In the focus group, when this participant mentioned it, all three of the other participants present remembered experiencing this activity as well. Here is a description of that activity:
Figure 11
The Concept Map Provided During Individual Interviews as an Example.

Karen (focus group): “I remember that now ... We had to think of three things that we had in common, three things we didn’t, and then, how we can make those connections.”

Two participants used concept mapping to plan. One participant used concept mapping personally to plan her workload, and one used it to plan out lessons to teach:

Jean (individual interview): “I’ve also used it in my personal life for all the things that this encompasses [points to the example, Figure 11] because I feel like it’s very easy to write all the things that are due.”

Phyllis (individual interview): “Definitely as a planning tool ... When you’re planning ... when you’re thinking about, ‘OK, let me sit down and plan what I want to do. So, first I need to take the concept, let’s say reading, ‘What do I want to do with reading?’’”

One participant used concept mapping during Residency with her fourth-grade students in her Residency school:

Marylynn (individual interview): “When I was teaching about food webs. It came very much in handy knowing about this [points to the example, Figure 11] because they were able to see through — not only having their concept mapping previously — but they were..."
also able to connect that straight into a science standard we were working on because, similarly, they [concept maps and food webs/chains] have the arrows that represent transfer of energy.”

It is important to understand the context of these students’ experiences in order to gain an understanding of the construction of their perceptions of concept mapping and their reported experiences, represented in Table 5. The four subthemes that emerged from participants’ descriptions of their experience with concept mapping after being accepted into Residency include: breaking down ideas, making connections, meaningfulness, and ongoing.

**Table 5**

*Participants’ Reported Experiences with Concept Mapping During Residency*

<table>
<thead>
<tr>
<th>Number of Participants</th>
<th>Creating a Concept Map on the Process of Teaching in a Course First Semester Senior Year</th>
<th>Creating a Concept Map with a Partner about Similarities and Difference in a Course First Semester Senior Year</th>
<th>Using as a Planning Tool During the Second Semester of Senior Year</th>
<th>Using with Students During the Second Semester of Senior Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td></td>
<td></td>
<td>29%</td>
<td>14%</td>
</tr>
</tbody>
</table>

**Breaking Down Ideas.** The first subtheme from past experience(s) with concept mapping that emerged from all seven individual interviews was that they had to break down information from general to specific. Specific terms and phrases participants used when describing their experiences were “scaffolding,” “broken-down,” “chunk” and “start off general.” The following quotes from participants were associated with how they experienced breaking down information with concept mapping:

Diana (individual interview): “The instructor was able to start off general with us ... then each class we got deeper into it, which included going to class and reading from my textbook and doing our various homework assignments. We started in the general basis of ... an assessment ... and then here is all things that fall under this umbrella of making an assessment.”
Jean (individual interview): “So we started [at] the top with our title/generic idea ..., and they get more specific as you go down.”

Marylynn (individual interview): “[In concept mapping, it’s] important that you have your main topic and then, as you’re going down, you’re getting more specific in your information.”

Susan (individual interview): “Definitely in an assessment course, we used it a lot. I think it starts with a broad idea and can be broken down to various smaller ideas that are connected to the broader idea, and then that just continues to break down as you go down the line, and also you can show connections between different topics within the larger category as well.”

Phyllis, while explaining using concept mapping as a lesson planning tool (individual interview): “I can see it broken down into each part, and I can see, if they don’t get this part, then they can’t get this part at all. So, [with] fractions, they have to, they have to know this side of the concept map before they can even go to the right side. So, it kind of moves like that. And that’s really cool, too. And it really helped me plan, ‘OK, so they got this step. So now let’s go to the next chunk. Let’s go to the next part of this concept map.’”

Karen (individual interview): “I feel like I know [the role of assessments in the process of teaching] a lot more because I went through it so many times. It can be helpful, like when you’re trying to really learn something new or break down something really specifically.”

Making Connections. The third subtheme that emerged was the experiences preservice teachers had in connecting ideas when breaking down the concepts in their map. All seven participants described their experiences linking the concepts through lines and propositions. Although some of the data overlaps into other categories, this process warranted its own category because it was reported as new by the participants when utilizing concept mapping; therefore, making those connections stood out to the participants. Excerpts from all seven participants associated with this subtheme were included:

Diana (individual interview): “Start with the general topic ... then you might connect it and you might have two more ideas that branch off from that. So then you connect those to the main idea, then you get more specific with each bubble. And then, those branch off into three more and they branch off ... So, it was a lot of branches that you could just elaborate on.”
Jean (individual interview): “[Concept mapping is] specifically used for broader topics. It can be used for more specific topics as well, but I would say it’s mainly for broader topics because you have so many branches [and] ways you can branch off. And then we have lines that connect to different ideas with connecting words or propositions that go to more connections … Those connecting words. Sometimes I would struggle to strictly define the connection.”

Marylynn, describing using concept mapping with fourth-graders (individual interview): “I used it that way so students would have a reference they could go back [to] and look at the different terms we were learning and how they connected to each other... I like to start at the beginning, so as we learn throughout a learning segment, they are able to make connections from the beginning of the unit all the way to the end when they’re into those very fine details. I saw a lot of students who sometimes have a problem with connecting certain ideas [now] have a physical model of how things work together, and it was very powerful for them because they were able to see instead of just the standalone vocabulary terms that things do connect, and especially in the lesson with my food chains and food webs. It was very helpful for them to look and see how these things actually connected so the students were able to literally see and make those connections physically and in their heads once they were able to map it all out on their paper.”

Susan (individual interview): “Building those connections just makes it stick with you longer. I think [I] understand the reason or the purpose more of assessments because I had to relate assessments back to the process of teaching, so it made me realize the importance of assessments and the reason that we do have to give them or why I should be more focused on them than [I] originally thought.”

Phyllis, describing her experience with concept mapping (individual interview): “OK, that makes sense. I see how that is connected to this. Oh, this is also connected to this because I need to know this. I like seeing things on paper... I can see that A is connected to B or B is connected to C.”

Adrienne, while describing her successes with using a concept map as a student (focus group): “Being able to make different connections between assessments and all the different things on the concept map. [The concept map helped] to make us realize what goes into teaching and how it’s all connected in some way.”

Adrienne (individual interview): “It’s one of those things. It really gets you thinking about the big ideas and the small ideas and how they’re all connected.”

Karen, describing herself as a learner after learning about concept mapping (focus group): “I think I maybe look at things and look for connections more when I’m learning about something. I think the main thing that I changed the most was the connections. I realized [during the process of teaching concept mapping experience], after assessments, you can actually go back to instruction or these two [concepts] are a both-directions arrow. The linking words, I feel like, got more specific, and then the different types of assessments [I put in the concept map] got more specific as the semester went on.”
Meaningfulness. The fourth emerging subtheme from all seven participants was that concept mapping made the learning more “meaningful” and “individualized” because they were able to “reference” their learning later since they had a “visual” that allowed them to “see thinking” occur and how it was “related” while activating “prior knowledge” and “seeing growth” in their learning. Again, since this was a common subtheme from all seven participants, a relevant statement from the individual interviews was included:

Diana (individual interview): “The concept map was the visualization that showed us, ‘OK, here’s an assessment and everything that you need to be able to do as you try to give one.’ In the class, a lot of people do things differently. Some people chose to do different shapes, some people chose different propositions, some people decorated theirs and added color. So creativity was totally allowed, which is good, ’cause every learner is different. So why have the same concept map? I think it made sense to me. Just, I knew that one big topic could go into something just as important, and then a little bit more important then, and maybe it’s not based, or it’s not based on importance, but it’s basically based on, ‘Hey, what information can you get from this topic, and then what further details can be constructed from these ideas?’ And so with that, I thought that made sense to me, because I understand at least with assessments, like, you have the overarching assessment. So, you have these two examples then, here are some examples that can go with that, and then here’s what more examples of what those examples could look like. And so that just made sense to me.”

Jean (individual interview): “[Concept mapping is] individualized for the learner because I see that after you assess, this is when you should reflect, but some people say they’re not going to be the same because I think planning instruction, assessing, [then] reflection. It was meaningful for me as a learner because I could see every part of it right there on that page. Also, it feels creative, too, because when we were making those concept maps in our classes, mine wasn’t the same as the person next to me, but it was still just as meaningful, and it was still correct. And I think that that’s really special, especially in education, because we don’t all think the same. You might sit down and you might draw a concept map, and your experience in your life and how you are maybe totally different than mine. And we may have a lot of the same information, though we might not organize it the same; we might not connect it the same.”

Marylynn (individual interview): “[Concept mapping is] essentially getting your ideas on paper and relating them through arrows or through other ways that makes sense to that person. I think that it can bring a lot of value to students when they can see their thinking on a piece of paper and how that thinking connects. So, for example, when I was teaching about food webs, it came very much in handy knowing about [concept mapping] because [my fourth-graders] were able to see their concept mapping previously [and] they were also able to connect that straight into a science standard we were working on. They’re able to better see and better understand what exactly they want to include in [their
scientific] writing. I can tell, through my work, that from the beginning to the end, I definitely had a shift in my understanding. So it’s incredibly important and incredibly self-reflective for students to be able to go back and see how their thinking has grown.”

Susan (individual interview): “I think it’s relating prior knowledge or experiences all together, and it’s showing students how that is all related.”

Phyllis, describing using concept mapping as a lesson planning tool (individual interview): “So if we started with a fraction. What is a fraction? Decomposing, but my kids are still stuck on, what is even a fraction or the denominator? So, I’d have to go back… So, you can see the broken-down steps and you can either go forward or backwards. So, definitely for planning. Using concept mapping has a lot of positives. I would use it again because it’s a clear way of seeing your planning or seeing your concepts on paper or in your brain. You can see, how it’s broken down and why it’s broken down.”

Adrienne (individual interview): “I was able to visually see how much I knew because I put it on paper… I think I said this before, but just realizing how much I actually knew. Sometimes we forget how much we know and we forget what we use every day.”

Karen (focus group): “My first actual concept map, there’s no details. It’s just very big. I think I got frustrated; it was just like, I’m done. But then my last one, all my relationship words are a lot better. Look at me, figuring it out. I like you could either choose to get a completely new paper every time or you could reuse the same one, or… and I feel like that helped, too, because sometimes I may have gone weeks without getting a new paper and then suddenly I’ll be like, actually, no, I really needed a new paper. So there was a lot of flexibility and how you chose to edit your concept map.”

Ongoing. The fifth subtheme that emerged as participants described their experiences using concept mapping was the “ongoing process” of “modifying” their maps. Many expressed how the “repetition” of the concept mapping process allowed them to “add” new learning and it eventually became “routine” but also created feelings of “uneasiness.” Relevant excerpts are presented below:

Diana (individual interview): “I was thinking, ‘Why are we doing this? How’s it going to help me with assessments?’… And then each class, we got deeper into it, which included going to class and reading from my textbook and doing our various homework assignments.”

Jean, when describing her experiences modifying her concept map in the assessment course (individual interview): “I don’t want to say routine, but it almost did seem routine because it was like, ‘Oh! I know that this will be my broad concept, I know that this will be here, I know that this will connect to this this way.’ And it was almost like I could just
sit down and do it. I changed a few things, but I mean, I’m a nitpicky perfectionist, so that’s just kind of me.”

Marylynn (individual interview): “When I was first using it, I felt a little apprehensive just because I didn’t want it to be overwhelming, but I think the way that I use in my classroom where I started with a big topic and [the fourth-graders] built throughout the lessons was very beneficial because they were able to see where they started and kind of where they ended, and it was a really great way for them to grow with the organizer.”

Susan (individual interview): “It was an ongoing process. It was first [the] initial [experience of] creating one of what you thought you knew about the process of teaching and then adding on. I think we worked on it each week to see what more knowledge or more connections we can make each time. During the time, I thought it was a little repetitive, but I mean, I understand [it] in hindsight — what it was being used for and the purpose of it — but at times, I was a little frustrated just having to repeat the process.”

Adrienne (individual interview): “I felt like I had to keep adding to it. But there’s only so much I could have done. But I kept feeling like I had to add to it. In class, we would do it independently, reflect on our knowledge of teaching and being in the classroom and then our new knowledge of concept mapping.”

Karen (individual interview): “We were constantly learning new things ... so it’s like I got to add in some more, got to add in some more. I think I was ... You know when you are challenged and you’re like, ‘I’m not used to this,’ and so then when you have to actually do it, you’re like, ‘OK, that’s not bad,’ and then you get used to it over time? ... So, the beginning, it was like, ‘I don’t know what I’m doing.’ And so I had to learn how to do it, and it was annoying, but that’s just because I’m used to knowing how to do things. And I feel like I remember so much more. And also, it was really repetitive, which is probably why I remember so much because I was actually making it so many times.”

During the focus group, the participants were presented these themes and subthemes in the form of Figure 12, and participants agreed that these were an accurate experience of theirs. Here is a relevant excerpt from the focus group interview:

Researcher: “Is there any other experience that you feel wasn’t captured in these or that any of these aren’t accurate to your experience?”

Marylynn: “I find these to be very accurate.”

Karen: “I agree.”

Diana: “When you say ‘See Thinking’ ... just talking about a visualization?”
Figure 12
Themes and Subthemes Related to RQ 1 Presented During Focus Group for Member Checking.

Researcher: “Exactly. That’s actually one of the words that kept coming up was ‘visual’ or ‘visualization,’ and so that got grouped into ‘Seeing Thinking.’”

Diana: “OK, yeah, I agree.”

As detailed in the researcher’s journal in Figures 13 and 14, the researcher rephrased “Modifying (Repetitive)” to the subtheme now titled “Ongoing” after the focus group and listening to the focus group’s audiotape four times because this was more encompassing and a more accurate description of the participants’ experiences. Participants did not always modify or change their maps, but they did revisit them in the ongoing experiences of using concept mapping.

**Theme 2 — Definition of Concept Mapping**

The second theme that emerged was participants’ definition of concept mapping. This section addresses the second question and its first subquestion: *What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction? 2a. What is their perception of their knowledge of concept mapping?* When asked to define concept mapping, five out of the seven participants used the term “graphic organizer” or “organize.” The other two participants, Phyllis and Adrienne, described it as tool that organizes one’s thoughts and ideas but without using any form of the word “organize.”
Thursday, February 6

10:30 - 3:00 -

Created questions in Focus Group Interview based on Themes
- merged some themes and changed
  For Q2a - merged modifying with repetitive bloc that’s what was repetitive.
  Changed verbiage “Broken down” to “Breaking Down Ideas” to be more inclusive.

Figure 13
Excerpt of Researchers’ Journal Before Focus Group.

Sunday, Feb. 9, 2020

Listened to focus group - fourth time

Past Experiences
- RA1: Combined all under
  For clearer organization, split into subthemes
  1) None before Residency 2) Breaking connections, thinking through ideas

RA2, changed - Meaningful to Meaninglessness to be more descriptive of the experience
  - Modifying to Ongoing
  This is more accurate - updated Excel spreadsheet it includes; adding modifying, changing, and repetitive. (Sometimes they didn’t actually change anything but they did revisit thing)

Figure 14
Excerpt of Researchers’ Journal After Focus Group.
Diana, Jean, Marylynn, Susan, and Karen also included a description that identified the organization of the map that allowed the learner to “connect,” “categorize,” or “relate” ideas. Jean, Marylynn, and Susan also described that because of the organization, it “makes sense” or is “unique” to the learner. To highlight the pronounced commonalities of their definitions, all participants’ answers from their individual interview were included:

Diana (individual interview): “Concept mapping is basically a graphic organizer, where you start from a very general topic, and then you branch out into more specified detail. So you branch from general to very specific, and then [it] involves shapes and lines and connecting dots. So, there starts with the general topic, and then you might connect it and you might have two more ideas that branch off from that. So then you connect those to the main idea, then you get more specific with each bubble. And then those branch off into three more and they branch off. So it was a lot of branches that you continuously just elaborate on.”

Jean (individual interview): “Concept mapping is a type of graphic organizer, specifically used for broader topics. It can be used for more specific topics as well, but I would say it’s mainly for broader topics, because you do have so many branches — ways you can branch off. And you have so many options of how you can organize it that it’s unique to the learner as well.”

Marylynn (individual interview): “So concept mapping is, in my opinion, when you have all of your ideas on a piece of paper organized in a way that makes sense to you. It’s essentially getting your ideas on paper and relating them through arrows or through other ways that makes sense to that person. [It is] important that you have your main topic and then, as you’re going down, you’re getting more specific in your information.”

Susan (individual interview): “I think concept mapping is a form of a graphic organizer, but I don’t want to label it as a graphic organizer because I think it goes a little further than that. It is an outline for organizing your thoughts, so I think it starts with a broad idea and can be broken down to various smaller ideas that are connected to the broader idea, and then that just continues to break down as you go down the line, and also you can show connections between different topics within the larger category as well.”

Phyllis (individual interview): “I think concept mapping is having an idea and using that idea — that is the concept. [That idea or concept] is like the base or the bottom or the baseline of something; a concept is that. And then concept mapping is just building around that. So, building around your baseline, so, having the base of the house and then building it up. I guess general to not general, so getting more specific as you go on.”

Adrienne (individual interview): “Concept mapping, I guess, would just be a way for you to take all of your thoughts that are going on in your head and putting it on paper. You have an idea and you just kind of need to figure it out.”
Karen (individual interview): “Concept mapping is a way to organize information. You can use it to not only categorize things but disqualify things. So, [for] example, you can write ‘[this] is not this’ as opposed to just ‘all these things are this.’ ‘This is an example of something that it’s not.’”

During the focus group, before presenting the themes for member checking, the researcher once again asked the focus group participants what their definition of concept mapping was. Their answers reiterated the findings from the individual interviews:

Karen: “I’ll go first. Concept mapping is a way to ... of organizing information like a graphic organizer, but it illustrates the relationship between two parts of the map using prepositional phrases. Is that the word I am looking for?”

Marylynn: “Proposition.”

Karen: “Propositions. That’s it. That’s all.”

Researcher: “Does anyone else have anything to add or anyone disagree with anything?”

Marylynn: “It’s good. It’s tiered. It starts with a main idea and works down to the finer details.”

Diana: “And then the relationship part is key because you’ll have the lines that you add on with the propositions in the middle showing how everything connects to the main idea at the top.”

Researcher: “Excellent. Just to be clear, can anyone define what propositions are?”

Diana: “Similar to transition words. Basically ...”

Marylynn. “Yeah.”

Diana: “When [Karen] said prepositions, it really was a great word, as you often use prepositions words to show propositions, which just provide transitions from on-topic to the one that connects below it.”

Theme 3 — Perceived Educational Value

The third theme to emerge from this research question included the perceived benefits of concept mapping utilization and addresses the second research question and its second subquestion: What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction? 2b. What do they perceive are the barriers and benefits of
concept mapping? Three subthemes emerged referencing the perceptions of the benefits of concept mapping: (1) breaking down concepts; (2) seeing thinking; and (3) meaningfulness for the learner. Although some of the data is included in other themes, it is important to note that these were the participants’ perceptions of concept mapping when asked what the benefits of concept mapping could be. Detailed information on each of these subthemes is included below.

**Breaking Down Concepts.** All participants perceived that the organized process of breaking down concepts from general to more specific when moving down the concept map and forming connections between concepts with propositions was beneficial to the learner. A quote from each participant is included:

Diana, describing benefits to her as a learner (individual interview): “I knew graphic organizers are important and students use it ... in a lot of their work to help kind of break down big topics, but seeing concept maps, it was put on a bigger screen just because it wanted you to get more detailed about it. So, the [university] class taught me, ‘Hey, you have this general idea, but there are deeper things in it that you can dive into.’ And you can do that with any topic/event. It makes sense you always want to talk about a general topic and then go further into it because it’ll help [to] ... deepen your understanding of your writing or deepen your understanding of history facts ... because there are just so many things that go along with every topic. It can be like a foundation for a student. So the beauty of a concept map is that it’s meant to hold ... a large amount of details.”

Jean, describing her experience using concept mapping as a planning tool (individual interview): “I think that it’s a wonderful tool for not only instruction but also just in general [for] organization because I’m one of those people who tends to get overwhelmed with information ... And I think that it speaks volumes that I sat down and used it for my life because it does make me feel better and it does make me feel less overwhelmed. You can sit down and break it down ... And here’s the parts and these are the subcategories and the details and the more specific details. It was very helpful. And I wish that it was a broader-taught thing. I wish someone would have sat me down in fourth grade and been like, ‘Look at how you can organize your thoughts and your learning.’”

Marylynn (individual interview): “Relating it to text or to big-unit ideas where [students] are constantly building knowledge ... I think that can be really beneficial. And for that reason, it can be incredibly beneficial for elementary school students because they’re able to use it as a scaffold for their information and also as a reference later on. So, when we’re going back and we’re reviewing these really big terms, instead of having all these definitions on a page, they can look at their concept maps and be like, ‘Oh, let me go review this. Let me see the main terms [and] how I made sense of it’ ... When we’re
looking at very complex texts in high school or even college … we can really break down all the different aspects of that character or that text using concept mapping. I think it’s really important, and in my opinion, I like to start at the beginning so as we learn throughout a learning segment, they are able to make connections from the beginning of the unit all the way to the end when they’re into those very fine details.”

Susan (individual interview): “I think it would be really important and helpful. [In] helping students organize thoughts, I think I see the benefit in helping students, so that’s why I would want to implement it.”

Phyllis (individual interview): “[Concept mapping] was really good with the general to nongeneral because it started with this and then breaks it down. So it’s really good for seeing [topics] broken down into different parts. It’s a clear way of seeing your … concepts on paper or in your brain: You can see how it’s broken down and why it’s broken down.”

Adrienne (individual interview): “So at first, I would just put the basics … and then I would grow on that … and I would just grow on each little concept and see how they connected. … [Concept mapping] really gets you thinking about the big ideas and the small ideas and how they’re all connected.”

Karen (individual interview): “[Concept mapping] can be helpful, like when you’re trying to really learn something new or break down something really specifically. I think that’s when it’s most helpful.”

**Seeing Thinking.** All participants identified that being able to “see” one’s thinking or having a “visualization” was beneficial to the educator in identifying misconceptions and student understanding. In addition, increased “motivation” and “engagement” for the learner were perceived as benefits because the learner could “see” their growth as “connections” were being made during the learning. Relevant statements made by each participant are included to illustrate the commonalities that warrant this as a subtheme:

Diana (individual interview): “With anything that you are teaching or being taught it, there’s one big central focus: There’s one main idea and then you have to dive deep to fully understand it. And so, with concept map[ping], you get a visualization of it, and what the idea is supposed to look like, and then here are all the things that fall in line under it. So I think the beauty of a concept map [is it] provides you with being able to see what you’re supposed to be learning … I feel like more engaged students would be the main benefit because they would see, ‘Oh, hey, here’s how my learning is being affected. Now here’s what it really looks like.’”

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Jean (individual interview): “You could see not only what you wanted them to know but what they actually knew. [Concept maps] could provide you the information that question/answer tests couldn’t. [Concept maps] could show perspective on [how] these two things are connected ... ‘Why do you think they’re connected that way?’ I feel like you could dive deeper into things, into that higher order thinking. And I think that those connections ... I really love that because a lot of times, you don’t see those connecting phrases and words; you just see this into this and that into that. But you have these connecting words, so you can see exactly how this connects to this ... And I think that that is very helpful. I want to teach high school history, and I feel like that is a great way to see all of this, the effects, the facts.”

Marylynn, describing the benefits from her experience with using concept mapping with her fourth-grade students in her Residency placement classroom (individual interview): “I think the way that I used it in my classroom where I started with a big topic and they built throughout the lessons was very beneficial because they were able to see where they started and kind of where they ended, and it was a really great way for them to kind of grow with the organizer. I really liked the way I used it ... I saw a lot of students who definitely sometimes have a problem with connecting certain ideas have a physical model of how things work together, and it was very powerful for them because they were able to see instead of just the standalone vocabulary terms that things do connect, and especially in the lesson with my food chains and my food webs. It was incredibly helpful for them to look and see how these things actually connected, so the students were able to literally see and make those connections physically and in their heads once they were able to map it all out on their paper. Again, I saw students who I normally don’t see writing or not able to see how things connect literally connect them and be able to go back and see those connections.”

Susan (individual interview): “I think it also shows the specific knowledge of each student so you can see what their experience or what their definition of a specific topic is and then how you could find misconceptions they have or what they related it to in their personal life connections ... [Concept mapping] shows everything you’ve learned and how that’s related to what you already know ... I think it is a higher order level of knowledge to be able to make connections between things and then makes you understand a specific topic better.”

Phyllis (individual interview): “[The students’ concept maps] would all look different because they have 30 different personalities, so all their concepts maps would look totally different. [The benefits of this would be that] I could see where they’re thinking ... They can even work together and share ideas ... So, me seeing that and then also their peers seeing that would be really good. Another positive: They can see their own thoughts on the paper. They can see, ‘Oh, wow, OK, that makes sense. I see how that is connected to this,’ or, ‘Oh, this is also connected [to] this because I need to know this.’ But just seeing everything — I like seeing things on paper; I’m a visual person, too — but just seeing, ‘OK, I can see that A is connected to B or B is connected to C ...’”
Adrienne (individual interview): “I think it’s a good way to visually see what’s going on in your brain ... I feel like this is a good way to see, ‘OK, you know what? You know what you’re doing. You’re fine’ [laughs].”

Karen (individual interview): “I think when you’re diving into something that has a lot of specific qualifications or areas that may have relationships to each other ... when you’re making those connections, you can really see them.”

During the focus group, the researcher asked participants to expand on why seeing thinking was a perceived benefit of concept mapping. Three participants stated that seeing their growth by referencing, revising, and modifying the concept map helped the learner make meaning from their maps, reintegrating this as an emerging subtheme.

**Meaningfulness.** Six of the seven participants described concept mapping as “meaningful” because learners could “connect” their “schema” and “make sense” of the information in their own way while “relating” it to new information and realizing how much one has grown in their thinking. Three participants mentioned concept mapping as “differentiated,” “personalized,” or “individualized” because students’ concept maps can be “different.” As described by each of these participants:

Diana (individual interview): “Everyone needs a different way of learning because it helps for students that would prefer to see a chart than just a lot of words or paragraphs. So it provides the differentiation. It provides every student to be able to get what they need to be successful. So students would feel more excited to see, ‘Hey, we’ve done all this! What else is there to learn?’ It was fun ... something different to do ... and you knew you weren’t going to write for a long time, but you got to be able to create your own notes and do it the way that made you feel comfortable that helped you to understand it as well.”

Jean (individual interview): “I think it was very meaningful to sit down and take a whole concept and break it down. It was meaningful for me as a learner because I could see every part of it right there on that page ... It doesn’t feel like busy work; it feels meaningful. It feels purposeful ... Also, it feels creative, too, because ... students could have creativity ... and they could demonstrate their learning ... in your own organization — how you think about it, how you work it out.”

Marylynn, when asked about the benefits of concept mapping from an educator’s standpoint (individual interview): “Being able to reflect back on their work, being able to go back and reference their concept mapping to make more sense of what’s going on in
class, etc. ... [it] gives you an opportunity to look back at your thinking. The thing about concept mapping that I love and that I think could be really beneficial, is the fact that you can really personalize it to your thinking. Looking back and seeing how students are really able to make these connections and how meaningful it is for them to, again, see from beginning to end how their ideas grow was really wonderful.”

Susan, when asked about the benefits of concept mapping from an educator’s standpoint (individual interview): “I think it’s relating prior knowledge or experiences all together and ... it’s showing students how that is all related ... Their existing schema and then how they’re relating the connection between their thoughts ... I think [concept mapping] showed being able to build connections between different schema or different knowledge, I think, sticks with you better and also gives you more perspective.”

Phyllis, when asked about the benefits of concept mapping from an educator’s standpoint (individual interview) “I think my kids would understand [concepts] more. They would retain it more ... I feel if you know why you’re doing something, you want to do it a bit more. You’re more motivated that way. So, if I knew why I’m [connecting] this, there’s a point instead of just, ‘I’m just doing it because she told me to do it.’ ‘I’m doing this so I can know how to do this later ... So, I know there’s a point to me doing this now.’”

Adrienne, when describing the benefits of concept mapping from a learner’s perspective (focus group): “I was able to realize how much I knew about teaching and how much I’ve learned over the past five years, and put it down on paper and just see, ‘OK, I’m actually learning and experiencing these things.’”

During the focus group, the researcher asked participants to elaborate on why concept mapping was described as meaningful and why that description was a perceived benefit of concept mapping. All four participants reiterated that making connections and being given the opportunity to connect and build on what the learner already knows with new information allows them to push their thinking by forcing them to explain their connections. Additionally, reevaluating the concept maps gives the learner the power to show what he or she knows in a way that makes sense to him/her.

**Theme 4 — Perceived Barriers in Implementation**

The fourth theme to emerge from this research question included the perceived barriers of concept mapping utilization and addresses the second research question and its second subquestion: *What are elementary education preservice teachers’ perceptions of concept*
Four subthemes emerged: (1) time; (2) learner characteristics; (3) content area; and (4) preservice teachers’ self-efficacy. Some of the data overlaps into other categories, as often occurs in qualitative research. Detailed information on each of these subthemes is included below.

**Time.** Six of the seven participants explicitly mentioned the word “time” when asked what the challenges of concept mapping could be or were for them as a learner. Time was described in the form of actual time teaching the process to students and restrictions within the given curriculum:

Diana (individual interview): “So, definitely time would be the challenge, just make sure that you’re trying to hit every concept on the map. This time is always a challenge; it goes by very quickly, and you could plan for one thing happening for an entire week and then it’s a surprise fire [drill] … and all your time is gone.”

Jean (individual interview): “I would say probably the time of having to [model]. I mean, it’s not even really time, just the doing it.”

Marylynn (individual interview): “My only negative is just making sure you’re scaffolding and also, at the beginning, explicitly explaining how [a] concept map works. That does take time … Just being more explicit and [the] time opportunity to just make sure I have that time to explain.”

Phyllis (individual interview): “Just being disciplined to do it, with the having everything else going on, too. Time. Time management … Having the time to actually do it and sit down and think about it. So, definitely time management or being disciplined.”

Adrienne (individual interview): “And then negative is I think just the timing. The time that goes into creating one. I feel like teachers don’t have all the time in the world to really put down on paper what they want to do or, you know, all their ideas and their thoughts and how they all connect. So … but I feel like it’s a good idea, but it takes time. It’s hard because of time.”

Karen (individual interview): “We would spend more time thinking about how do we concept map than what’s actually being talked about. It takes time and thought, and that sounds so lazy [laughs], like the amount of thought that you have to put into it. Like the very first time that you do it. The very first time that you do it … it takes a lot of thought. And I think early on I was like, ‘This is not worth it’ … [Also,] following the [math] curriculum, there’s not a whole lot of time to implement anything [else]. To do this,
you’re not following the curriculum. Curriculum requirements and district requirements [are barriers].”

During the focus group, the participants were presented this theme and subthemes associated with the barrier portion of Research Question 2b in the form of Figure 15, and participants agreed that these subthemes were an accurate experience of theirs, with two clarifications and additions. Here is the excerpt from the focus group interview as participants were member checking this theme:

Researcher: “Anything else that could possibly be a barrier that doesn’t seem to be included in these umbrellas [referring to Figure 15]?”

Diana: “Can we say the teacher? Not the preservice one, but the real one?”

Researcher: “Yeah. Your experience as a learner?”

Diana: “The mentor, the person that is really over the classroom. You can say they are a barrier because just because you want to implement it doesn’t mean that they would do it the same way or …”

Marylynn: “Let you.”

Researcher: “Good point.”

Karen: “Also, maybe, I mean, time. Kind of goes along with time, but following the [math] curriculum. There’s not really a whole lot of time to implement. I feel if I was like, ‘Oh, let’s take more time out of our day to do this,’ you aren’t following the curriculum, so if someone from [district office] was to come through, they’d be like, ‘What are you doing?’”

Researcher: “Excellent. Anything else that could be a barrier?”

Diana: “No.”

Marylynn: “No. I think that covers everything.”

Karen: “No.”

Learner Characteristics. All seven of the preservice teachers participating in this research reported that Grade 4 to college would be better age levels to use concept mapping with
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*Figure 15*
Themes and Subthemes Related to RQ 2 Presented During Focus Group for Member Checking.
students. Six participants stated it was because of the learners’ developmental level, and one said younger students would have a lack of background knowledge needed to create a concept map.

Quotes associated with these perceptions are included from all participants:

Diana (individual interview): “I think kindergarten through second, they would enjoy it, but they just can’t dive as deep into it … Oh, [and students] knowing what was supposed to go in that map.”

Jean (individual interview): “I think [students would] have to have the proper background information to properly use it. I think just developmentally, it would be a lot for my [first-graders] to sit down and break down.”

Marylynn (focus group): “I would not be anywhere near as confident [implementing with kindergartners], in all honesty, simply because I feel like it is a lot … How am I going to integrate that in? Additionally, a lot of kindergarteners don’t even have a lot of those writing skills, so how am I going to have them physically write something down? I feel like it would have to be very [teacher]-led to be successful.”

Susan (individual interview): “I think probably you could try starting in first grade, but it may be a little too complicated or [in]appropriate for their level, but definitely once students are able to write paragraphs through on up to adults — college-level students. I think they’re perfect. Once they have the skills developed enough [for] basic writing. The absence of knowledge of a topic [could also be a barrier], so if you’re asking a student to write about something they don’t know about, how are they even supposed to create a concept map about it? I think that would potentially be a problem.”

Phyllis (individual interview): “You can use [concept mapping] for all ages, but I think probably fourth [grade] through 12th grade or even through college could really understand and get the grasp of concept mapping.”

Adrienne (individual interview): “I think especially with younger students, they might not take it serious; they might just put one or two words and not really understand the reason behind the concept map. And that would be the challenge.”

Karen (focus group): “I think it’s harder for earlier grades. What does it look like in younger grades? I feel like I can’t even picture it.”

Karen (individual interview): “I feel like some of my [third-graders] would just, like, probably act like me and get discouraged and frustrated and then maybe not persevere and not get the benefit of it and then that would be potentially like a waste of a class period. And if you don’t have kids who are in the same place linguistically or with academic language, that’s a big barrier and a big challenge, so you have to make sure that there’s, like, an entryway for everyone. There’s gotta be an entry place for everyone, no matter, like, what their ability level is.”
**Content Area.** The subject area was also reported as a barrier. Five preservice teachers specifically mentioned it would be difficult to do in math. When using TagCrowd to analyze each interview by research question, Figure 16 demonstrates how often math was referred to as a barrier.

![Word Cloud from TagCrowd on RQ2b Barriers.](image)

Diana (individual interview): “Hard to do with math. Maybe steer away from math.”

Adrienne (individual interview): “For, like, math, you have a set answer and a way to solve the problem, and then you solve the problem.”

Jean (individual interview): “The content. We know that the [high school] content is much deeper [than first grade]. The content is much more detailed. The content lends itself to that kind of thing better ... It would probably overwhelm [first-graders]. I think that might be a little overwhelming [to first-graders], but I do think that they could definitely understand it. I think if we did reading and it was reading, maybe [first-graders] could dive a little deeper than that. I think it’ll probably depend on the context.”

Marylynn (individual interview): “I would say it would not be as efficient for some students [in math], because sometimes connecting certain things ... for example, if you have division as your main topic hierarchically, and then you try to, like, build off of that, then [that] might confuse students. I could still see how they could use it, but relating it to text or to big-unit ideas where they’re constantly building knowledge, I think that can be really beneficial. So really [concept maps could be used in] any subject. The only one I would be kind of hesitant to use one in is math.”

Phyllis (individual interview): “I think if I wasn’t in the math classroom, if I was in a different classroom, I would definitely use it if I was in English or something.”

Karen (individual interview): “ELA [English Language Arts], maybe, you could do it even earlier, because I feel like they’re so used to writing anyways, but definitely not early [in] math.”
**Self-Efficacy of Preservice Teacher.** When asked about the barriers of concept mapping implementation in instruction, six participants referred to themselves as barriers to implementation: Two cited their own lack of experience using concept maps as the reason for this, and four cited their lack of background knowledge on presenting concept maps to students. More specifically, two participants mentioned knowing and identifying propositions as barriers to label connections, and four participants mentioned their self-efficacy in presenting, modeling, and/or explaining concept mapping procedures to students as an area of weakness. Examples of data that align with this subtheme include:

Diana, when asked what challenges exist in implementing concept mapping into instruction (individual interview): “Challenges are probably far more me. [laughs] And I think I just haven’t tried to use it, [so] I haven’t immediately thought about it. I don’t know how I would actually do it or be good at it in real life.”

Jean (individual interview): “Those connecting words. Sometimes I would struggle to strictly define the connection.”

Marylynn, describing her experience when using concept mapping with her fourth-graders (individual interview): “So it was very interesting and challenging for me to make sure that each student was including enough, but also not including everything. So really making sure that they understood that it doesn’t have to look the same as the person next to them, but it needs to be meaningful to them and how they think.”

Phyllis (individual interview): “Even before I’m even planning anything, like, ‘OK, I know that I need to figure out the concept first. And I need to think about how to break it down first before I even put a lesson or make a lesson plan or anything.’ I would definitely have to practice using it with the kids because I know it for myself, and I can look at and I know what I meant to say. But definitely explaining it. I need to practice it. Because it’s a whole new ballgame. So just practicing it and knowing, ‘OK, this is the concept, and then how do I break this up from there?’ kind of thing.”

Adrienne (individual interview): “I feel like it’s been awhile since I took that class [and used a concept map]. At least it feels like awhile. And so, I feel like I would have to do my own ... I’d have to figure out how to teach it to younger students because I saw [it] taught to adults. And obviously that’s going to be different.”

Karen (individual interview): “I feel like being comfortable with the terminology ... If you don’t know how something includes that, that can be overwhelming. I feel like, and then if you’re not comfortable or familiar with the terminology. I mean, I just got caught up in the words. So maybe, like, that could be a barrier for someone else.”
This subtheme directly relates to the next theme and subquestion, so some data overlaps into the following theme and research subquestion.

**Theme 5 — Preservice Teachers’ Self-Efficacy**

The fifth theme to emerge from this research question included the self-efficacy levels of the preservice teachers in concept mapping utilization and addresses the second research question and its third subquestion: *What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction? 2c. How confident are elementary education preservice teachers in implementing concept mapping into their own classroom?*

Participants were asked to rate their level of confidence implementing concept mapping with certain grade bands on a scale of 1 to 10, where 1 is low and 10 is high. Figure 17 shows each participant’s specific rating, but the average, as depicted in Figure 18, for Grades K-1 was 3.71, for Grades 2-3 was 5.5, for Grades 4-5 was 7.71, and for Grades 6 and above was 8.07. All participants’ ratings grew or stayed the same as the grade bands increased, apart from one participant rating Grades 2-3 as the highest and lowering her self-score by one level for the higher grade bands, stating that the students’ behaviors influenced her rating:

Diana (focus group): “*For [Grades 2-3], this will be higher than the next one. I would say [a rating of] 8 for mine only because of that motivation part. They would be more excited about it. They still get giddy. They are at that age where they want to learn and that want to learn with you. ... [With Grades 4-5], there would be a lot more classroom management that would have to come into play ... ‘Hey, how can I teach you this lesson without you having a side conversation with your best friend?’ or trying to make sure that, ‘Hey, let me see how many highlighters I can shoot into the basket while you’re teaching.’”*

Again, learner characteristics were the major influencer in these confidence ratings. All perceived kindergartners and first-graders as potentially struggling because of the writing needs necessary to complete a concept map. And, as the students age, all participants believed they
would have more writing experience, background knowledge, and prior schema to construct a concept map and create connections:

Karen, discussing her increased rating with Grades 2-3 (focus group): “Because they are older and they know a lot of words ... You would have to be very clear about your expectations, but yeah.”
Also, as the grade levels increased, it was communicated that the students were not as much of a factor in the ratings as the preservice teacher themselves:

Karen (focus group): “I feel at that point [Grades 6-plus], it’s the age range that’s throwing us. It’s just our comfortableness with actually concept maps.”

Adrienne, referring to Grades 6-plus (focus group): “You’d really have to make sure, with an assignment like that, that they’re on track. That I know what I’m doing [laughs].”

**Theme 6 — Perceived Future Implementation**

The sixth theme to emerge from data collection included the perceived future implementation of concept mapping utilization and addresses the second research question and its fourth subquestion: *What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction? 2d. How do they perceive they would, if at all, implement it in their future classroom?*
All seven participants reported potentially using concept mapping in their future classroom depending on the grade level and content area. Three of the seven participants specifically described using concept mapping to introduce a topic or course structure and revisiting it over the course of study. Two of the seven mentioned the benefits of seeing misconceptions and the learners’ connections. Three of the seven stated they would use concept mapping with their future students in writing. Two of the seven included using this with history/social studies content.

Diana (individual interview): “I think it would be a great way to kind of introduce the class of course as a whole ... We’re starting on this big topic, and then we’re going to dive deeper into it by hitting these points, and then I’m going to add on. It allows students to get that visual of, ‘Here’s everything we’re about to do for the next couple weeks’ ... So I think it’s a great way to kind of set the stage for what students will be learning, even if I don’t fully put it into instruction. Even, like, the parents would appreciate that because they would get to see where you’re taking their students academically ... So I think everyone would be engaged [in] the household, I guess, I think, because just concept mapping is kind of just a tool of the trade for teachers. I think always in my head, like, a tool is great to be used in the classroom, but then there’s just, like, so much more that students need beyond the tools and strategies that we are taught in the classroom. So, it’s great to know about concept mapping, but I don’t think that’s all I needed to be a good teacher.”

Jean (individual interview): “I want to teach high school history, and I feel like that is a great way to see all of the effects, the facts ... [It could] be used to sit down and write a concept map about the Federalist Papers and just see where it could go, see what they could learn, what they could write down, what they could connect. And I think that would be a very good system for our school district because I think that it would just be so powerful to see everything, like, broken down into details, into connections, and we can see how we went from this all the way down to this detail and be able to trace it back up.”

Marylynn (individual interview): “I really liked the way I used it. I would probably use it that way again. [I started with a big topic and they built throughout the lessons.] Or possibly ... I would have them read a text and possibly make their own [concept map] based off a text. If I were to use this in ELA, upper elementary, or science or social studies in upper elementary, I’d use it very similarly to the ways I’m using it now, but I would introduce it in the year earlier so I could use it for multiple concepts. I think that this would be a really great way to introduce big-unit topics and then grow on them throughout the entire unit. And if I wanted to, if I taught it at the very beginning of the year, what I would do is I’d start with our first unit. We do that whole one together, so going back to explicitly explaining, taking that whole time to do the first one together.
After that, at the beginning of each unit, they would have their topic and build on it as we go through that unit. So that way, again, that we can do with the very first unit together. And then as we grow, they’re able to have that idea and able to have their own kind of way they craft and learn how to do it so as the year progresses, I can see, ‘So this is how Student X does this concept map, and this is where they’re making connections.’ And for me, I can refer to that to see, ‘Is [sic] there any misconceptions or miscommunication or misunderstandings in the content?’ Because I can see that they’re connecting something here, but they’re not including these key concepts.”

Susan (individual interview): “I think my experiences helped me understand challenges or benefits that it would bring to the students as well … I’m trying to think of different ideas and new things to keep students interested. I think just going back to what I said earlier, just the grade level. And I think I would mostly use it in writing and using it in the planning stage before students write.”

Phyllis (individual interview): “If I was [in] an English [classroom], I definitely would use it with my kids. Because they can see, even with researching, they can see, ‘This is where I’m going with this. This is how I want to structure my paper. This is how I want to structure my paragraph.’”

Adrienne (individual interview): “I feel like concept maps would be a good way to teach writing. It would be a good way to organize a draft or just organize writing instead of just write. It’s a good way to get them to really think about what they want to write, why they want to write it, and go into those details.”

Karen (focus group): “I wouldn’t do concept mapping on this scale [points to example from her college course]. I don’t see myself doing it by choice because it takes a lot of time and energy. We [could] look at something in the beginning, like, say, four weeks ago when we started fractions … and then when we come back to the end of fractions … they would have been able to fill in all of the concept map, having that as, like, a thing that we do consistently over the course of seven weeks because we’re doing fractions. I think that could be the most real-life [situation where] I can see [myself] doing this.”

During the focus group, the participants were presented these themes and subthemes associated with the second research question in the form of Figure 15, and participants agreed that these subthemes were an accurate experience of theirs. Here is a relevant excerpt from the focus group interview:

Researcher: “So, with your perception on concept mapping, is there anything you want to add or anything that doesn’t feel that it was included, or are there any questions?”

Karen: “Yeah, I agree.”

Marylynn: “I find these to be very accurate.”
Summary

The purpose of this research was to examine elementary preservice teachers’ experiences and perceptions of concept mapping. The data from the interviews were analyzed, and themes emerged from the interview questions relating to this study’s research questions. The data were presented in this chapter to support the themes using participants’ own words from excerpts from interview transcripts.

The first theme, identified as past experiences utilizing concept mapping in instruction, relates to the first research question. The following five themes related to the second research question: (1) definition of concept mapping, (2) perceived educational value, (3) perceived barriers in concept mapping implementation, (4) preservice teachers’ self-efficacy with concept mapping, and (5) preservice teachers’ perceived future implementation of concept mapping in their future classroom.

The subsequent chapter will discuss and interpret the data.
Chapter Five: Discussion and Conclusions

The purpose of this basic qualitative study was to examine the experiences and perceptions of concept maps with elementary preservice teachers. The study was composed of seven participants completing a one-to-one interview and four of those participants participating in a focus group interview. All interview questions related back to the study’s two research questions and subquestions as noted in Tables 2 and 3. Collected data were analyzed using a three-stage thematic analysis as outlined in Chapter 3. One theme emerged that aligned with the first research question and five themes emerged relating to the second research question. An explicit explanation of that data and supporting evidence was included in Chapter 4. This chapter offers a discussion of those findings by providing an interpretation, limitations, recommendations for further research, and implications of this research.

Interpretation and Implications of the Findings

The findings will be presented by the two research questions of this study and related subquestions. Interpretation and implications will be discussed in relation to the two research questions and will follow the discussion of the findings. Connections to the literature from Chapter 2 will also be reviewed.

Research Question 1: What are elementary education preservice teachers’ experiences with concept mapping?

Theme 1 - Past Experiences

Participants’ previous experiences emerged as the overarching theme from the data relating to this question. This theme was broken down into five subthemes: (1) no experience before Residency; (2) breaking down ideas; (3) making connections; (4) meaningfulness; and (5) ongoing.
Research Question 1a. What are their prior experiences before being accepted to Residency?

No Experience Before Residency. All participants reported not having any experience with concept mapping before their senior year. This finding aligns with the only study found that focused on evaluating elementary preservice teachers’ construction of concept maps. Subramaniam and Esprívalo Harrell (2015) surveyed 200 elementary preservice teachers’ prior experience with concept mapping, and 53% stated they had used them in their K-12 schooling. However, when asked to draw a concept map, 0% of 200 participants drew a concept map that was hierarchical and contained linking words with directional arrows to represent clear relationships as defined by Novak and Gowin’s (1984) definition of a concept map. “Most importantly, the lack of using linking phrases on connecting arrows indicated that participants in this study confused ‘concept maps’ with ‘mind maps’” (Subramaniam & Esprívalo Harrell, 2015, p. 232). This echoes the experiences uncovered in this study: “I didn’t even know what a concept map was. I don’t think we ever used it. The closest thing to concept mapping would probably just be typical graphic organizers, so maybe a bubble map that just breaks off into different circles, but that was it. We never went any deeper than that.”

Research Question 1b. What are their experiences during Residency?

Breaking Down Ideas. Breaking down ideas refers to the participants describing their experiences with concept mapping, and 100% of the participants described experiences of breaking down larger concepts into smaller parts, or “chunks,” to “scaffold” their learning. All participants in this study described “start[ing] off general” and “get[ting] more specific as you go down” as their experiences with concept mapping during Residency. This finding aligns with Novak and Gowin’s (1984) purpose in creating a hierarchical concept methodology to serve as a scaffold to help structure knowledge because meaningful learning theory states learning is
hierarchical: When inclusive concepts are presented at the top of the map with general concepts below, the brain makes more meaning out of the information (Ausubel, 1968; Ausubel et al., 1978). In addition, these experiences align with Bruner’s (1966) research on scaffolding: He realized that students built on what they already know, and learners of any age could maintain new information if the information is organized in a meaningful way (Bruner, 1966; Driscoll, 2014).

**Making Connections.** Making connections refers to the experiences described by 100% of participants of this study where making connections stood out to them. One participant during her one-on-one interview recalled, “It really gets you thinking about the big ideas and the small ideas and how they’re all connected.” Another participant declared, “Building those connections just makes it stick with you longer.” This mirrors current research that concept mapping compounds students’ ability to think critically and deeper when making connections to concepts and linking ideas (Ajaja, 2013; Kinchin, 2000). This finding also aligns with Novak and Gowin’s (1984) experience: “Students and teachers constructing concept maps often remark that they recognize new relationships and hence new meanings (or at least meanings they did not consciously hold before making the map)” (p. 17). Furthermore, meaningful learning theory mentions that information is more likely to be transferred to long-term memory when highlighting relationships between knowledge structures (Ausubel, 1968).

**Meaningfulness.** This theme emerged after all participants described their experiences with concept mapping as meaningful because they were able to make sense of their own learning, they were offered choice in the design of the concept map, and they were able to relate new knowledge to existing schema. This aligns with Ausubel’s (1968) meaningful learning theory, which relies on the notion that knowledge is formed from what one already knows, and
one must relate that new knowledge to existing schema. Additionally, this theory allows learners the choice to organize information based on perceived relationships that exist, allowing the learner to understand better by making those connections (Ausubel, 1968; Ausubel et al., 1978). Participants also said being able to see their work helped them make sense of the material. For example, a participant recalled, “I was able to visually see how much I knew because I put it on paper.” This aligns with current literature stating, “Concept mapping is in itself a cognitive strategy that students can learn and employ to enhance their own learning by providing visual representation of information” (Stevenson et al., 2017, p. 4).

**Ongoing.** Six out of seven participants described their experiences with concept mapping as an ongoing process where they had to review and revise their maps based on the new knowledge presented since the last time they had worked on concept maps. Some participants found this frustrating at first, but all six reported value in the process. Their experiences are an example of Piaget’s (1961) accommodation, which describes changing one’s understanding after being exposed to new information. Participants describe changing their perspective after being exposed and utilizing concept mapping. As one participant stated, “I can tell, through my work, that from the beginning to the end, I definitely had a shift in my understanding. So it’s incredibly important and incredibly self-reflective for students to be able to go back and see how their thinking has grown.” One participant reported working through uneasiness related to her experiences with concept mapping: “[In] the beginning, it was like, ‘I don’t know what I’m doing.’ And so I had to learn how to do it, and it was annoying … It was really repetitive, which is probably why I remember so much.” This aligns with current literature on reflective thinking practices: “Learning then becomes about connecting new ideas to one’s own thinking” (Ritchhart et al., 2011, p. 49). This also supports Ausubel’s theory that “meaningful learning is a continuous
process wherein new concepts gain greater meaning as new relationships (propositional links) are acquired” (Novak & Gowin, 1984, p. 99).

**Interpretation of Findings for Research Question 1**

Research Question 1 asked, “What are elementary education preservice teachers’ experiences with concept mapping?” The fact that none of the participants remembered or reported using concept maps in their elementary school, secondary school, or first three years of collegiate experience is significant. These findings help explain the lack of construction knowledge preservice teachers have with concept mapping (Subramaniam & Esprívalo, 2015). Participants did not have any memorable experiences with concept mapping before their final year in college; however, once they were exposed to concept mapping, they described experiences in line with Novak’s intentions of developing a tool that facilitates meaningful learning by breaking down concepts, making connections, labeling those connections, and revisiting the tool once more knowledge has been gained (Ausubel, 1968; Ausubel et al., 1978; Novak & Gowin, 1984).

**Implications of Findings for Research Question 1**

The implications of the findings from this research question are to inform teacher educators and elementary teacher preparation programs about preservice teachers’ prior experiences with concept mapping. Through the results of this study, it seems likely that these preservice teachers need more experience with concept mapping. Elementary teacher preparation programs and teacher educators need to take prior experiences into account and design instruction to explicitly teach this tool to preservice teachers in order to attend to any limited experience with concept maps.
Research Question 2: What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction?

Five overarching themes about concept mapping emerged from data aligned with the second research question: (1) definition; (2) perceived educational value; (3) perceived implementation barriers; (4) self-efficacy in utilization; and (5) perceived future implementation. These themes will be discussed in relation to the subquestion that aligns with it. Integration and implications for Research Question 2 will follow.

Research Question 2a. What is their perception of their knowledge of concept mapping?

Theme 2 — Definition of Concept Mapping

When asked to define concept mapping, participants described the tool as Novak envisioned: “Concept maps are intended to represent meaningful relationships between concepts in the form of propositions … Because meaningful learning proceeds most easily when new concepts … are subsumed under broader, more inclusive concepts, concept maps should be hierarchical” (Novak & Gowin, 1984, p. 15). Four participants specifically mentioned moving from broader topics to more specific concepts. All participants defined it as a way to organize and help the learner make sense of information. Furthermore, many participants explicitly described it as a way to “connect” and “relate” information as concepts “branch” from each other through “arrows” or “lines.” This finding also reinforces literature from NRC (2012) that “knowledge is characterized by a rich, conceptually organized, well-connected, and fluently integrated set of representations” (p. 117).

Research Question 2b. What do they perceive are the barriers and benefits of concept mapping?
Theme 3 — Perceived Education Value

Participants’ perception of the benefits of concept mapping emerged as the overarching theme from the data relating to this subquestion. This theme was divided into three subthemes: (1) breaking down concepts; (2) seeing thinking; and (3) meaningfulness for the learner.

Breaking Down Concepts. All participants perceived that breaking down concepts was a benefit of concept mapping and that it “deepen[s] your understanding.” This aligns with current research that demonstrated an increase in student achievement when utilizing concept mapping (Bramwell-Lalor & Rainford, 2014; Hwang et al., 2014; Jaafarpour et al., 2016; Jin & Wong, 2015; Martin et al., 2015; Pishgooie et al., 2019; Sun & Chen, 2016). Additionally, two participants chose to use this tool for personal planning purposes to help break down tasks. “I’m one of those people who tends to get overwhelmed with information … And I think that it speaks volumes that I sat down and used it for my life because … it does make me feel less overwhelmed. You can … break it down” This is an example of Piaget’s (1961) equilibration. Equilibration is when the learner’s notions, grounded in prior knowledge, correspond with the new knowledge. This learner used her prior knowledge of concept mapping to help break down new knowledge: her assignments and coursework due dates.

Seeing Thinking. All participants reported value in concept mapping as an opportunity for thinking to be seen, which directly aligns with Novak’s purpose for creating this tool since it is “a kind of visual road map showing some of the pathways we may take to connect meanings of concepts in propositions” (Novak & Gowin, 1984, p. 15). One participant determined that concept mapping allowed for misconceptions to be seen by the teacher. This aligns with current research that concept mapping uncovers misconceptions (Bramwell-Lalor & Rainford, 2014; Hwang et al., 2014; Jing & Wong, 2015). One participant perceived that engagement of students
would increase because the students could see their thinking. This also aligns with current research on visible thinking, since it aims to increase student engagement: “We need to make thinking visible because it provides us with the information we as teachers need to plan opportunities that will take students’ learning to the next level and enable continued engagement with the ideas being explored” (Ritchhart et al., 2011, p. 27).

**Meaningfulness for the Learner.** As described in Chapter 4, almost all participants perceived concept maps to be “meaningful” because learners can “connect” their “schema” and “make sense” of new knowledge. The participants’ perception of the benefits of concept mapping align with Novak’s purpose for creating the tool to elicit from learners an opportunity to make learning meaningful, as Ausubel outlined in his meaningful learning theory (Ausubel, 1968; Ausubel et al., 1978; Novak & Gowin, 1984). This also supports current research that found concept mapping allows users to form meaningful connections (Bauman, 2018).

**Theme 4 — Perceived Barriers in Implementation**

Participants’ perception of barriers emerged as the overarching theme from the data relating to this subquestion. This theme was broken down into four subthemes: (1) time; (2) learner characteristics; (3) content area; and (4) preservice teachers’ self-efficacy.

**Time.** Since concept mapping includes revision and requires time for learners to practice “reflective thinking just as teams need time to practice a sport” (Novak & Gowin, 1984, p. 19), it is no surprise that almost all participants described time and curriculum restrictions as barriers to implementing concept mapping in the classroom. These findings mirror what teachers report when implementing a new tool or strategy across a variety of elementary subjects (Dinkel, Lee, & Schaffer, 2016; Johnson & Dabney, 2018; Little, Marrs, & Bogue, 2017; Rock et al., 2006).
**Learner Characteristics.** All participants perceived the age and writing ability of younger students as barriers in implementing concept mapping. On a scale of 1 (low) to 10 (high), the participants rated themselves as a 3.71 on average in implementing concept mapping with kindergarten and first-grade students. This could be attributed to the majority of concept mapping research involving upper elementary students through collegiate level (Ajaja, 2013; Asan, 2007; Bramwell-Lalor & Rainford, 2014; Huang et al., 2017; Jaafarpour et al., 2016; Jin & Wong, 2014; Sun & Chen, 2015; Pishgooie et al., 2019; Tripto et al., 2017; Wang et al., 2016). Research that does exist utilizing concept mapping with kindergarten and lower elementary grades uses an adaptive model of concept mapping that deviates from Novak’s definition of concept maps used for this research (Birbili, 2006; Giombini, 2004; Sundararajan et al., 2018). This finding is not surprising in conjunction with the finding that participants have only used it as college students. As one participant revealed, “What does it look like in younger grades? I feel like I can’t even picture it.” Since the only exposure participants reported was using collegiate-level information to construct a concept map, they do not have the schema to implement this strategy for younger learners. This finding also supports literature that novice teachers struggle to identify instructional strategies to uncover student preconceptions and misconceptions (Cox et al., 2016; Gomez-Zwiep, 2008; Seo et al., 2017).

**Content Area.** The majority of participants listed math as an area in which it would be hard to implement concept mapping techniques. This follows the gap in literature on concept mapping in elementary math content. The few math studies uncovered that involved concept mapping were conducted internationally with middle schoolers on algebraic concepts (Jin & Wong, 2015; Niemelä et al., 2018). Most of the research on concept mapping is conducted with science content (Ajaja, 2013; Bramwell-Lalor & Rainford, 2014; Hwang et al., 2011; Jang, 2010;
Koponen & Nousiainen, 2013). Since the only experience participants reported with concept mapping did not use math-related content, they do not have the schema to implement this strategy for math concepts. Additionally, mathematics content is oftentimes perceived procedurally instead of conceptually, so preservice teachers may struggle with these competing perceptions and not be able to identify ways to use concept mapping with math. Furthermore, Novak’s (1990) own research primarily focused on concept mapping in science, and when discussing ways to introduce concept maps to students, there are no procedures for implementation in math and only one example of a math-related concept map from a high school algebra course (Novak & Gowin, 1984). In comparison, Novak describes how to introduce concept maps in language arts, and the examples provided for elementary-age (K-5) students center on science concepts (Novak & Gowin, 1984).

**Self-Efficacy of Preservice Teacher.** Most of the participants perceived they were a barrier to concept mapping execution because of lack of experience with the tool or lack of knowledge on how to implement it with students. Learner characteristics were an influencer in this rating; however, it became clear the preservice teachers’ perceptions of their ability to use concept mapping was a major factor. This aligns with research that found novices have difficulty “elicit[ing] complex ideas in a meaningful way” (Wang et al., 2018, p. 457). As one participant stated, “Challenges are probably far more me … I don’t know how I would actually do it or be good at it.” This also reinforces Novak’s (1990) own research: “The studies by Beyerbach and Smith [1990] and Hoz, Tomer, and Tamir [1990] point to the need for empowering teachers to learn meaningfully so that they can be more successful in helping their own students learn meaningfully” (p. 943). The data overlap and continues into the next theme.
Research Question 2c. How confident are elementary education preservice teachers in implementing concept mapping into their own classroom?

Theme 5 — Preservice Teachers’ Self-Efficacy

Relating to the previous subtheme, this theme emerged independently because, as participants described their confidence levels in concept mapping implementation, it became clear it was participants’ perception of their own low self-efficacy with concept mapping that was a key factor in ratings. This also aligns with research identifying major limitations of the use of concept mapping in instruction: “Concept mapping is not easy to construct, and respondents require training and practice in producing maps … Thus limitations are found to frustrate low achievers in mastering the techniques required for the use” (Ajaja, 2013, p. 6-7). These reported perceptions are an example of Vygotsky’s (1978, 1980) research in ZPD. Participants’ descriptions of uncertainty toward concept mapping implementation in elementary classrooms indicate they are in the distal zone, since they report not having received modeling of concept mapping with elementary students. However, they imply they are in the ZPD if they were just afforded assistance. As one participant revealed, “I’d have to figure out how to teach it to younger students because I saw [it] taught to adults.” This finding connects with Vygotsky’s research, as with any learner who does not have the prerequisite skills to move forward, these participants account for not being able to translate their experiences with concept mapping to experiences appropriate for younger students.

Research Question 2d. How do they perceive they would, if at all, implement it in their future classroom?
**Theme 6 — Perceived Future Implementation**

The perceptions uncovered in this theme are significantly influenced by the previous theme of low self-efficacy with concept mapping in an elementary setting. All reported they would potentially use concept mapping in their future classrooms, but it would depend on the characteristics of their learners and the content area. Almost half of participants perceived they would use it to introduce a topic and revisit the maps during a learning segment, which supports the intentions of Novak (1984) while incorporating one of the key tenets of Ausubel’s meaningful learning theory: relating existing schema to new knowledge. History/social studies and writing were the only subject areas mentioned in which concept mapping would be utilized. Less than half of the participants reported using it for identifying misconceptions and seeing the connections their students were making, which aligns with Novak’s intentions of creating this tool while simultaneously supporting research that reflective practices such as concept mapping can be used to uncover misconceptions (Ausubel et al., 1978; Beyerbach & Smith, 1990; Cañas & Novak, 2006; Novak & Cañas, 2006; Novak & Gowin, 1984; Seo et al., 2017).

**Interpretation of Findings for Research Question 2**

Research Question 2 asked, “What are elementary education preservice teachers’ perceptions of concept mapping in classroom instruction?” To the best of my knowledge, these participants have not been directly exposed to Ausubel’s (1968) meaningful learning theory but described the key tenets of the theory when talking about their perceptions of the tool. Their definition of concept mapping not only aligned with Ausubel’s theory but also with Novak’s purposes for designing this instructional instrument. Yet there is a disconnect: Although participants were able to define concept mapping in line with Novak’s intentions, extract the fundamental principles of Ausubel’s meaningful learning theory, and understand the intended
educational benefits in using this instructional instrument with students, all were reluctant to commit to implementing it in a future classroom. They perceived concept mapping as hierarchical and noted making connections to new knowledge while incorporating schema as important features. They also perceived value in concept mapping because of those factors. However, self-efficacy played a large role in the participants’ perceived barriers and future implementation. Although participants could state the educational advantages in implementing concept maps in instruction and three participants reported using it outside of requirements for a college course, they were all hesitant to declare they would absolutely use this tool in a future classroom due to self-efficacy, time, learner characteristics, and the content area of what they could be teaching in the future.

**Implications of Findings for Research Question 2**

The implications of the findings from this research question are to inform teacher educators and elementary teacher preparation programs about preservice teachers’ current perceptions with concept mapping utilization in instruction. “It is only when we understand what our students are thinking … we can use that knowledge to further engage and support them in the process of understanding” (Ritchhart et al., 2011, p. 27). Reflective practices such as concept mapping assist learners in utilizing their schema while connecting it to new knowledge (Ausubel et al., 1978; Beyerbach & Smith, 1990; Cañas & Novak, 2006; Novak & Cañas, 2006; Novak & Gowin, 1984; Seo et al., 2017). Elementary education teacher preparation programs are positioned to address the problems of a lack of concept mapping construction knowledge and low awareness of strategies to incorporate student preconceptions and uncover student misconceptions for novice teachers (Cox et al., 2016; Gomez-Zwiep, 2008; Seo et al., 2017). To
combat this issue, one must look at elementary education teacher preparation programs and how they prepare future elementary teachers.

The results of this study indicate that these preservice teachers need more experience with concept mapping as students and should be explicitly taught how to implement it as an elementary teacher. With the small amount of exposure these preservice teachers had to the tool, they were all able to extract the key tenets of meaningful learning theory through their definition of concept mapping and find educational benefits for the learner and educator using the tool. Nonetheless, the perceived barriers seem to outweigh these beneficial factors, since all participants were tentative in stating they would implement concept maps with future students. However, the perceived barriers reported could be overcome by more experience and explicit modeling with the tool.

Elementary teacher preparation programs need to explicitly teach concept mapping to preservice teachers in order to attend to the low self-confidence ratings uncovered in this study. The instruction should allow preservice teachers multiple opportunities to use concept mapping with collegiate-level information and model how to use the tool with elementary-age students. If elementary teacher educators teach concept mapping with younger students and for math courses, preservice teachers may utilize the tool more frequently, which would provide more meaningful learning opportunities for future students. This could increase self-efficacy with the tool and improve novice teachers’ implementation strategies to elicit preconceptions and misconceptions from their learners.

**Limitations**

There are several limitations of this study that should be noted:
• This study focused on the experiences of preservice teachers at one university and did not include the general population. Increasing the number of teacher preparation programs would increase the credibility and generalizability of this study.

• Since this study is qualitative and the participants self-reported their experiences, inaccurate self-reporting could occur in the form of selective memory, remembering an accurate event but on an inaccurate timeline, crediting positive experiences to oneself and negative experiences to an outside source, and/or embellishment.

• The interview protocols were designed specifically for this study. Using interview protocols that were previously vetted and credible would further increase the credibility of this study.

• Since I am a beginning researcher, a more experienced researcher may have been able to more fluidly create supplemental questioning based on the interviewees’ responses.

Recommendations for Further Research

The purpose of this study was to examine the experiences and perceptions of elementary preservice teachers on the utilization of concept mapping in instruction. This was an exploratory study, and future, more in-depth research would be informative. The following ideas to further this research include but are not limited to:

1. A longitudinal study following students exposed to concept mapping in elementary school through college could explore the differences, if any, in those participants’ experiences and perceptions compared with participants who did not have any experience with concept mapping before their senior year of college.
2. Replicating this research at other institutions with elementary preservice teachers across the nation could determine whether these are common experiences and perceptions of concept mapping.

3. Providing professional development focused on concept mapping implementation specific to grade levels and content areas current novice teachers are teaching in could be beneficial. Then, studying the perceptions and implementation of concept mapping by those participants could garner further insight into implementation perceptions once participants have more exposure with the tool.

4. Executing concept mapping instruction explicitly in an elementary teacher preparation program and then replicating this study to examine the experiences and perceptions of those preservice teachers could determine whether self-efficacy of concept mapping implementation was influenced positively.

5. A longitudinal study involving participants from this research in their first years of teaching could be informative to see whether the perceived implementation ideas identified in this study came to fruition or manifested in another unexpected way.

Conclusion

The findings from this study determined that preservice teachers can describe the purpose and find educational value in concept mapping that align with the theoretical framework of this study and of this tool even though they reported not having any experiences with concept mapping prior to their senior year in undergraduate studies (Ausubel, 1968; Ausubel et al., 1978; Novak & Gowin, 1984). However, the preservice teachers’ lack of exposure and explicit teaching of this tool impacted their self-efficacy of current and future concept mapping implementation. Although all participants perceive they may use this tool in the future, they
reported that the barriers of time, learner characteristics, content area, and themselves would prevent future usage. Providing more purposeful learning experiences and explicit instruction on how to implement concept maps in elementary school could potentially raise self-efficacy and overcome the perceived barriers of implementation. This conclusion echoes the words of one participant: “I really enjoy learning new stuff … but having maybe a PD (professional development) or just being constantly reminded, ‘This is how you do different ways to do concept mapping’ … Because I know this was my first time, [and] it seems like years ago.”

Reflective practices in classrooms have gained traction as metacognition plays a larger role in elementary education. As Novak (1990) stated:

The use of concept mapping and other metacognitive tools in teacher education programs may play a useful role in two ways. First these tools may help prospective or in-service teachers to move their own learning approaches toward more meaningful and less rote practices. They will seek to make subject matter more conceptually transparent ...

Second, they will become skillful in the use of metacognitive tools … and thus hold more confidence in using these tools with their own students. (p. 943)

Continued research on concept mapping and usage with all ages of learners could prepare our preservice teachers more adequately to be able to identify instructional strategies to provoke more meaningful learning experiences for students.
References


Hall, A. (2019, November 11). ICL program review. Presented at the Student Retention and Completion Meeting, Memphis, TN.


Appendices

Appendix A: IRB Approval

PRO-FY2019-625 - Initial: Approval - Expedited

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January 27, 2020

PI Name: Logan Caldwell
Co-Investigators:
Advisor and/or Co-PI: Cliff Mims
Submission Type: Initial
Title: Elementary Preservice Teachers’ Perceptions of Concept Mapping
IRB ID: #PRO-FY2019-625

Expedited Approval: January 27, 2020

The University of Memphis Institutional Review Board, FWA00006815, has reviewed your submission in accordance with all applicable statutes and regulations as well as ethical principles.

Approval of this project is given with the following obligations:

1. When the project is finished a completion submission is required
2. Any changes to the approved protocol requires board approval prior to implementation
3. When necessary submit an incident/adverse events for board review
4. Human subjects training is required every 2 years and is to be kept current at citiprogram.org.

For additional questions or concerns please contact us at irb@memphis.edu or 901.6783.2705.

Thank you,

James P. Whelan, Ph.D.
Institutional Review Board Chair
The University of Memphis.
Appendix B: Initial Email to Participants

Dear Current Teacher Candidate,

I am working on my dissertation and am reaching out to see if you would be able and willing to participate in my research study. The purpose of my basic qualitative study is to describe the experiences and perceptions of concept mapping utilization during instruction with undergraduate, elementary preservice teachers at the University of Memphis. Attached to this email is the consent form with more specific and detailed information about the study.

There are no direct benefits for participants who opt to participate in this study. However, the findings from this study would provide to the existing literature and could assist future teacher educators locally and nationally in designing effective instruction on using concept mapping for preservice teachers in teacher preparation programs.

It is up to you to decide whether you want to volunteer for this study. It is also ok to decide to end your participation at any time. There is no penalty or loss of benefits to which you are otherwise entitled if you decide to withdraw your participation or choose not to participate. Your decision about participating will not affect your relationship with the researcher, your status as a student, or the University of Memphis. At any time, you may send your consent via email, telephone, or face-to-face.

If you volunteer to take part in this study, you will be asked to participate in an individual face-to-face interview with the lead researcher, Logan Caldwell, that will take around 60 minutes in a confidential setting in her office 420C Ball Hall. You may also be asked to participate in a 60-minute focus group interview that would include other participants from this study and take place in a quiet, reserved room in Ball Hall. If any questions during any of the interviews make you uncomfortable, you may skip it or stop the interview at any time. Your real name will never be used in any part of this research or publication. You do not need to do anything to prepare for this interview. There are no wrong answers. The interview is about your experiences and already existing perceptions.

If possible, the individual interview would be scheduled by the end of this week.

The focus group interview (45-60 minutes) will be scheduled in the second or third week of February 2020 once all of the individual interviews are complete.

Don’t hesitate to contact me with any questions if needed.

Please use this link below to indicate whether you provide initial consent or not. Again, your decision about participating will not affect your relationship with the researcher, your status as a student, or any faculty member at the University of Memphis. If you offer consent, you will be provided with a copy of the attached consent form and the opportunity to sign the attached form before we begin the interview.

Initial Consent: https://forms.gle/8SWXGjK72j88Q5Qb7

If you DO provide consent, I will be in contact with you to schedule the individual interview (45-60 minutes). It would just be you and me during the individual interview in my office (420C Ball Hall) to ensure confidentiality and comfortability. If you do NOT provide consent, I appreciate your time. You do not need to fill anything else out. Thank you.

Thank you for your time and consideration. Please don’t hesitate to reach out if you have any questions.

Sincerely,

Logan Caldwell
Clinical Instructor
Elementary Education Department
Instruction Curriculum and Leadership

The University of Memphis
420C Ball Hall
Memphis, TN 38152
LoganCaldwell@memphis.edu | memphis.edu

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Appendix C: Participant Informed Consent Letter

Consent for Research Participation

Title: Elementary Preservice Teachers' Perceptions of Concept Mapping

Researcher(s): Logan Caldwell, University of Memphis

Researchers Contact Information: 901-360-0516, lpoyette@memphis.edu

You are being asked to participate in a research study. The box below highlights key information for you to consider when deciding if you want to participate. More detailed information is provided below the box. Please ask the researcher(s) any questions about the study before you make your decision. If you volunteer, you will be one of about 6 people to do so.

<table>
<thead>
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<th>Key Information for You to Consider</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voluntary Consent:</strong> You are being asked to volunteer for a research study. It is up to you whether you choose to participate or not. There will be no penalty or loss of benefit to which you are otherwise entitled if you choose not to participate or discontinue participation.</td>
</tr>
<tr>
<td><strong>Purpose:</strong> The purpose of this research to learn what your experiences with concept mapping are and your perceptions of concept mapping usage.</td>
</tr>
<tr>
<td><strong>Duration:</strong> It is expected that your participation will last approximately 60 minutes for an individual face-to-face interview and the possibility of being selected for a focus group interview that will also last around 60 minutes.</td>
</tr>
<tr>
<td><strong>Procedures and Activities:</strong> You will be asked to attend an individual interview with the researcher listed above and the possibility of a focus group interview.</td>
</tr>
<tr>
<td><strong>Risk:</strong> There are not any risks associated with this study.</td>
</tr>
<tr>
<td><strong>Benefits:</strong> Though there are not any direct benefits for the participants, some of the benefits that may be expected include the findings from this study could assist future teacher educators in designing effective instruction on using concept mapping for preservice teachers in teacher preparation programs.</td>
</tr>
<tr>
<td><strong>Alternatives:</strong> Participation is voluntary, and the only alternative is to not participate.</td>
</tr>
</tbody>
</table>
Appendix C: Participant Informed Consent Letter Continued

Who is conducting this research?

Lead Investigator, Logan Caldwell of the University of Memphis, Department of Instruction Curriculum and Leadership, is in charge of the study. Her faculty advisor is Dr. Clif Mims.

There is not a financial interest of conflict of interest related to this research.

What happens if I agree to participate in this Research?

If you agree you will be asked to participate in an individual face-to-face interview with the lead researcher that will take around 60 minutes. You may be asked to participate in a 60 minutes focus group interview what would include other participants from this study. If any question makes you uncomfortable, you may skip it or stop the interview at any time.

During the individual interviews, the audio of the sessions will be recorded and transcribed by the lead investigator. A pseudonym will be attached to your data, and no personal information will be published. Any personal information obtained during this study will be stored in a locked filing cabinet in the researcher’s office. Any electronic data will be stored on a password protected computer. If you participate in the focus group study, the audio will be recorded and listened to only by the lead investigator of this project. The same pseudonym will be attached to your data and no further personal information will be collected at that time.

What happens to the information collected for this research?

Information collected for this research will be used to provide data for the lead researcher’s dissertation. Your name will not be used in any published reports or any conference presentations. The lead investigator plans to publish/present the results of this research. However, she will keep your name and other identifying information confidential. Your personal data will not be shared in any capacity with anyone.

How will my privacy and data confidentiality be protected?

We promise to protect your privacy and security of your personal information as best we can. Although you need to know about some limits to this promise. Measures we will take include:

- Conducting research in a private setting and/or other space considerations with your choice of where the individual interview will take place
- Pseudonyms will be used in the transcriptions and data reporting for each participant. A document that links participants to pseudonyms and demographic information will be stored in a locked filing cabinet in the researcher’s office. The data will be de-identified beginning at the individual interview stage. All transcribed data will be stored on a password protected computer. The audio recordings will be initially stored on an iPhone that is password protected. The audio recordings will be uploaded to a password protected account in a web-based transcription application for transcription. As soon as the data is transcribed, the audio recordings will be removed from the iPhone and only remain in the web-based, password protected account.
Appendix C: Participant Informed Consent Letter Continued

- At the conclusion of this study and after a successful dissertation defense, the audio recordings will be deleted from the transcription application. The transcriptions and consent forms will be stored in a locked filing cabinet for 3 years in the researcher's office. After that 3 years, all data will be destroyed.
- There are not limitations to security as the primary researcher is the only person to have the passwords to all machines and accounts listed.

Individuals and organization that monitor this research may be permitted access to inspect the research records. This monitoring may include access to your private information. These individual and organization include my advisor, Dr. Mims, and the Institutional Review Board.

Research team members are required to report the following if a team member suspects child abuse or neglect, or suicidal thoughts. TN Laws may require this suspicion be reported. In such case, the research team may be obligated to breach confidentiality and may be required to disclose personal information.

What if I want to stop participating in this research?
It is up to you to decide whether you want to volunteer for this study. It is also ok to decide to end your participation at any time. There is no penalty or loss of benefits to which you are otherwise entitled if you decided to withdraw your participation. Your decision about participating will not affect your relationship with the researcher(s) or the University of Memphis. At any time, you may resend your consent via email, telephone, or face-to-face.

Will it cost me money to take part in this research?
There are no costs associated with participation in this research study.

Will I receive any compensation or reward for participating in this research?
You will not be compensated for taking part in this research.

Who can answer my question about this research?
Before you decide to volunteer for this study, please ask any questions that might come to mind. Later, if you have questions, suggestions, concerns, or complaints about the study, you can contact the investigator Logan Caldwell at loganc@memphis.edu or her faculty advisor, Dr. Cliff Mims at cliffm@memphis.edu. If you have any questions about your rights as a volunteer in this research, contact the Institutional Review Board staff at the University of Memphis at 901-678-2705 or email irb@memphis.edu. The lead investigator will give you a signed copy of this consent to take with you.
Appendix C: Participant Informed Consent Letter Continued

STATEMENT OF CONSENT

I have had the opportunity to consider the information in this document. I have asked any questions needed for me to decide about my participation. I understand that I can ask additional questions through the study.

By signing below, I volunteer to participate in this research. I understand that I am not waiving any legal rights. I have been given a copy of this consent document. I understand that if my ability to consent for myself changes, my legal representative or I may be asked to consent again prior to my continued participation.

As described above, you will be audio recorded while performing the activities described above. Audio recordings will be used for data collection. Initial the space below if you consent to the use of audio recording as described above.

[ ] I agree to the use of audio recording.

________________________   ___________________________   _____________
Name of Adult Participant   Signature of Adult Participant   Date

Researcher Signature (To be completed at the time of Informed Consent)

I have explained the research to the participant and answered all of his/her questions. I believe that he/she understand the information described in this consent and freely consent to participate.

________________________   ___________________________   _____________
Logan R. Caldwell   Signature of Research Team Member   Date
## Appendix D: Focus Group DoodlePoll

Poll "Focus Group Availability for Dissertation Research"

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Count: 1

https://doodle.com/poll/y6sur52vxx8xt8a3s
Appendix E: Individual Interview Protocol

Individual Interview Protocol

Set up:
- Welcome participant and include related small talk to make participant comfortable.
- Explain the purpose of the interview and remind participant of the protocol to ensure their privacy.
- Allow at least 15 minutes for participant to review and sign the paper version of the consent form. (The interviewer will step out of the room during this stage.)
- Check to ensure the audio recording is working.
- Check to ensure the transcription app is working.

Question 1:
- Define and describe concept mapping.
Follow up Question:
- How did you develop this definition?

(If a participant does not describe Joseph Novak’s definition of concept mapping, use Alternative Question A1.)

Novak’s definition: “Concept maps that are hierarchical include more general concepts at the top of the map while more specific and focused ideas are organized below the more inclusive concepts and are linked through lines and propositions (Novak & Gowin, 1984). Propositions are defined as the descriptive word that declares the relationship between the two concepts that are linked. (Novak & Gowin, 1984).

Why I’m asking this:
Research Question 2: What are elementary education preservice teachers’ perceptions of the utilization of concept mapping into classroom instruction?
2a. What is their perception of their knowledge of concept mapping?
2b. What do they perceive are the benefits and barriers of concept mapping?

Alternative Question A1:
The interviewer will state, “For the purpose of this interview, we are going to use Joseph Novak’s definition of concept mapping: Concept maps that are hierarchical include more general concepts at the top of the map while more specific and focused ideas are organized below the more inclusive concepts and are linked through lines and propositions (Novak & Gowin, 1984). Propositions are defined as the descriptive word that declares the relationship between the two concepts that are linked. (Novak & Gowin, 1984).”

The researcher will show the interviewee an example of a concept map that was drawn during a course assignment from their assessment course at the University of Memphis (ICL 3333) that each participant had, but the example will not be any of the current participants’ work. See Figure 1.1 below.

The interviewer will then restate question 1:
- Define and describe concept mapping in your own words.

Why I’m asking this:
Appendix E: Individual Interview Protocol Continued

Research Question 2: What are elementary education preservice teachers’ perceptions of the utilization of concept mapping into classroom instruction?
  2a. What is their perception of their knowledge of concept mapping?
  2b. What do they perceive are the barriers and benefits of concept mapping?

**Question 2:**
• Is concept mapping important? Why or Why not?

  *Why I’m asking this:*
  Research Question 2: What are elementary education preservice teachers’ perceptions of the utilization of concept mapping into classroom instruction?
  2a. What is their perception of their knowledge of concept mapping?
  2b. What do they perceive are the barriers and benefits of concept mapping?

**Question 3:**
• When could/should concept mapping be used? Why?
  **Follow up Questions:**
  • What content areas could concept mapping be used? Why?
  • What age levels of students could concept mapping be used? Why?

  *Why I’m asking this:*
  Research Question 2: What are elementary education preservice teachers’ perceptions of the utilization of concept mapping into classroom instruction?
  2a. What is their perception of their knowledge of concept mapping?
  2b. What do they perceive are the barriers and benefits of concept mapping?
  2d. How do they perceive they would, if at all, implement it in their future classroom?

**Question 4:**
• In what capacity have you used concept mapping BEFORE Residency I?
  **Follow up Questions:**
  • How was it used?
  • Why was it used?
  • Describe a memory of concept mapping being used in instruction.
  • How did you feel about using it? Why?
  • Do you think it was an effective instructional tool from an educator's viewpoint? Why or why not?

  *Why I’m asking this:*
  Research Question 1: What are elementary education preservice teachers’ experiences with concept mapping?
  1a. What are their prior experiences before being accepted to Residency?

**Question 5:**
• Describe your experiences with concept mapping BEFORE Residency I.
  **Follow up Questions:**
  • How was it used?
  • Why was it used?
  • Describe a memory of concept mapping being used in instruction.
  • How did you feel about using it? Why?
Appendix E: Individual Interview Protocol Continued

- Do you think it was an effective instructional tool from an educator’s viewpoint? Why or why not?
- What successes did you have during this experience?
- What challenges did you face during this experience?
- What did or would have helped you overcome these challenges?
- Did these experiences make you more or less likely to implement them in your future classroom? Why or why not?
- Do you think it was an effective instructional tool from an educator’s viewpoint?

_Why I’m asking this:_

Research Question 1: What are elementary education preservice teachers’ experiences with concept mapping?

1a. What are their prior experiences before being accepted to Residency?

**Question 6:**

- Why do you think your instructor used concept mapping during this [these] experience(s)?

_Why I’m asking this:_

Research Question 1: What are elementary education preservice teachers’ experiences with concept mapping?

1a. What are their prior experiences before being accepted to Residency?

Research Question 2: What are elementary education preservice teachers’ perceptions of the utilization of concept mapping into classroom instruction?

2a. What is their perception of their knowledge of concept mapping?

2b. What do they perceive are the barriers and benefits of concept mapping?

**Question 7:**

- When, if at all, have you utilized concept mapping _AFTER_ Residency I?

Follow up Questions:

- How was it used?
- Why was it used?
- Describe a memory of concept mapping being used in instruction.
- How did you feel about using it? Why?
- Do you think it was an effective instructional tool from an educator’s viewpoint? Why or why not?
- What successes did you have during this experience?
- What challenges did you face during this experience?
- What did or would have helped you overcome these challenges?
- Did these experiences make you more or less likely to implement them in your future classroom? Why or why not?
- Do you think it was an effective instructional tool from an educator’s viewpoint?

_Why I’m asking this:_

Research Question 1: What are elementary education preservice teachers’ experiences with concept mapping?

1b. What are their experiences after being accepted to Residency?
Appendix E: Individual Interview Protocol Continued

Question 8:
- Describe your experiences with concept mapping AFTER Residency I.
Follow up Questions:
  - How were they used?
  - How did you feel about using it? Why?
  - Did you notice any barriers and/or benefits during these experiences?
  - What were your positive and/or negative perceptions?
  - Did these experiences make you more or less likely to implement them in your future classroom?

  Why I'm asking this:
  Research Question 1: What are elementary education preservice teachers’ experiences with concept mapping?
  1b. What are their experiences after being accepted to Residency?

Question 9:
- Why did you use concept mapping in that capacity?
- Would you choose concept mapping if you could do it over again? Why or why not?

  Why I'm asking this:
  Research Question 1: What are elementary education preservice teachers’ experiences with concept mapping?
  1b. What are their experiences after being accepted to Residency?

  Research Question 2: What are elementary education preservice teachers’ perceptions of the utilization of concept mapping into classroom instruction?
  2a. What is their perception of their knowledge of concept mapping?
  2b. What do they perceive are the barriers and benefits of concept mapping?

Question 10:
- How comfortable do you feel implementing concept mapping? Why?
Follow up Questions:
  - Are there specific things that you have done or haven't done that make you feel that way?

  Why I'm asking this:
  Research Question 2: What are elementary education preservice teachers’ perceptions of the utilization of concept mapping into classroom instruction?
  2b. What do they perceive are the barriers and benefits of concept mapping?
  2c. How confident are elementary education preservice teachers in implementing concept mapping into their own classroom?

Question 11:
- How, if at all, did utilizing concept mapping influence your self-confidence in teaching?
Follow up Questions:
  - Why do you feel that way?
  - What successes did you experience?
  - What challenges did you experience?
  - What could or did help you through those challenges?
Appendix E: Individual Interview Protocol Continued

Why I'm asking this:
Research Question 2: What are elementary education preservice teachers' perceptions of the utilization of concept mapping into classroom instruction?
   2a. What is their perception of their knowledge of concept mapping?
   2b. What do they perceive are the barriers and benefits of concept mapping?
   2c. How confident are elementary education preservice teachers in implementing concept mapping into their own classroom?

Question 12:
- How, if at all, do you plan on utilizing concept mapping in your future classroom? Why or why not?
Follow up Questions:
- Can you explain why you feel that way?
- What might be some challenges you may experience?
- What might be some benefits you may experience?
- Do you think your past experience with using concept mapping as a student has an influence on how you feel about using them as a teacher? Please explain.

Why I'm asking this:
Research Question 2: What are elementary education preservice teachers' perceptions of the utilization of concept mapping into classroom instruction?
   2a. What is their perception of their knowledge of concept mapping?
   2b. What do they perceive are the barriers and benefits of concept mapping?
   2c. How confident are elementary education preservice teachers in implementing concept mapping into their own classroom?
   2d. How do they perceive they would, if at all, implement it in their future classroom?

Conclusion:
The interviewer will thank the participant for their time and ask demographic information.

- What is your age?
- What gender do you identify as?
- What race do you identify as?

Figure 1.1: Alternative Question 1A Image
Appendix F: Focus Group Protocol

Focus Group Interview Protocol

Set up:
- Welcome participants and include related small talk to make participants comfortable.
- Explain the purpose of the interview and remind participants of the protocol to ensure their privacy.
- Allow participants the opportunity to withdraw consent.
- Check to ensure the audio recording is working.

Question 1:
- As a group, define/describe concept mapping.

(If the participants do not refer to Joseph Novak’s definition of concept mapping, use Alternative Question A1.)

Alternative Question A1:
The interviewer will state, “For the purpose of this interview, we are going to use Joseph Novak’s definition of concept mapping: Concept maps that are hierarchical include more general concepts at the top of the map while more specific and focused ideas are organized below the more inclusive concepts and are linked through lines and propositions (Novak & Gowin, 1984). Propositions are defined as the descriptive word that declares the relationship between the two concepts that are linked. (Novak & Gowin, 1984).”

The researcher will show the interviewee an example of a concept map that was drawn during a course assignment from their assessment course at the University of Memphis (ICL 3333) that each participant had, but the example will not be any of the current participants’ work. See Figure 1.1 below.

Question 2:
- Since we last spoke, does anyone have anything new they remembered about concept mapping?

Follow up questions:
- Describe the experience.
- How did you feel about using it? Why?
- What successes did you have during this experience?
- What challenges did you face during this experience?
- What did or would have helped you overcome these challenges?
- What was your view on the use of concept mapping in this instance? Why?
- Did these experiences make you more or less likely to implement them in your future classroom? Why or why not?
- Why do you think your instructor used concept mapping during this experience?

Question 3:
- Since we last spoke, does anyone have anything new they experienced regarding concept mapping?

Follow up questions:
- Describe the experience.
Appendix F: Focus Group Protocol Continued

- How did you feel about using it? Why?
- What successes did you have during this experience?
- What challenges did you face during this experience?
- What did or would have helped you overcome these challenges?
- What was your view on the use of concept mapping in this instance? Why?
- Did these experiences make you more or less likely to implement them in your future classroom? Why or why not?
- Why do you think concept mapping was used during this experience?

**Question 4:**
- Show the focus group my themes for each question.
  State: I organized the interviews into like ideas and came up with the themes in the chart. [Researcher passes out chart. See Figure 1.2]

  For each question ask:
  - Are there any questions about the organization of the themes?
  - Are there any concerns about the organization of the themes?
  - Is there anything that is out of place or missing?
  - Are there any comments about the themes?

**Question 5:**
Here is an example of some exposure that you may have gotten before your Residency I year. Does this trigger any new experiences or memories? [Researcher shows students readings from their junior year science methods course that discussed concept mapping.]

  - Describe the experience.
  - How did you feel about using it? Why?
  - What successes did you have during this experience?
  - What challenges did you face during this experience?
  - What did or would have helped you overcome these challenges?
  - What was your view on the use of concept mapping in this instance? Why?
  - Did these experiences make you more or less likely to implement them in your future classroom? Why or why not?
  - Why do you think your instructor used concept mapping during this experience?

**Question 6:**
Here is some of the work that each of you described as an experience you had after entering Residency I. Does this trigger any new experiences or memories? [Researcher gave each participant the concept maps they worked on in their Residency II year in a course about Assessments.]

  - Describe the experience.
  - How did you feel about using it? Why?
  - What successes did you have during this experience?
  - What challenges did you face during this experience?
  - What did or would have helped you overcome these challenges?
  - What was your view on the use of concept mapping in this instance? Why?
  - Did these experiences make you more or less likely to implement them in your future classroom? Why or why not?
  - Why do you think your instructor used concept mapping during this experience?
Appendix F: Focus Group Protocol Continued

If needed, ask any clarifying questions that emerged during coding from the individual interviews.

**Conclusion:** The interviewer will thank the participants for their time.

**Specific Clarifying Questions:**

Diana: “So I think the beauty of concept map provides you with being able to see what you’re supposed to be learning and hearing it later on.”

Please elaborate further.

Diana: You mentioned it could be a performance-based assessment, can you elaborate?

Jean: You said concept mapping “Yes, it’s important because it can be used to do so many different things”

What are those different things?

Jean: You described using concept map as less overwhelming (when talking about your personal usage). Can you elaborate on why it is less overwhelming?

“I was teaching high school history, I feel like it would probably be like a regular assessment” Why would you use it as a regular assessment in this case?

Marylynn:

You mentioned: “Yes, I think that it can bring a lot of value to students when they can see their thinking on a piece of paper and how that thinking connects”

Why does seeing their thinking bring value?

“Under that then they added more information about those particular organisms that were meaningful to them.”

Marylynn: What made it meaningful to them?

Marylynn and Susan

You both said, if you used them in your future classroom you could see misunderstanding or misconceptions. Please elaborate

Marylynn: “because I can see that oh they’re connecting something here, but they’re not including these key concepts.”

Susan: you said “Yes, because I think it also shows the specific knowledge of each student so you can see what their experience or what their definition of a specific topic is and then how you could find misconceptions .....

Adrienne: You mentioned that in your coursework; We used it to compare us and another classmate. We did like because [student name] and I were partners. And so we had like some differences like we had our names in the middle of the concept map was some similarities, and then on the ends or differences so kind of like a compare and contrast.”
Appendix F: Focus Group Protocol Continued

Does this quote anyone else’s memory?

Adrienne: You mentioned “easier to grade” when discussing using a concept map in writing “go off my own Rubric or checklist and just mark it off.” Why?

Karen: You mentioned: “Time and engagement and behavior”. Would be an anticipated challenge if you implemented concept mapping in your future classroom.

Why did you mention engagement and behavior?

Figure 1.1

Example of Concept Map Constructed During Assessments Course
Appendix F: Focus Group Protocol Continued

Emergent Themes to Member Check

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<td>Time</td>
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<tr>
<td>Learner Characteristics</td>
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<td>Preservice Teacher</td>
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<td>Content Area</td>
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<tr>
<td><strong>2b. What do they perceive are the BENEFITS of concept mapping? (Perceived Educational Value)</strong></td>
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<tr>
<td><strong>Breaking Down Ideas</strong></td>
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<tr>
<td>Connections</td>
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<tr>
<td>Seeing Thinking</td>
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<tr>
<td>Learner Benefits</td>
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<tr>
<td>Flexible</td>
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<tr>
<td><strong>2c. How confident are elementary education preservice teachers in implementing concept mapping into their own classroom? (Preservice Teachers’ Self-Efficacy)</strong></td>
</tr>
<tr>
<td>Self-Efficacy</td>
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<tr>
<td>Helpful</td>
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<tr>
<td>Challenges</td>
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<tr>
<td><strong>2d. How do they perceive they would, if at all, implement it in their future classroom? (Perceived Future Implementation)</strong></td>
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<tr>
<td>See Growth</td>
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<td>Connections</td>
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<td>Challenges</td>
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<td>Content Areas</td>
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