The Nature of Knowledge Change

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Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
In
Curriculum and Instruction (Educational Psychology)

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March 10, 2016
Blacksburg, VA

Keywords: Conceptual change, knowledge change, continuous case study, peer leadership, post-positivist design
An Investigation into the Nature of Knowledge Change

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ABSTRACT (academic)

The following dissertation is comprised of three manuscripts presenting a theory-to-practice design for studying the nature of knowledge change. Knowledge change—as defined for this dissertation—is an exploration of the quantitative and qualitative change in how knowledge is used over a period of time. Knowledge change is derived from the broader scholarship on conceptual change; that is, how people develop, organize, and then re-organize knowledge (Vosniadou, 2013). Conceptual change has been widely used to describe the cognitive process behind how a novice acquires and organizes knowledge in order to become an expert (Carey, 1985), particularly in the hard sciences (e.g. Science, Technology, Engineering, and Mathematics, or “STEM” subjects) (Vosniadou, 2008, 2013). However, more recent research has been dedicated to establishing the need to explore conceptual change in the social sciences (Murphy & Alexander, 2008). The present research was designed to explore knowledge change as one specific component of the conceptual change process. The research is presented in three manuscripts. The first manuscript details how the researcher blended conceptual change learning with the disciplinary domain of the present study, leadership studies. The second manuscript chronicles the design of a continuous case study—the primary tool for data collection used in the present study—as well as the methodology used. The third and final manuscript offers an overview of the first study undertaken using the collected data; that is, an exploration of the nature of knowledge change within an undergraduate peer leadership course.
An Investigation into the Nature of Knowledge Change

Matthew W. Grimes

ABSTRACT (public)

The following dissertation is comprised of three manuscripts presenting a theory-to-practice design for studying the nature of knowledge change. Conceptual change learning helps explain how understanding big concepts develops from simple to more complex over time (Carey, 1985). Knowledge change refers the changes that occur in how people use the small pieces of information necessary in explaining big concepts. Leadership education provides a unique setting in which to explore the nature of knowledge change, in particular because of undergraduates students’ development of a leader identity while learning about and experiencing peer leadership. The research is presented in three manuscripts. The first manuscript is a review of how conceptual change learning can help to explain what happens as students learn about leadership. The second manuscript describes the design of a continuous case study course assignment used to collect data about students’ knowledge use. The third and final manuscript describes a study intended to explore the nature of knowledge change among students in an undergraduate peer leadership course.
Acknowledgements

First, I would like to thank Sue Magliaro for her kind words, encouragement, collegiality, and, maybe most importantly, for her willingness to take on a “lost puppy” as an advisee. Sue, you are a fantastic advisor and committee chair, and have taught me so very much about what it means to be a faculty member. I hope that I’ve made you proud!

Next, I would like to express my gratitude to each of my committee members. To Peter Doolittle: You confused me perfectly and made me think more deeply! To Kate McConnell: You have helped me realize how important it is to design well and listen to the data, all while becoming a colleague and friend! And, to Curt Friedel: Not only did you let me intrude upon your class; you never wavered in treating me with kindness, respect, and friendship!

Finally: Jessica, there is no way in the world that I could have finished this research or degree without your patience and encouragement; and, Zander, I am so thankful that you helped me balance work and play. I love you both dearly!
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Introduction

Matthew W. Grimes

This paper serves as an introduction to the three manuscripts submitted as a collective exploration of knowledge change. Each of the three manuscripts attends to a key element of the research process. Included is an explanation of the purpose of the research and a summation of each of the three manuscripts.

Purpose of the Research

There were three distinct elements necessary to develop a rigorous exploration of knowledge change. First, it was the researcher’s intention to explore the nature of knowledge change as a key element in the conceptual change process. Conceptual change has been studied for decades, stemming from the idea of the “paradigm shift” outlined by Kuhn (1970). This research seeks to explore knowledge change—or, what happens to the smaller increments of knowledge that make up broader conceptualizations.

Second, the exploration of conceptual change within the social sciences has become more and more relevant to conceptual change scholarship over the past decade (Murphy & Alexander, 2008). One focus for this research is to explore knowledge change within one discipline categorized as a social science; i.e., leadership studies. It was important to better understand how the study of leadership is well-suited as a venue for exploring knowledge change.

Finally, as this research is centered in educational psychology scholarship, it was important to develop a straightforward and practically applicable study. The researcher designed a continuous case study to capture knowledge change as it happened over the course of a Principles of Peer Leadership course. Additionally, the researcher developed a methodology that could sustain the study of knowledge change using a number of existing and to-be-developed...
metrics related to human cognition. Keeping these three distinct elements in mind, the next section of this paper introduces each of the three manuscripts, and outlines their necessity in the exploration of the nature of knowledge change.

**Conceptual Change in Leadership Education: A Review of the Literature**

Embedding theories of and approaches to conceptual change within leadership education scholarship could provide a novel setting for understanding knowledge change. The first manuscript is intended to provide a strong framework for studying knowledge change by exploring how learning happens in the study of leadership and in conceptual change scholarship.

First, the literature review focuses on the idea that leadership is a learning-centered process, and shared practical tools leadership educators use to help their students learn leadership. The second component of the literature review is an exploration of conceptual change learning. The history of conceptual change can be traced back to Kuhn (1970), but is likely best understood through four distinct approaches: theory change, ontological shifting, framework theory, and knowledge-in-pieces. DiSessa’s (1988, 1993, 2008) knowledge-in-pieces approach suggests that the smallest increments of conceptual change (pieces of knowledge) are organized and re-organized throughout the conceptual change learning process. The literature review concludes with an explanation of knowledge as a cognitive element and as critical to understanding and applying leadership. It suggests that in order to further understand how leadership is learned, it is important to explore what happens to students’ knowledge bases as they acquire new information and begin to apply what they know about leadership.

**Designing a Continuous Case Study to Explore Knowledge Change**

The second manuscript focuses on the methodology for a study on knowledge change. Specifically, it chronicles the design of a continuous case study that can be used to study
knowledge change in a variety of ways. First, there is a description of the setting and participants; that is, a principles of peer leadership course with the unique requirement for enrolled students (the study’s participants) to obtain a peer leadership role on campus. Next, the manuscript offers an explanation for the benefits of using problem-based learning—in the present study, as a continuous case study. Then, the manuscript walks through the process for designing the continuous case study, including specific topics a prompts used the present study, as well as a number of methods that could be used to study knowledge change using this particular case design. Finally, the manuscript ends with an explanation of the specific methodology being used in the present study.

The Nature of Knowledge Change among Students in a Peer Leadership Course

The third and final manuscript is a detailed account of the study “The Nature of Knowledge Change among Students in a Peer Leadership Course.” This study is a direct result of the review of the literature and the methodology outlined in the first two manuscripts. The manuscript begins with an introduction to the purpose of studying knowledge change, as well as an overview of the relevant literature. Next, there is a description of the specific methodology used for the present study, including how three types of knowledge—i.e., declarative, procedural, and conditional (Jacobs & Paris, 1987)—were used to develop the three research questions used to guide the study:

1. To what extent does students’ declarative knowledge change as they learn about the five exemplary leadership practices?

2. To what extent does students’ procedural knowledge change as they learn about the five exemplary leadership practices?
3. To what extent does students’ conditional knowledge change as they learn about the five exemplary leadership practices?

Following the methodology, both quantitative and qualitative data are presented to provide a comprehensive overview of the results. Then, the statistical and interpretive findings are discussed for each research question. The manuscript ends with implications of the findings on knowledge change as well as some suggestions for future study.
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Keywords: conceptual change, knowledge change, reflective thinking, learning in leadership

This is the pre-peer reviewed version of the following article:


This article has been published in final form at:

http://www.journalofleadershiped.org/index.php/vol-14-iss-4
Conceptual Change in Leadership Education

Matthew W. Grimes

ABSTRACT

As the field of leadership education continues to prioritize learning in leadership, it is important to ask the question: What do we know about the learning process itself? Conceptual change, a learning framework used in educational psychology, can help to explain learning in leadership. Research on conceptual change in the social sciences is emergent and ripe for further exploration. Until the results of such research are readily available, there are some pedagogical tools produced by conceptual change researchers that leadership educators might find valuable in curriculum design. This paper introduces conceptual change theory and research to leadership educators as a viable framework from which to research learning in leadership, and presents pedagogical tools that encourage deeper learning through conceptual change.
Introduction

In learning leadership, it is important to consider not only the concept and practice of leadership, but the process of how learning works. The literature on leadership education has become increasingly more prevalent over the past two decades (Brungardt, 1996; Eich, 2008; Klimoski & Amos, 2012; Komives, Longerbeam, Owen, Mainella, & Osteen, 2006; Perruci, 2014; Roberts, 2007). Brungardt (1996) defined leadership education as “learning activities and educational environments that are intended to enhance and foster leadership abilities” (p. 83). It is important to provide a relevant and useful explanation for how understanding the science behind learning can greatly improve educational practice (Bohlin, Durwin, Reese-Weber, 2012) as well as design learning environments that support deeper learning (Bandura, 1986; Nilson, 2013; Pascarella & Terenzini, 1991, 2005; Roberts, 2007). In particular, conceptual change learning offers insight into how students’ prior conceptions develop into more sophisticated conceptions as they learn new information (Bransford, Brown, Cocking, 2000). This paper offers a perspective about how conceptual change research can inform leadership educators’ understanding of how people learn leadership.

Learning Leadership

As the roots of leadership education began to take hold, Rost and Barker (2000) encouraged scholars of leadership study to focus on a more transformational approach, better suited to a focus on leadership as a learning opportunity. This transformational approach seems to have found its way into leadership literature and practice, particularly in higher education. Eich (2008) found that reflecting on leadership experiences is important to how students in high-quality programs practice leadership individually and collectively. Guthrie and Jones (2012) provided practical examples of how intentional reflective activities are important to leadership
roles in student services and can lead to an increase in skill capacity and to experiential learning among college students. Using the results of a grounded theory study of college students practicing relational leadership, Komives, Owen, Longerbeam, Mainella, and Osteen (2005) produced a Leadership Identity Development (LID) model. The LID led Komives et al. (2006) to suggest a number of implications for incorporating reflective learning into leadership education, including individual activities to encourage students to think about the knowledge they are developing as they begin to identify what it means to be a leader.

The importance of learning through co-curricular leadership opportunities is revealed in heavy doses throughout college student affairs scholarship (Roberts, 2007). For example, Terenzini, Springer, Yaeger, Pascarella, and Nora (1996) revealed that leadership opportunities are beneficial to college student’s general development. In kind, Astin and Astin (2000) found that leadership development opportunities should be readily available for college students as there is a direct connection between leadership and learning. Kuh (2001) linked students’ leadership experiences to institutional goals for providing a rich environment for student learning. And finally, Roberts (2007) called for deeper learning in leadership to offer college students a more comprehensive collegiate learning experience, particularly in the opportunities and experiences they undertake.

While learning is clearly a focus in scholarship relevant to leadership education, what does the process of learning look like? If there is a direct connection to leadership and learning, a call for reflective learning in leadership, and a need for deeper learning in leadership, there must also be a definition for learning that sets the foundation for further research, design, and assessment in leadership education. Educational psychology provides a number of theoretical frameworks that help to define how learning works. In particular, the study of conceptual
change offers a unique perspective on what happens when learners’ prior conceptualizations are complicated with new knowledge and experiences.

**Learning through Conceptual Change**

While it is well-established that educating college students about leadership is important to their general development and is associated with positive outcomes in their role performance, there is little evidence as to what extent students experience conceptual change as they learn about leadership. Kuhn (1970) argued that the logical empiricism of scientists should be questioned, suggesting that there should be a focus on replacing historically inaccurate paradigms with new “revolutionary” theories. He suggested that shared knowledge, beliefs, ideas, and assumptions create paradigms—i.e., foundational concepts and practices of scientific disciplines. As new knowledge emerges over time, existing paradigms become obsolete and must be replaced with new, more accurate paradigms, often through scientific revolutions.

Kuhn (1970) also explored revolutions in terms of shifts in worldview, describing the process as when environmental and other factors caused scientists traditional perceptions to change. In essence, scientists had to re-educate themselves to fit newly acquired information and conceptualizations into their existing worldviews, or transform their worldviews to fit newly acquired information and conceptualizations. Thagard (1992) explained the idea of worldview transformations as conceptual revolutions; that is, the reformation of complex conceptual structures. The revolutionary process led to a departure from the epistemological underpinnings found in people’s existing mental models. He came to understand conceptual change as a process of moving through simple additions and subtractions of base knowledge into complex—and sometimes complete—re-organizations of the mental representation of concepts.
Kuhn’s (1970) and Thagard’s (1992) works are two examples of seminal perspectives on conceptual change that focuses on how scientific theories change over time. In fact, the great majority of conceptual change theorizing and research has been done in the hard sciences (i.e., science- and math-related subjects), but there have been far fewer studies in the social sciences (Lundholm & Davies, 2013). Murphy and Alexander (2008) suggested that the lack of research on conceptual change in the social sciences is likely due to the objectivity found within the hard sciences, making it empirically easier to prove what is accurate or correct. The subjective idea of what is correct or acceptable as accurate in the social sciences has, until recently, been neglected by most conceptual change scholars.

The emergent research on conceptual change in the social sciences has shown that there is a more personal, opinion-driven set of variables (e.g., values, beliefs, socio-cultural factors) to take into account (Lundholm & Davies, 2013). In a reasonably thorough search for conceptual change research within the still emergent studies of learning in leadership education, the results were negligible at best. Therefore, to begin to explore conceptual change within the context of leadership education it is important to review the literature that currently exists on conceptual change. This paper offers insight into how “concept” is defined in the literature on conceptual change, discusses the prominent conceptual change frameworks—including relevant research, reveals how understanding types of knowledge and reflective thinking can help in understanding conceptual change learning, and begins to build a framework for future research on how conceptual change can provide a framework for understanding learning in leadership education.

**What is a concept?** There are a wide variety of definitions for a concept in the literature. As the pioneers of *concept mapping*, Novak and Gowin (1984) defined a concept as “a perceived regularity or pattern in events or objects, or records of events or objects, designated by a label”
The events refer to something that has happened while objects are something that exists and is observable. Thagard (1992) views concepts as complex structures that can be thought of as frameworks containing rules, associations, and hierarchies. Flavell, Miller, and Miller (1992) referred to concepts as creating a mental grouping of similar entities. Miller and Johnson-Laird (1976) posited that conceptualization involves developing mental hierarchies as representations and relations to understand “the context of a larger system of knowledge and belief” (p. 28). Carey’s (2009) work looks at concepts as the building blocks of mental representations and “units of thought, the constituents of beliefs and theories” (p. 5).

Among the scholarly definitions of concepts, mental representations, hierarchies, groupings—or, some form of categorizing or structuring appear. Focusing on concepts as mental categorizations, Smith and Medin (1981) and Medin and Smith (1984) presented three views of concepts, classical, probabilistic, and exemplar. The classical view posits that all examples of a certain concept have commonality and follow the same rules to sufficiently define it as that concept. The probabilistic view, however, is a more abstract view of conceptualization; i.e., that occurrences that are characteristic of the concept indicated the summary representation of the concept. Finally, the exemplar view allows for new instances of a concept to be categorized based on how sufficiently similar it is to known examples of the concept. Medin’s and Smith’s collective works (1981, 1984) offered an explanation of concepts that led to a number of questions about the complexity of categorization and the importance of diversifying the definition of what a concept is. Thagard’s (1992) work furthered the study of concepts, providing an excellent overview of the conceptual system that helps to clarify the makeup of a concept.
Ultimately, a concept is a cognitive process, organized in structures, subject to (and a part of) rules, and is relational by nature (Thagard, 1992). While early views of concepts were centered on the metaphysical ideation and a result of sensory experience, Locke (1961) suggested that ideas could be both simple (sensory) and complex (formed in the mind) whereas the behaviorists (e.g., Skinner, 1976) insisted that analysis of the mind should be limited to that which can be observed (as cited in Thagard, 1992). The development of a conceptual change framework, however, considers concepts as emergent mental representations that are a part of a complex system. Thagard (1992) took a cognitive approach to conceptualization; in that, as knowledge is learned, cognitive frameworks are created to help organize that knowledge into concepts. He also recognized the importance of understanding human memory systems in much the same way as a computer’s memory. His view supports the idea that organized concepts are stored and later accessed for revision and re-organization. One influence on the revision of concepts related to the presence and creation of rules.

According to Holland, Holyoak, Nesbitt, and Thagard (1986), rules are matched to concepts based on their classification and relevance. Miller and Johnson-Laird (1976) and Holland and Thagard (1989) used a computational method of conceptualization to attach sets of rules to pieces of information. Both sets of findings showed that concepts could be mapped pragmatically using the rules associated with them. This method is also relevant to understanding human conceptualization. For example, if student A associates “position of authority” with their conceptual understanding of the concept leader, then when asked “What is a leader?” student A might respond “Someone who holds a position of authority.” If student B associates “confidence” as a necessary trait for leadership, and associates “leadership” with their conceptual understanding of the concept leader, then when asked the same question, student B
might respond “Someone who shows leadership.” However, because of how student B understands *leader*, it would take additional conditions for student B to add “confidence” to their conceptualization of *leadership*. This level of complication is one of the reasons Thagard (1992) believed that conceptual systems are organized to better handle complex and changing conditions.

Conceptual organization is important to understanding conceptual change because, as Thagard (1992) wrote, “conceptual systems consist of concepts organized into kind-hierarchies and part-hierarchies” (p. 30). The practice of concept mapping (Novak & Gowin, 1984) is based on organizing concepts around knowledge-based relations through synonymy and antonymy. Concepts must be represented hierarchically, moving from the most general to the more specific. Conceptual hierarchies reveal the organization of knowledge through synonymy by two types of links, kind- and part-relational (Thagard, 1992). Kind-relational links consist of knowledge that is similar to, or sometimes an example of, the concept. If the concept is *leader*, then a kind-relation might be a positional reference such as *president*. Another kind-relation, further down the conceptual hierarchy, might be *President of the United States*, and further, *Barack Obama*. Part-relational links consist of knowledge that helps to describe the kinds and sub-kinds. A part-relation to the concept *leader* might be a trait, such as *confidence* or *expertise*. Antonymous conceptual relations are also important to conceptualization, providing a cognitive tool for distinguishing what pieces of knowledge should *not* be associated with a particular conceptualization.

Hierarchies and relations are significant in understanding concepts to provide some measure of relevance to conceptualization and to illustrate the connective nature of concepts. Take, for example, a conceptual hierarchy for *leadership*. Figure 1 shows a progression from the
concept of leadership that could be associated with a first-year college student, defined by
observations of leaders, indicating a part of what defines a leader (authority), and showing kinds
of leaders that are part of their current conception (teacher, parent, coach).

**Figure 1.** A possible conceptual hierarchy of a first-year student’s conception of leadership.

The conceptual hierarchy associated with the first-year college student in Figure 1 might
have looked different when they were in elementary school, and will change as they learn about
leadership in college. This is explained by the process of conceptual change. To better
understand this process, it is important to provide a brief overview and comparison of the
theoretical perspectives found in conceptual change literature.

**Conceptual change.** Conceptual change is a process that takes the learner from an
incorrect, incomplete, or lack of conceptual understanding to more accurate conception of
knowledge. Vosniadou (1999) cited science education and developmental psychology as the
primary disciplines that use a conceptual change model of learning. In science education, the
primary focus is on correcting knowledge misconceptions by replacing them with more accurate
knowledge (Sainsbury & Walker, 2011). For example, the idea that the sun revolves around the
Earth would be replaced with the knowledge that the Earth revolves around the sun.
In developmental psychology, conceptual change is important in helping to understand how children’s knowledge acquisitions and conceptions change as they develop (Sainsbury and Walker, 2011). For example, developmental psychologists are interested in observing how a child’s conceptual understanding changes as they move from pre-K learning into more formal schooling (Carey, 1985). Research conducted around conceptual change has proven beneficial in understanding how learners’ cognition, affect, and environment influence their conceptual understanding (Vosniadou, Vamvakoussi, & Skopaliti, 2008).

Thagard (1992) identified nine degrees of conceptual change that helped to clarify the change that may occur (pp. 34-39). The varying degrees show a progression from more simplistic to more complex changes:

1. Adding a new instance.
2. Adding a new weak rule.
3. Adding a new strong rule that plays a frequent role in problem solving and explanation.
5. Adding a new kind-relation.
6. Adding a new concept.
7. Collapsing part of a kind-hierarchy.
8. Reorganizing hierarchies by branch jumping, that is, shifting a concept from one branch of a hierarchical tree to another.
9. Tree switching, that is, changing the organizing principle of a hierarchical tree.

Applying a more simplistic change (found in degrees 1-3) to the concept of leadership might be learning that confidence is a trait that research has shown to be indicative of a leader; or that learning a new rule about leaders, such as manipulation is a less desirable leadership
quality than is encouragement. In both cases, there is an addition to how leadership and/or leader are defined – or a deletion, e.g., if the new knowledge about manipulation results in a disassociation of leader and manipulation. These instances help explain what Thagard (1992) referred to as a revision of belief, or a change to what has been accepted as known based on everyday experiences and observations.

Often, the addition or deletion of relations results in a more complex level of conceptual change that moves beyond belief revision. An example of degrees 4-6 could be further development of the concept of leadership by concluding that leadership that has its own sub-concepts (e.g., peer leadership or team leadership) that should be higher in the hierarchy. Another example might be adding leadership theories and approaches as new rules for the conceptualization of a leadership (a transformational leader is ____, or an authentic leader is ____ ) that further distinguish the parts of leadership as necessary to understanding it as a broad concept.

More complex conceptual changes are when concepts take on new meaning or are reclassified completely (degrees 7-9). In leadership, this could be shown by a student concluding that relying on a person identified as a leader to demonstrate certain qualities does not always indicate leadership (degree 7). The concept of leader takes on a new meaning when they add this level of understanding to their existing conceptual hierarchy, particularly after realizing their new, more sophisticated conceptualization of leadership. Moreover, a student could decide to completely shift leadership to becomes its own major conceptualization (degree 8) or even reclassify leader as a byproduct (rather than defining quality) of performing leadership; that is, they might reorganize their hierarchy with leadership becoming the overarching concept, while
leader becomes a sub-concept that signifies the labelling of a person who exemplifies leadership (rather than what a leader does signifying the presence of leadership).

Thagard’s (1992) degrees of conceptual change help to illustrate the cognitive process that occurs during conceptual change. More simply put, Thagard produced a theory of how conceptual change processes alter, expand, delete, and create the mental representations of concepts. Thagard was not the only scholar to tackle the idea that theoretical and belief-centered underpinnings could be drastically altered or replaced as a result of conceptual change. Four approaches to conceptual change are prevalent in the literature: theory change, ontological shift, framework theory, and knowledge-in-pieces.

**Theory change.** In studying conceptual change among children, Carey (1985) discussed theory change as view of restructuring knowledge to move from child (novice) to adult (expert). She explained it as when the understanding of a concept within a theory changes, the theory itself must change. One type of theory change involves the revolution of a theory—that is, when one theory transitions to another theory over time. This transition often occurs when new concepts are used to explain newly discovered information with the theoretical domain and is reminiscent of Kuhn’s (1970) explanations of paradigm shifts as revolutions in science. Smith (2007) described theory change as when new knowledge simply cannot be integrated into prior conceptualizations (cannot be altered), thus leading to a new conceptualization (creation). In addition, while new knowledge can sometimes simply enrich prior conceptualizations, more advanced learning mechanisms can provide easier links between current and new conceptualizations. More advanced conceptual restructuring leads to the development of new theories.
**Ontological shift.** Chi (2005) offered an ontological approach (or *ontological shift*) to conceptual restructuring. She posited that naïve conceptions (or misconceptions) are the source information for conceptual change. In her view, adding new knowledge to fill what is a missing or incomplete conception is not as complete of a change as when prior knowledge is in direct conflict with new knowledge (Chi, 2008). Using a domain-general approach within the sciences, Chi (2005) characterized conceptual commonalities by means of ontological categories; that is, the basic understanding people have of what exists in the world—i.e., objects and events. Conceptual change that occurs at an ontological level of categorization does so due to a mismatch of conception and reality. For example, in the study of leadership, a base-level misconception would be that *leader* and *leadership* can be used interchangeably. For many learners, this might be a common sense understanding of *one* concept, rather than two separate concepts. In leadership studies, ontological shifting might also be explained using studies that consider worldview as a factor in understanding leadership (see Wallace, 2007; Bass & Steidlmeier, 1999). The altered foundational conceptions that emerge when new information challenges an existing worldview as a prior knowledge misconception provides an excellent example of conceptual change in the form of an ontological shift.

**Framework theory.** In a more recent approach to understanding conceptual change, Vosniadou, et al. (2008) developed a framework theory approach to conceptual change. Learning in the sciences requires students to completely reorganize their prior understandings of scientific concepts, derived from their observations and experiences in everyday life—much like the ontological shift (Vosniadou & Skopeliti, 2014). However, unlike the ontological shift, the organization does not come from the fragments of observation and experience, but from what Vosniadou and Skopeliti (2014) labeled “a relatively coherent explanatory system—a framework
theory” (p. 1428). While students’ prior understandings are ontological in nature, there is also evidence of a need to re-categorize erroneous information with new information. Vosniadou & Skopeliti (2005) found that new mental representations develop when new knowledge cannot be integrated into prior mental representations – much like the theory change approach. But, framework theory differs where learners develop new mental representations as a result of the learner reconciling incompatible knowledge into prior conceptualizations.

In essence, the framework theory approach re-presents prior conceptualizations of conceptual change – theory change, ontological shift – taking into account the influence and importance of ontological, epistemological, and representational changes in the process of change (Vosniadou & Skopeliti, 2014). In leadership studies, framework theory would suggest that learners have developed an explanation of leadership based on their prior observations and experiences. In order to undergo conceptual change, learners must be willing to engage their ontological and epistemological categorizations of leadership – e.g., as a concrete idea that exists and that they have developed a meaning of – creating new conceptualizations of leadership. Framework theory suggests that new conceptualizations involve a more complex understanding of perspectives; e.g., that other people have a different conception of leadership that reveals a different understanding that is also “correct” (from that perspective).

Knowledge-in-pieces. DiSessa (1993) suggested that developing rather than rejecting pieces of knowledge helps learners move toward a deeper level of understanding. When a conceptualization is developed, diSessa (1988, 1993, 2008) posited that the learner is not re-organizing a conceptualization in a way that restricts it to what is correct versus incorrect. Instead, knowledge-in-pieces explains conceptual change as a measured construction of small fragments of knowledge, notions, information, and ideas that exist across the process of coming
to understand a concept. For example, in learning *leadership*, it is less important to define the novice learner as not yet knowing and more important to view their learning process as inclusive of a broader version of knowing. As Davis, Horn, and Sherin (2013) suggested, the expertise of *leadership* may be limited to a particular binary, whereas the knowledge-in-pieces approach allows for the learner to conceptualize *leadership* using their entire knowledge base, largely obtained from their subjective, prior experiences with leadership.

**Some observations about conceptual change frameworks.** The four perspectives presented above offer a foundation for understanding conceptual change. Thagard (1992) suggested that it is important to identify various kinds of conceptual change. Each perspective contains similar ideas such as viewing concepts as mental representations, as well as characteristics like the organization and re-organization of concepts into conceptual systems. In addition, the existence (and some form of revision) of belief, varying uses of perspective, and prior knowledge and experiences are all represented across the approaches. The contrasts among them appear to come in the form of the processes described – e.g., how they approach organization, prior knowledge management, etc. In some ways, the contrast provides its own version of conceptual organization.

A more in-depth investigation reveals varying degrees of knowledge use and depth of thinking throughout explanations of conceptual change. Thagard (1992) wrote “increases in knowledge are additions to what is believed” and that revisions to what is believed “can only be understood in terms of the overall structure of our conceptual system” (pp. 19-21). Increasing knowledge, or knowledge change, serves as a building block of meaning found within conceptual structures. Chi and Ohlsson (2005) studied the idea of complex declarative knowledge as it contributes to thinking and reasoning, stating that the study of procedural
knowledge is already well-documented in the literature. Carey (1985) described that the development of a conceptual system involves a restructuring of knowledge through a change in both knowledge and in patterns of knowledge. Where conceptual change occurs, however, is where the changes in knowledge lead to fundamental changes at the conceptual level, where the knowledge change requires a shift in the mental representation of observed and experience objects and events.

Changes at the conceptual level suggest a deeper level of understanding through a more sophisticated cognitive process (Chi, 2005). Conceptual changes occur when mental representations fundamental to understanding are altered in some way by knowledge that is added to – or gives reason to remove or significantly alter – prior knowledge. Pintrich, Marx, and Boyle (1993) indicated that the use of deeper processing strategies (e.g., perceptions of competence, reflective thinking, self-regulated learning) should lead to the level of logical-rational cognition necessary to experience conceptual change learning. In their use of concept mapping and Vee diagrams, Novak (1990, 2010) and Novak and Gowin (1984) found that both knowledge change and reflective thinking contribute to conceptual change. The presence of differing levels of knowledge acquisition and depth of thinking within multiple perspectives on conceptual change suggests that both knowledge and reflective thinking serve some role with the conceptual change process.

Because of the lack of research into conceptual change in leadership education, it is important to attempt to understand conceptual change as it pertains to learning leadership. The next section of this paper reveals how both knowledge acquisition and reflective thinking are relevant to leadership education, explores three types of knowledge and the reflective thinking
process, then offer implications for how these factors might be used to study conceptual change in leadership education.

Knowledge and Reflective Thinking in Leadership Education

The literature on the study of knowledge in leadership studies appears to be limited, but there is evidence of a developing literature base. Leadership education programs have been shown to focus on technical knowledge (i.e., leadership skills) and humanistic knowledge (i.e., knowledge about individuals and groups; Harvey & Jenkins, 2014). Müller-Merbach (2008) presented an overview of knowledge management in leadership, in particular how knowledge comprehension, knowing what to do with knowledge, and knowledge about processes can be beneficial to leadership. Rai & Prakash (2012) used a relational perspective to develop a model to facilitate knowledge creation in servant leadership.

Specifically related to college student learning, Brungardt and Crawford (1996) determined that students can learn and develop a knowledge base about leadership as an area of study. Furthermore, students in leadership courses have been found to retain and apply their knowledge up to three years after having learned it (Binard & Brungardt, 1997; Williams, Townsend, & Linder, 2005). The literature base on knowledge acquisition in leadership education exists, but is still emerging. However, the use of developing a leadership knowledge base remains important to consider in understanding learning in leadership.

There is some evidence of reflective thinking as an area of interest within leadership education scholarship. It is important for students in leadership courses to have opportunities to reflect, in particular as it helps them assess their learning and clarify their values (Bringle & Hatcher, 1999). Roberts (2008) raised a compelling argument for the value of not only presenting leadership theory and developing students’ skillsets, but to intentionally incorporate
Reflective thinking as vital to future leadership roles. Practicing reflection has been identified as essential to individuals and groups and is an essential component to the leadership process (Komives, Lucas, and McMahon, 1998).

Reflecting on prior leadership knowledge and experiences has also been found to enhance the overall development of leadership skills (Gardner, Avolio, Luthans, May, & Walumba, 2005). Cartwright (2002) presented double-loop learning, a process for teaching leadership that was found to be effective in helping learners reflect on their prior knowledge about leadership in order to develop new strategies for learning about leadership. Harvey and Jenkins (2014) clearly outlined the need for students to experience critical reflection as a building block of undergraduate education. In fact, White (2012) found that students perceived reflection as a way to learn how to practice leadership.

In reviewing the literature on reflective thinking (also, reflection) in leadership education, there appears to be a strong connection to experiential learning (Guthrie & Jones, 2012; White, 2012). Moore, Boyd, and Dooley (2010) explored students’ perceptions of and attitudes toward experiential learning in a leadership course. By incorporating reflective thinking strategies into the curriculum, they found that students experienced deeper learning about leadership. Guthrie and Jones (2012) provided a number of practical examples of how intentional reflective activities are important to experiential leadership roles on campus and can lead to an increase in skill capacity among college students. Finally, Jenkins (2012) identified critical reflection as one of the most frequently used instructional strategies in undergraduate leadership education.

Much like the literature on knowledge acquisition, the literature base for reflective thinking in leadership education exists and is primed for further exploration. The next section
explores both knowledge and reflective thinking as constructs that are important to consider in understanding conceptual change learning.

**Knowledge**

Knowledge is mentioned throughout conceptual change literature, both as a part of the process of change through knowledge acquisition and organization (Thagard, 1992; Linn, 2008; Sainsbury & Walker, 2011) and as a foundational component of understanding conceptual change (diSessa, 1988, 1993, 2008; Murphy & Alexander, 2008). Murphy and Alexander (2008) explored how studying topic-knowledge change (among other variables) is one approach to understanding conceptual change and Murphy and Alexander (2012) investigated both subject-matter knowledge and strategic processing among students in educational psychology. Carey (1999) described knowledge acquisition as a catalyst for the more complex process of conceptual change. Linn (2008) also studied the influence of knowledge change (through knowledge integration) in the conceptual change process, while Nash, Liotta, and Bravaco (2000; in a college chemistry course) and Naveh-Banjamin, McKeachie, Lin, and Tucker (1986; in a psychology of aging course) focused on assessment and measurement of knowledge change.

Özdemir and Clark (2007) provided an overview of two competing perspectives on knowledge structure in conceptual change: Knowledge-as-theory and knowledge-as-elements. The knowledge-as-theory perspective is represented well in this paper as theory change, framework theory, and ontological shift (Carey, 1985; Vosniadou, et al, 2008; Chi, 2005). Knowledge-as-theory is any model that suggests a person’s conceptions are a collected as epistemological and ontological beliefs in a coherent structure that resembles a theory or framework (Özdemir & Clark, 2007). Thagard’s (1992) aforementioned body of work, as well as diSessa’s (1988, 1993, 2008), Linn’s (2008), and Linn, Eylon, & Davis (2004) efforts provide
an excellent example of the knowledge-as-elements perspective. For these scholars, the elements themselves are significant in that they are independently significant, but organized as a collection of elements – e.g., phenomenological primitives (or *p-prims*; informally learned, personally observed, and under-developed everyday ideas), fact, mental models, etc (Özdemir & Clark, 2007). Finally, Novak and Gowin (1984) opened their text *Learning How to Learn* with a concept map dedicated to outlining the “acquisition and construction of knowledge” to be found in their book, with the concept “knowledge” placed at the top of the hierarchy (p. 2).

But, what is knowledge and how is it defined in educational psychology literature? Knowledge is a widely researched topic in educational psychology literature, particularly as it pertains to student’s acquisition of knowledge in school (Bransford, Brown, & Cocking, 2000). Some of the perspectives on knowledge found regularly in educational psychology literature include constructivist (Piaget, 1952, 1963; Vygotsky, 1978), metacognitive (Brown, 1987; Flavell, 1976, 1979), experiential (Dewey, 1933, 1938; Kolb, 1981, 1984), and behavioral (Bandura, 1986) to name a few. However, in understanding how knowledge is fundamental to conceptual change learning, it is important to begin with one perspective on knowledge. This paper uses Jacobs’ and Paris’ (1987) descriptions of three types of knowledge used by learners: declarative, procedural, and conditional.

Declarative knowledge has been used in a number of manners in both theory and research. Kluwe (1982) described declarative knowledge as information stored in long-term memory and procedural knowledge as information about a person’s cognitive processes. Declarative knowledge has also been described as knowing what factual information or concepts are known (Alexander, Schallert, & Hare, 1991; Ambrose, et al, 2010) or what Jacobs and Paris (1987) referred to as an awareness of what is known. For example, students defining
transformational leadership. Another way of explaining declarative knowledge is that it is often represented by the knower identifying what is stored in memory—i.e., what information they know (or believe) to be factual (Weinert & Kluwe, 1987). According to Ohlsson (1994), declarative knowledge is descriptive and is the type of knowledge used to explain concepts. Chi and Ohlsson (2005) studied how changes in declarative knowledge occur when current conceptualizations are not sufficient in understanding new knowledge.

Procedural knowledge refers to understanding processes (Alexander, Schallert, & Hare, 1991) or putting structure to information that indicates an awareness of how to process something (Jacob & Paris, 1987). For example, students express procedural knowledge when they can explain how they understand how to lead (i.e., their cognitive representation of the process of leadership). Procedural knowledge is represented by how the knower can identify how they have structured their cognitive processes—i.e., their cognitive “how to” (Weinert & Kluwe, 1987). Chi and Ohlsson (2005) revealed an extensive body of research focused on procedural knowledge acquisition, often found in learners’ approaches to problem solving and strategizing.

Conditional knowledge refers to an ability to explain decisions related to using information stored in memory and is related to cognitive strategy use. Garner (1987) described cognitive strategy use as involving situational awareness of why and when to (and why and when not to) apply learning strategies. The conditional application of knowledge is related to the use of both declarative and procedural knowledge (Jacobs & Paris, 1987). For example, students are expressing conditional knowledge when they begin to identify what leadership approaches they decide are necessary to employ in a given situation and can explain why they apply those approaches. In other words, conditional knowledge can be defined as deciding when and why to
apply declarative and procedural knowledge (Waters & Schneider, 2010). Novak’s and Gowin’s (1984) work with concept mapping or Thagard’s (1992) explanation of conceptual hierarchies are an excellent example of conditional knowledge acquisition (and application) within the conceptual change process. In both, learners have to alter the organization of their conceptualizations based on how new knowledge is presented—that is, learners decide when and why to alter, re-organized, expand, or even discard prior conceptions based on newly presented conditions.

Using the three types of knowledge described above has proven beneficial in classroom learning. Novak and Gowin (1984) detailed how the use of concept maps and Vee diagrams help students construct and organize conceptualizations. In these tools, students’ declarative knowledge is necessary to begin piecing together the maps or diagrams. For example, if a student were asked to create a concept map to respond to question “what is leadership?” they would likely be responding as though the question read “what do you know about the concept of leadership?” This type of conceptual recognition indicates that students should begin by assessing what they know about leadership – i.e., their declarative knowledge.

A search for procedural knowledge studies revealed that they are often contextualized within mathematics education as the cognitive “how to” of algorithms, theorems, and other math processes (Baroody, Feil, & Johnson, 2007; Hiebert, 2013; LeFevre, et al., 2006; Rittle-Johnson & Star, 2007). In many cases, the findings concluded that when students reflected on the how to processes they knew, their classroom performance was higher than when they did not. By and large, when procedural strategies were taught and used, gains in learning appeared.

In a study on activating conditional knowledge in reading comprehension, college students were asked to reflect on effective study strategies prior to taking a comprehension test
(Bouffard-Bouchard, 1994). Students who reflected about what study strategies would be most effective in helping them comprehend the material found that their text performance was greatly improved. In other words, intentional thought about when and why to apply knowledge about specific study strategies increased their test performance.

Educationally-centered research on declarative, procedural, and conditional knowledge all appears to include some level of reflection on the part of student. That is, to measure any knowledge gains, one must first discover what prior knowledge exists through the process of inquiry and reflection (Dewey, 1933). But, how is reflective thinking defined and in what ways is it associated to conceptual change learning?

**Reflective Thinking**

Reflective thinking is important to consider in learning leadership, as students experience deeper learning (Avolio & Hannah, 2008). When students are encouraged to think reflectively, it leads to increased understanding of course content and the development of relevant skills (Schön, 1987; Moon, 2004). And, according to Nilson (2013), reflective thinking activities can be designed to result in higher instances of self-regulated learning, a practice necessary for deep, lifelong learning.

Reflection, and its lexical variations, is a construct represented throughout education literature. Boud, Keogh, and Walker (1985) explained that reflection is a generic term related to a person’s cognitive and affective exploration of experiences. Clift, Houston, and Pugach (1990) suggested that reflective practice is a state of mind and a set of activities that has no uncontested definition. Moon (2004) defined reflective learning as “the intention to learn as a result of reflection” (p. 80). Reflective practice (coined by Schön, 1983, 1987) refers to the application of reflection in activities that are unclear in their purpose and structure. But according to Rodgers
(2002), as scholars and practitioners manipulated the concept for their various uses, the true meaning of reflective thinking as defined by Dewey (1933) has been lost (p. 843).

Reflective thinking as defined by Dewey (1933) is an ongoing process during which learners acquire knowledge through novel experiences and make conscious choices about how and when to apply knowledge to future experiences. It is important to explore Dewey’s original definition of reflective thinking, particularly as it relates how learning works as a cognitive, experiential process.

**Dewey’s reflective thinking.** John Dewey is widely recognized as being the preeminent scholar with regard to reflective thinking as a key component of learning (Boud, Keogh, & Walker, 1985). Dewey presented experience in education as an approach to understanding how people learn that included their life experiences and their reflections on these experiences. (Dewey, 1916, 1933, 1938). He viewed learning (which he often referred to interchangeably with logical/scientific thinking/reasoning) as a continual process of experience; in essence, combining and evaluating prior and new experiences to better prepare for understanding future experiences (Dewey, 1916). For Dewey, learning is cognition in that it is a complex, pragmatic, intellectual process during which all aspects of life are experienced. Dewey (1933) wrote that “reflection is aimed at the discovery of facts that will serve this purpose” (p. 14). The “purpose” to which Dewey referred is evidence in support of a person’s supposed knowledge or beliefs. This pragmatic approach to how people learn through experience is an important to consider when trying to accurately representing the foundations of reflective thinking as a construct (Rodgers, 2002).

Dewey (1938) explained how experience is key to learning, in that learning happens when there is some level of interaction with people, environments, objects, or ideas. Dewey was
concerned with how learning involves reflective thinking, and is both cognitive and affective, as well as a cognitive process and a logical practice (Dewey, 1933). Rodgers (2002) characterized Dewey’s version of what reflective thinking is using four criteria: a meaning-making process, a way of thinking rooted in scientific inquiry, communally interactive, and intended to produce personal and intellectual growth (p. 845).

According to Rodgers (2002), in meaning-making, people must undergo a cognitive process to better understand the elements of experiences. This involves consideration of understanding how one perceives an experience and then comes to understand it in a way that adds relevant meaning to it. Dewey (1916, 1933) explained that there must first be a period of disequilibrium (when an experience is not yet fully understood) before the learner seeks a way to understand – through reflection. Reflection, as a way of thinking, is when learners have an experience, interpret and attempt to analyze the experience, and then seek to clarify the experience through experimentation – or, take action to (try intelligently to) resolve their disequilibrium (Rodgers, 2002). Thus, reflection involves a response that “is based on the knowledge and awareness of the learner” (Johnson, 1998, p. 2, as cited in Rodgers, 2002).

In sum, reflective thinking is important to learning, grounded in experience, involves a cognitive inquiry into how new knowledge and prior knowledge interact, and is influential to practice (Rodgers, 2002). Dewey’s (1933) perspective on reflective thinking as a critical component to the learning process has led to a number of scholars to elaborate on reflective thinking through an array of approaches (e.g., experiential learning theory: Kolb, 1981, 1984; reflective practice: Schön, 1987; and the reflective judgement model: King & Kitchener, 1994). In each of these models, there is a consistent theme of cognitive growth through developing new
perspectival and conceptual understanding by evaluating new knowledge and experiences, not unlike conceptual change learning.

**Reflective thinking in conceptual change.** In terms of conceptual change, reflective thinking is connected to learners’ abilities to distinguish between prior knowledge and new knowledge, in particular as it involves a conscious decision about what new knowledge is relevant or not relevant in a given situation (Waters & Schneider, 2010). From a constructivist view, Limón (2001) suggested that conceptual change relies on prior knowledge conceptions which set the stage for learning through reflective thinking. Novak and Gowin (1984) found that asking focus questions to assist students in their construction of Vee diagrams resulted in good reflective thinking in that students had to consider what they knew about the topic and how they could integrate new knowledge into their prior conceptions. They discussed meaning-making as a social constructed process integral to understanding concepts through concept mapping and Vee diagrams.

Student reflections have also been found to be deceptive in understanding students’ conceptual knowledge, depending on the perspective taken. In a study about meaning making in genetics, Furberg & Arnseth (2009) indicated that what students say is not always a good indication of what they know (or how what they know is related to prior knowledge through reflective thinking). On the other hand, Pintrich, Marx, and Boyle (1993) posited that reflection must be a part of the conceptual change process considering students’ explanations of how their prior knowledge influences their development of new knowledge. Both reflective thinking and knowledge are constructs that garner attention in conceptual change research and theory and are ripe for further study.
Knowledge and Reflective Thinking in Conceptual Change Learning

There is an extensive body of research that looks at knowledge acquisition and prior knowledge conceptions as they relate to conceptual change. In particular, diSessa’s (1988, 1993, 2008) work with “knowledge-in-pieces” as conceptual change places a high value on the smaller pieces of information that are sub-conceptual, but can be organized and re-organized as is contextually necessary to explain both every day and complex conceptual phenomena. In much the same way as reflective thinking, however, the influence of knowledge acquisition on conceptual change learning is sorely lacking in conceptual change research outside of the hard sciences.

While reflective thinking is a process that helps to describe the cognitive (and/or metacognitive) process of considering prior knowledge that is paramount to conceptual change, it is not readily apparent in conceptual change research. The lack of research that ties reflective thinking to conceptual change is possibly due to the fact that the great majority of conceptual change research occurring in subjects that require heavy objectivity, e.g., math and science.

The research on conceptual change shows that there is value in understanding it as a cognitive process in order to provide more robust and comprehensive learning opportunities for students (Vosniadou, 2013). It would stand to reason that further research on conceptual change in leadership study could provide insight into the depth of understanding students experience in conceptualizing leadership.

Concluding Remarks

A key to leadership education should be in helping students develop a capacity for reflective thinking that leads to a deeper understanding of their leadership knowledge as they begin to identify as leaders and develop excellent leadership skills. While students may adopt
the necessary skills to function well in their particular leadership roles, are they experiencing the depth of thinking that leadership educators hope that they are? Leadership educators may be certain that the information they are sharing (and the ways they are sharing it) are being retained by students. But, is that information resulting in conceptual change, knowledge change, and/or reflective thinking?

This paper presents the theoretical underpinnings to support an argument for developing a more complete understanding of what kind of learning is happening in their classrooms; in this case, by beginning to explore the value of assessing students’ conceptual change in learning leadership. By designing course content using knowledge change and reflective thinking as frameworks, leadership educators can incite students to develop a more robust understanding of leadership.
References


Designing a Continuous Case Study to Explore Knowledge Change

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Second Doctoral Manuscript submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
In
Curriculum and Instruction (Educational Psychology)

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March 10, 2016
Blacksburg, VA

Keywords: continuous case study, knowledge change, knowledge use, peer leadership
Designing a Continuous Case Study to Explore Knowledge Change
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ABSTRACT

Problem-based learning has been found to result in deeper understanding of content, and leads to more distinctive and applicable knowledge gains (Hmelo-Silver, 2004; Nilson, 2010, 2013). According to Nilson (2010), continuous case studies are one approach to problem-based learning that often leads to in deeper learning among students. This paper chronicles the design of a continuous case study assignment for a peer leadership course that has online, experiential, and in-person components. The design includes the steps necessary to determine course content and develop discussion prompts, as well as a description of how to create a narrative that is both engaging and relevant to students. The resulting design can be used to study knowledge change in a variety of ways. The methodology for one current study is detailed, alongside three suggested studies that could be conducted using the continuous case study at the center of this paper.
Introduction

This paper chronicles the design of a continuous case study to better understand the extent to which knowledge changes among students in a peer leadership course. Knowledge change is best explained using the literature on conceptual change. Conceptual change has been a popular topic of study in the hard sciences for decades (Vosniadou, 2013), but recently has been recognized as a necessary research in the social sciences (Murphy & Alexander, 2008). As new studies emerge regarding learning in leadership, it is important to build a foundation of research that includes how conceptual change occurs in leadership education.

Knowledge acquisition is considered a foundational component of the conceptual change process (Chi, 2005; diSessa, 1993, 2008; Novak & Gowin, 1984; Thagard, 1992). Learners experience a change in their knowledge base as new knowledge is accumulated and then organized into conceptual understanding (diSessa, 1993, 2008; Thagard, 1992). The specific nature of how knowledge changes during conceptual change has not been extensively researched, making it a prime candidate for further study.

While conceptual change research often measures students’ knowledge acquisition in science and math learning—using tools such as concept maps and Vee diagrams (Novak & Gowin, 1984)—it is important to explore methods of assessment that could be effective in discovering the nature of conceptual change in the social sciences. For example, one type of assessment that has been shown to result in significant learning gains is case-based learning (Nilson, 2010). Case-based learning is a byproduct of the project- or problem-based learning movement that encourages the use of real-world scenarios as a vehicle for applying basic concepts (Hmelo-Silver, 2004). In order to use case studies to better understand the extent to
which students’ knowledge changes, it is important to ensure that the case study is purposefully designed to do so.

The purpose of this paper is to outline the process of designing a case study assignment to assess the extent to which students’ knowledge changes during an undergraduate peer leadership course. The paper begins with a description of the course setting and the student population that serves as the exemplar for design. Next, there is an account of the relevant theory and research that support a case study approach. Then, the paper presents both the course-specific and case study design content used to construct the case study assignment. Next, there is a step-by-step walkthrough of the continuous case study design process. This paper concludes with a methodology for a qualitative study to explore the extent to which knowledge changes using data gathered from student responses to the case study assignment as well as four types of studies that could be conducted using the designed case.

The Principles of Peer Leadership Course

It is important to provide a background of the setting and target population used as the basis for describing the continuous case study design. The leadership studies program at Virginia Tech is comprised of courses intended to help students develop a better understanding of leadership as an academic discipline and of themselves as leaders. In the leadership studies program, there are three primary backgrounds from which students begin their study: membership in a leadership focused living-learning community, a desire to pursue the leadership and social change minor, or a desire to take leadership courses as an elective. One of the courses offered in the program is focused on the development of students as peer leaders, which serves as the setting for the development of the case study assignment.
Principles of Peer Leadership (PPL) is an undergraduate course that was established to help students learn about how to operate within a more collaborative organizational structure in which they need to motivate and encourage their peers (Friedel, 2015). In addition, PPL adds value to the overall leadership curriculum as a unique elective option to further students’ understanding of leadership concepts. PPL is a collaborative effort, bringing in the expertise of instructional faculty and student affairs practitioners to develop a course that bridges the curricular and co-curricular experiences of college students.

The established learning goals for the course are: 1) To enable students to serve as representatives of Virginia Tech with effective strategies and knowledge of campus resources to motivate peers to collaborate, build community, and grow as an individual; 2) To expand students’ knowledge of leadership as a function of tasks and relationships performed as a team of peers working towards a common goal; and 3) To prepare students to be peer leaders with the skills to promote leadership and personal growth and success of fellow students at Virginia Tech. For purposes of the course, a peer leader is defined as any college student who holds a position of influence over a fellow student (Friedel, 2015).

The course began as a traditional lecture course, which met twice per week for one semester. Due to the unique design of the course, the primary instructor felt that moving the in-person content delivery portion to an online format was a better fit. The course varies in number of students enrolled, but typical enrollment falls somewhere between 100 and 200 students per fall semester.

The unique design of the PPL course involves three components. Students who enroll in the course must have a peer leadership role outside of the course. Typical peer leader roles include leadership positions in student affairs units (e.g., resident assistants, orientation leaders),
academic peer leaders (e.g., teaching and/or research assistants), and student athletes (e.g., varsity team captains, sport club leaders). The content delivery component is online and uses the web application selected by the institution. As is typical in online course design, students are given reading, writing, discussion, and group assignments with deadlines for completion. The final component is a recitation led by students’ supervisors/advisors in their peer leader roles. The recitation instructors are given instructions explaining the recitation learning outcomes and suggested activities. Recitations are connected to the course, but the instructors do have autonomy in how they approach their weekly meetings with students (e.g., individually or in groups of students in similar or the same roles).

Students who enroll in the course are interested in learning about peer leadership in a number of ways. Some students have acquired a peer leadership role that requires they participate in this or an equivalent course. These may be volunteer roles or connected to a job on campus. Other students have acquired a peer leadership role and they (or their advisors) believe that participation in the course will help them perform at a higher level as peer leaders. The course also includes students who are simply interested in the concept of peer leadership, and then acquire a peer leadership role in order to participate in the course. The current iteration of the PPL course includes two sections: One that includes peer leaders required by their employers to take the course, and another that includes students interested in taking the course out of their own interest.

As PPL evolves, it is important to continue reviewing and revising its one-of-a-kind course format and developing assignments that best meet the intended learning goals for the course. One way of doing this is to review theory and research to find relevant and innovative techniques to assess student learning. For PPL, the experiential learning component begs for
course content that asks students to consider real-world, “what if” scenarios to help them begin learning how to apply new knowledge alongside their peer leadership experiences. The next section offers a brief overview of the relevant scholarship being used in the design of the continuous case study assignment that is the focus of this paper.

**Relevant Scholarship**

Over the past two decades, it has become increasingly common to find scholarship that encourages the study of learning in leadership (Brungardt & Crawford, 1996; Eich, 2008; Klimoski & Amos, 2012; Komives, Longerbeam, Owen, Mainella, & Osteen, 2006; Perruci, 2014; Roberts, 2007). Leadership educators attempt to design courses that provide students with real-world learning experiences, particularly those that seek to develop their problem-solving, decision-making, situational response, and critical thinking skills. Problem-based learning is a mechanism for this kind of learning, and case studies give instructors the freedom to specify the content that is discipline-relevant (Hmelo-Silver, 2004).

In designing a curriculum, instructors have a responsibility to ensure that the methods used are both relevant and effective in guiding students toward the specific learning outcomes (Nilson, 2010). Problem-based learning activities, such as case studies, are experiential learning opportunities focused on problem-solving (Hmelo-Silver, 2004). This section provides a concise overview of how case studies as problem-based learning activities are effective tools to stimulate student learning.

**Problem-based learning.** Problem-based learning (PBL) was first introduced as a learning method in medical education in the mid-20th century to enhance reasoning and problem-solving in the curriculum (Barrows & Tamblyn, 1980). PBL has expanded across disciplines and in a tremendous variety, in most cases centered on fostering deeper learning, as well as problem-
solving and reasoning skills (Barrows, 1996). PBL has also shown to reduce the time learners spend attempting to focus on the inundation of information and instead points them toward what is relevant to creating a solution (Nilson, 2013).

PBL involves meaningful, experiential, and reflective learning practices (Hmelo-Silver, 2004). By situating learning in realistic problem-solving scenarios, PBL encourages learners to be active in the learning process and to take responsibility of their own learning. The PBL process was developed by Barrows (1996) to include two critical elements: a richly designed problem to consider and student-centered process. The Barrows and Tamblyn (1980) model consisted of grouping students, providing a facilitated problem or case to consider, student-led problem-solving process, and a period of post-case reflection.

Hmelo-Silver (2004) identified two critical elements to PBL approaches: an active, collaborative construction of knowledge and students taking responsibility for their own learning. It is important for students to lead their own process of inquiry and research as this level of responsibility creates a learning environment that is both experiential and learner-centered. Learning through case studies produces students who better understand the process of problem-solving in a given context. In fact, understanding the problem-solving process might be a more important learning outcome that actually solving the given problem (Nilson, 2013).

Case studies are one type of problem-based learning that focuses on presenting students with difficult decision-making and problem-solving dilemmas that course content can help clarify (Stanford Center for Teaching and Learning, 1994). There are many benefits of using case studies to reinforce course content (Nilson, 2013). Case studies can help add variety to the typical course content delivery in a course (Foran, 2001). A simple change of pace can help students re-focus (or focus more deeply) on paying attention and retaining course knowledge.
Case studies offer active learning, a key component to instructional innovations in any classroom format (Herreid & Schiller, 2013). Cases can be designed as individual or group activities (Nilson, 2013). This is helpful in encouraging independent learning that is potentially more inclusive of students’ individual needs. In addition, cases are often focused on specific course content. While outside research can be encouraged, case studies are typically designed to focus students on particular topics and objectives from the course. Finally, well-designed case studies challenge students’ preconceptions about how learning happens (Nilson, 2013). Students often expect to be fed information to remember and reuse when prompted to do so. However, case studies push students to think about problems with unclear answers, devise their own process for learning content, and guide themselves rather than wait for instructor guidance.

Examples of how student learning can be assessed using case studies within a number of disciplinary contexts are available in the literature. Chaplin (2009) showed that using case studies to assess student learning in an undergraduate biology course (vs. traditional, lecture-based methods) resulted in higher critical-thinking skills and increases in academic performance. In leadership studies, Atkinson (2014) found that using case studies as teaching tools resulted in Ph.D. students’ enhanced creativity and ability to apply and learn course content effectively. Hall and Etling (2014) developed an ongoing case study assignment to help business students develop more robust cultural awareness and communication skills. Finally, Raju and Sankar (1999) provided one example of how case studies have been used in engineering courses to connect students’ learning to real-world scenarios, resulting in their further development of problem-solving skills.

Because the PPL course content is primarily delivered through a web application, there could be challenges in developing an effective case study assignment. There are some examples
of how others have used PBL techniques in e-learning environments, e.g., Kim and Kee (2013) designed an e-PBL and provided a post-problem discussion for students to share solutions and reflect on experiences. In the current study, students were asked to submit their responses to the PBL assignment through an open discussion forum. While their submissions were made independent of other students’ comments, students were grouped within the forums giving them a way to receive peer feedback and input that could be taken into future consideration.

The PPL curriculum is grounded in the experiential learning framework of Kolb (1981, 1984). As a form of experiential learning, case-based learning fits well into the PPL course. First, it encourages reflective thinking, a critical element of experiential learning (Dewey, 1933). Case-based learning gives students class assignments that encourage real-world practice with concepts before (or alongside) the relevant peer leadership experiences that accompany their coursework. Finally, Nilson (2010) suggested that case studies provide students with a different form of coursework that often holds their attention more effectively due to its realism, relevance, and (when done well) direct connection to course objectives. It is important to find innovative techniques to engage students in content delivered and then at least partially processed in an online learning environment.

Continuous Case Study Design

Designing case studies that can be used to facilitate and assess student learning is more than just writing a story. According to Nilson (2013), cases relevant to the course content can be found or adapted from other sources, or created from scratch. In any case, it is important for case studies to meet the established learning outcomes of the course. The easier it is for an instructor to incorporate case studies into the flow of the course, the better students will receive and meet the presented challenges.
Nilson (2010) described four, must-have components of good case design. First, a case must be realistic. Students should be able to identify with the case content which is strengthened with characters, historical context, and relevant detail. Next, a case should prompt students to draw on prior knowledge, where course content and outside knowledge are encouraged. Then, a case needs enough ambiguity for students to create unique problem-solving processes and solutions. Finally, a case must rouse a sense of urgency in students. Although they will know that the case is illustrative of what is real, students will be more engaged when they feel that it is critical that they work through it.

In addition to providing the steps to case design, Nilson (2010) also identifies a variety of case types. One such type is the continuous case. A continuous case “tells an unfolding story in segments over real or condensed time” (p. 183). This structure has many benefits to deepen the student learning experience. First, it adds realism as real-life situations often increase in depth and change over time. Second, it builds on the uncertainty of good case design by creating a cliffhanger. While students are aware that new information is coming, or that previous information will be altered in some way, they remain uncertain as to what the future holds.

Atkinson (2008) wrote about the writing elements that strengthen case study content. He took the approach of creative writing, in that cases should include setting, plot, characters, conflict, and conclusion. Using this writing technique, instructors have to spend time considering both the details and the broader scope of the course content within a real-world scenario. For example, it was beneficial to use the actual campus as the setting in which the case occurs, as well as characters and scenarios that were realistic and familiar to peer leaders.

The continuous case study was designed as a course assignment revealed in pieces during the semester. The design followed Nilson’s (2010) suggested guidelines for using a case method
to assess student learning and Atkinson’s (2008) suggestions for key components to writing good cases. The next section describes the course content that has been selected for use in the case.

**Selecting the course content.** It is important to select course content that will contribute to students’ knowledge base from which to draw in responding to the case study (Nilson, 2010). The primary course text for PPL is Kouzes’ and Posner’s (2008, 2014) *The Student Leadership Challenge*. Through their research, Kouzes and Posner identified five practices for exemplary leadership, which they adapted into a model of leadership (Kouzes & Posner, 1987). The model of what they dubbed “exemplary leadership practices” was adapted to the college student perspective using a case-study approach to discover what practices were common across college student leaders (Posner & Brodsky, 1992).

Within their 2008 text, Kouzes and Posner listed five exemplary leadership practices (ELPs): Model the Way, Inspire a Shared Vision, Challenge the Process, Enable Others to Act, and Encourage the Heart; as well as ten commitments associated with the five ELPs (two per ELP). The five ELPs serve as an accessible and relevant model for students in peer leadership roles that are critical to the PPL course. In addition, the PPL curriculum was designed to use the text over the course of the semester as a foundation for students to learn more about peer leadership, and apply it to their day-to-day practice. Figure 1 shows the five ELPs, along with ten accompanying commitments for exemplary leadership practice.
Figure 1: The five ELPs and ten corresponding commitments (Kouzes & Posner, 2008, p.22).

The case design process. Cases should directly connect to the learning objectives of the course (Nilson, 2013). The PPL learning objective most relevant to this assignment is “Develop and/or enhance personal skills in leadership through critical reflection” (Friedel, 2015). In addition, this assignment also has a direct link to two course goals. They are “To expand the students’ knowledge of leadership as a function of tasks and relationships performed as a team of peers working towards a common goal” and “To prepare students to be peer leaders with the skills to promote leadership and personal growth and success of fellow students at Virginia Tech.”

Along with Nilson (2010) and Atkinson (2008), guidelines for the case writing process were considered in the design process (GTTP, 2015). Nilson’s (2010) guidelines for creating
original case studies provided a “must-include” framework for case design. Atkinson (2008) offered key components to creating compelling characters, setting, and plot that support the purpose of the case. GTTP (2015) recommended research, analytical, and writing processes necessary to writing effective case studies. The following case writing steps were developed for this continuous case design:

1. Identify the course content that should be represented in the case. The course content selected was the Five Practices of Exemplary Leadership (Kouzes & Posner, 2008).

2. Develop an overall story that is compelling and realistic. Ensure that the setting, characters, plot, and conflict are relevant to the college student (as peer leader) audience (Atkinson, 2008) and that the organization of the story makes sense sequentially (GTTP, 2015).

3. Divide the story into the number of segments necessary to both adapt it to a continuous case format and to remain consistent with course content. Because there are five ELPs, five segments were written to accompany each ELP (Figure 1). A final, sixth segment was created as a conclusion and to serve as a prompt for students to consider the case as a whole. The conclusion in a continuous case should serve as a way to provide new information one final time (Nilson, 2010) and provide a concise summary of the problem(s) to solve (GTTP, 2015).

4. Consider each segment of the case separately to ensure that segments function independently as well as collectively. Kouzes and Posner (2008) presented five ELPs as both common practices among outstanding leaders and independent ideas that collectively makeup the common practices. Continuous case design provides a sense of urgency that compels the reader to be prepared for new information (Nilson, 2010).
5. Formulate the problem(s) to be considered. The problem(s) should be clear and concise (GTTP, 2015). Furthermore, the problem(s) should prompt students to access their prior knowledge (from the course content; Nilson, 2010).

6. Identify the content that will be included in the case, as well as the content that will not be included in the case. Because a case should maintain some ambiguity (Nilson, 2010), it is important to decide what content students need (or do not need) in order to work toward solving the case.

7. Revise (as necessary) to best represent the course content and still fit to the overall story. Once the overall case is written, it is essential to re-read the story to determine whether or not it flows well (Atkinson, 2008). Each segment should still be able to stand independently and collectively in a continuous case (Nilson, 2010).

8. Use the case responses provided by students who completed the case to assess student learning. Assessment is important to better understand if students learned and the cognitive processes they engaged in during the assignment.

The next portion of the case design process follows the steps as they were used in the present case design. Included are direct references to course content, actual examples of what was and was not included in the case, and an explanation as to how the case is continuous in nature.

**Identify the course content that should be represented in the case.** As previously indicated, the course content selected for developing the case is the course text, *The Student Leadership Challenge*, and the five exemplary leadership practices (ELP) therein (Kouzes & Posner, 2008).
- The ELP “Model the Way” (MTW) is associated with leaders behaving in a way that sets an authentic example through shared values and by giving voice to the group they represent.
- The ELP “Inspire a Shared Vision” (ISP) is associated with leaders presenting a compelling vision for others to embrace as the common good.
- The ELP “Challenge the Process” (CTP) is associated with leaders seeking improvement through new, innovative ideas and solutions to problems.
- The ELP “Enable Others to Act” (EOA) is associated with leaders creating collaborative environments where all feel engaged and competent.
- The ELP “Encourage the Heart” (ETH) is associated with leaders recognizing and celebrating the contributions of community members.

Students are required to read through the course text over the course of the semester. The five ELPs will be a focus of learning in the course beginning the first week of class.

**Develop an overall story that is compelling and realistic.** In PPL, an overarching learning outcome is for students to develop an understanding of peer leadership through scholarship and experience. The story that serves as the vehicle for the content in the case must capture students’ attention in such a way that they will be able to draw from their knowledge of the five ELPs in order to effectively work through the problem(s) presented.

The case’s relevance is found in its connection to the peer leadership experience. Scholars who have studied college student involvement often refer to the value of involvement in student leadership as a contributor to students’ overall success, growth, and development during college (Astin & Astin, 2000; Kuh, 2001; Pascarella & Terenzini, 1995, 2000; Roberts, 2007). In essence, by setting the story in student leadership and involvement experiences, students are
more likely to find a relevant connection from which to engage in the case. In this case, the structure of the story was developed using Atkinson’s (2008) guidelines for constructing a case by developing a setting, plot events, characters, and conflicts that are relevant and compelling to students as peer leaders.

Setting. The setting for a continuous case must be broad enough for students to understand that it will be explored further as the case progresses. The setting for this case is a student organization in which students are the primary decision-makers, problem-solvers, and hold both named and unnamed leadership roles. In this case, the setting is a fictitious student organization called “Students for Leadership through Service.” This setting indicates three elements that are likely relevant to students taking the PPL course: membership in a campus organization, student leadership, and a service component (which links to the university motto).

Plot. There need to be multiple events that occur during the case. Each event should correspond to one of the five ELPs and should be able to stand alone and function as one segment of the collective case. In this case, the plot events are based on the interactions among members and peer leaders in the student organization.

Characters. In order to make the case both compelling and relatable, the characters used should be realistic. For purposes of this case, each unnamed character in the story is intended to be representative of peers the students know and/or remind them of peers with whom they have interacted at some point. The unnamed main character (referred to as “you”) is a student in an organizational leadership role featured throughout the case and is at the core of each plot event. Students are asked to draw upon each of the five ELPs over the course of the case assignment by performing decision-making, problem-solving, and other skills necessary for peer leadership.
Conflict. The conflicts in this story are the catalysts for problem-solving. In other words: The story conflicts are what turn the case-as-story into a case-as-study. Included with each plot event are small conflicts presented within each of the five segments of the case, and alongside each of the five ELPs. The conflicts are presented both directly and indirectly so that students are prompted to respond using the appropriate ELP, but also to maintain the sense of uncertainty necessary to case development (Nilson, 2010). In addition, the final case includes an overall conflict to combine and essentially “wrap-up” the events of the case in such a way that prompts the students to respond in another unique manner.

Divide the story into the number of segments necessary to adapt it to a continuous case format and to remain consistent with course content. Because there are five ELPs in the leadership challenge, there needed to be at least five segments developed for students to consider. In addition, it is important to conclude a continuous case in a way that prompts students to reflect upon the overall case and end their expectation for forthcoming information. Each segment will correspond with assigned readings from the course text. Table 1 shows the continuous case assignment progression.
Table 1

*Progression of the Continuous Case Assignment*

<table>
<thead>
<tr>
<th>Segment</th>
<th>Week Assigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model the Way</td>
<td>Week four</td>
</tr>
<tr>
<td>Inspire a Shared Vision</td>
<td>Week four</td>
</tr>
<tr>
<td>Challenge the Process</td>
<td>Week five</td>
</tr>
<tr>
<td>Enable Others to Act</td>
<td>Week eight</td>
</tr>
<tr>
<td>Encourage the Heart</td>
<td>Week nine</td>
</tr>
<tr>
<td>Conclusion</td>
<td>Week fifteen</td>
</tr>
</tbody>
</table>

Note: The “Week assigned” was determined based on the corresponding readings assigned in the course syllabus.

*Consider each segment of the case separately to ensure that segments function independently as well as collectively.* Once the segments of the story are developed, it is important to insert the plot events that will compel students to begin reasoning through the situation. Each segment was presented independently, except for the final segment, which presented the case in its entirety as a prelude to the segment. The plot event for each segment should include enough information for students to engage in a problem-solving process of their own creation and that calls upon their memory of the ELP associated with that segment. The plot event for the final segment includes all previous information and incites students’ reflection about their knowledge concerning all of the ELPs in order to select those which they feel must be used to provide a comprehensive response to the case. The plot events developed for the case are concisely presented in Table 2.
**Table 2**

*Plot Events Associated with each Segment of the Case*

<table>
<thead>
<tr>
<th>ELP</th>
<th>Plot Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model the Way</td>
<td>New members enter the organization. It is clear that they have only a vague idea of what their membership means.</td>
</tr>
<tr>
<td>Inspire a Shared Vision</td>
<td>Many members voice their uncertainty as to the purpose of the organization and directly ask leadership for clarification.</td>
</tr>
<tr>
<td>Challenge the Process</td>
<td>Upon reviewing the organization’s accomplishments, the historian shares that they are annually the same as they were when the organization began over a decade ago.</td>
</tr>
<tr>
<td>Enable Others to Act</td>
<td>Members are beginning to complain that leadership won’t let them contribute to the work of the group. In addition, they share their observations that other members put forth little interest and effort.</td>
</tr>
<tr>
<td>Encourage the Heart</td>
<td>Members are working on a number of projects, but they are starting to wonder if what they are doing is helpful to the organization.</td>
</tr>
<tr>
<td>Conclusion</td>
<td>The number and variety of concerns that have been presented over the course of the semester are indicative of a need to strategize for future semesters to be better prepared for the needs of the organization and its membership.</td>
</tr>
</tbody>
</table>

**Formulate the problem(s) to be considered.** In a continuous case study, the problems presented must directly link to prior knowledge and should create a sense of urgency in the student problem-solver (Nilson, 2010). In this continuous case assignment, six problems are presented. Each of the first five problems corresponds to one of the five ELPs, alongside a relevant plot event, and with a title that explicitly indicates the ELP to be considered by the student completing the assignment. The sixth problem asks students to consider all of the ELPs about which they have read, effectively creating the uncertainty that Nilson (2010) also suggested is essential to developing an effective case study.
More specifically, each of the five independent problems was designed to draw upon students’ knowledge of each of the five ELPs in order to best work toward a solution. Each problem includes information that directly links to an ELP, but also purposefully omits some key components of the ELP to encourage students to determine the best approach to the given case. The final problem is presented as an overarching issue which students must consider and omits direct links to any specific ELP. In other words: The final problem requires students to “fill-in-the-blanks” by deciding which ELP(s) to prioritize as they work toward a solution. Table 3 provides a summative explanation of the problems used to stimulate student response.

Table 3

Problems Presented to Students in each Case Segment

<table>
<thead>
<tr>
<th>Case segment</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment 1: Model the Way</td>
<td>Decide how to help new members begin to understand the organization’s values, and what it means to be a contributing member.</td>
</tr>
<tr>
<td>Segment 2: Inspire a Shared Vision</td>
<td>Decide how to create a common vision and rally membership toward that vision.</td>
</tr>
<tr>
<td>Segment 3: Challenge the Process</td>
<td>Decide how to innovate change to improve the organization moving forward.</td>
</tr>
<tr>
<td>Segment 4: Enable Others to Act</td>
<td>Decide how to develop a collective trust and competence among the organizational membership.</td>
</tr>
<tr>
<td>Segment 5: Encourage the Heart</td>
<td>Decide how best to recognize the efforts of members and to ensure the organization celebrates them.</td>
</tr>
<tr>
<td>Segment 6: Conclusion</td>
<td>Given the number of events and conflicts that have occurred over the course of the semester, decide how to plan for the following semester and indicate any or all ELPs to employ in their strategy.</td>
</tr>
</tbody>
</table>
Identify specific content that will be included in the case, as well as the content that will not be included in the case. The case framework includes decision-making prompts for students. It is primarily for this reason that it is important to include some content and purposefully omit other content from the case. Using this format, students can be given information that directly links to relevant course content, but also be prompted to reflect upon their prior knowledge of the content to determine other pieces of relevant information to include in their responses. In this case, the directly linked information in each of the first five segments is provided by the segment titles and response prompts that contain the corresponding ELP. The direct link in the sixth segment is provided by the title “conclusion,” to indicate the case finality and a response prompt asking students to include any or all of the ELPs in their response. The information intentionally omitted from the case study will be language directly linked to the ten commitments (Kouzes & Posner, 2008). Using this method, students are directed to consider the ELP(s) to consider in their responses, but are purposefully not directed to the ten commitments associated with those ELPs. Table 4 shows the response prompt for each segment.
Table 4

*Segment Prompts*

<table>
<thead>
<tr>
<th>Case segment</th>
<th>Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment 1: Model the Way</td>
<td>How can you use “Model the Way” to respond to this scenario?</td>
</tr>
<tr>
<td>Segment 2: Inspire a Shared Vision</td>
<td>How can inspiring a shared vision help you respond in this scenario?</td>
</tr>
<tr>
<td>Segment 3: Challenge the Process</td>
<td>In what ways could challenging the process help to improve the organization?</td>
</tr>
<tr>
<td>Segment 4: Enable Others to Act</td>
<td>Respond to this scenario by enabling others to act.</td>
</tr>
<tr>
<td>Segment 5: Encourage the Heart</td>
<td>Decide how to encourage the hearts within the organization.</td>
</tr>
<tr>
<td>Segment 6: Conclusion</td>
<td>As the semester nears its end, consider how using any or all of the exemplary leadership practices could help in planning ahead for next semester.</td>
</tr>
</tbody>
</table>

*Revise (as necessary) to best represent the course content and still fit to the overall story.* Because the assignment is progressive, there is an opportunity to adjust future segments as necessary. While major changes could alter the purpose of the assignment, it is essential to ensure that the assignment continues to flow well and is engaging students in the course content as intended. In addition, the continuous nature of the assignment must remain intact. If necessary, subsequent segments can be adjusted to make certain that the assignment content will be received in the ways that it is intended to be. For example, if responses to the first segment are wholly vague or unsubstantial, it may be important to revise subsequent segments to include more direct references to course content and/or to revise the segment prompts to better guide students toward the relevant course content.
Use the case responses provided by students who completed the case to assess student learning. While assignments are often scored and used in the determination of students’ level of summative performance in a course, it is also important to assess what students are—or are not—learning. Students’ case responses should be reviewed to discover evidence of student learning. While there are many ways to assess student learning (Bransford, Brown, & Cocking, 2000), the data in the present study were analyzed to determine the extent to which students’ knowledge about the five exemplary leadership practices changes over the course of the assignment. The next section of the paper explains how knowledge was explored in one study using the continuous case design at the center of this manuscript.

Exploring Knowledge Change in a Continuous Case Study Assignment

The present study is guided by conceptual change learning; in particular, knowledge change. Knowledge change has been found to occur through knowledge acquisition and organization (Thagard, 1992), as a building block toward conceptual change (diSessa, 1988, 1993, 2008), and as an event to stimulate complex conceptual change (Carey, 1999). While all of these ideas were considered in research design, it is important to clarify how knowledge was defined in the present study.

Knowledge. In this study, knowledge was explored by identifying knowledge acquisition and use in constructing a deeper conceptual understanding (Novak & Gowin, 1984). The present study used the definitions of three types of knowledge: declarative, procedural, and conditional (Jacobs & Paris, 1987). Declarative knowledge is simply what is known. If students’ case study responses included details about the ELP as presented in the course text, they were presenting what they know—or their declarative knowledge. Procedural knowledge is how to use what is known. If students responded to the case studies using a description of a process
they developed using the ELP to address the presented problem, they were expressing procedural knowledge. Finally, conditional knowledge is deciding *when and why to apply* declarative and procedural knowledge. Students who responded to the case by elaborating on *their reasoning for* when and why they would use their knowledge of ELPs in response to the case was illustrative of conditional knowledge. In addition, student responses that included examples of knowledge transfer—a process during which the learner applies knowledge about one situation applies (or does not apply) to a different situation (Singley & Anderson, 1989; Perkins & Salomon, 1992)—were also considered conditional knowledge.

**Research questions.** To assess the nature of knowledge change, it was important to identify specific research questions to guide the study. The following research questions were developed:

1. To what extent does students’ declarative knowledge change as they learn about the five exemplary leadership practices?
2. To what extent does students’ procedural knowledge change as they learn about the five exemplary leadership practices?
3. To what extent does students’ conditional knowledge change as they learn about the five exemplary leadership practices?

These questions provided a framework for studying knowledge change that allows for a variety of research methodologies. Because the desire was to explore the extent to which knowledge changed using student responses, it was important to understand and interpret how students made meaning of their knowledge of the five exemplary leadership practices during an extended period of time—in this instance, during an undergraduate peer leadership course. In this study, a post-positivist approach that blended descriptive and interpretive analysis was used.
**Additional data sources.** Because this study was intended to discover the extent to which students experienced knowledge change, it was important to consider the knowledge base from which change occurs, as well as how students’ required peer leadership experiences influenced their learning about the five exemplary leadership practices. In addition to the continuous case study, the present study considered two other assignments: Goal-setting forms and a final paper.

**Goal-setting forms.** The *Student Leadership Practices Inventory* (SLPI) was used to ensure that students had a knowledge base, or at least some introduction to the five exemplary leadership practices prior to engaging in the course content. Students were asked to complete the SLPI, an instrument created by Kouzes and Posner (2008, 2014) aligned with their book’s content, to help identify the frequency with which students engage in ELP behaviors. Students received their SLPI results and were asked to set goals for their peer leadership roles that were related to their inventory results (for a sample student result, see Appendix A). The goal-setting forms were later used in tandem with the final paper assignment for students to reflect on their experiences with the five ELPs over the course of the semester.

**Final Paper.** The final paper asks students to reflect on and then write about their personal best as a peer leader over the course of the semester. The final paper was adopted from Kouzes and Posner (2008) to discover the most exemplary practices in student leadership. The assignment specifically asked for students to consider their “personal best”; i.e., their application of any or all of the ELPs during their personal best as peer leaders. Using the final paper provided important insight into how students described when and why they have applied the five ELPs—i.e., their conditional knowledge. Table 5 presents a breakdown of the assignments used
to collect data in this study, as well the type of knowledge for which each assignment was
designed to explore.

Table 5

Data Sources

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Timeframe</th>
<th>ELP</th>
<th>Type of Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal-setting forms</td>
<td>Week 1</td>
<td>All</td>
<td>N/A (baseline)</td>
</tr>
<tr>
<td>Case Segment 1</td>
<td>Week 4</td>
<td>MTW</td>
<td>DK, PK</td>
</tr>
<tr>
<td>Case Segment 2</td>
<td>Week 4</td>
<td>ISV</td>
<td>DK, PK</td>
</tr>
<tr>
<td>Case Segment 3</td>
<td>Week 5</td>
<td>CTP</td>
<td>DK, PK</td>
</tr>
<tr>
<td>Case Segment 4</td>
<td>Week 8</td>
<td>EOA</td>
<td>DK, PK</td>
</tr>
<tr>
<td>Case Segment 5</td>
<td>Week 9</td>
<td>ETH</td>
<td>DK, PK</td>
</tr>
<tr>
<td>Case Segment 6 (the case in full)</td>
<td>Week 15</td>
<td>Any</td>
<td>CK</td>
</tr>
<tr>
<td>Final Paper</td>
<td>Week 16</td>
<td>Any</td>
<td>CK</td>
</tr>
</tbody>
</table>

Note: MTW = Model the Way; ISV = Inspire a Shared Vision; CTP = Challenge the Process; EOA = Enable Others to Act; ETH = Encourage the Heart; DK = Declarative Knowledge; PK = Procedural Knowledge; CK = Conditional Knowledge.

Case study response self-assessment. While the case study responses would reveal some written evidence of knowledge change, it was also important to understand how students approached their responses. After each case study response, participants were given a prompt that asked students to self-assess their response; e.g., “Describe how you included (ELP) in your scenario response.” Some students provided a separate response to the self-assessment prompt, while others responded to the self-assessment prompts within one, inclusive response to each
segment. Students’ responses were used to assess knowledge change regardless of how they were structured.

**Data Analysis**

Data analysis focused on the extent to which students experienced knowledge change as evidenced in the information extracted from their responses to the case and final paper assignments. The data were reviewed for evidence of the three types of knowledge—declarative, procedural, and conditional. Analysis was conducted using frequency counts, and both content and aggregate analyses. Specific analysis per data source is listed below.

**Goal-setting forms.** Students’ goal-setting forms were not analyzed for purposes of this study, but will be in a future study on how students developed a knowledge base of the five exemplary leadership practices in a peer leadership course. Students were, however, directed to consider the goals they set as they completed the final paper.

**Case study responses.** Responses to the first five case segments were analyzed using content analysis and frequency counts. Responses were analyzed by identifying specific examples of words and phrases participants’ used that indicated the specific ELP identified as the topic of the segment. Each word or phrase was then analyzed for evidence of declarative, procedural, or conditional knowledge, and tallied using a score of “1” per example found. The content was analyzed and recorded using descriptors of how the student used the type of knowledge discovered in each example.

Consider the following example “I modeled the way by aligning my actions with the goals of the organization.” In this response, there is evidence of the student referring to one of the ten commitments of model the way—“aligning my actions with the goals of the
organization”—which would be analyzed as use of what is known or declarative knowledge content. This would result in a tally of “1” under declarative knowledge.

**Concluding case segment.** Responses to the concluding case segment were also analyzed using content analysis and frequency counts. Responses were analyzed by identifying specific examples of words and phrases participants’ used that indicated any or all of the ELPs identified by the students in their responses. Because the concluding segment prompts were designed for students to apply their ELP knowledge in strategizing toward the future, each word or phrase was analyzed for evidence of conditional knowledge, and tallied using a score of “1” per example found. The content was analyzed and recorded using descriptors of how the student used conditional knowledge discovered in each example.

**Final paper.** Responses to the final paper were also analyzed using content analysis and frequency counts. Responses were analyzed by identifying specific examples of words and phrases participants’ used that indicated any or all of the ELPs identified by the students in their paper. Because the final paper prompts were designed for students to reflect upon how they applied their ELP knowledge as a peer leader, each word or phrase was then analyzed for evidence of conditional knowledge, and tallied using a score of “1” per example found. The content was analyzed and recorded using descriptors of how the student used conditional knowledge discovered in each example.

**Across assignments.** Because the study was intended to discover the extent to which knowledge changed across time, evidence of patterns of change across all assignments was investigated using an aggregate analysis. This analysis was conducted by searching the tallies and analyzing content for changes in knowledge use over time.
The aggregate analysis of the tallies involved a side-by-side comparison of the mean and total tallies, as well as an analysis of the mean and total weighted tallies, as necessary (i.e., if the number of respondents vary across assignments). Knowledge change was identified by interpreting any increase, decrease, or no change in the mean and total tallies, and in the means and total weighted tallies.

The aggregate analysis of the knowledge students used in their responses was conducted using distinctive qualities of the content for each knowledge type and through a side-by-side comparison of knowledge used across types of knowledge. In addition, an aggregate analysis was conducted using the quantity of knowledge used by students across all assignments. Knowledge change was identified by interpreting any increase, decrease, or no change in the quantity and quality of knowledge use, within each type of knowledge and across all three types of knowledge.

For example, if students’ responses showed lower tallies of procedural knowledge across the first two case segments, but higher tallies across the final three case segments, the quantity of knowledge change would be considered increasing. In kind, if how students used procedural knowledge across the first two case segments differed from how students used procedural knowledge across the final three case segments, the differing usages were interpreted as knowledge change.

Presentation of results. The results of the present, post-positivist research study will be presented statistically and interpretively. First, there is an overview of the statistical results. Next, there is an overview of the results per type of knowledge as outlined in the research questions—i.e., declarative, procedural, and conditional.
Discussion of the findings. The discussion of the findings is presented using an interpretive analysis. First, the overall findings are presented, including those related to overall tallies and students’ knowledge base development. Next, findings specific to each of the three research questions are presented. Finally, overall conclusions and implications for future study are presented.

Conclusion

Designing a case study assignment takes time, research, and involves intricate decision-making with specified learning outcomes. In kind, assessing the learning that does, or does not occur among students completing the assignment is an important step in determining its value as an educational tool. This researcher believes that many students do not always engage in leadership content that leads to the types and depth of knowledge necessary for deeper learning. Having students engage in a continuous case study will help to shed some light on the nature of knowledge change occurs among students in a peer leadership course.
References


Available at: http://dx.doi.org/10.7771/1541-5015.1004


The Nature of Knowledge Change among Students in a Peer Leadership Course

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Third Doctoral Manuscript submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
In
Curriculum and Instruction (Educational Psychology)

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March 10, 2016
Blacksburg, VA

Keywords: conceptual change, knowledge change, peer leadership, course assignment
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ABSTRACT

Conceptual change scholarship is focused on how people develop, organize, and then re-organize knowledge (Vosniadou, 2013). While the great majority of conceptual change research has been conducted in the hard sciences, there is a growing trend toward exploring conceptual change in the social sciences (Murphy & Alexander, 2008). The present study was designed to explore one component of conceptual change; i.e., knowledge change. The knowledge-in-pieces approach to understanding conceptual change is when smaller pieces of knowledge are re-organized to make meaning of broad conceptualizations (diSessa, 1988, 2008). Using three types of knowledge—declarative, procedural, and conditional (Jacobs & Paris, 1987)—this study explores the nature of knowledge change among students in a peer leadership course. The findings reveal that as students’ presentation of knowledge changed as they progressed through the course.
Introduction

In designing a curriculum, instructors have a responsibility to ensure that the methods used are both relevant and effective in guiding students toward the specific learning outcomes (Nilson, 2010). When teachers work to create conditions that are favorable to learning, students are more likely to learn (Ambrose, Bridges, DiPietro, Lovett, & Norman, 2010). While there are many ways to assess student learning, a key to effective instruction is figuring out how students will do their best learning. Learning is a process involving acquisition, but is centered more on change through student-driven activity than on simply memorizing and regurgitating information (Ambrose, et al., 2010; Bransford, Brown, & Cocking, 2000).

But, if some sort of cognitive change is central to learning, then what course activities incite that change? Assuming that courses are designed to introduce specific content (Nilson, 2010), and then build upon that content in a way that incites cognitive change, to what extent does students’ knowledge change occur as they learn course content?

A change in how a learner comes to understand acquired knowledge is a significant event in the learning process (Thagard, 1992). Knowledge change is a key component of the broader process of conceptual change, a well-studied body of scholarship with a number of relevant theoretical frameworks from which to draw (Chi, 2005; diSessa, 1988, 2008; Novak & Gowin, 1984; Vosniadou, 2008, 2013). Conceptual change has been a popular topic of study in the hard sciences for decades (Vosniadou, 2013), but has emerged as relevant research in the social sciences (Murphy & Alexander, 2008). As scholarship on conceptual change in the social sciences grows, it is important to study the various aspects of conceptual change, including knowledge change.
Learners experience a change in their knowledge base as new knowledge is acquired and then organized, making an important contribution to the process of conceptual change (diSessa, 1993). But what happens to knowledge once it is acquired? The changes that occur in learners’ development of a knowledge bases has not been extensively researched, particularly as it relates to learning in the social sciences. The existing gap in conceptual change literature makes knowledge change a prime candidate for further study.

One way that students experience change is as they transition into college, particularly as they become engaged in leadership-related activities (Astin & Astin, 2000; Kuh, 2001). Among college students, leadership begins to emerge as a key component of their identities rather than a position they hold (Komives, Longerbeam, Owen, Mainella, & Osteen, 2006). Recent literature on the study of leadership calls for a focus on learning leadership as a way to deepen students’ understanding of leadership as a concept (Grimes, 2015; Harvey & Jenkins, 2014; Roberts, 2007). As the field of leadership studies continues to adopt a more learning-centered focus (Brungardt & Crawford, 1996; Rost & Barker, 2000), an increasing body of scholarship is being introduced to understand teaching and learning in leadership (Clegorne & Mastrogiannini, 2015; Grimes, 2015; Harvey & Jenkins, 2014). Marrying the need to explore learning in leadership and to better understand knowledge change in the social sciences appears to be a relevant setting to study conceptual change learning. The purpose of this paper is to better understand the extent to which knowledge changes among students in a peer leadership course as they learn course content, particularly the five exemplary leadership practices established by Kouzes and Posner (2008, 2014).

This study is focused specifically on knowledge change. As an element of the conceptual change process, knowledge change has been found to occur through knowledge acquisition and
organization (Thagard, 1992), as an event to stimulate complex conceptual change (Carey, 1999), and as a building block toward conceptual change (diSessa, 1988, 1993, 2008). For purposes of this study, knowledge change was defined as any quantitative or qualitative change in how students used their knowledge of the five exemplary leadership practices to respond to specific course assignments.

In order to best explore the nature of knowledge change, three research questions were developed to guide this study:

4. To what extent does students’ declarative knowledge change as they learn about the five exemplary leadership practices?

5. To what extent does students’ procedural knowledge change as they learn about the five exemplary leadership practices?

6. To what extent does students’ conditional knowledge change as they learn about the five exemplary leadership practices?

This paper begins with a review of the literature used to frame this study. Next, there is an overview of the methodology, which includes a brief description of the case-based assignment designed for data collection. Then, results are presented using descriptive and interpretive data. Finally, the paper concludes with a discussion of the findings along with an overview of how what the data suggest could be useful in understanding the overall nature of knowledge change.
A Review of the Literature

Three areas of literature provided a framework for this study: conceptual change learning, types of knowledge, and learning in leadership.

Conceptual Change Learning

Learning is often viewed as a cognitive process in which new information is considered and then developed alongside existing knowledge into something that is known (Ambrose, et al, 2010; Bransford, Brown, & Cocking, 2000). Conceptual change is an approach that explains the development of new knowledge by characterizing the acquisition and processing of new information as a result of how existing knowledge is restructured (Vosniadou, 2007).

The origins of conceptual change learning can be traced to the idea of “paradigms” (Kuhn, 1970). Chalmers (1982) used paradigms to explain the complexity of a belief system, in particular as a framework that is applied in practice. As new ways of thinking emerge, existing paradigms become obsolete and must be replaced with new, more accurate paradigms—often due to a significant shift in a person’s worldview (Mezirow, 2000). Learning is often catalyzed from meaning making that occurs during experiences that include new information, a need to revise inaccurate or incomplete information, or more complex layers of understanding.

Conceptual change is a process of moving through simple additions and subtractions of everyday knowledge into the complex restructuring of knowledge. Thagard (1992) outlined the reformation of complex conceptual structures as a departure from the epistemological underpinnings of the belief revisions found in people's existing mental models. Existing mental models are often the result of understanding that is based on everyday experiences and requires new information to complete, or replace those models (Vosniadou, 2007). Additionally, Hatano and Inagaki (1997) discovered that conceptual change is influenced and occurs in broader social contexts.
contexts, suggesting that the social sciences could provide a unique venue for exploring conceptual change.

In the social sciences, conceptual change research has gained traction as an effective method of understanding (Lundholm & Davies, 2013). Murphy and Alexander (2008) suggested that the lack of research on conceptual change in the social sciences is likely due to the objectivity found within the hard sciences, making it empirically easier to prove what is accurate or correct. Social science research has had to ensure its rigor using techniques such as triangulation, peer evaluation, and member checks (Denzin & Lincoln, 2005). The subjective idea of what is correct or acceptable as accurate in the social sciences has, until more recently, been challenging to explain using conceptual change research.

The emergent research on conceptual change in the social sciences has shown that the subjective components of conceptual understanding (e.g., values, beliefs, socio-cultural factors) must be considered when trying to determine whether any significant change has occurred (Lundholm & Davies, 2013). Conceptual change is a process that takes the learner from one way of understanding to another. In diSessa’s (1988, 1993, 2008) knowledge-in-pieces approach, conceptual change occurs as a reorganization of the smallest increments of knowledge into new conceptualizations. He suggested that developing rather than rejecting pieces of knowledge helps learners move toward a deeper level of understanding. It is from this approach to conceptual change where the present study begins to take shape.

While there is an extensive body of research that looks at knowledge acquisition and prior knowledge conceptions more broadly—i.e., in theories, ontologies, and frameworks—diSessa’s knowledge-in-pieces perspective places a high value on the smaller pieces of knowledge that are sub-conceptual, but can be organized and re-organized as are contextually
necessary to explain both simple and complex conceptual phenomena. But, if the smaller increments of knowledge are key to conceptual change, what is knowledge and how is it used in this study?

Knowledge

Knowledge is a widely researched topic in educational psychology literature, particularly as it pertains to student’s acquisition of knowledge in school (Bransford, Brown, & Cocking, 2000). Some of the perspectives on knowledge found regularly in educational psychology literature include constructivist (Piaget, 1952, 1963; Vygotsky, 1978), metacognitive (Brown, 1987; Flavell, 1979), experiential (Dewey, 1933, 1938; Kolb, 1981, 1984), practical (Schön, 1983, 1987), and behavioral (Bandura, 1986).

In designing a study of knowledge change, it was important to select one perspective on knowledge to use as a framework. This study used the definitions of three types of knowledge: declarative, procedural, and conditional (Jacobs & Paris, 1987). Declarative knowledge is simply what is known. Procedural knowledge is how to use what is known. Conditional knowledge is deciding when and why to apply declarative and procedural knowledge. All three types of knowledge suggest the need for a wide range of cognitive processes.

Learning through Instruction

As conceptual change research continues to contribute to the understanding of how learning happens in the social sciences (Murphy & Alexander, 2008), studies must continue in multiple social sciences disciplines to add to the growing body of scholarship. Because this study was conducted during a course, it is important to briefly explore the scholarship related to how students learn through instruction.
One goal of good teaching is to provide the tools and settings necessary for students to learn (Nilson, 2010). Rogoff (1990) posited that learning is a social venture in which students learn to interact with teachers and peers in a way that results in learning. Fenstermacher (1986) introduced the idea of studenting as the activities a student needs to learn to succeed academically and socially in school. In kind, Fleer (2011) discussed learning how to behave in school as a central motive of students. Good instruction will help students understand how to learn rather than simply understand how to be students in school (Novak & Gowin, 1984; Sainsbury & Walker, 2011). Ambrose, et al (2010) and Nilson (2010, 2013) characterized the instructor’s role in student learning as the provider of clear outcomes and creator of learner-centered environments.

Anderson and Krathwohl (2001) developed a revised version of Bloom’s (1965) Taxonomy to help instructors determine educational outcomes that met the needs of learners. The revised taxonomy outlines various types of knowledge moving from concrete (factual knowledge) to abstract (metacognitive knowledge) over the course of the learning process. As learners progress from lower-to-higher order thinking, the types of knowledge that they use also becomes more complex. Anderson and Krathwohl (2001) did not restrict the types of knowledge to a fixed level of understanding, making relevant a wide variety of ways knowledge is referred to in the literature—e.g., tacit knowledge, content knowledge, propositional knowledge, empirical knowledge, etc. Knowledge is most relevant through an intersection with learners’ cognitive processes and within intentionally designed instruction. The significance of how knowledge development intersects with cognitive understanding provides a unique opportunity to explore the nature of knowledge change as students learn.
The literature on conceptual change learning, types of knowledge, and learning through instruction all contributed to the design of this study. The next section of this paper outlines the methods used to research the extent to which knowledge changes among students in a peer leadership course.
Methodology

To better understand the nature of knowledge change within the context of a leadership education course, it was important to use a research method that could result in rich, descriptive detail about the nature of knowledge change. Therefore, a qualitative design was employed for this study. This section of the paper focuses on how the study was designed and conducted, and includes a description of the case study assignment used to collect data.

Setting and Participants

The setting for this study was an undergraduate peer leadership course at a large, public, Research I institution. Rost and Barker (2000) directed scholars to focus on leadership as a way for students to learn and develop a knowledge base about leadership. The peer leadership course was selected because it employs a unique design involving three components: experiential learning (by way of students securing a peer leadership role prior to enrolling in the course), a recitation for reflective dialogue, and content delivery via a web application selected by the institution. One of the goals of this course is to promote conceptual change in learning intentional, constructive ways to practice leadership.

Participants in the study were undergraduate students from a variety of majors and leadership experiences. The researcher presented the study to the students at the start of the course. Informed consent was obtained from each participant prior to beginning the study, and all participants had the option to withdraw at any time. In addition, the choice to participate in this study had no impact on students’ course grades or in the review of their assignments by the course instruction team.
Data Sources

In order to provide the most realistic and nonintrusive vehicle for collecting data, the course assignments related to the primary course text provided the data for this study. The primary course text for the peer leadership course was *The Student Leadership Challenge* (Kouzes & Posner, 2008, 2014). This text outlines five practices for exemplary leadership (ELPs), the content used to design the continuous case. Figure 1 shows the five ELPs, along with ten accompanying commitments for exemplary leadership practice.

![ELPs and Commitments](image)

*Figure 1:* The five ELPs and ten corresponding commitments (Kouzes & Posner, 2008, p.22).

Three assignments related to the five exemplary leadership practices were used: Goal-setting forms, discussion forums, and the final paper.
**Goal-setting forms.** The *Student Leadership Practices Inventory* (SLPI) was used to ensure that students had a knowledge base, or at least some introduction to the five exemplary leadership practices prior to engaging in the course content. Students were asked to complete the SLPI, an instrument created by Kouzes and Posner (2008, 2014) aligned with their book’s content, to help identify the frequency with which students engage in ELP behaviors. Students received their SLPI results and were asked to set goals for their peer leadership roles that were related to their inventory results (for a sample student result, see Appendix A). The goal-setting forms were later used in tandem with the final paper assignment for students to reflect on their experiences with the five ELPs over the course of the semester.

**Discussion forums.** In the principles of peer leadership course, students were asked to respond to various prompts throughout the course of the semester. The intent of these was for students to discuss their interpretations of course content with other students using an online format. In order to collect student data without compromising the integrity of the initial course design, it was decided to incorporate an intentionally designed case study into the existing discussion forums related to the five ELPs.

Designing case studies that can be used to facilitate and assess student learning is more than just writing a story. According to Nilson (2013), cases relevant to the course content can be found or adapted from other sources, or created from scratch. Nilson (2010) introduced the continuous case, explaining that it “tells an unfolding story in segments over real or condensed time” (p. 183). For purposes of this study, a continuous case assignment was intentionally designed to explore students’ knowledge change.
The continuous case assignment was divided into six segments. Each segment was posted in the week corresponding the assigned reading about the five ELPs, with the sixth and final segment serving as a case conclusion (Table 1).

Table 1

*Continuous Case Study Segments Timeline*

<table>
<thead>
<tr>
<th>Case Segment</th>
<th>Timeframe</th>
<th>ELP</th>
<th>Type of Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Segment 1</td>
<td>Week 4</td>
<td>MTW</td>
<td>DK, PK, CK</td>
</tr>
<tr>
<td>Case Segment 2</td>
<td>Week 4</td>
<td>ISV</td>
<td>DK, PK, CK</td>
</tr>
<tr>
<td>Case Segment 3</td>
<td>Week 5</td>
<td>CTP</td>
<td>DK, PK, CK</td>
</tr>
<tr>
<td>Case Segment 4</td>
<td>Week 8</td>
<td>EOA</td>
<td>DK, PK, CK</td>
</tr>
<tr>
<td>Case Segment 5</td>
<td>Week 9</td>
<td>ETH</td>
<td>DK, PK, CK</td>
</tr>
<tr>
<td>Case Segment 6 (the case in full)</td>
<td>Week 15</td>
<td>Any or all</td>
<td>DK, PK, CK</td>
</tr>
</tbody>
</table>

*Note:* MTW = Model the Way; ISV = Inspire a Shared Vision; CTP = Challenge the Process; EOA = Enable Others to Act; ETH = Encourage the Heart; DK = Declarative Knowledge; PK = Procedural Knowledge; CK = Conditional Knowledge.

**Final Paper.** The final course assignment was a capstone paper developed by the course instructor (Appendix B, Friedel, 2015). One component of the paper asked students to write about their “personal best” as a peer leader. Students were asked to reflect on their initial goals—included in the goal-setting forms—and share experiences they had in their peer leader roles that exemplified ELPs. In this study, the final paper was used in tandem with the case assignment to better understand the extent to which students’ knowledge changed as they learned about the five exemplary leadership practices.
Data Collection

Data were collected using students’ responses to the discussion forums and the final paper. Once enrolled in the course, students were directed to the course website to review the syllabus and informed consent documentation that explained the purpose and scope of the study. All assignments were assigned, reviewed, and completed via the course website. While all students were asked to complete the same course assignments, only those assignments completed by participants in this study were reviewed for data collection and analysis. Data were collected via a secure course site, and access to students’ information and responses was limited to the course instruction team and the researcher.

Goal-setting forms. During week 1, students were assigned the SLPI. Upon completion of the inventory, students received a report with their results. The results were reported in numerical form, with a score out of 30 possible points for each of the five ELPs. The higher the score, the more frequently students were engaged in behaviors that correspond to the particular ELP. Students submitted their scores to the course website using a goal-setting form (Appendix C). Each goal used one or more of the ELPs and helped established students’ knowledge bases with regard to the five ELPs.

Discussion forums. Students were asked to read and post a response to each case segment using the discussion forums. Each of the first five case segments was titled for students to consider a particular ELP in their responses. The concluding segment was designed and titled for students to consider any or all of the ELPs in their responses. Each segment included two prompts. The first prompt asked students to respond to the case segment using a particular ELP. Table 2 shows each of the first prompts used in the case assignment.

Table 2
### Prompts Used for Each Case Segment

<table>
<thead>
<tr>
<th>Case segment</th>
<th>Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment 1: Model the Way</td>
<td>How can you use “Model the Way” to respond to this scenario?</td>
</tr>
<tr>
<td>Segment 2: Inspire a Shared Vision</td>
<td>How can inspiring a shared vision help you respond in this scenario?</td>
</tr>
<tr>
<td>Segment 3: Challenge the Process</td>
<td>In what ways could challenging the process help to improve the organization?</td>
</tr>
<tr>
<td>Segment 4: Enable Others to Act</td>
<td>Respond to this scenario by enabling others to act.</td>
</tr>
<tr>
<td>Segment 5: Encourage the Heart</td>
<td>Decide how to encourage the hearts within the organization.hecy.</td>
</tr>
<tr>
<td>Segment 6: Conclusion</td>
<td>As the semester nears its end, consider how using any or all of the exemplary leadership practices could help in planning ahead for next semester.</td>
</tr>
</tbody>
</table>

The second prompt for each case segment was a self-assessment to better understand how students approached their responses. The general format of the self-assessment prompt was “Describe how you included (ELP) in your scenario response.” Students were asked to respond to both prompts in the same forum post.

**Final Paper.** The final paper was a capstone assignment for the course (Appendix B). Students responded to two prompts related to the five ELPs (Figure 1).
Figure 1. This figure shows the section of the final paper rubric used as the data source in this study.

For purposes of this study, only students’ responses to the section of the final paper that corresponded to the two prompts was used.

Data Analysis

Data analysis focused on the extent to which students experienced knowledge change as evidenced in the information extracted from their responses to the case and final paper assignments. The data were reviewed for evidence of the three types of knowledge—declarative, procedural, and conditional. Analysis was conducted using frequency counts, and both content and aggregate analyses. Specific analysis per data source is listed below.

Goal-setting forms. Students’ completions of goal-setting forms were not analyzed for purposes of this study. Instead, students were directed to consider the goals they set as they completed the final paper.

Discussion Forums. Responses to the first five case segments were analyzed using content analysis and frequency counts. Responses were analyzed by identifying specific examples of words and phrases participants’ used that indicated the specific ELP identified as the topic of the segment. Each word or phrase was then analyzed for evidence of declarative, procedural, or conditional knowledge, and tallied using a score of “1” per example found. The content was analyzed and recorded using descriptors of how the student used the type of knowledge discovered in each example.
Consider the following example “I modeled the way by aligning my actions with the goals of the organization.” In this response, there is evidence of the student referring to one of the ten commitments of model the way—“aligning my actions with the goals of the organization”—which would be analyzed as use of what is known or declarative knowledge content. This would result in a tally of “1” under declarative knowledge.

**Concluding case segment.** Responses to the concluding case segment were also analyzed using content analysis and frequency counts. Responses were analyzed by identifying specific examples of words and phrases participants’ used that indicated any or all of the ELPs identified by the students in their responses. Because the concluding segment prompts were designed for students to apply their ELP knowledge in strategizing toward the future, each word or phrase was analyzed for evidence of conditional knowledge, and tallied using a score of “1” per example found. The content was analyzed and recorded using descriptors of how the student used conditional knowledge discovered in each example.

**Final paper.** Responses to the final paper were also analyzed using content analysis and frequency counts. Responses were analyzed by identifying specific examples of words and phrases participants’ used that indicated any or all of the ELPs identified by the students in their paper. Because the final paper prompts were designed for students to reflect upon how they applied their ELP knowledge as a peer leader, each word or phrase was then analyzed for evidence of conditional knowledge, and tallied using a score of “1” per example found. The content was analyzed and recorded using descriptors of how the student used conditional knowledge discovered in each example.

**Across assignments.** Because the study was intended to discover the extent to which knowledge changed across time, evidence of patterns of change across all assignments was
investigated using an aggregate analysis. This analysis was conducted by searching the tallies and analyzed content for changes in knowledge use over time.

The aggregate analysis of the tallies involved a side-by-side comparison of the mean and total tallies, as well as an analysis of the mean and total weighted tallies, as necessary (i.e., if the number of respondents vary across assignments). Knowledge change was identified by interpreting any increase, decrease, or no change in the mean and total tallies, and in the means and total weighted tallies.

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For example, if students’ responses showed lower tallies of procedural knowledge across the first two case segments, but higher tallies across the final three case segments, the quantity of knowledge change would be considered increasing. In kind, if how students used procedural knowledge across the first two case segments differed from how students used procedural knowledge across the final three case segments, the differing usages were interpreted as knowledge change.

**Trustworthiness of the Procedures**

Because the data analysis was conducted by one researcher, it was important to employ a number of methods to ensure the trustworthiness of the procedures and of the data generated.
Prior to conducting the study, the researcher established a pilot group of ten students familiar with both the peer leadership course and the course content. These students were given the case segments and prompts and asked to respond and provide feedback as to their level of understanding of the data source. Students’ responses to the case segments indicated an understanding of the procedure and resulted in analyzable content.

With regard to the actual study, detailed notes were maintained throughout data collection and analysis to keep a record of decisions made with regard to handling the data. The researcher engaged the data by linking interpretations with specific examples from students’ responses. Finally, the researcher trained three independent reviewers to analyze a small number of responses using the data analysis procedures listed above. All three reviewers tallied their findings and highlighted content in a manner that closely corresponded with the researcher’s analysis.

The methodology described resulted in rich, descriptive data that was used to better understand the nature of knowledge change. The following section of the paper details the results of the data collection.
Results

This study is presented in a post-positivist format, where both quantitative and qualitative results were considered (Trochim, 2006). The quantitative results provide an overview of the types of knowledge categorized in the analysis. The qualitative analysis responds to the overall study’s focus: to understand the extent to which students experience knowledge change. Thus presenting the results interpretively will help to better understand the subtleties and nuances of knowledge change that occurred.

The results are presented in two primary ways. First, there is an overview of the statistical results, including the tallies of types of knowledge used by students across all assignments. Next, there is a synopsis of the nature of the words and phrases that comprised the types of knowledge students’ used within and across assignments.

Statistical Results

A statistical overview of the tallies for the three types of knowledge (TOK) uncovered from students’ responses across all assignments is presented below. The study began with 87 students giving their consent for participation in the research and ended with 76 participants from whom usable data were collected. Three students ended their enrollment in the course. Three students stopped responding to the forums during the semester. Five additional students were removed after the final data collection (the final paper) because they either a) did not respond to the final paper and the concluding case segment, or b) after reviewing the collected data, the researcher discovered they had not included responses to multiple assignments. Table 3 shows the number of respondents (n) per assignment.
Respondents per Assignment

<table>
<thead>
<tr>
<th></th>
<th>MTW</th>
<th>ISV</th>
<th>CTP</th>
<th>EOA</th>
<th>ETH</th>
<th>CONC</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Respondents</td>
<td>76</td>
<td>76</td>
<td>73</td>
<td>74</td>
<td>73</td>
<td>65</td>
<td>72</td>
</tr>
</tbody>
</table>

Note. MTW=Model the Way; ISV=Inspire a Shared Vision; CTP=Challenge the Process; EOA=Enable Others to Act; ETH=Encourage the Heart; CONC=Case Conclusion; FP=Final Paper.

Because there were varying numbers of participants for each assignment, the total and weighted tallies of knowledge were used. Table 4 shows frequency counts in the form of the total and weighted tallies of knowledge used by students, within and across assignments.

Table 4

Total Frequency Counts

<table>
<thead>
<tr>
<th></th>
<th>MTW</th>
<th>ISV</th>
<th>CTP</th>
<th>EOA</th>
<th>ETH</th>
<th>CONC</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Tally TOK</td>
<td>326</td>
<td>343</td>
<td>373</td>
<td>390</td>
<td>403</td>
<td>431</td>
<td>737</td>
</tr>
<tr>
<td>Weighted Tally TOK</td>
<td>326.0</td>
<td>343.0</td>
<td>388.3</td>
<td>400.5</td>
<td>419.6</td>
<td>496.3</td>
<td>777.9</td>
</tr>
</tbody>
</table>

Note. The weighted tallies were determined by adjusting the value of each total tally for n=76.

An upward trend in the total and weighted tallies indicated an increase in the frequency of types of knowledge included in students’ responses across all assignments. Figure 2 shows the increase in the frequency of knowledge used across all assignments.
In addition to the numerical tallies, the three types of knowledge—declarative knowledge (DK), procedural knowledge (PK), and conditional knowledge (CK)—were tallied using words and phrases from student responses over the course of the study. Table 5 shows examples of how each type of knowledge tallied in the present study.

Table 5

**Descriptions of How Each Type of Knowledge Was Tallied**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DK</td>
<td>Presenting information as factual knowledge, or <em>what is known</em>. For example: “Kouzes and Posner (2014) wrote that ‘modeling the way’ is…”</td>
</tr>
<tr>
<td>PK</td>
<td>Explaining a plan or process using knowledge, or <em>how to use what is known</em>. For example: “I would use model the way by…”</td>
</tr>
<tr>
<td>CK</td>
<td>Illustrating scenarios they would or have applied knowledge, or <em>when and why to apply declarative and procedural knowledge</em>. For example: “As a peer leader, I modeled the way when I… because…”</td>
</tr>
</tbody>
</table>

*Note.* Conditional knowledge was tallied only when the response indicated a student’s decision to apply ELP knowledge to the given scenario.
The weighted tallies of TOK revealed patterns within and across assignments. DK stayed relatively consistent across all assignments. While there was a slight decrease in DK use from MTW to ISV, DK then steadily increased through ETH, then remained fairly consistent across the final three assignments. There was a steady increase in PK use across the first four case segments (MTW, ISV, CTP, & EOA), then a decrease across the final three case segments (EOA, ETH, & CONC). PK use increased again in the final paper responses. Finally, CK use steadily increased across all assignments, from a value of 3.0 (MTW) to a value of 110.8 (final paper). Figure 3 shows a graph of DK, PK, and CK use across all assignments.

![Figure 3](image)

**Figure 3.** A bar graph depicting the pattern of use among the weighted tallies of DK, PK, & CK across all assignments.

In order to analyze the data further, words and phrases used in students’ responses were sub-categorized into themes that assisted in identifying types of knowledge. The following
sections elaborate on the more intricate process of developing themes to help in understanding and interpreting the TOK presented in students’ responses.

**Types of knowledge**

The various words and phrases students used to present their knowledge were coded into eleven themes. Table 6 defines each of the themes, as well as how they were sorted into each TOK.

Table 6

*Definitions of Themes*

<table>
<thead>
<tr>
<th>TOK</th>
<th>Theme</th>
<th>Definition used for coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>None</td>
<td>Any response where an ELP was referenced, but used inaccurately, incompletely, or without a clear origin from the course content.</td>
</tr>
<tr>
<td>DK</td>
<td>Direct content</td>
<td>Words or phrases pulled directly from the course text, often accompanied by quotes and citation.</td>
</tr>
<tr>
<td>DK</td>
<td>Indirect content</td>
<td>Paraphrases of the course text, or descriptions of ELPs using outside sources (e.g., other course materials).</td>
</tr>
<tr>
<td>PK</td>
<td>Examples</td>
<td>Examples of how the respondent would use an ELP, typically following a definition or description (DK).</td>
</tr>
<tr>
<td>PK</td>
<td>Experiences</td>
<td>A recounting of how respondents’ experiences (including observations from the past) are illustrative of how they could use an ELP.</td>
</tr>
<tr>
<td>PK</td>
<td>Step-by-step plan of action</td>
<td>A walk-through of how they would use an ELP, typically in the form of a process they created.</td>
</tr>
<tr>
<td>PK</td>
<td>Ideas</td>
<td>A “what if” description of how an ELP could be useful, given the opportunity to use it, typically following a definition or description.</td>
</tr>
<tr>
<td>CK</td>
<td>Elaboration</td>
<td>An expanded description of DK or PK that details a strategy</td>
</tr>
</tbody>
</table>
for when and/or why an ELP should be applied.

**CK Generation**
Combining multiple ELPs in application to a scenario, often by rearranging elements of ELPs to form an untested strategy.

**CK Personalization**
Evaluating the impact or results of applying an ELP, either before (e.g., “what would happen as a result of applying”) or after (e.g., “what did happen as a result of applying”).

**CK Integration**
Focusing on the elements of an ELP as the specific foci for applying the overall ELP.

Each of the eleven themes created a more direct path to sub-categorizing TOK as DK, PK, or CK. In addition, it allowed for frequency counts of more qualitative data to analyze for patterns of use within DK, PK, and CK.

**Declarative knowledge.** Direct content was used more often than indirect content in each assignment except for ETH (indirect content was used 10% more) and EOA (where each type of DK was used equally). It is also important to note that direct content use dipped nearly 20% from CTP to EOA (and slightly more than 20% from CTP to ETH). Table 7 shows the percentage use of each DK theme across all assignments.

Table 7

*Percentage Use of DK Themes*

<table>
<thead>
<tr>
<th></th>
<th>MTW</th>
<th>ISV</th>
<th>CTP</th>
<th>EOA</th>
<th>ETH</th>
<th>CONC</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total DK</td>
<td>83</td>
<td>77</td>
<td>78</td>
<td>86</td>
<td>92</td>
<td>81</td>
<td>94</td>
</tr>
<tr>
<td>Direct Content</td>
<td>55%</td>
<td>60%</td>
<td>67%</td>
<td>50%</td>
<td>45%</td>
<td>54%</td>
<td>52%</td>
</tr>
<tr>
<td>Indirect Content</td>
<td>45%</td>
<td>40%</td>
<td>33%</td>
<td>50%</td>
<td>55%</td>
<td>46%</td>
<td>48%</td>
</tr>
</tbody>
</table>

*Note:* Percentages were determined using the total instances of DK found in the responses for each assignment.
**Procedural knowledge.** Students’ use of examples increased overall across case segments, decreasing only from ISV to CTP. The percent of the time examples were used more than doubled from MTW through CONC. Percentage use of examples did decrease from CONC to FP, but was still found in student responses 64% of the time in the final paper. Students’ use of experiences decreases overall across case segments, but saw a dramatic increase from CONC to the final paper (a 34% increase in use). Instances of step-by-step plan were at their highest during MTW, but steadily decreased throughout case segments. No instances of step-by-step plan were found in the final paper assignment. Finally, students’ use of ideas increased from MTW to CTP, but then decreased through the rest of the case segments. Only one instance of ideas was recorded in the final paper assignment. Table 8 shows the percentage use of each PK theme across all assignments.

Table 8

*Percentage use of PK Themes*

<table>
<thead>
<tr>
<th></th>
<th>MTW</th>
<th>ISV</th>
<th>CTP</th>
<th>EOA</th>
<th>ETH</th>
<th>CONC</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PK</td>
<td>90</td>
<td>107</td>
<td>118</td>
<td>140</td>
<td>124</td>
<td>80</td>
<td>112</td>
</tr>
<tr>
<td>Example</td>
<td>28%</td>
<td>40%</td>
<td>33%</td>
<td>41%</td>
<td>41%</td>
<td>71%</td>
<td>64%</td>
</tr>
<tr>
<td>Experience</td>
<td>12%</td>
<td>7%</td>
<td>3%</td>
<td>9%</td>
<td>5%</td>
<td>1%</td>
<td>35%</td>
</tr>
<tr>
<td>Step-by-step plan</td>
<td>46%</td>
<td>28%</td>
<td>25%</td>
<td>19%</td>
<td>23%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Ideas</td>
<td>14%</td>
<td>25%</td>
<td>39%</td>
<td>30%</td>
<td>31%</td>
<td>24%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Note:* Percentages were determined using the total instances of PK found in the responses for each assignment.

**Conditional knowledge.** Elaboration was the only form of conditional knowledge found in student responses until CONC and the final paper. The number of instances of elaboration increased from three to 28 across the first five case segments, and up to 33 instances in the final
paper. Students’ use of generation, personalization, and integration first appeared in the final case segment, CONC. Generation (16%) and integration (27%) were prevalent in responses during CONC, but decreased to 5% and 2% respectively in the final papers. Personalization, however, was found in 23% of responses during CONC and increased to 62% in final paper responses. Table 9 shows the percentage use of each CK theme across all assignments.

Table 9

*Percentage use of CK Themes*

<table>
<thead>
<tr>
<th></th>
<th>MTW</th>
<th>ISV</th>
<th>CTP</th>
<th>EOA</th>
<th>ETH</th>
<th>CONC</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total CK</strong></td>
<td>3</td>
<td>20</td>
<td>21</td>
<td>26</td>
<td>28</td>
<td>62</td>
<td>105</td>
</tr>
<tr>
<td><strong>Elaboration</strong></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>34%</td>
<td>31%</td>
</tr>
<tr>
<td><strong>Generation</strong></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>16%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Personalization</strong></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>23%</td>
<td>62%</td>
</tr>
<tr>
<td><strong>Integration</strong></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>27%</td>
<td>2%</td>
</tr>
</tbody>
</table>

*Note:* Percentages were determined using the total instances of CK found in the responses for each assignment.

The data provided a wealth of information related to the extent to which students’ referenced the types of knowledge. The following section of this paper provides an interpretation of the results to discover evidence as to the extent to which knowledge change occurred.
Interpretive Analysis and Discussion

This study sought to discover the nature of knowledge change among students in a peer leadership course. Three research questions were crafted to examine the extent to which students’ (a) declarative, (b) procedural, and (c) conditional knowledge changed as they learned about specific course content, the five exemplary leadership practices (ELPs; Kouzes & Posner, 2008, 2014). Data were collected from classroom assignments including intentionally-designed case studies and a capstone, final paper. The results of this study indicated that knowledge changed in both quantity (i.e., an increase, decrease, or no change in the frequency of knowledge use) and quality (i.e., the increasing complexity of the words and phrases students used).

This section of the paper presents overall findings and then addresses each of the three research questions. Included in the discussion of each research question is a more in-depth exploration of the nature of how knowledge changed along with evidence that suggests a number of cognitive processes students engaged in as they experienced knowledge change in this study. This section concludes with how this study adds to the current scholarship on the nature of knowledge change.

Overall Findings

While there was specific evidence of knowledge change that was discovered during the investigation of the results, there are also some important observations to be made with regard to the overall nature of knowledge change that occurred during this study. Overall findings highlight three major areas of consideration, which include changes to the initial methodology, evidence of students’ knowledge bases pertaining to the five ELPs, and the quantities of knowledge use discovered as a result of the overall frequency counts.
Methodological changes. There are two important changes to highlight with regard to the methodology. First, each segment of the case study was followed by two prompts. The first prompt was always intended to incite students to respond to the scenario using their current knowledge of the ELPs. The second prompt was an attempt to invoke students to conduct and share a self-assessment of their response. Intriguingly, nearly all student responses were written as one response; that is, students did not separate the two prompts, but instead rolled their thoughts into one response. In light of this, the methodology was adapted to review students’ responses as one response to the two scenario prompts rather than two responses to two prompts.

In addition, while the initial methodology was designed under the assumption that students would be less likely to draw upon conditional knowledge during the first five case segments than during the final case segment and the final paper, and less likely to use declarative and procedural knowledge during the final two assignments than during the first five case segments. However, data analysis revealed that students relied upon all three types of knowledge across all assignments. Therefore, the decision was made to modify the methodology to include all three types of knowledge in each of the seven assignments used to collect data.

Overall content tallies. A first step in studying knowledge change is by investigating for evidence of knowledge acquisition. In this study, knowledge acquisition was quantified through frequency counts. During frequency counts, each type of knowledge and evidence of depth of thinking were tallied as they were discovered in a student response. The results showed that students’ use of their knowledge of the ELPs increased as they progressed through the semester.

The tallies of types of knowledge (TOK) plus depth of thinking (DOT) increased in every subsequent assignment, which corresponds to the initial, knowledge acquisition stages of
conceptual change learning (Novak & Gowin, 1984; Novak, 1990; Thagard, 1992). Anderson and Krathwohl (2001) included knowledge and cognitive dimensions within which learners operate. While students’ use of knowledge was evaluated using the three types of knowledge established by Jacobs and Paris (1987), the similarity to the knowledge dimension allowed for some interpretation of students’ cognitive processing as they completed the assignments in this study.

For example, Anderson and Krathwohl (2001) suggested that learning at its most basic level occurs through remembering—that is, through memory activities like retention, recognition, and recall. In this study, the results suggested that students were not only gaining and then retaining declarative knowledge, but retrieved increasing amounts of knowledge as they moved through the assignments. The results also suggest that students operated within the other five cognitive dimensions, which will be highlighted in the discussion of this study. In addition to how students’ knowledge changed, it is important to highlight how students developed a knowledge base of the five ELPs.

**Students’ prior knowledge bases.** In designing this study, it was assumed that students did not have a significant knowledge base related to the five ELPs. While this study did not measure students’ prior knowledge of the five ELPs, students were asked to complete the Student Leadership Practices Inventory (SLPI). Students’ SLPI results helped assure that they began the course with at least some exposure to the ELPs, if only through the SLPI.

Students were asked to set semester goals after having received these results. Many students commented on the significance of improving on one or more of the five ELPs. For example, one student wrote that establishing a planning team made up of undergraduate students from all years “will serve to ‘enable others to act’ by encouraging the freshmen students to take
leadership roles and experiment with their own styles of leadership.” Whether or not this student had prior exposure to the five ELPs, the goal illustrated a basic understanding of the *enable others to act* (EOA) ELP’s most basic meaning.

Additionally, some students indicated a peer leader role-specific prior knowledge base entering the course. For examples, one student set a goal that was directly related to a job expectation, and planned to “model the way by leaving my suite and room doors open” to help peers see the value of “inviting in (others)” and “encouraging conversation.” In this case, the student tied an initial understanding of *model the way* (MTW) directly to the peer leader role that led to enrollment in the course.

Overall, students’ reported a relatively high frequency of behaviors associated with each of the five ELPs, particularly of modeling the way (81%) and enabling others to act (81%). Table 10 shows a summary of the frequency of ELP use that resulted from students’ SLPI results prior to engaging in the course.

Table 10

*Summary of SLPI Results*

<table>
<thead>
<tr>
<th></th>
<th>MTW</th>
<th>ISV</th>
<th>CTP</th>
<th>EOA</th>
<th>ETH</th>
</tr>
</thead>
<tbody>
<tr>
<td>High frequency (21-30)</td>
<td>60</td>
<td>46</td>
<td>46</td>
<td>60</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>81%</td>
<td>62%</td>
<td>62%</td>
<td>81%</td>
<td>66%</td>
</tr>
<tr>
<td>Medium frequency (11-20)</td>
<td>14</td>
<td>28</td>
<td>26</td>
<td>13</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>19%</td>
<td>38%</td>
<td>35%</td>
<td>18%</td>
<td>32%</td>
</tr>
<tr>
<td>Low frequency (0-10)</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>
Note: Percentage frequency of use was determined using the total number of students who provided their SLPI scores (n=74).

Whether or not students had prior exposure to the ELPs before this course, the SLPI gave students an idea of the behaviors in which they were already engaged related to the five ELPs. By completing the goal-setting form (See Appendix C), students began to establish a knowledge base for learning about the five ELPs. The next section of this paper examines students’ declarative, procedural, and conditional knowledge change, and offers evidence of the cognitive processes discovered in an investigation of their assignment responses.

Declarative Knowledge Change

The first research question asked “To what extent does students’ declarative knowledge change as they learn about the five exemplary leadership practices?” Results revealed that students’ declarative knowledge use was consistent across all assignments and was a mix of both direct and indirect content.

Consistency of declarative knowledge. Students used declarative knowledge in their responses at the same relative rate across all assignments. According to the results, there appear to be two likely reasons for this. First, because students were prompted to use a specific ELP for each of the first five case segments, it was reasonable for them to assume they were being evaluated based on whether or not they used the ELP accurately. One way that students ensured their use of an ELP was accurate was to refer back to the source; i.e., the descriptions and principles of each ELP found in the course text. For example, in response to the prompt “Describe how you included model the way in your response,” one student wrote that “by highlighting the principle of leading by example… the description of this practice from the Leadership Challenge states…” Many students did this by citing the course text (using direct
content), while others paraphrased the course text’s description of the ELP in a highly discernable manner (using indirect content). Examples of each type of content are provided in the next section of the paper.

The results suggested a second explanation for why declarative knowledge use was uniform across all assignments—that is, the consistent presentation of what they know in a prescribed format. From an early age, children are taught certain practices that are deemed appropriate for being a student (Fenstermacher, 1986). Fleer (2011) discussed the idea that students’ motives to complete school activities are to fit a particular set of institutional expectations. Kohn (1993) suggested that children are given little choice in how and when they complete assignments throughout their primary and secondary schooling because teachers and schools create a prescribed structure—e.g., for written assignments (Mlynarczyk, 1998). Writing using a prescribed structure takes away from learners’ agentive minds, from which more advanced cognitive processes emerge (Bruner, 1996).

For the students who participated in this study, uniformity in presenting declarative knowledge across all assignments appeared to be a pattern of learned behavior from studenting (Fenstermacher, 1986). In some ways, students’ presentation suggests an accretion model—i.e., the repetition of new information transferred from an external medium into new knowledge (diSessa, 1988; Norman, 1993). However, the responses themselves did include varying types of declarative knowledge. In particular, the results revealed that students were making choices to present their declarative knowledge as either or both direct content and indirect content.

Use of direct and indirect content as declarative knowledge. In presenting declarative knowledge, students formatted their responses using both direct content and indirect content. Using direct content gave student the opportunity to illustrate an ELP in two particular ways.
First, it allowed students to provide a citation directly from the course text. For example, in response to the third case segment about *challenge the process*, one student wrote “According to the text, challenging the process includes stepping outside of normal routines and ‘treating every project, assignment, or job as an adventure’ (pg. 115).”

Second, direct content gave students foundational points from a reliable source from which to build their responses. For example, the same student followed the quote with an interpretation of it, “All officers of this organization would need to join together to establish an attitude and atmosphere of adventure, one that encourages out-of-the-box thinking and collaboration with other organizations.” The interpretation illustrated a more advanced cognitive dimension (*understanding*; Anderson & Krathwohl, 2001), as well as a foray into how the declarative knowledge could be applied (procedural knowledge, which will be detailed in the next section of the paper).

When students presented declarative knowledge as indirect content, they were primarily using their own words to recite what they knew. In most cases, indirect content was used in the form of paraphrasing. In responding to the fourth case segment, one student wrote “It takes trust, which doesn’t come easy… you are preparing others to move up into leadership roles.” The statement implies a need to *build trust* and *strengthen others*—two components of enabling others to act—but is presented in the student’s own words. There were also cases of indirect content where students used other course content (e.g., another course text) or outside references (e.g., concepts learned outside of class) to present their ideas and help support what they knew about a particular ELP. Regardless of how students presented their declarative knowledge, there was evidence of learner agency (Bruner, 1996; Kohn, 1993; Vygotsky, 1962) as opposed to a purely transaction-based transfer of knowledge sans-meaning.
To what extent did declarative knowledge change? Whether they used direct or indirect content, students’ responses indicated the ability to use what they knew in response to case scenarios. The declarative knowledge change that occurred was primarily in the quality of students’ responses rather than the quantity. Students exhibited competence in the cognitive dimensions of remembering and understanding (Anderson & Krathwohl, 2001) and showed a knack for using what they knew to set themselves up to use increasingly complex types of knowledge. In fact, it was rare that students used only declarative knowledge in their responses. Student relied upon what they knew before attempting to develop a process to use it, or make decisions about when and why to apply it. Students’ use of declarative knowledge suggests an emergent pattern of the purposefully using their declarative knowledge to move into more complex types of knowledge and more advanced cognitive dimensions. However, before declaring that such a pattern exists, it is important to first explore the results as they pertain to students’ use of procedural knowledge.

Procedural Knowledge Change

The second research question asked “To what extent does students’ procedural knowledge change as they learn about the five exemplary leadership practices?” Results revealed that students’ procedural knowledge use increased and then decreased as students moved through the case segments, but increased again in final paper responses. Furthermore, the particular themes of procedural knowledge students used varied, helping to provide an explanation for the nature of change in students’ procedural knowledge.

Variance in procedural knowledge use. What does the pattern of movement in students’ procedural knowledge use suggest about how students responded to the course
assignments? The results suggest that students’ responses were crafted using procedural knowledge in two distinct ways.

First, students used procedural knowledge immediately following declarative knowledge to exemplify their understanding of an ELP. This practice resembled Piaget’s assimilation, in that students’ appeared to be using procedural knowledge to explain how they knew what they knew (Inhelder & Piaget, 1969). The practice of using procedural knowledge as a follow up to declarative knowledge was written as necessity for most students; that is, students needed to use some form of procedural knowledge to enrich their understanding, and their responses. Consider two examples of student responses:

- Example 1 (case segment three, challenge the process): “The scenario response relates to *challenge the process* through searching for opportunities and *experimentation*. As a leader, *I encouraged/challenged the members to start their own activities or look for other existing opportunities.*”

- Example 2 (cases segment two, inspire a shared vision): “(Envisioning the result) will give all of the group members a chance to see for themselves the need that would be fulfilled by this project… *We are going to all go to the site*…”

In each example, declarative knowledge is underlined and procedural knowledge is shown using italics. These examples show how students could use procedural knowledge to enrich the presentation of what they know in the given scenario.

Second, students approached procedural knowledge differently for each assignment. In order to completely answer the second research question, it was important to find the deeper meaning and intent behind students’ use of procedural knowledge. Evidence of procedural knowledge found in students’ responses were grouped into four themes: Examples, experiences,
step-by-step plans of action, and ideas. During the first case segment, students focused heavily on offering a sequential process by which they could use procedural knowledge (step-by-step plan of action). For example, one student wrote “I would first clarify our values… (tell) stories to instill values… set the example in order to clarify roles and actions to other members… model the way for others to step into roles of leadership.” By ordering how to use knowledge of model the way, the student created a sequentially organized plan.

As the case progressed, students spent more time developing ideas, mostly through a process of if-then. In the following excerpt, the student imagined what could happen if the group tried something new:

I would then encourage the group to… at least work on new opportunities to improving the events already in place… My hope would be that even if the team did decide to only improve the current activities that those improvements would lead to interest of new activities to participate in.

While the provided scenario was not real, the case was illustrative as to how the student was able to incorporate procedural knowledge into the imaginary scenario as if it were.

During the concluding case segment and the final paper, students’ procedural knowledge was almost exclusively used as examples and experiences. Students were prompted to draw upon their prior knowledge of the ELPs from the earlier weeks in the semester. In the concluding case segment, students were future-focused, and most students used examples to strategize their approach to building the fictional organization’s future leadership efforts using the ELPs as a guide. In the final paper, students were focused on their prior experiences using the ELPs in their peer leadership roles, which they presented in the form of examples or as a re-telling and analysis of their actual experiences. In both assignments, students used procedural
knowledge to comprehensively breakdown the ELPs to detail their decision-making process, illustrating both the *analyzing* and *evaluating* cognitive dimensions (Anderson & Krathwohl, 2001). Additionally, students’ responses suggested that they had acquired or developed so many pieces of knowledge, it was easier for them to re-organize that knowledge into more advanced conceptions of how to use the ELPs (diSessa, 1988, 1993).

**Use of examples as the core of students’ procedural knowledge use.** While the quantity of procedural knowledge used varied, students’ use of *examples* was consistent across all assignments. The results showed that examples made up more than one-third of all students’ procedural knowledge use across all assignments after the first case segment. It was through the use of examples where students’ depth of thinking truly began to emerge.

While students’ non-reflective, descriptive writing was consistent across all assignments, it did not offer any significance to the research questions outside of providing simple detail to the responses. Students’ use of examples, however, was where evidence of descriptive reflection became easy to identify. Consider the following excerpt from a students’ response to the final case segment (case conclusion):

> The second practice is inspiring a shared vision. This is essential for the future success of any organization because all group members need to work together towards their common goal. Unfortunately, there seems to have been some confusion in the purpose of Students for Leadership through Service, as numerous members have expressed their concerns about their place in the organization and do not feel inclined to participate in required events. The organization needs to establish and inspire a shared vision for all members in order to (ensure) the group will succeed in the future and evolve into something even more meaningful.
Here, the student provides a substantial description of what inspire a shared vision is and how it could be used in the organization in the future. Additionally, the student moves from a description of inspire a shared vision into why it is important to use in the future—a telltale sign of descriptive reflection. Exemplifying what needs to be done through the statement “in order to ensure that the group will succeed in the future and evolve into something more meaningful” indicates that the student considered the significance of why using inspiring a shared vision beyond its definition.

**To what extent did procedural knowledge change?** In using procedural knowledge to complete assignments, students showed a propensity toward expanding on their declarative knowledge and the capacity to think more deeply about the five ELPs. While the procedural knowledge used varied in quantity, its variance in quality provided a stronger gauge for how students came to understand the ELPs. Furthermore, the intentional use of procedural knowledge to strengthen declarative knowledge indicates that students were deliberate in their decisions to include it in their responses rather than following a simple pattern of responding.

Students also illustrated more complex cognitive dimensions with their use of procedural knowledge (Anderson & Krathwohl, 2001). While declarative knowledge led to remembering and understanding, students showed evidence of the analyzing and evaluating dimensions when they produced procedural knowledge. In addition, students’ use of procedural knowledge often prompted conditional knowledge use, in particular as a precursor to applying their ELP knowledge to the given scenarios, their prior experiences, and toward future use. The next section of the paper presents an overview of students’ use of conditional knowledge in this study.
Conditional Knowledge Change

The third research question asked “To what extent does students’ conditional knowledge change as they learn about the five exemplary leadership practices?” Results revealed that students’ conditional knowledge use increased over the course of the semester. Moreover, the increase can be explained using the conditional knowledge themes that were discovered in students’ responses, revealing that students appeared to develop their conditional knowledge use and deepen their thinking over the course of the semester.

Developing conditional knowledge. Students’ use of conditional knowledge began minimally, but increased their ability to use conditional knowledge in terms of quantity and quality as the semester progressed. They appeared to develop a capacity for using declarative and procedural knowledge methodically, breaking away from any anchor to the course text, and instead drawing upon their own prior knowledge and experiences. This development of a systematic way of approaching knowledge aligns well with diSessa’s (1988, 1993) perspective on conceptual change, in that any change in knowledge is a re-organization of what is known to fit a novel scenario. As Novak and Gowin (1984) found, the externalization of conceptual understanding is a gateway into knowledge organization and newly constructed meanings.

Conditional knowledge is the most complex of the three types of knowledge used in this study (Jacobs & Paris, 1987). According to Anderson and Krathwohl (2001), knowledge becomes increasingly more complex as learners venture into more advanced cognitive dimensions. In this study, students’ use of conditional knowledge developed from relatively simple to increasingly complex as students used more advanced cognitive processes.

Initially, students’ use of conditional knowledge was an elaboration of their declarative and procedural knowledge. Students were making decisions as to when and why knowledge
should be applied to a given scenario, but it appeared to be limited to reassuring themselves—or their evaluators—that they were accurately using their ELP concepts. For example, in response to the first case segment, one student used a real-world scenario to illustrate her ability to apply knowledge related to model the way:

Current (peer leaders) constantly tell the trainees stories about their past tours and every (peer leader’s) tour is a little different and distinctive to their personality. They also engage the trainees in conversation about their experience in training and the expectations of the evaluation committee… (new per leaders) incorporate those facts into (their experiences).

In this excerpt, the understanding of a fellow peer leaders’ role led the student to elaborate by way of an extended example—i.e., using a relevant, real-world experience—that developed into an instance of conditional knowledge use.

When elaboration was used through the first five case segments, it sometimes appeared to be indiscriminate, or reactionary—as in, the student reacted to include the specific pieces of knowledge they had already developed. Students’ use of elaboration aligns with how Surbeck, Han, and Moyer (1991) used the term “elaborating” to describe how people respond to various stimuli by extending meanings to include what they already know rather than generating their own meanings.

Where students’ use of conditional knowledge truly began to take shape was in the final two assignments: the case conclusion and the final paper. Both assignments were intended to provide students with some closure and were assigned during the final two weeks of the semester. Additionally, both assignments were designed with components that prompted students to reflect and respond in a way that would call for them to use conditional knowledge.
Students’ responses revealed two thought-provoking findings regarding their grasp of conditional knowledge.

**Expanded use of conditional knowledge.** First, students expanded the ways that they presented conditional knowledge beyond simple elaboration. While elaborating on knowledge showed that students were trying to apply what they knew and how to use it, the final assignment responses illustrated a more complex use of conditional knowledge that suggested more advanced cognitive processes. For example, one student wrote:

> By dividing up the organization into groups with one experienced leader each they are able to work more closely with someone who knows what they’re doing so that they can learn the ins and outs of the group… this is a perfect example of modeling the way so that others can learn how to act. By enabling others to act we can create more leaders throughout the group and the more leaders the better. The members who have ideas for the organization now can learn how to present them to the group… By being open to new ideas and innovative ways to improve the organization, the organization is able to grow instead of staying the same… The only way to grow is to take a risk by challenging the process.

In this excerpt, there is evidence of the applying, analyzing, and creating cognitive dimensions (Anderson & Krathwohl, 2001), as the student integrated model the way, enable others to act, and challenge the process in order to explain an idea for a new “groups” initiative that could help the imaginary student organization in its future. This student generated a new meaning for three ELPs, as well as a unique application of those ELPs.

**More purposeful use of conditional knowledge.** Second, students used conditional knowledge more purposefully than in the first five case segments. Where students followed a
response pattern of declarative knowledge → procedural knowledge → conditional knowledge through the first five case segments, the final assignment responses often began with conditional knowledge, then used various combinations of declarative, procedural, and, at times, more conditional knowledge to enrich conditional knowledge. For example, when describing a peer leadership role experience, one student wrote:

The practice of leadership I felt that I predominately demonstrated… was Inspire a Shared Vision. It is easy, in the things that I participate in, to lose sight of the overall vision… Every step of the way our goals seem to change. Initially, our goal is to have fun and learn how to work as a team. As we grow older the girls work on being recruited by continuing to work on their skills and balance their academics to do as well. It hardly gets easier in college. Yes, the recruitment is over, but the balancing act remains to go along with the collegiate pressure. It takes much more discipline to be successful in a team dynamic at that level. The Student Leadership Challenge states, “You get better at imaging the future when you intentionally and consciously reflect on where you want to take others. This requires you to reflect on your past, attend to the present, imagine the future, and feel your passion.” I think this is exactly where I got better as an individual because I became a leader when I looked at where I had come from via softball, where I am now that softball is gone, where I want to be in the future, and nursing is my new found passion that I am so excited for. By using these experiences of mine to base my coaching, I feel like I help the girls better prepare for their futures. But as I have learned that being a leader comes with continuous development.

In this case, the student focused on the pieces of ELP knowledge that corresponded to why it made sense to use inspire a shared vision in response to one particular experience. This type of
response was not uncommon in students’ final paper responses, indicates an intentional selection of one ELP to apply, and suggests that the application of knowledge was of higher priority than defining the knowledge.

**Increased depth of thinking when conditional knowledge use increased.** Along with evidence of increasingly more complex cognition, students’ depth of thinking also increased. As with procedural knowledge, students’ responses included a higher number of instances of descriptive reflection. However, instances of dialogic reflection remained relatively minimal until the final paper; an assignment that, as previously written, included a much higher likelihood of conditional knowledge use among students. In kind, the only instances of critical reflection discovered in this study were in students’ final papers.

Students’ final papers showed a dramatic increase in the personalization theme of conditional knowledge. Instances of personalization typically included direct references to students’ peer leadership roles and experiences, and were often written in a manner that suggested an active, dialogic cognitive process. For example, one student wrote:

> On the flip side, the practice of leadership I saw improve the most in my leadership practices was Model the Way. I’ve always considered myself to be a good example to others, but once you are actually in leadership position where people look up to you, it is a completely different game. I was in a position where I was being looked up to all the time, looked to for answers, and sought out for guidance. When you are put in that sort of position, you have to work very hard to model the way for those who need you to be the example for them… Sometimes my personal values vary from the values of those that live in my house. We have the same foundation of values for the most part, but mine differ because we are all different. I heavily relied on my values to guide me through any
of the tough situations I encountered and let them help me make decisions. At the end of the day, if I don’t have my values, what do I have? … However, by leaning on my values to carry me through, I was able to follow through and uphold my integrity. I was able to model the way for my residents, and show them what respecting your values truly means.

In this excerpt, the student reflected on two different instances where the student wondered what might happen if certain conditions were met. There is even evidence of actual self-questioning, in particular asking, “if I don’t have my values, what do I have?” When this student (and others) personalized the ELPs to their own experiences, their responses were rich with examples of conditional knowledge.

To what extent did students’ conditional knowledge change? In their use of conditional knowledge, students showed increasingly more complex knowledge use and an engagement in more advanced cognitive dimensions. While the quantity of conditional knowledge was relatively minimal through most of the assignments, the quantity and quality of conditional knowledge use in the final two assignments illustrated the importance of building cognitive capacity by breaking down knowledge into smaller increments. In diSessa’s (1988, 1993) findings about knowledge, she found that it was the smallest increments of knowledge that are developed, used, then recycled in a myriad of ways that showed the most striking evidence of conceptual change. Externalizing knowledge in a way that triggers a unique, newly discovered, or generated meaning results in an learner engaged in the construction of knowledge rather than a vessel in which knowledge is received or discovered (Novak & Gowin, 1984; Novak, 1990).

Additionally, students’ use of conditional knowledge changed over from somewhat purposeful, to often indiscriminate and reactionary, to very purposeful based on the type of prompting. When students were challenged to create their own plan (in the concluding case
segment) and reflect on their own peer leadership experiences (in the final paper), they appeared to embrace the freedom of choice and wrote in a more cognitively advanced manner. Most notably, students’ decisions to prioritize more complex pieces of knowledge in their responses illustrated a more advanced cognition, and indicated some level of self-regulated learning (Nilson, 2013; Zimmerman, 2002). It appeared that students knew enough about the five ELPs that it was less important for them to prove what they know and how they know it, and more important to take ownership of when and why they needed to apply it.

**Conclusions and Next Steps**

Over the course of this study, knowledge change presented itself in a number of intriguing ways. The results showed that students used declarative, procedural, and conditional knowledge throughout their peer leadership course to extend their knowledge base of the five ELPs. Now, it is important to step back from the results and consider some of the broader implications of the nature of knowledge change that emerged from this study. In this study, knowledge change occurred in four primary ways.

**The quantity of knowledge fluctuates depending on necessity.** Across all students, there were a myriad of examples of how students used knowledge intentionally, depending on the presented conditions. This study primarily employed a continuous case study to prompt students to develop their knowledge bases and use that knowledge. Students’ responses through segmented presentations of the case were largely specified to the prompting of each segment, and limited to a small number of instances of knowledge use necessary to provide an adequate response. As noted by diSessa (1993), a learner must first develop an understanding of knowledge in its smallest increments (i.e., knowledge-in-pieces) in order to organize those pieces of knowledge into more advance configurations leading to more complex conceptualizations.
Students in this study appeared to construct their understandings of the ELPs in small increments before significantly increasing the quantity of knowledge used during the final assignments.

**The quality of knowledge used became increasingly complex.** While the research questions asked about the extent to which three types of knowledge changed, the results implied that the type of knowledge is only part of the equation in determining the extent to which knowledge changes. When students were prompted to respond to the case assignment, the prompts were focused on a specific piece of course content (the five ELPs). However, students’ responses illustrated how they considered much more than the content as presented in their course text.

For example, while students’ responses to the first assignment were relatively standard—i.e., they provided enough information to provide an adequate assignment response—the quality of the responses increased for each subsequent assignment. Students appeared to master the format of the case segments fairly early, as evidenced by their accuracy in use of content and the types of knowledge. Where the quality of knowledge change truly became evident was how students’ agency showed through in the well-crafted, often entirely personalized responses to the final assignments. This study adds to the increasing scholarship on the importance of providing students unstructured, yet still intentional opportunities to learn from their own experiences and from analyzing their own educational narratives (CITE).

**Knowledge change is aided by assignments that increase in complexity.** For knowledge to change, there must be an intentional pattern of creating a knowledge base, giving students time to develop an understanding of—and practice using—new knowledge, and incremental increases in difficulty. In this study, the continuous case assignment, in tandem with the SLPI and a final paper, provided just such a pattern.
The continuous case study design benefitted learners by revealing a real-world scenario in pieces alongside readings from the course text that revealed pieces of knowledge about each of the five ELPs. Nilson (2010) indicated that a good case should intentionally prompt students to engage prior knowledge. Students had a prior knowledge base because of their initial completion of the SLPI, but more importantly, because the timing of each segment immediately followed a relevant reading from the course text. When responding to the case, students were prompted to use specific knowledge, while not being restricted to it. This helped them develop a basic understanding of each ELP. Once students reached the last two weeks of the semester, the focus of the assignments turned much of the decision-making over to students, which instigated a more advanced set of cognitive skills—and, resulted in more complex knowledge use.

**Knowledge changes.** So as not to depart from the obvious, it should be recorded that there was clear evidence of knowledge change in this study. While there is a well-defined body of literature on conceptual change (Vosniadou, 1999, 2008, 2013), using the elements of conceptual change learning within the social sciences is still emergent scholarship. This study offers one example of how knowledge did indeed change in both quantity and quality as students progressed through a peer leadership course that incorporated experiential learning, group reflection, and independent learning. Over the course of the semester, students’ responses included increasingly complex types and uses of knowledge, more advanced cognitive processing, and evidence of developing (or a heightened awareness of) learner agency.

The results of this study beg the questions: How does knowledge change in other disciplines as students develop their knowledge bases? Are there other types of assignments that provide an intentional support mechanism for students to experience knowledge change? How can instructors benefit from knowing how knowledge changes as they design and assess their
courses? The results of this study present a solid foundation for researching knowledge change as a relevant contribution to the emergent scholarship on conceptual change learning in the social sciences.
References


Appendix A

Sample student results summary from the Student Leadership Practices Inventory.

![Profile for Amanda Lopez](image)

**The Five Practices Data Summary**

This page summarizes your Student LPI 360 responses for each leadership Practice. The Self column shows the total of your own responses to the six behavioral statements about each leadership Practice. The Observers' Average column shows the average of all of your Observers' total responses. The Individual Observers columns show the total of each Observer's six responses for the Practice. Total responses for each Practice can range from 6 to 30, which represents adding up the response score (ranging from 1=Rarely or Seldom to 5=Very Frequently) for each of the six behavioral statements related to that practice.

<table>
<thead>
<tr>
<th>Practice</th>
<th>SELF</th>
<th>OBSERVERS' AVERAGE</th>
<th>INDIVIDUAL OBSERVERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model the Way</td>
<td>22</td>
<td><strong>21.3</strong></td>
<td>18 25 21 24 19 21</td>
</tr>
<tr>
<td>Inspire a Shared Vision</td>
<td>21</td>
<td><strong>22.3</strong></td>
<td>21 25 23 26 20 19</td>
</tr>
<tr>
<td>Challenge the Process</td>
<td>22</td>
<td><strong>22.0</strong></td>
<td>22 27 21 23 19 20</td>
</tr>
<tr>
<td>Enable Others to Act</td>
<td>28</td>
<td><strong>24.3</strong></td>
<td>26 25 26 24 23 22</td>
</tr>
<tr>
<td>Encourage the Heart</td>
<td>26</td>
<td><strong>21.2</strong></td>
<td>24 19 24 20 18 22</td>
</tr>
</tbody>
</table>

Appendix B

Final Paper – Fall 2015
LDRS 2014 Principles of Peer Leadership

The purpose of the Final Paper is to reflect on your experiences as a peer leader. Again, the two goals of the course were to: 1) facilitate the development of peer leadership for Virginia Tech, and 2) present leadership concepts and principles that may be used to lead peers after leaving Virginia Tech.

Requirements: Your paper should be a minimum of 2 pages and a maximum of 4 pages. Please single-space your papers, use appropriate headings, and use a 12-point font with 1-inch margins. Please include a reference page; this is not included in the page count. The following information provides specific prompts for this paper and will be used as a rubric to assess your work. This assignment is worth 100 points. Each section is evaluated against two criteria, overall analysis and academic analysis.

<table>
<thead>
<tr>
<th>Points Possible</th>
<th>Overall Analysis</th>
<th>Academic Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Five Exemplary Practices of Leadership</strong></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>• Which of the five practices of leadership did you predominately demonstrate during your experience as a peer leader? Explain how this practice was exhibited.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Which of the five practices of leadership have you improved as a result of your experiences as a peer leader? Provide a specific example of how this leadership practice was demonstrated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connection to Peer Leader Experience</strong></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>• In your role as a peer leader this past semester, how have you helped create an environment that emulated positive growth and development for a fellow student or students to assist them in becoming successful at Virginia Tech? Explain the significance of your leadership and how the student or student benefited.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Critical Reflection</strong></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>• Describe if you feel you were successful in your peer leadership experience. Explain why.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• What would you have done differently to make your experience better in the future?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Personal Application</strong></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>• What was the value of serving as a peer leader to you personally?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Have your beliefs, attitudes, or actions related to leadership changed as a result of this experience.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall Impression</strong></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• Grammar, spelling, elements of writing followed, references included and cited</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
Goal Contract Form

To Be Completed by the Peer Leader with Peer Leader Supervisor

Peer Leader: _______________________________  Signature: _______________________

Peer Leader Supervisor: _____________________  Signature: _______________________

The Peer Leader should list his/her Student Leadership Practice Inventory results (the practice and your rating).

Student LPI:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

The peer leader and the supervisor agree to work on three goals during the peer leader components of the course. Goals should be challenging, relevant to the peer leader experience, and reinforce the improvement of the five leadership practices. Most importantly, goals should be SMART (Specific, Measurable, Attainable, Realistic, and Time-oriented)

The peer leader will set three goals, each goal should be related to the development of skills associated with one of the five leadership practices listed above. Please state which leadership practice correlates with your respective goals.

The identified goals will serve as a basis for the peer leader’s reflection and final exam for the course.

Please write your goals to develop your skills on the next page.

Goal One:

Goal Two:

Goal Three:
Conclusion

Matthew W. Grimes

Upon completion of three manuscripts intended to study knowledge change, it is important to explore the possibilities for next steps. This document serves as a conclusion to the doctoral manuscript submissions by outlining the possibilities for future study using the data collected.

Further Explorations of Knowledge Change

While it is one component of the conceptual change process, knowledge change is itself a multilayered cognitive process. Knowledge change must be explored from a variety of angles in order to provide the most comprehensive explanation for what is happening as students learn leadership. The continuous case study design process used in the present study resulted in a wealth of data that could (and should) be studied further. Described below are suggestions for how to study knowledge change using depth of thinking, patterns of knowledge use, and knowledge base development.

Depth of thinking. Depth of thinking presents a unique opportunity to develop future studies. As students moved through the course assignments, the data showed evidence that their depth of thinking became more complex. Students’ responses could be examined for evidence of advanced cognitive functions such as cognitive control (Norman & Shallice, 1986), self-regulation (Pintrich & DeGroot, 1990), and increasingly complex cognition (Anderson & Krathwohl, 2001). In one example, the data could be studied to determine the depth of reflective thinking among students.

Reflective thinking is generally defined as an ongoing process during which learners acquire new knowledge and then cognitively evaluate and alter their knowledge base to
accommodate present and future experiences (Dewey, 1933; Hatton & Smith, 1995; Moon, 2004). Using Hatton and Smith (1995), students’ responses could be investigated as a source of reflective thinking through their written responses. By asking students to explain how they used course content—in this case, one of the five exemplary leadership practices—students would be prompted to reflect upon what they originally knew about a practice and how their response reflects a new understanding of the practice. Similar to the present study, a change in students’ depth of knowledge could be evaluated using the number of times responses included evidence of reflective thinking, and by analyzing for how students wrote their reflections.

Patterns of knowledge use. As students experience knowledge change, it is important to focus on collective and individual change. One way of doing so is by investigating the existence of patterns exhibited by students as they progress through the continuous case study assignment. As students’ respond to the case assignment prompts, patterns indicating how, when, and what knowledge change occurs could emerge. For example, if there was a shift in the knowledge content use among large number of students during their responses to a particular case segment, it would be important to highlight and interpret that shift as a pattern of knowledge change that emerged.

Additionally, investigating students’ responses for individual exemplars of the nature of knowledge change across the case assignment could prove enlightening. As a student progresses through the assignment, it is likely that they will use knowledge differently than their peers, particularly as they learn and experience peer leadership content in their own unique ways. For example, if a particular student uses a self-determined template for responding to the prompts, it is important to extract and highlight that template as an exemplar for knowledge change. In
kind, each student uses knowledge in unique and differently complex ways, patterns of cognition that would prove interesting to highlight.

**Knowledge base development.** Because students engaged in learning about *The Student Leadership Challenge* (Kouzes & Posner, 2008, 2014) would have the opportunity to engage in the *Student Leadership Practices Inventory (SLPI)*, it is possible to explore how their knowledge bases about the five ELPs develop. As students complete the SLPI, they are introduced to the five ELPs as practices already relevant to their current leadership practice. Once students begin to complete segments of the continuous case assignment, they enter into a more in-depth study of each ELP, and begin to make decisions as to how they could use the ELPs in a variety of related scenarios. Additionally, once students respond to the concluding case segment, they have not only learned about each ELP, but they are asked to make decisions as to which ELP they need to use in the given scenario, as well as why they chose to use it. This progression of learning about the five ELPs could be viewed as a process of building a knowledge base about the ELPs, potentially using metrics like Bloom’s Revised Taxonomy (Anderson & Krathwohl, 2001) or something leadership-centric, like the Leadership Identity Development Model (Komives, Owen, Longerbeam, Mainella, & Osteen, 2005).

**Conclusions**

It is important to consider the implications of research, including the possibilities for future study. The three potential directions outlined above would further build upon an understand of knowledge change in a peer leadership course, the effectiveness of using a continuous case study to explore student learning, and the nature of knowledge change as a key element of the conceptual change process. Additionally, the manuscripts submitted beg the question: In what ways could this research be adopted to other courses and disciplines, within the
social and hard sciences? The present study offers an in-depth look into knowledge change among students in a peer leadership course, and a foundation for further study.
References


