

## **How Does Learning in Leadership Work? A Conceptual Change Perspective**

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### **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, I believe that it is important to consider the process of how learning works. Brungardt (1996) defined leadership education as “learning activities and educational environments that are intended to enhance and foster leadership abilities” (p. 83). As an instructor in undergraduate leadership courses, I have found that educational psychology scholarship clarifies the science behind learning and helps me design learning environments that support deeper learning of leadership among my students. Conceptual change research offers insight into how students’ prior conceptions of leadership develop into more sophisticated conceptions as they learn (Bransford, Brown, & Cocking, 2000). This paper offers a perspective about how conceptual change theory and research can inform leadership educators’ understanding of how students learn leadership, provides a platform for future study, and introduces effective pedagogical tools developed by conceptual change researchers.

**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 as it relates to reflective practice and leader identity development. 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.

Komives, Owen, Longerbeam, Mainella, and Osteen (2005) produced a Leadership Identity Development (LID) model, which led them 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.

Leadership development opportunities should be readily available for college students as there is a direct connection between leadership and learning (Astin & Astin, 2000). Kuh (2001) linked students' leadership experiences to institutional goals for providing a rich environment for student learning. Deeper learning in leadership provides college students with a more comprehensive collegiate experience, particularly in the opportunities and experiences they undertake (Roberts, 2007).

While learning is clearly a focus in relevant leadership education literature, 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 conceptions 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 (Astin & Astin, 2000; Terenzini, Pascarella & Terenzini, 2005; Springer, Yaeger, Pascarella, & Nora, 1996), there is little evidence as to what extent students experience conceptual change as they learn about leadership. In the sciences, conceptual change has been used to explain how students develop their knowledge base. Kuhn (1970) introduced the idea of how scientific paradigms are created from shared knowledge, beliefs, ideas, and assumptions. As new knowledge emerges from research and theory, the existing paradigms become obsolete and must be replaced with new, more accurate paradigms, often through what he called 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 experiencing conceptual revolutions. 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. This view was a departure from the epistemological underpinnings of the belief revisions found in existing mental models.

Kuhn's (1970) and Thagard's (1992) works are two examples of seminal perspectives on conceptual change that focus on how scientific theories change over time. The great majority of conceptual change theorizing and research has been done in the hard sciences (i.e., science- and

math-related disciplines), 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 an insufficient level of objectivity, making research in the hard sciences easier to prove. The subjective idea of what is correct or acceptably accurate in the social sciences has, until recently, been challenging to 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 to take into account (e.g., values, beliefs, socio-cultural factors; Lundholm & Davies, 2013). Leadership study is a social science (Perruci, 2014), and subjectivity is significant in leadership education (Avolio & Gardner, 2005; Brungardt, 1996; Gardner, Avolio, Luthans, May, & Walumba, 2005).

To explore conceptual change within the context of leadership education, it is important to first review relevant conceptual change literature. The following section offers a review into the conceptual change literature by explaining what a concept is and discussing prominent approaches to conceptual change.

**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 label given to the structure or patterns perceived in events (something that has happened) or objects (something that exists and is observable). Thagard (1992) viewed concepts as complex mental frameworks containing rules, associations, and hierarchies. Flavell, Miller, and Miller (1992) referred to concepts as the creation of a mental grouping of similar entities. Miller and Johnson-Laird (1976) posited that concepts are like mental hierarchies that help to understand “the context of a larger system of knowledge and belief” (p. 28). Carey’s (2009) work describes concepts as the building blocks of mental representations and “units of thought, the constituents of beliefs and theories” (p. 5).

The scholarly definitions of concepts all include terms like mental representations, hierarchies, and groupings; i.e., something that indicates cognitive organization. Smith and Medin (1981) and Medin and Smith (1984) offered an explanation of concepts that led to a number of questions about the complexity of categorizing concepts and the importance of diversifying the definition of what a concept is. Thagard’s (1992) work furthered the study of conceptual change by 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 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 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). Thagard (1992) took a cognitive approach to conceptualization; in that, as knowledge is learned, mental frameworks are created to help organize that knowledge into more complex conceptual systems. Thagard recognized similarities in human memory systems and the organization of computer memory systems. His idea was that once organized, concepts must be stored and later accessed for revision. One influence on concept revision is the presence of rules.

Rules are matched to concepts based on their classification and relevance (Holland, Holyoak, Nesbitt, & Thagard, 1986). Like Johnson-Laird (1976), Holland and Thagard (1989) used a computational method of conceptualization to attach sets of rules to pieces of information. Their findings showed that concepts could be mapped pragmatically using their associated rules. This method is relevant to human conceptualization. For example, if student A associates *position of authority* with her conceptual understanding of the concept *leader*, then when asked “What is a leader?” student A might respond with “Someone who holds a position of authority.” If student B associates *confidence* as a necessary trait for *leadership*, and associates *leadership* with his conceptual understanding of the concept *leader*, then when asked the same question, student B might respond with “Someone who shows leadership.” However, because of how student B understands *leader*, it would take additional conditions for student B to mention something about *confidence*. 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). In concept mapping, learning is based on organizing concepts in a hierarchy around knowledge-based relations, and offers a visual of kind- and part-hierarchies (Novak & Gowin, 1984). Moving from the most general to more specific concepts, conceptual hierarchies reveal the organization of knowledge through kind- and part-relational links (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*. Further down the conceptual hierarchy, might be sub-kinds, like *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 traits such as *charisma* or *expertise*.

Hierarchies and relations are significant in understanding concepts to provide some measure of relevance to conceptualization and to illustrate the connective nature of concepts. For example, consider 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.

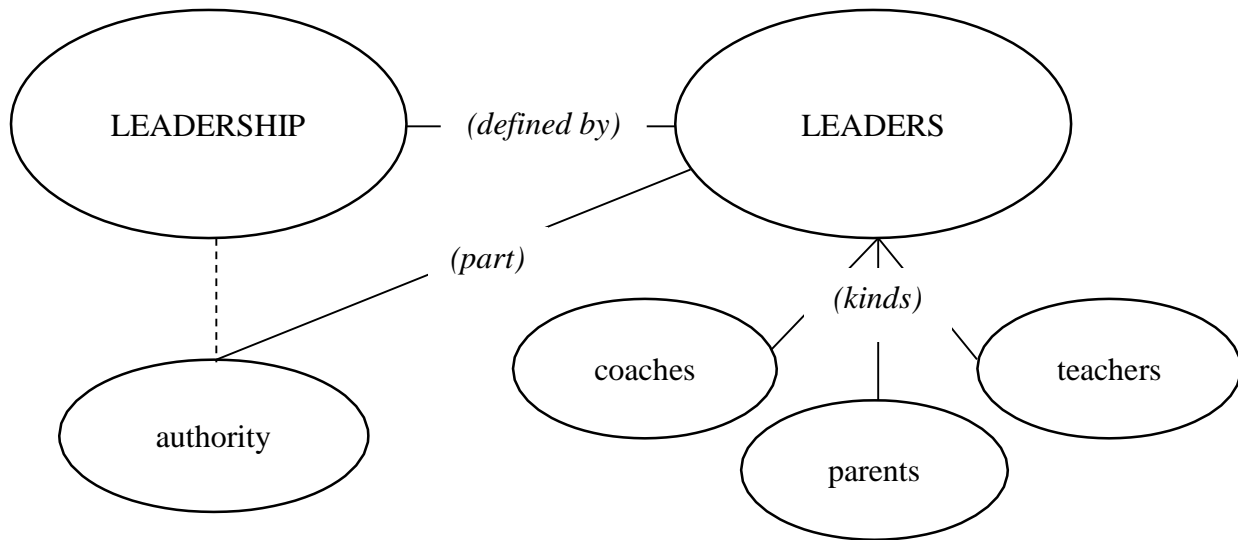


Figure 1. A possible conceptual hierarchy of a first-year student’s conception of leadership.

The conceptual hierarchy associated with the first-year college student in Figure 1 might look different from when in elementary school (e.g., Figure 2), and is expected to change and become increasingly more complex as leadership is learned in college. This is explained well by conceptual change. However, to better understand conceptual change learning, it is important to provide a brief overview and comparison of the theoretical perspectives found in conceptual change literature.

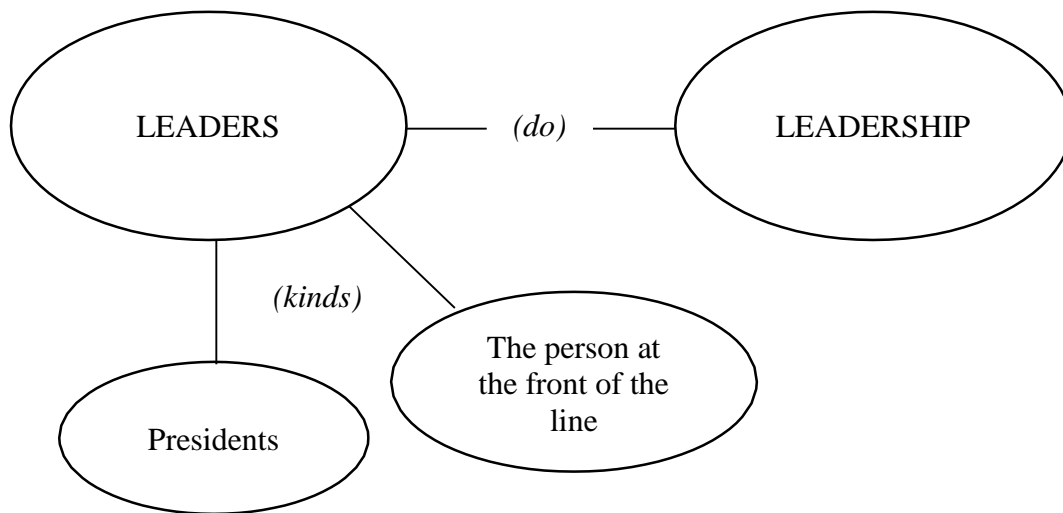


Figure 2. A possible conceptual hierarchy of an elementary school student’s conception of leadership.

**Conceptual change.** Conceptual change is a process that takes the learner from an 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 & Walker, 2011). For example, developmental psychologists are interested in observing how a child's conceptual understanding changes as he moves 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, & Skopeliti, 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.
4. Adding a new part-relation.
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.

Examples of more simplistic changes (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 learning a new rule about leaders, such as being manipulative is not a desirable leadership quality. In both cases, there is conceptual addition to how leadership and leader are defined (or a conceptual deletion; e.g., if the new knowledge causes the learner to disassociate a trait such as *manipulation* from their conceptualization of *leadership*). 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 every day 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 become a new 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 labeling of a person who exemplifies leadership rather than what a leader does signifying the presence of leadership—e.g., as exemplified in Figures 1 and 2.

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 suggested that it is important to identify various kinds of conceptual change. Three different approaches prevalent in conceptual change literature are theory change, ontological shift, and framework theory.

**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 that when the understanding of part of a theory changes, the theory itself must change. Smith (2007) described theory change as when new knowledge simply cannot be integrated into prior conceptualizations (cannot be altered), thus leading to a new conceptualized (knowledge construction) theory. New knowledge can sometimes enrich prior conceptualizations, but conflicting knowledge result in more advanced conceptual restructuring, and leads to the development of new theories.

**Ontological shift.** Chi (2005) 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 when prior knowledge is in direct conflict with new knowledge (Chi, 2008). Chi (2005) characterized conceptual change using ontological re-categorization, i.e., the basic conceptualizations people have of what objects and events exist in the world as they know it. For example, a student could experience a mismatch of conception and reality by believing that leaders are those in a position of authority, and that leader behavior defines leadership. This is likely an everyday understanding of leadership instead of multiple conceptions (e.g., of *leader* and *manager*). Studies that use worldview to predict or explain leadership offer a good example of possible ontological shifts as conceptual change (e.g., Bass & Steidlmeier, 1999; Wallace, 2007). The shift occurs when new information (leadership can occur without a position of authority) challenges a prior knowledge misconception (leadership is always defined by those in a position of authority), creating a new worldview that leadership exists with different constraints.

**Framework theory.** Framework theory is a more recent approach to understanding conceptual change (Vosniadou et al., 2008). It is unique because learners take 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 a complete, structured 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., leadership exists and is defined by leader behavior. Creating a new conceptualization of leadership would involve a more complex reorganization of their understanding—e.g., other people have a different conception of leadership that reveals a different understanding that is also *correct* (from other perspectives). In framework theory, fragments of knowledge and ontological beliefs are only part of the larger process that is conceptual change.

***Observations about approaches to conceptual change.*** The prevalent approaches to conceptual change contain similar ideas. First, they all view concepts as mental representations, and sharing characteristics like the organization and re-organization of concepts into conceptual systems. In addition, they address the existence and revision of belief and that consideration of prior knowledge and experiences are a part of the process. The contrasts among them appear to come in the form of the processes described—e.g., how they approach organization, prior knowledge management, thinking and reasoning, etc. In some ways, the contrasts exemplify the various perceptions and conceptions among unique learners.

A more in-depth investigation reveals varying degrees of knowledge use and depth of thinking throughout the literature on conceptual change. 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 foundation component of understanding conceptual change (diSessa, 1988, 1993; Murphy & Alexander, 2008). Murphy and Alexander (2002) investigated conceptual change through subject-matter knowledge and strategic processing among students in educational psychology. Murphy and Alexander (2008) explored how studying topic-knowledge change (among other variables) is also an approach to understanding conceptual change. Carey (1999) described knowledge acquisition as a catalyst for the more complex process of conceptual change. Linn (2008) studied the influence of conceptual change through knowledge integration, 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 any model that suggests people structure their conceptions from their epistemological and ontological beliefs in a way that resembles a theory or framework (Özdemir & Clark, 2007) and is represented in this paper as theory change, ontological shift, and framework theory (Carey, 1985; Chi, 2005; Vosniadou et al, 2008). Thagard's (1992) aforementioned body of work, as well as the contributions of diSessa (1988, 1993, 2008), Linn (2008), and Linn, Eylon, and Davis (2004) provide excellent examples of the knowledge-as-elements perspective, in which the elements themselves are independently significant, but organized into collections of elements, facts, mental models, etc. (Özdemir &



Clark, 2007). Finally, Novak and Gowin (1984) opened their text *Learning How to Learn* with a concept map for *knowledge* that outlined how knowledge acquisition and construction were to be presented in conceptual mapping.

Knowledge serves as a building block of meaning found within conceptual structures and as an addition to one's current belief structure (Thagard, 1992). Chi and Ohlsson (2005) studied complex declarative knowledge (what is known) in thinking and reasoning, and stated that procedural knowledge (how to use what is known) is well-documented in the literature. DiSessa's (1988, 2008) work places a high value on the sub-conceptual, fragments of knowledge because they can be mentally organized and re-organized as is contextually necessary to explain both every day and complex conceptual phenomena. Carey (1985) described that the development of a conceptual system involves a restructuring of knowledge through a change in knowledge and in patterns of knowledge leading to fundamental changes at the conceptual level.

Change at a conceptual level also suggests a deeper level of understanding through a more sophisticated cognitive process (Chi, 2005). Conceptual change occurs when mental representations are altered in some way by knowledge that is added to—or gives reason to remove or significantly alter—prior knowledge. Reflective thinking is an ongoing process during which learners compare newly acquired knowledge to prior knowledge in order to make conscious choices about how and when to apply knowledge to future experiences (Dewey, 1933). When students are encouraged to think reflectively, it leads to increased understanding of course content and the development of relevant skills (Schön, 1983, 1987; Moon, 2004).

DiSessa (1993) suggested that developing rather than rejecting pieces of knowledge helps learners move toward a deeper level of understanding, particularly when compared to prior knowledge. Pintrich, Marx, and Boyle (1993) indicated that the use of deeper processing strategies like reflective thinking should lead to the level of cognition necessary to experience conceptual change learning. In their use of concept mapping and Vee diagrams, Novak (1990) and Novak and Gowin (1984) mentioned knowledge change and reflective thinking as contributing factors to conceptual change. The presence of differing levels of knowledge use and depth of thinking within the multiple perspectives on conceptual change suggests that both knowledge and reflective thinking serve some role with the conceptual change process.

It is important to attempt to explore some of the building blocks of conceptual change as they pertain to learning leadership for multiple reasons. First, there is a lack of research into conceptual change in leadership education. Because this research is gaining momentum in the social sciences, there is an opportunity for leadership education to explore conceptual change learning on the ground floor. Second, deeper learning is often ignored by students in their focused attempts to get a grade or complete an academic requirement. Conceptual change research could provide leadership educators with evidence as to how providing students with activities that inspire reflective thinking and new constructions of knowledge will help focus on the learning process itself. Finally, the pedagogical tools that have resulted from conceptual change research have been proven to helping understanding what and how students learn. By contextualizing conceptual change research to leadership education, pedagogical tools can be developed (or better adapted) for use in leadership programs.

Knowledge acquisition and deeper thinking appear to be two of the building blocks of conceptual change learning, making them appropriate for further inquiry. The next section of this paper builds the case for how these two components may be a good starting point for studying conceptual change in learning leadership.

**Knowledge Acquisition and Reflective Thinking in Leadership Education.** There appears to be a developing knowledge base on the study of knowledge in learning leadership. Brungardt and Crawford (1996) determined that students can learn and develop a knowledge base about leadership as an area of study. 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). 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 understanding leadership. Rai and Prakash (2012) used a relational perspective to develop a model to facilitate knowledge creation in servant leadership.

There is evidence of reflective thinking as an area of interest within leadership education (Avolio & Hannah, 2008; Jenkins & Cutchens, 2011). Harvey and Jenkins (2014) clearly outlined that critical reflection among students is a building block of undergraduate education. Roberts (2007) raised a compelling argument for how presenting leadership theory, developing students' skillsets, and rousing students' to think reflectively are all vital to future leadership roles. It is important for students in leadership courses to have opportunities to reflect, as it helps them assess their learning and clarify their values (Bringle & Hatcher, 1999). In addition, incorporating reflective thinking strategies into the curriculum can result in students experiencing deeper learning about leadership (Moore, Boyd, & Dooley, 2010). Cartwright (2002) presented a process for teaching leadership that is effective in helping learners reflect on their prior knowledge in order to develop new strategies for learning about leadership.

Practicing reflection has also been identified as essential to individuals and groups and is an essential component to the leadership process (Komives, Lucas, & McMahan, 1998). Reflecting on prior leadership knowledge and experiences has been found to enhance the overall development of leadership skills (Gardner et al., 2005). White (2012) found that students perceived reflection as a good way to learn how to practice leadership. Leadership studies also present a strong connection to experiential learning (Guthrie & Jones, 2012; White, 2012), an approach in which reflective thinking is inherent (Dewey, 1933, 1938; Kolb, 1981, 1984).

Much like the literature on knowledge acquisition, the literature base for reflective thinking in leadership education exists and is primed for further exploration. 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). While reflective thinking is a well-researched process with already developed measures (e.g., Kember et al., 2000), changes in prior knowledge from this perspective have not been extensively considered in conceptual change research. The lack of research that ties reflective

thinking to conceptual change could be attributed to the great majority of conceptual change studies occurring in subjects that require heavy objectivity, e.g., math and science. There is an opportunity for leadership education to expand the research on conceptual change in the social sciences and better understand the leadership learning process.

## **Implications of Conceptual Change Learning in Leadership Education**

The research on conceptual change shows that there is value in understanding it to provide more robust and comprehensive learning opportunities for students (Vosniadou, 2013). Further research on conceptual change in leadership study could not only provide insight into the depth of understanding students experience in learning the social sciences, but more specifically into their developing conceptualizations of leadership. Until the results of such research emerge, there are a few pedagogical tools that conceptual change research has produced that leadership educators might find valuable in the design of courses, curricula, and degree programs. In addition, each of the tools has some relation to either or both reflective thinking and knowledge acquisition and offer practical implications for leadership education.

**Conceptual Change Tools for Leadership Education.** While a theoretical perspective on what the value of assessing conceptual change in leadership education might be is a reasonable start, it is important to provide a few practical ideas to build programs and curricula around the idea of teaching for conceptual change. Below are three examples of approaches to teaching for conceptual change that could be adapted to leadership classrooms and curricula, as well as offer a foundation for further study.

**Concept mapping.** Concept mapping has been used extensively in science education, widely due to the ease of objectively presenting and organizing basic concepts (Novak & Gowin, 1984). However, concept maps also have value in social science disciplines (Novak & Gowin, 1984; Wheeldon & Faubert, 2009).

In concept mapping, the goal is to semantically link two or more concepts to show the meaningful relationship between and among them (Novak & Gowin, 1984; Novak, 2010). Concept maps are hierarchical; that is, they represent a progression from broader ideas to more specific ideas. This helps teachers and students move more easily toward meaningful learning. Concept maps—similar to Thagard's (1992) description of conceptual hierarchies—involve a visual presentation of concepts, related concepts and sub-concepts, and various links between and among them.

Concept maps are particularly beneficial when they are developed over an extended period of time—i.e., as new knowledge and experiences are acquired. In higher education, concept maps are most effective when students are at the center of instruction, and given time to be creative, autonomous, and reflective in their progression of knowledge (Kinchen, De-Leij, & Hay, 2005). Concept maps are often evaluated using quantitative measures, but have been successfully evaluated using qualitative measures (Kinchen, Hay, & Adams, 2000; Wheeldon & Faubert, 2009). Poole and Davis (2006) indicated that implementing concept maps results in a higher instance of promoting retention than other instructional methods (e.g., lectures, reading, class discussion).

Concept maps have been successfully implemented in school leadership programs (Pegg, 2007), used as a methodology for identifying brand networks in marketing (John, Loken, Kim, & Monga, 2006), and used by Blackwell and Williams (2006) to help students build a conceptual framework for leadership. In Blackwell's and Williams' study, concept maps helped students to experience deeper learning and course instructors be able to see what concepts students retained and how they organized them. Practically, they offered instructors the opportunity to better evaluate where students conceptualizations began and understand how students retained constructed knowledge over the course of the semester. For additional examples of how to use and assess concept maps, Strautmane (2012) provides an excellent overview.

**Vee diagrams.** Vee diagrams grew out of Gowin's (1970) research on the structure and production of knowledge (as cited in Novak & Gowin, 1984). The purpose of a Vee diagram is to encourage learners to recognize the importance of how the conceptual informs the methodological – and vice versa. In essence, a Vee diagram provides a way for learners to consider the construction and use of knowledge by stepping back to consider the meaning behind the work they are doing.

The V-shape of the Vee diagram is visually found at the center. A large, V-shaped drawing is intended to distinguish two sides (the conceptual or *thinking* side and the methodological or *doing* side), a focus (often a question) found at the V's opening, and the goal object or event found at the point of the V. Vee diagrams ask learners to engage in a deeper and more challenging level of learning than does rote memorization as they necessitate interpretation, analysis, appraisal, and construction of knowledge. A good template for Vee diagrams can be found in Novak and Gowin (1984, p. 150).

Vee diagrams have been used in a variety of disciplines. In math and science, Afamasaga-Fuata'I (2009) presented a case study of Vee diagramming in a student teacher's attempts to become more proficient in communicating mathematical concepts to her students, while Alvarez and Risko (2007) used Vee diagrams to help third graders understand science concepts. In the social sciences, Nussbaum (2008) showed that using Vee diagrams helped educational psychology students present multiple perspectives of an issue in reflective writing assignments and Calais (2009) discussed the value of Vee diagrams beyond the hard sciences. There are a few components of Vee diagrams that could prove beneficial in the leadership classroom.

For example, Novak and Gowin (1984) indicated that an important question to ask when using Vee diagrams to evaluate learning in practical settings is "What do these things we are observing mean?" (p. 112). Leadership classrooms are ripe with students who have developed ontological conceptualizations of leadership from prior observations and experiences. These naïve conceptions are often made up of partial or incorrect ideas that leadership research and theory can help to clarify. Asking students to reflect on their prior conceptions, or intentionally placing them in experiential settings without challenging them to connect what they are doing to what they need to know, could prove costly to student learning. Vee diagrams provide a format for the kind of conceptual-methodological interplay that will almost certainly lead to deeper learning of leadership.

**Representation construction.** While modeling has been a primary tool for inciting conceptual change learning, Tytler and Prain (2013) presented a different kind of approach they called representation construction. In representation construction, knowledge is viewed from a combination of approaches to conceptual growth focused on students engaging in a process of inquiry, not unlike Dewey's (1933) pragmatic approach to learning. The instructor's role in the process is closely tied to Vygotsky's (1978) adult guidance, in that the instructor intentionally scaffolds the process for students to navigate.

Representation construction departs from modeling due to its intentional focus on learner characteristics like emotion, perception, and identity, as well as conditional contexts and emergent cognitive patterns (Tytler & Prain, 2013). Representations are "signs that stand for something for an interpreter" (p. 563). The distinctive nature of representations is not unlike the three types of knowledge presented earlier in this paper. Using this analogy, the concepts themselves are declarative (what), while the understanding of the procedural (how) and conditional (when and why) use of the concepts relates well to concept representation. For example, the way a student in an introductory leadership course begins to explain the role of followership through words, gestures, or drawings is not an indication of a complete concept model, but can be viewed as a representation of students' reasoning process as they are developing a more complete conceptual understanding.

Representation construction begins with the teacher presenting a series of representational challenges for students to consider and draw conclusions from (Tytler & Prain, 2013). In this first step, teachers need to clarify the main conceptual focus to give students a representational need to contemplate. The second step is explicit discussion about the representations among the students with ongoing scaffolding and support from the teacher. The discussion should result in some level of group resolution. To help student reach such a resolution, the teacher should suggest some of the features and coherence of representations, which students likely could not discover on their own. The third step involves representation of meaningful learning independently. Students should be encouraged to create their own representations, which allows for their agency in the process of understanding the concept and creates a collective of unique ideas that sets the groundwork for social learning. The final step is an ongoing process of progress assessment, shared by teacher and student, and attentive to the initially presented representational need. In essence, this is a process of guided inquiry where the responsibility for learning is collaborative and results in an original process of knowledge construction within a community of learners.

Research on representation construction showed evidence of deeper learning among students and instructors, as well as high levels of conceptual thinking (Tytler & Prain, 2013). Because this body of conceptual change research is new, there are few examples of research beyond the original research presented here. However, this leaves the door open for conducting further research across social sciences disciplines that will add value to representation construction literature.

## 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 we as leadership educators hope for? We may be certain that the information we are sharing (and the ways we are sharing it) is being retained by students. But, is that information resulting in deep learning through knowledge change and reflective thinking?

This paper presents the beginning of an argument for why we as leadership educators should consider researching how conceptual change learning is happening in our leadership classrooms and programs. If we can develop a better sense of what students know about leadership, and offer a more intentional focus on deeper, reflective thinking, our students could develop wonderfully complex and practical conceptualizations as they learn about leadership.

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