EFFICACY OF CONCEPT MAPPING INSTRUCTIONAL TECHNIQUES TO TEACH ORGANIZATIONAL STRUCTURES AND INTERACTIONS

A dissertation submitted to the
Kent State University College of Education, Health and Human Services in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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Businesses are challenged by the accelerating global changes in infrastructures, competition, and consumer demand. However, there is a gap in American undergraduate business student preparation. Graduates are not ordinarily taught about the interactions between the hierarchical levels within an organization. These graduates learn on the job which inhibits their value creation.

Concept mapping is an instructional technique that identifies the relationships between ideas. The most common organizational charts are fundamentally hierarchical concept maps. However, utilizing a concept map instructional approach to teach organizational structures and interactions has not been explored. Technological adaptations of a concept mapping instructional approach may provide further means to effectively teach business structures and interactions through active learning and feedback.

This study utilized a between participants design with business undergraduate students ($N=91$). Participants were randomly assigned to one of four treatment groups: a control group that read about the structures and interactions, and three concept mapping instructional groups that used passive learning, active learning with basic feedback, or active learning with elaborative feedback. Achievement was measured on a post
instruction assessment. The results from the one way ANOVA of the participants’ achievement scores indicate that there is a statistically significant difference between the treatment groups, $F(3,91) = 3.517, p = .018$. The post hoc analysis of the treatment groups indicated that both of the active learning groups performed significantly better than the control group, but not the passive learning group. These results show that concept mapping can be deployed successfully with undergraduate business students.
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CHAPTER I
INTRODUCTION

Introduction

The fast-paced global business environment today requires organizations to be nimble and responsive. Managers and staff need to deal with large, complex information loads while making decisions that have a high degree of uncertainty. Multiple stakeholders require managers to be adept at planning, organizing, directing and controlling. Constant change in technology, regulations, and consumer demand requires managers to also have agility in decision making, adaptability, and innovation. Businesses today are generally leaner, more agile, and frequently reorganizing to respond to competition or gain market advantage which blurs traditional functional boundaries.

To be successful managers within these highly competitive markets, undergraduate business students need to understand organizational structures, dynamics, and functions. Traditionally this has been taught through presenting organizational charts, job descriptions, and definitions of terminology. Furthermore, each of the managerial functions is taught as a set of discrete activities: accounting, operations, economics, marketing, finance, communication, statistics, law, and human resources. This teaching model was developed in the 1960s and has not been adapted to the fast paced, interactive business climate of today (Bennis & O’Toole, 2005). Authors have suggested that this “silo” approach of teaching business functions requires a more integrative approach. “Silos” represent big, thick, tall windowless structures which obstruct interdepartmental issues from being resolved.
Organizations with strong hierarchical values and functional silos are not able to respond to a marketplace that demands flexibility and customer responsiveness. Not coincidentally, this characterization has also been applied to business schools which have similar hierarchical values and functional silos. However, employers desire graduates who can make sound, real time decisions in dynamic environments under high stress and a high degree of uncertainty. Businesses use a myriad of instructional techniques to train their employees and also deploy technological means that enhance learning while providing a high return on investment. Undergraduates can benefit from these ideas which allow more self-directed learning and flexibility.

**Organizational Charts**

Organizational charts were first developed in the middle of the 19th century to help the railroads run on time. Businesses have since used organizational charts to visually indicate how authority, responsibility, and accountability are assigned and flow within a firm. For example, during new employee orientation, organizational charts are often used to depict the key personnel, the essential functions, and what should happen within a firm. Organizational charts also indicate the chain of command and how authority and communication should flow from senior leadership down to the front line employees. Organizational charts can also aid senior management in adapting the formal structures to create the highest value proposition for customers while simultaneously optimizing the resources of the business. It is therefore essential that business school graduates can decipher the explicit formal structures depicted in an organizational chart.
Concept Mapping

Concept maps are graphical displays of relational information. The technique of concept mapping was developed by Joseph D. Novak in the 1970s. The nodes display the concepts while the connecting lines indicate the relationships between the nodes. Teachers have successfully used concept maps to help students link new information to what they already know. Concept mapping has been used with students as a pre-writing activity to outline, as advanced organizers to scaffold, problem solving activities for higher order thinking, and as assessment tools. Businesses have used concept mapping for brainstorming, project management, problem solving, and communication. However, no research has been conducted on whether utilizing concept mapping instruction is an effective approach to organizational understanding.

Active Learning, Feedback, and Technology

Concept mapping is an active learning process to organize and encode new information into long term memory. In their meta-analysis on concept maps, Nesbit and Adesope (2006) stated that the active learning that occurs with concept mapping causes greater knowledge retention. This corresponds with Ausubel’s theory of assimilation (1968) that students construct meaning of new information by integrating it with prior knowledge.

Active learning that also provides feedback from teachers is essential to guide student knowledge construction. However, providing all students with specific, immediate feedback during active learning is difficult for teachers due to time constraints. Yet feedback is considered one of the most important tools to guide and
support student learning (Hattie & Timperley, 2007). Computers have the potential to offer students specific, useful, and immediate feedback that relates to instructional goals.

Educators and researchers are exploring the opportunities to utilize the ubiquitous and relatively low cost technology available today. Technology holds promise for improved educational outcomes (U.S. Department of Education, 2013), but the hardware and software alone will not improve undergraduate learning. To facilitate effective deployment of concept mapping techniques, proper technological support and sound andragogical deployment is necessary.

However, only a very limited number of studies have demonstrated the effectiveness and limitations of concept mapping that employs technology. Scholars have suggested that concept mapping may be particularly effective in technological environments (Novak, 1998; Canas et al., 2003). Additional research is necessary to fully develop and effectively deploy the opportunities suggested by concept mapping and instructional technology.

**Problem Statement**

Business school graduates are entering highly competitive work environments and could be much better prepared to meet the demands of their jobs with a more thorough understanding of organization structures and interactions. Although organizational charts are a form of concept maps, this instructional approach has not been researched. Technologies are available today that may further enhance concept mapping as an instructional technique to teach business school undergraduates about the structures and interactions depicted in organizational charts.
Purpose

Therefore, the purpose of this study is to investigate whether concept mapping as an instructional approach for organizational understanding that is deployed as a passive learning demonstration, an active learning process with basic feedback, or an active learning with elaborative feedback has a significant impact on student achievement. This study also attempts to determine whether one of these approaches is superior and suggest ways to utilization this information to enhance undergraduate business student knowledge building.

Significance

This study investigated whether utilizing a concept map instructional approach is superior to teach organizational structures and interactions over traditional expository methods. A study that tests various concept map instructional approaches will provide empirical evidence whether these approaches will improve business student organizational understanding. I hypothesized that concept mapping instruction will improve student knowledge building of organizational structures and interactions. Business professors can use these results to enhance course design that better prepares graduates for the rigorous demands of the new global business market. In addition, businesses can use this instructional technique for new employee orientation and reorganizations to more rapidly prepare employees to adapt to new business environments.
Research Questions

1. Does passive learning when using concept map instruction have a significant impact on student achievement in comparison to traditional expository instruction?

   Hypothesis: Students who observe a demonstration of concept map creation will perform significantly better on an assessment than students who have traditional expository instruction.

2. Does the active learning with immediate, but basic feedback during concept map instruction have a significant impact on student achievement in comparison to traditional instruction or passive concept map learning?

   Hypothesis: Students completing a concept map with immediate, but basic feedback will perform significantly better on an assessment in comparison to traditional instruction and passive concept map instruction.

3. Does the active learning with immediate and elaborative feedback during concept map instruction have a significant impact on student achievement in comparison to traditional instruction, passive concept map instruction, or active learning with basic feedback?

   Hypothesis: Students completing a concept map with immediate and elaborate feedback will perform significantly better on an assessment in comparison to traditional instruction, passive concept map instruction, and active learning with basic feedback.
4. Does passive or active learning during concept map instruction promote better student attitudes about the learning of organizational structures and interactions in comparison to traditional instruction?

Hypothesis: Students who have concept map instruction will have better attitudes about their instruction.

**Theoretical Framework**

Concept maps are visual representations of the relationships between units of information. These units of information, or concepts, are usually enclosed in boxes or circles with lines linking related concepts. Concept maps are rooted in constructivism which holds that learners actively construct knowledge. The technique of concept mapping was developed by Joseph D. Novak in the 1970s through his research at Cornell University using graphical displays to teach children basic science. Novak used assimilation theory of cognitive learning to tie new concept meanings into learners’ existing propositional frameworks through the use of concept maps. Ausubel’s assimilation theory (1960) contends that cognitive structures are hierarchically organized and new knowledge is arranged under existing higher level concepts. Meaningful learning occurs when individuals consciously relate new knowledge to prior knowledge they already possess.

Concept maps provide a template to activate relevant prior knowledge in a particular domain to organize new information. This is similar to the schemata theory of teachers helping students build on their existing schemas through visual aids such as graphics and advanced organizers to develop cognitive connections. These connections
improve the storage, access, and ultimately the utilization of knowledge according to cognitive load theory (Sweller, 1988). Concept maps can also provide scaffolding for learners to enable them to work within Vygotsky’s Zone of Proximal Development (1978). Teachers can use concept maps as an instructional aide to communicate and clarify the organization of concepts or ideas.

One specific type of a concept map scaffold is to provide students with a template or “skeleton” map. Working with the skeleton map will not necessarily provide business students with all they need to learn about organizations, but will provide a means to connect to prior knowledge and a way to organize the new knowledge as a form of advanced organizer. Teacher feedback while working with a skeleton map should further enhance student knowledge building.

Therefore, concept mapping can be useful in clarifying ambiguous relationships and helping novice students understand complex relationships. The interactive nature of concept map creation or modification through technological means allows students to more readily construct meaning between previously disparate ideas. Teachers can therefore deploy concept mapping as an instructional strategy for student learning by guiding knowledge creation through the construction of meaning and integration with prior knowledge.
Definition of Terms

Accountability

Accountability is the stated responsibility an employee has for the outcome of a process. It is also the expectation that an employee will be responsible for his/her actions.

Active Learning

Active learning is generally defined as any instructional technique that engages students in their learning. Active learning is contrasted with traditional lectures where students passively receive information from the teacher.

Authority

Authority is the formally granted influence of a position to make decisions, pursue goals and secure resources to pursue goals. Authority in a managerial role may exist only to the extent that superiors agree to grant this authority or subordinates follow the orders from that position.

Chunking

Information or data can be grouped, or chunked, into a single unit. Chunked information can be processed in working memory. Adults can process five to nine pieces of information in working memory at a time (Miller, 1956).

Cognitive Load Theory

Cognitive Load Theory (Kalyuga, 2011, Sweller, 1988) describes when working memory has limits in capacity and duration. Cognitive overload occurs when either the visual and verbal inputs exceed the ability of the individual to process which inhibits
learning. A student will learn most effectively when the total cognitive load is within their ability to process information. A high cognitive load, such as a novice student who is attempting to learn a complex subject, may prove to be too difficult or even a barrier to learning and should be considered in instructional design.

**Concept Mapping**

Concept maps are visual representations of knowledge topics and their relationships. Nodes contain concept information while connecting lines are labeled with relational propositions. (Novak & Gowin, 1984). Concept maps can be used as an instructional strategy, study strategy, collaborative learning tool, or as a means to assess students’ understanding within a domain. In this dissertation, concept mapping is considered as an instructional strategy that facilitates student learning through the use or creation of hierarchical maps.

**Constructivism**

Constructivism is a theory of learning that students construct knowledge through interactions and experiences. When viewed from a constructivist perspective, learning is an active process where students interpret, create, and reorganize their knowledge (Windschitl, 1999).

**Delegation**

Delegation is the process of assigning a task to a subordinate along with the commensurate responsibility and authority to carry out the task.

**Dual-Coding Theory**
Dual coding theory (Paivio, 1986) stipulates that visual and verbal stimuli are processed separately in the brain and coding into long term memory is best when both channels are used simultaneously.

**Expository Instruction**

Information to be learned is explicitly presented by the teacher to the students through lectures, explanations, and textbooks (Ormrod, 2008).

**Feedback**

Feedback is the information provided by a teacher to a student regarding their performance or understanding. For feedback to be instructional, the information provided to the student must fill the gap of what is understood and what is the desired understanding (Hattie and Timperley 2007).

**Meaningful Learning**

Meaningful learning occurs when people associate new information with knowledge already acquired and stored in long term memory. New information that has meaning for people is more easily stored and retrieved (Anderson, Reder, & Simon, 1995).

**Multimedia Learning**

Multimedia learning is defined as any instruction that utilizes various combinations of media to deliver instructional content that often includes static images, text, video, sounds, narration, and animation. Multimedia instructional design includes
the underlying principles of working memory, dual-coding theory, and cognitive load theory (Mayer & Moreno, 2003).

**Passive Learning**

In traditional instruction, information is provided by the teacher to the students in the form of lectures. Students passively receive this information and are expected to record it into long term memory.

**Schema**

Schema are a set of related ideas or concepts on a specific subject stored in long term memory. Schema are a framework for understanding new information and influence our attention and how we interpret new ideas into long term memory (Piaget, 1928, Bartlett, 1932).

**Self-Regulated Learning**

Self-regulated learning is the process where students set educational goals and monitor their progress while proactively seeking information to attain goals.

**Working Memory**

Working memory is the short term storage and processing of information (Baddeley & Hitch, 1974). Working memory is limited in size and duration.

**Zone of Proximal Development**

Lev Vygotsky developed the theory of the zone of proximal development (1978) to describe what a student can accomplish with and without assistance. A teacher can help scaffold a student to guide and advance their learning
CHAPTER II
REVIEW OF LITERATURE

Introduction

Companies expend a great deal of effort and resources to understand and manage complex interactions within their organizations, in their business-to-business (B2B) relationships, and with their customers. Placing all of these multifaceted relationships within a hierarchical context allows companies to optimize business processes, manage customer relations, and achieve strategic plans. A business that does not successfully manage all their hierarchical levels will ineptly prioritize and misalign with their goals.

Business school graduates are entering complex, fiercely competitive markets unprepared to grasp the organizational structures and interactions necessary to be effective. A 2005 Harvard Business Review article by Bennis and O’Toole condemned the progressively worsening state of business school graduates. They claimed that the antiquated, post-World War Two model of business school instruction relies excessively on the scientific method that utilizes quantitative data for all decisions and not a more comprehensive approach that also considers all the dynamics of complex business environments. Former Harvard president Bok (2006) points out that many Americans graduate from college without the capacity to reason or analyze complex, non-technical problems.

Meanwhile, business undergraduates continue to learn about organizations through an outdated, siloed instructional approach. “Silos” are considered to be big, thick, tall windowless structures that inhibit cross functional interaction and
collaboration. Walker and Black (2000) noted that business schools follow an andragogical model that was developed decades earlier by teaching business functions as discrete activities. This was confirmed by Campbell, Heriot, and Finney (2006) in their review of 43 undergraduate business programs. They argue that the failure of business schools is not curricular, but in andragogy and that instructors should use a more integrative model for teaching.

The Association to Advance Collegiate Schools of Business (AACSB) is the leading accrediting organization for higher education business programs. In the current AACSB standards, they recommend that “Contents of the learning experiences provided by programs should be both current and relevant to needs of business and management positions. There are many avenues of opportunity for higher education in filling the knowledge gap left by the galloping global economy” (2008). Although encouraged by the AACSB standards, Verna Allee (2009) pointed out there is still a gap of student understanding how organizational structures results in various performance levels. Allee suggests that businesses have shifted from a functional view to a process view which further focuses on the social networks in organizational life. This focus enhances the knowledge sharing and communication to develop learning communities.

Aram and Noble (1999) also argued that business schools are not adequately preparing students to understand and cope with the levels of ambiguity and uncertainty they will encounter in organizations. They are severe critics of business education in stating that the current system only prepares students for low change situations and does “…little to prepare them for the swampy lowlands where messy, confusing problems
defy rational solution” (p. 324). They suggest that incorporating the paradoxical and unpredictable into teaching to prepare future managers for the chaotic, rapidly changing world. Duarte (2009) suggests from her teaching experience that having students use their imagination is a valuable andragogical approach in management education as it encourages contextualization of organizational activity and fosters reflection and critical thinking. These skills are more suitable today than the current approaches that emphasize the technical and instrumental aspects of management.

Nonetheless, business schools continue to teach with a functional, discrete model while employers desire graduates who can make sound, real time decisions under high stress and a high level of uncertainty. This knowledge gap was demonstrated by Giessner and Schubert in 2007. In a series of three experiments, business undergraduate students perceived the power of a job was due to its placement within an organizational chart and the length of the line connecting it to other jobs. A job that was positioned higher vertically in an organizational chart was viewed as more powerful. Also, a longer line between a job title and its subordinates was also viewed as more powerful. Schubert and Giessner (2009) stated that these studies were conducted on business students who should have realized that the length of the line has no formalized meaning. This reinforces the idea that undergraduate business students lack an understanding of organizational structures and interactions.

In addition, Anderson (2007) noted that students become frustrated and confused by the myriad of management theories that lead them to believe there is academic misunderstanding about the reality of business and therefore doubt the value of the
academic knowledge they are learning. Hamilton, McFarland, and Mirchandani (2000) asserted that the discussion has moved away from determining the appropriate balance of content in business schools, which is rooted in traditional functional areas, to a determination of effective methods for developing softer skills, self-directed learning, and a holistic understanding of the internal and external environment of organizations. Colakoglu and Littlefield (2011) stated that business schools teach how organizational culture impacts behavior and outcomes, but not how culture dictates the mechanisms within an organization to manage internal and external relationships. Blaylock, McDaniel, Falk, and Hollandsworth (2009) also argue that business students should be exposed to the integrated operations and processes of business.

Therefore, there is a gap in undergraduate business student education and a new instructional approach is needed to understand the dynamics of organizational structures and interactions. Argyris and Schon (1996) advanced that in order for learning to be organizational, it must be incorporated by means of epistemological artifacts such as maps, memoranda, and program. Traditionally, business students have been taught about organizational structures and interactions through presenting organizational charts, job descriptions, and definitions of business terminology as individual concepts. But providing students with only these surface features of businesses does not reveal the interrelationships of the various departments and personnel within an organization and with the customers. Due to their novice level of understanding, business students studying these organizational charts will likely only understand the superficial top down chain of command in an organization. This is essentially rote memorization and results in
incomplete understanding of how businesses operate to create value for their customers. A principal constructivist instructional strategy is to enable processes that influence student retrieval, recall, and higher order thinking with new information to create knowledge. By using organizational charts to instruct and scaffold students, they will have a framework to connect and organize new knowledge. This would result in graduates who understand the structures and interactions within an organization and are more likely to be successful and add more value to their organizations. Therefore, business school instructors may be able to use this approach to better prepare these students.

**Organizational Charts**

Organizational charts are visual displays of organization structures, lines of authority (chain of command), staff relationships, and lines of communication. Although various types of organizational charts have been developed, the most commonly used chart is the hierarchical (Rummler & Brache, 1995). Each level of a hierarchical organizational chart is subordinate to the one above it. An organization chart is the institutional decisions of how to arrange the employees within a business to best meet its objectives.

The sociologist Max Weber was a pioneer in organizational design with his Bureaucracy Model in 1922. Weber’s theory asserted that organized hierarchies are necessary to maintain order and maximize efficiency (Visitchaichan, 2003). Key to Weber’s theory is a division of labor and authority to control human resources which are arranged to achieve specific goals. Activity within the organization is therefore shaped
by its formal structure. An organizational chart is then used to visually depict the
hierarchical structure of the business and delineate the chain of command.

The first organization chart was developed by Daniel McCallum in 1854 to have a
simple, visual representation of the complex New York and Erie Railroad (Rosenthal,
2013). Further uses of node-link diagrams were developed such as flow charts by Frank
and Lillian Gilbreth in 1921 to show the intermediate steps between inputs and outputs in
a system. Since then, various charts have been used to depict the formal activities that
occur within an organization. The two key purposes of an organization chart are to show
how job titles have been grouped together for operating efficiency and to show reporting
relationships. Because of the ease of visually representing the bureaucratic structures
necessary for control and coordination, organization charts continued to be used.

The structure of a business is the arrangement of job titles within a company and
is designed to meet the specific objectives of that organization. The structure dictates the
interactions and dynamics that occur both within the organization and externally.
Companies have traditionally represented their organizational structures in a hierarchical
format to illustrate the level of authority and responsibility of each position within an
organization. A hierarchical structure resembles a pyramid with the president at the top,
managers in the middle, and front line employees at the bottom as shown in Figure 1.
The president is part of the executive team who coordinates the strategic activities of the
organization. Managers deal with tactical activities that will occur over the next year.
Supervisors deal with operational issues on a day to day basis. Front line employees
accomplish the tasks for that particular day. Each of these levels has requisite authority
and responsibilities. Note how each level of the organizational pyramid lines up with the titles within the organization chart in Figure 1. The president at the top is shown as having a focus on strategic issues while the front lines employees at the bottom have a focus on immediate tasks required for that day.

![Management Levels](image)

*Figure 1: Hierarchical Levels of an Organization*

By studying organizational charts and the associated terminology, students gain fundamental knowledge of organizational structures. However, because of the traditional siloed approach to their education, the various concepts are not necessarily linked until they acquire on the job learning as depicted in Figure 2. Students begin with separate, inert pieces of knowledge that teachers attempt to advance. Yet current business education does not “connect the dots” between the inert knowledge shown as the nodes in a concept map. New graduates are then forced to learn on the job to make the connections shown as propositions on concept maps. This causes business school graduates to make errors and underperform until they understand the organizational dynamics. Employers are less tolerant of mistakes and desire management graduates
who can make sound, real time decisions under high stress and a high level of uncertainty with the prerequisite understanding of organizational structures and interactions.

Figure 2: Graduates Current Organizational Learning While on the Job

In undergraduate education, organizational charts are used to teach the scope and function of each position in an organization. However, students achieve only a superficial understanding of how authority, responsibilities, functions, and relationships are organized within a company which will ultimately inhibit their careers. In addition, students will not likely comprehend the degree of decision making, accountability, communication channels, and work coordination which is indicated within an organizational chart. Pugh, Hickson, Hinings, and Turner reviewed 52 businesses on 64 variables of organizational structure and found four basic dimensions. They demonstrated that the four dimensions were not related to the standard bureaucratic model used in both businesses and business schools. In spite of this, the teaching approach has not changed.
Concept Mapping and Organizational Charts

An externally mediated cognitive process that facilitates the transfer of knowledge into long term memory can be defined as a learning strategy (Bruning, 1983). Some common strategies include rereading, underlining, highlighting, repetition, outlining, concept mapping, paraphrasing, and note taking. However, not all strategies are equally effective in facilitating learning objectives. For example, the frequently used student strategy of rereading has very low utility (Paris, Wixson, & Palincsar, 1986, Van Blerkom, Van Blerkom, & Bertsch, 2006, Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013). Cognitive learning theory posits that for knowledge to be retained, attention must be directed to encode it by linking new information to prior knowledge. Concept mapping fosters this process by helping students relate new ideas to existing concepts in memory in a hierarchical framework. Novak (1990b) pioneered this process of linking and coding information into long term memory through concept mapping to promote meaningful learning.

A concept map is a diagram showing the semantic relationships among concepts. A concept map consists of nodes (concepts), lines and linking phrases that describe the relationship between the nodes. Two nodes connected with a label are called a proposition. Declarative knowledge is listed in concept maps in a hierarchical format and relationships are indicated by lines, symbols, and words. Concept maps are versatile graphic organizers that can represent many different forms of relationships between concepts. Figure 3 is an example of a concept map that shows the key features of concept maps.
The technique of concept mapping was developed by Joseph D. Novak in the 1970’s through his research at Cornell University using graphical displays to teach children basic science. The theoretical framework for concept mapping is based on David Ausubel’s assimilation theory of learning (1968) which stresses the importance of individuals’ existing cognitive structures in being able to learn new concepts. Novak investigated whether concept maps could be used to establish a hierarchy to link existing knowledge to new information which would foster higher order thinking to develop meaning and depth of understanding (Novak & Cañas, 2008). Concept mapping is a constructivist epistemology as it actively engages learners to elicit and link new schemas with prior knowledge (Hay & Baker, 2008).

Novak and Gowin stated that “Because meaningful learning proceeds most easily when new concepts or concept meanings are subsumed under broader, more inclusive concepts, concept maps should be hierarchical; that is, the more general, more inclusive concepts arranged below them” (1984, p. 15). This hierarchical arrangement directly
matches the use of organizational charts in business. Teachers who use concept maps to instruct business students on the hierarchal structure of organizations could then make the ideas more meaningful by linking the ideas.

An organizational chart is a simple simulation of a business structure. A concept map created with paper and pencil to resemble an organizational structure has educational disadvantages. Since concept map construction is complex and difficult for novice students, a teacher has to continuously monitor a student’s progress to provide feedback. In addition, a paper and pencil concept map is difficult to revise. Therefore, an easier and more effective means to construct concept maps is through a computer based system. Fisher, Faletti, Patterson, Thronton, Lipson and Spring (1990) and Reader and Hammond (1994) showed that utilizing a computer based concept map instruction enhanced students map construction. However, novices still tended to become frustrated due to lack of assistance and feedback. This reduced the students’ opportunities to reflect on their own knowledge construction which reduced the benefit of utilizing concept maps.

Amadieu, van Gog, Paas, Tricot, and Marine’ (2009) studied the effects of prior knowledge versus the complexity of provided concept maps. They found in the 24 adults studied that low prior knowledge learners reported a significantly higher sense of disorientation while studying complex, hierarchically structured concept maps than a simple map and they acquired less knowledge from the complex map. However, highly complex hierarchical maps facilitated greater gain for high prior knowledge participants. Therefore, providing a skeleton map through a computer based system could reduce confusion and frustration for low prior knowledge students while allowing high prior
knowledge students the opportunity to fully examine the interactions between management levels.

There are a variety of concept maps used to make complex ideas easier to understand. These maps are all visual representation of information. The maps differ according to how they represent information and their use. The following sections describe the predominate types of concept maps that can be used to visually depict organizational structures and interactions.

**Social Network Analysis**

One successful approach to understanding the interactions within an organization is social network analysis which measures the interpersonal relationships and flows within an organization. Sociograms are the visual diagrams created from social network analysis where the color, length, and thickness of the lines indicate strength and direction of the connections. Informal networks are not necessarily the direct hierarchy of the organization, but indicate who knows who and who shares information and knowledge with whom. This is in contrast to an organization chart which depicts the formal relationships of who works where and who reports to whom.

Consultants use a form of social network analysis called Organizational Network Analysis to chart and understand relationships and flows of information within an organization (Molina, 2001). Figure 4 is an example of a social network that shows the friendship network in the research and development department as depicted by one of the employees. This map is then compared to the maps of other employees in the department to determine the interrelationships within the department. These maps help senior
management analyze the business configuration to align strategic intent with the organization structure.

Figure 4. Social Network Map Example, Molina, 2001

Semantic Networks

Another type of concept map is a semantic network. Mapping human semantic networks has aided computer artificial intelligence development and has also been used in philosophy, psychology, and linguistics (Sowa, 2007). Semantic networking aids learning by requiring students to analyze and articulate the structures of the ideas they are studying. The names applied to each concept are critical in the understanding of the relationships between concepts. This process helps students integrate new knowledge into existing knowledge structures. Although a semantic network approach can be considered a more formal approach to idea relationships (Hartley & Barnden, 1997), I
will use the broader term “concept map” in this study to indicate visualization of related ideas.

**Spider/Mind Maps**

A spider (or mind map) is a type of concept map that has a central idea in the center with sub-categories radiating outward. Spider maps differ from concept maps in that the central focus is on one idea. The advantage of spider maps is that they are non-linear and can outline an idea. Spider maps can be compared to neural networks of linked neurons in the brain. Figure 5 is an example of a spider map regarding the issues involved in a board of directors presentation and is used to show how the subtopics are interrelated.

![Figure 5. Spider Map Example](http://www.mindtools.com/pages/article/newISS_01.htm)

Concept maps (Novak & Gowin, 1984), semantic networks (Ross, 1966), knowledge maps (O’Donnell, Dansereau, & Hall, 2002) and mind maps (Buzan, 1974) are all terms used for graphical diagrams that indicate relationships between units of
information. These units of information, or concepts, are usually enclosed in boxes or circles (nodes) with lines linking related concepts. Table 1 summarizes the various concept map graphical design instructional approaches and how they differ. Of these map types, an organizational chart is most similar to a hierarchical concept map and it will therefore be used in this study.

Table 1

*Graphic Instructional Approaches to Organizational Understanding*

<table>
<thead>
<tr>
<th>VISUAL DESIGN APPROACH</th>
<th>DESCRIPTION</th>
<th>INTRODUCED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept Maps</td>
<td>Visual representations of multiple knowledge topics (concepts) and their relationships</td>
<td>Joseph D. Novak, 1972</td>
</tr>
<tr>
<td>Social Network Analysis/Sociograms</td>
<td>Measuring, mapping, and analyzing the organization interpersonal relationships of groups of employees.</td>
<td>Jacob Moreno, 1934</td>
</tr>
<tr>
<td>Semantic Networks</td>
<td>A form of concept map that uses a common set of directionally labeled links to connect ideas</td>
<td>Quillian Ross, 1966</td>
</tr>
<tr>
<td>Spider Maps (Mind Maps)</td>
<td>Has a central concept with 5 to 10 related ideas. Can be displayed as a tree or spider web</td>
<td>Tony Buzan, 1974</td>
</tr>
<tr>
<td>Knowledge Maps</td>
<td>Similar to the above designs except the relationships use a common set of directional and labeled links</td>
<td>O’Donnell, Dansereau, &amp; Hall, 2002</td>
</tr>
</tbody>
</table>
Passive Learning

Undergraduates who sit in a large classroom listening to a long lecture are experiencing passive learning. In a passive learning environment, teachers are accepted as the source of information who are responsible for filling the “tabula rasa” or blank slates of students. Passive learning allows teachers to control the learning environment and present a great deal of information through lectures, handouts, reading assignments, and watching videos. Students are familiar and comfortable with this approach because they have commonly used it throughout their years of education and it requires little preparation and interaction.

Expository instruction has been the predominant mode for teaching undergraduates (Michel, Cater, & Varela, 2005). Finkelstein, Seal, and Schuster (1998) surveyed 172,000 faculty in the United States and found that 76% list lecturing as their primary instructional method. In Nunn’s 1996 observation of college classroom activity, less than 6% of class time was involve with student interaction. In passive learning, students are expected to receive information from the teacher and then use personally developed means to memorize it. This method of instruction relies on the straightforward transfer of knowledge and has been challenged by proponents of active learning.

Active Learning

With the rapidly increasing amount of material available in our information society, constructivist teaching practices are becoming more prevalent in teacher education and in public schools (Gordon, 2009). From a constructivist perspective, learning is an active process where students interpret, create, and reorganize their
knowledge (Windschitl, 1999). While there is some debate about the term “active learning,” it is generally defined as when a student moves beyond watching and passive listening to actively participating in their learning (Prince, 2004). Collaborative, problem based, and discovery based learning are all considered approaches to active learning (Michael, 2006). Active learning activities include debating, blogging, computer simulations, and concept mapping.

By actively participating in their learning, students seek knowledge and engage in the higher order thinking activities of Bloom’s taxonomy (1956): analysis, synthesis, and evaluation (Palis & Quiros, 2014). Active learning can also increase student motivation to learn which results in greater retention and transfer of knowledge (Michael, 2006). Students who are interested in what they study show higher academic achievement (Ormrod, 2008). Perkins, Adams, Pollock, Finkelstein and Wieman (2004) surveyed 750 students and found a positive correlation between favorable student attitudes and learning gains. In active learning, the teacher’s role moves from information provider to a facilitator of student knowledge building. Active learning instruction moves the focus from expert information transfer to student centered learning.

Studies have shown that active learning can improve undergraduate performance. Yoder and Hochevar (2005) found that students in a psychology course where the material was covered by active learning performed better on multiple choice exams over lecturing. Poirier and Feldman (2007) tested active learning with psychology students wearing wireless headsets to communicate real time responses and found they performed better on exams than traditional classrooms without the technology. Bullard, Felder, and
Raubenheimer (2008) found that sophomore engineering students with low GPAs performed significantly better with active learning instruction over students who were taught in traditional lecture based classes. Armbruster, Patel, Johson, and Weiss (2009) also found improved student academic performance when they redesigned an introductory biology course and incorporated active learning into every lecture.

In their 2014 meta-analysis of 225 studies which compared passive to active learning, Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, and Wenderoth found that active learning significantly increased students’ exam scores and reduced failure rates. The studies were all in undergraduate STEM courses (science, technology, engineering, and mathematics). Active learning increased examination scores by a half a letter grade and decreased failure rates by 55% over traditional lecturing. The results were consistent across all STEM disciplines. The greatest effect sizes were found in classes with less than 50 students. The authors recommended that traditional lecturing should be abandoned in favor of active learning to increase the number of students receiving STEM degrees.

Minhas, Ghaosh and Swanzy (2012) found significantly higher student performance on examination scores in an active learning physiology course versus a passive one over a two year period. The authors suggested that through active learning, students may be able to retain more information and apply that knowledge. Students also self-reported that they preferred the active learning approach yet also found value in the traditional lectures.
However, undergraduate business instruction continues to use a passive instructional method of delivering knowledge to students. Management teachers have more recently attempted to incorporate more active learning through the use of case studies, stimulations, and collaborative group projects to facilitate student knowledge construction. Wingfield and Black (2005) compared the outcomes of three business courses that had passive versus active course designs. The authors did not find a significant difference in final grades, but students perceived that the active learning course to be more useful to their careers. The lack of differentiation between the active and passive student grade achievement may have been due to the vastly different evaluation methods used in each of the three courses.

Michel, Cater, and Varela (2009) compared the learning outcomes of two sections of an introductory business course where one used a traditional passive learning approach and the other an active approach. Each section had 150 students who were nearly all first semester freshman. The active section teacher facilitated critical thinking exercises, class discussions, and group projects. The traditional section had lectures and three in-term exams. Students were tested at the end of the semester with a 50 question exam. The authors noted significant improvement in the cognitive outcomes of course material in the active learning section. The authors also noted that this improvement may have been due to the short quiz provided at the beginning of each active learning class. The authors concluded that while active learning outcomes were superior, there is great latitude on what consists of active learning activities and may only force to students to engage more with the course material. Table 2 compares passive and active learning.
### Table 2

**Comparison of Passive versus Active Learning**

<table>
<thead>
<tr>
<th>Cognitive Activity</th>
<th>PASSIVE LEARNING</th>
<th>ACTIVE LEARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td>Listening, Reading, Watching</td>
<td>Doing, Sharing, Experiencing</td>
</tr>
<tr>
<td></td>
<td>• Easily delivered through lectures, handouts, and reading assignments</td>
<td>• Encourages students to use initiative and creativity</td>
</tr>
<tr>
<td></td>
<td>• Teachers can present a great deal of information in a short period of time</td>
<td>• Student ideas and input are incorporated into their learning which ties to prior knowledge</td>
</tr>
<tr>
<td></td>
<td>• Learning environment very controlled by the teacher</td>
<td>• Students have more control over their learning which can be motivational</td>
</tr>
<tr>
<td></td>
<td>• Information can be presented in a very organized and structured way</td>
<td>• Can stimulate students to use higher order critical thinking skills</td>
</tr>
<tr>
<td></td>
<td>• Students are typically familiar and comfortable with this approach</td>
<td>• Engages students in their learning</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>Limited time for questioning, clarification, or discussion</td>
<td>Difficult for teachers to organize and structure</td>
</tr>
<tr>
<td></td>
<td>• Students may become distracted and bored</td>
<td>• Student unfamiliarity with learning approach may cause high anxiety</td>
</tr>
<tr>
<td></td>
<td>• Retention is limited</td>
<td>• Can be time consuming</td>
</tr>
</tbody>
</table>

**Feedback**

Active learning is a constructivist learning approach that emphasizes the role of the learner as an active participant in the learning process (Woolfolk, 2005). In a constructivist approach, students are encouraged to build knowledge in ways that are meaningful to them. However, teachers need to proctor student progress and provide feedback to ensure they do not develop erroneous concepts. In their 2007 meta-analysis of teacher feedback in education, Hattie and Timperley determined that feedback can be
one of the most effective influences on student learning and achievement. Feedback is the information provided by a teacher to a student regarding their performance or understanding toward learning goals. For feedback to be instructional, the information provided to the student must fill the gap of what is understood and what is the desired understanding. Instruction must first be provided for feedback to effective so students can build on prior knowledge. However, a question often remains after instruction: does the student understand the material and have they achieved the desired learning goals? Having students complete an assessment and then providing feedback with only an overall assessment score provides students with just a broad indicator of performance.

To be effective, feedback must be related to the current, defined performance of a specific student and delivered in a timely manner (Jonsson, 2012). The feedback can: provide encouragement (e.g. “Good Job!”), inform the student whether they were successful or not, how well they are performing, propose directions to indicate the next steps, or provide corrective feedback when a student makes an error. Students filter this feedback through their prior knowledge to create meaning. Butler and Winne (1995) suggested in their review of feedback research that both external and internal feedback influence student knowledge building. They posited that these two sources of feedback are the key determinants of students’ self-regulation of learning. The feedback provides students with guidance on their progress toward goals, direction toward next steps, and helps motivate them. Teachers may provide the input, but students determine what they need to do next.
In their meta-analysis of studies on feedback, Kluger and DeNisi (1996) found that although the effect of feedback varies, it improves student performance by an average of .41 standard deviations. However, they also noted that 38% of the effect size showed that control groups outperformed feedback groups suggesting that the nature of the feedback is critical. Although they found that both positive and corrective feedback can be beneficial to students, providing cues that support learning and attracting student attention to errors can yield gains above one standard deviation. The authors also suggested an alternative to student performance feedback is allowing trial and error. Combining cueing, gaining student attention to errors, and allowing trial and error may yield substantial student performance gains.

In their 2007 meta-analysis on feedback, Hattie and Timperley also found a range of effect sizes and isolated the types of feedback and conditions that promote the most effective learning. They contend that the key to effective feedback is to help the student understand their gap of understanding and providing direction to reduce this discrepancy. In this manner, praising students is not effective. However, they noted that feedback for the task, process and self-regulated learning is interrelated and is most effective when it is provided immediately, addresses faulty concept interpretations, and provides cues. This feedback can then increase student effort, motivation, and engagement to achieve a learning outcome. Yet the feedback must be clear and compatible with a student’s prior knowledge.

However, teachers are challenged to consistently provide timely and individual feedback to students. Bolhuis and Voeten (2001) concluded from their observations that
teachers provide little positive feedback to students and it is scarcely directed toward learning goals. Bergh, Ros and Beijaard (2013) found that of the 1,465 student-teacher interactions they studied, half provided guidance and feedback but only 5% were related to learning goals. To provide effective feedback, teachers need a thorough understanding of the task at hand, the performance of the student, and provided as immediately as possible which is a labor and time intensive endeavor. Computer technology can be used to effectively and efficiently delivery timely and substantive error correction feedback to individual students. Valdez (2012) found that students who received computer based feedback during instruction performed significantly better on a 24 item multiple choice test than those who did not receive feedback. “Individual” feedback as used in this study refers to the timing and not the tailoring to the individual student. In this study, the same feedback was provided to each student as they performed the instructional exercise.

Current and emerging technology has great potential to use feedback to engage students in their learning. For example, providing students with computer generated feedback on errors or success can help guide their knowledge construction. The two primary types of feedback are verification and elaboration (Kulhavy & Stock, 1989). Verification confirms whether the students’ response is correct or incorrect. Elaboration consists of information provided beyond verification. Verification alone has little effect at promoting learning (Kulhavy & Stock, 1989, Moreno, 2004). However, elaboration feedback is more efficient and effective at error correction than correct answer explanation (Kulhavy, White, Topp, Chan, & Adams, 1985). Kulik and Kulik,(1988) also found that immediate feedback for error correction results in faster rates of
knowledge acquisition. Moreover, students that receive immediate, substantive yet specific feedback that can be used to revise their work is the most engaging and effective (Jonsson, 2012).

**Concept Map Instruction**

Concept maps were developed by Dr. Joseph Novak at Cornell University as a way for students to graphically organize concepts and their interrelationships. Concept mapping was used as an active learning process to have students construct their understanding of a topic. Cronin and Dekher's (1982) qualitative research on student concept map creation validated Novak’s earlier work. They investigated whether providing concepts in pre-work of matching exercises enhanced the drawing of the concept maps. They found that the pre-work was helpful because students have difficulty with the arrangement of concepts into a hierarchical structure. After pre-work, the students could create a concept map within 45 minutes. Interestingly, they also found that the map creation of experienced teachers was similar to students except that the teachers had a much higher quality of propositional statements. The authors suggested more work would be necessary to help students define the relationships between concepts.

Ten years later, Wiegmann, Dansereau, and McCagg (1992) studied the parameters of concept map construction and presentation. They found that the cues used for encoding during concept map formation influenced knowledge acquisition. Specifically, node link embellishments provided information about node relationships
and improved student performance. They also found that maps created in the form of a spider web (a central concept in the middle) were less effective than hierarchical maps. Additionally, maps created with the gestalt principles of symmetry, proximity, and continuation improved student knowledge acquisition. These results indicated improved means to deploy concept maps in education.

Students who are familiar with concept mapping as a learning strategy realize greater achievement. Hall and O’Donnell (1996) conducted research on knowledge maps for college students. Knowledge map pre-training was provided and the students were then allowed to study a 1500 word text passage. Students who utilized knowledge maps had superior retention and understanding of both superordinate and subordinate propositions. In a later review of research on knowledge maps, O’Donnell, Dansereau, and Hall (2002) noted that students recalled more central ideas when they learn from a knowledge map than when they learn from text and those with low verbal ability or low prior knowledge often benefit the most. The authors suggested this occurred due to reduced cognitive load, drew attention to the macrostructure of the content, and encourage top down processing. In addition, they concluded that knowledge maps that were constructed using Gestalt principles (symmetry, proximity, and continuation) are recalled better than when presented in less well-structured maps. Consequently, concept maps can be viewed as a form of scaffolding to enable low prior knowledge students a greater opportunity to learn. The novice students have difficulty comprehending and linking complex ideas of business structures and interactions. An external map can provide off-loading to scaffold students as one of the ways to reduce cognitive load.
Different approaches to concept map utilization to improve knowledge retention and depth of learning have been explored. Nesbit and Adesope (2006) conducted a meta-analysis on the educational studies of concept map instruction. They estimated there were over 500 peer reviewed articles that were published mainly since 1997. They selected 55 studies where students had to construct, modify, or view concept maps and measured recall and retention in posttests. The studies included 5,818 students that ranged from fourth grade through postsecondary. They found that concept mapping was beneficial to learners across a broad range of educational levels, subject areas, and settings. They concluded that concept mapping was more effective for knowledge retention and transfer over reading text passages, attending lectures, and participating in class discussions. However, they also noted that benefit of instructing with concept maps was inconsistent but there were also no detrimental effects in their use.

Concept mapping has been shown to improve test results, student attitudes, and overall enjoyment of the subject matter (Kinchin & Hay, 2000). Chiou (2008) found that the students in an advanced accounting course using a concept mapping learning strategy believed that it helped them reduce barriers to learning and allowed better integration of the content. Laight (2006) found that students who are interested in mastery learning are more likely to report that concept mapping is helpful.

Concept mapping is an active learning process and can serve as an elaborative study activity. It requires students to retrieve and organize knowledge. Although there are means to successfully deploy concept maps in education, there is still a question of which strategies work best to promote effective encoding. Due to the advances in
technology, scholars have also suggested that concept mapping may be especially
effective in interactive environments (Simone, Schmid, & McEwen, 2001).

**Three Approaches to Concept Mapping Instruction**

Undergraduate business students generally have a novice understanding of
business terminology, structures, and interactions. Consequently, they require a high
level of support to avoid working memory overload yet they also need enough challenge
for the learning to be motivational and meaningful. The most common student study
strategy is reading and rereading text which has been shown to have very low utility,
particularly for students with low domain knowledge (Dunlosky, Rawson, Marsh,
Nathan, & Willingham, 2013). Instead, a concept mapping instructional approach may
be more effective study strategy to improve undergraduate business student knowledge
encoding and retention of organizational structures and interactions.

The primary focus of this study is to investigate the efficacy of concept mapping
as an instructional strategy for teaching organizational structures and interactions.
Furthermore, this study examined the relative effectiveness of three common
instructional approaches that utilize concept mapping. These three are: a passive learning
demonstration using a concept map approach, an active learning approach where students
complete a concept map but receive immediate but basic feedback, and an active learning
approach where students complete a concept map with immediate and elaborate
feedback. All three approaches use a constructivist approach with the opportunity for
students to use higher level critical thinking skills. In a passive learning demonstration,
dual coding theory (Paivio, 1968) can be used to explain enhanced retention and transfer. On the other hand, when students actively construct a hierarchical concept map, they must judge whether a term should be included and where it should be placed which demands their cognitive engagement (Novak & Gowin, 1984). Constructing a concept map with immediate feedback will provide guidance and should improve learning outcomes. These three concept mapping instructional approaches are further described below.

**Passive Learning With Concept Map Instruction**

Traditionally, teachers have assumed the expert role to fill students’ minds with knowledge. Students were viewed as passive recipients of information through lectures, reading, and note taking. More recently, instructional designs have been guided by dual coding and working memory theories. Dual coding recognizes that students can use both visual and auditory inputs (Paivio, 1986). Because visual and auditory inputs use separate cognitive resources, simultaneous processing can allow working memory to be more efficient. Mayer’s 2001 cognitive theory of working memory is displayed below in Figure 6. Learning is shown as integrating prior knowledge with information in working memory to construct new meaning and encoding into long term memory. By using both senses without exceeding students’ cognitive load (Sweller, 1988) on one of the channels through good design, (Mayer & Moreno, 2003), teachers can design instruction that is more effective at student processing information from working memory into long term
memory for greater retention. A current example of a passive student learning experience is showing a class a YouTube or TeacherTube video.

In a concept mapping demonstration, the opportunity to learn facts or concepts of business organization may be best accomplished by visual presentation of the information in the nodes and propositions with narration. For example, Moore and Skinner (1985) demonstrated that abstract textual information is better understood and learned when presented along with illustrations. Images may be more engaging and motivating for students than text alone. Through dual coding, presenting text, images, and providing verbal explanation of the interactions can activate prior knowledge and allow assimilation into long term memory. Finally, by allowing students to pause or replay a section, they will have more control to self-regulate their learning (Moreno, 2010).

Caution needs to be exercised when students have low prior knowledge. Entry level undergraduates are unfamiliar with business terminology, structures, and interactions. These students’ cognitive load can be easily exceeded. One approach is to
present the hierarchical concept map as a “guided tour” utilizing technology. The organizational hierarchy can be presented and the interactions between the levels explained. Each of the nodes can be individually examined from top to bottom to allow students the opportunity to assimilate and link to prior knowledge. Propositions can then be placed one at a time within the hierarchy and explained. Movement of the cursor on the screen can guide the student to reduce extraneous cognitive load. This passive learning approach may provide undergraduate business students an opportunity to better understand business organization over traditional instruction.

By combining the advantages of a concept mapping instructional approach with the advantages of a well-designed multimedia demonstration, student understanding of organizational structures and interactions should be enhanced. Students will more likely be engaged in meaningful learning and deeper cognitive processing of the material. As a result, students should have greater retention and a deeper comprehension of the material.

**Active Learning With Basic Feedback Concept Map Instruction**

Concept mapping can foster meaningful learning by helping students identify and organize abstract information. Researchers have investigated various concept map instructional strategies to scaffold students. Having students construct a concept map requires that they record their understanding of ideas and processes. Novak (1990b) stated that the construction of concept maps facilitates learning by forcing students to acknowledge the organization and structure of knowledge. Students can critically think about concept relationships and develop new meaning for long term memory storage.
Novice business students need particular assistance since their prior knowledge is so shallow and the cognitive demands of learning the nodes and propositions can be high. Wachter (1993) investigated the effects of partially completed and completed concept maps on reading comprehension and retention of 120 fourth grade students. The partially completed map had some of the concepts missing and the students were required to fill-in the shapes with the correct concept during reading. The completed concept map group was allowed to study the map before reading. Students were immediately tested by a written free recall followed later by a delayed written free recall and a delayed multiple choice test. The students who used either type of concept map approach recalled significantly more in both the immediate and delayed written free recall than students in the control group. Furthermore, the students in both concept map groups significantly outperformed the control group on a multiple choice test. The type of concept map did not seem to matter. The researcher concluded that when concept maps are presented first, they significantly aid reading comprehension and information retention regardless of concept map type.

Ruiz-Primo, Schultz, Li, and Shavelson (2001) studied fill-in concept maps compared to maps constructed from scratch (blank page). They found that constructing a map from scratch best reflect students’ knowledge and had the most accurate propositions (deepest learning). They also found a difference in fill-in the nodes versus fill-in the lines but concluded more research would be necessary to determine which would be most reflective of student learning. Both fill-in and construction methods could possibly be used to increase retention (nodes) and improve understanding (lines).
Farrand, Hussain, and Hennessy (2002) studied the use of mind maps with 50 medical students. The authors compared mind map construction with other self-study techniques. Recall of text was measured after an interfering task and one week later. Recall improved for both mind map and control groups at the immediate test. Improvement was robust only for mind map group after one week. The authors concluded that the mind map technique can potentially be an important improvement in long term student learning.

Berry and Chew (2008) studied 102 undergraduate students using two learning strategies: learner generated questions and concept maps. Generating questions especially improved performance for the lowest performing students. However, both low and high performing students improved performance when constructing simple concept maps. Lim, Lee, and Grabowski (2009) also found that learner generated concept mapping strategy was more effective than expert generated concept mapping on knowledge acquisition. These results support earlier research that map construction can be an effective learning strategy.

Concept maps can show the extensive underlying relationships within an organization but can be cumbersome and limiting to draw by hand. Furthermore, providing immediate, individual feedback can be nearly impossible with large groups of students. Chang, Sung, and Chen (2001) instructed and tested three computer based concept mapping approaches: map correction, scaffold fading, and map construction to determine comprehension and summarization on fifth grade biology students. The map correction method enhanced text comprehension the most. Students who drew concept
maps on a template had the highest learning gains. The authors suggest that similar gains in scaffold fading may not have been realized because the learners were too young or did not have enough training. However, researchers have reported that providing a skeleton concept map to students with low prior knowledge helps avoid “map shock” which lowers anxiety and frustration while increasing motivation to engage in meaningful learning (Bahr 2001, Czerniak 1998, Okebukola 1988). Furthermore, the students would have likely had greater gains if immediate feedback had been provided.

Therefore, constructing computer-based concept maps engages learners in (1) creating stronger links with prior knowledge by the ease of construction and modification; (2) higher critical thinking skills, which promotes better retention, retrieval, and (3) the ability to apply the knowledge in new situations (Fisher, Faletti, Patterson, Lipson, Thornton & Spring, 1990). By providing a template or skeleton map, low prior knowledge students will have a scaffold so that their working memory is not overloaded. In addition, students unfamiliar with concept maps are provided with more guidance and can focus on the learning of the concepts and propositions and not necessarily on how to use the tool. This will reduce student resistance and discomfort that has been reported with concept mapping (Laight, 2006). A similar result was found by Hwang, Wu and Kuo (2013) that students have a better attitude about using technology enabled concept mapping as opposed to paper and pencil. Students will therefore likely find the construction onto a skeleton concept map approach that utilizes technology leads to the greatest understanding and retention.
Active Learning with Elaborative Feedback Concept Map Instruction

Despite the demonstrated effectiveness of concept mapping instruction, there are limitations. For example, novice students are easily overwhelmed with all the concepts and propositions required to construct or study complex concept maps. Their working memory can easily be overloaded and they cannot process the map in a manner that allows higher order thinking. Without guidance, students can become anxious and frustrated causing a negative attitude which would inhibit their learning. A simpler, hierarchical map that provides immediate and elaborative feedback will guide novice students while they explore and provide an opportunity for critical thinking to improve knowledge retention.

Another issue with concept map construction is that concept maps do not have a prescribed order to complete. Although this could provide an opportunity for students to self-regulate their learning, novice students can become overwhelmed at where to begin constructing their concept map or how to proceed (Blakenship & Dansereau, 2000). The number and complex grammar that may be required in propositions could also overwhelm students. First providing students with the propositions and a skeleton hierarchy and then providing immediate feedback could reduce the cognitive load which may improve knowledge retention.

Another means to improve student knowledge retention is through engagement. Engaging higher education students leads to active and more meaningful learning (Scales & Varnado, 2012). Actively engaging students in their learning will promote self-regulated learning. Student who self-regulate their learning have a better understanding,
recall, and active use of their knowledge (Perkins, 1999). However, student who self-regulate their learning need external feedback to direct their learning (Brookhart, 2008).

One method of engaging students to construct knowledge while utilizing self-regulation is through educational game playing. During gaming, students are immersed in an active, personal learning experience that provides challenge and feedback. Games that provide a trial and error approach to problem solving allow students to take low stakes risks which facilitate their schema construction (Gee, 2003). Educational games may also stimulate curiosity and interest that will enhance students’ intrinsic motivation. Tuzun et al. (2008) provided an educational game about geography to elementary students and found that gaming students demonstrated significantly higher levels of intrinsic motivation when compared to traditional instruction.

In more recent years, business instructors have attempted to use case studies and gaming simulations to provide more meaningful learning. Gamlath (2009) investigated whether achieving a winning score in business computer simulation was the result of application of skill or due to luck. The simulation was used to improve students understanding of organizational functions and interactions. The students would make numerous decisions regarding their fictitious business and would be provided immediate feedback about its effect on net profit. Gamlath found that the higher scoring students were applying business skills learned in the two gaming simulations, but that there was no significant relationship between game performance and academic achievement in the course. He noted that the most important criteria for earning higher scores were the students’ positive attitude toward the simulation. If the students found the simulation to
be interesting and engaging they scored higher by attempting more trial and error activities. Students also scored highest in the areas that were covered both in the course and the simulation.

Since education games are designed to be engaging, an “interactive” concept map of an organization with drag and drop that also provided immediate feedback should increase student motivation and critical thinking. Rey (2011) found that students who had to drag and drop in a simulation had better transfer but not retention of information as compared to text boxes or scrolling. He claimed that the split attention effect (Ayres & Sweller, 2005) accounted for the poorer performance of the text box group. He suggested that students’ attention was split between the different areas of the computer screen, the keyboard, and the mouse. He also suggested that visual scanning should be minimized to improve retention and transfer of knowledge due to the principle of spatial contiguity (Mayer & Moreno, 2003). This also suggests that student with low prior knowledge with complex participants should have low element interactivity to avoid cognitive overload.

Simplicity of drag and drop as compared to multiple choice or completion was demonstrated to be superior by Heift (2003) on German language word order. Students performed the worst on the multiple choice learning approach but used the drag and drop the most. This suggests that the ease of drag and drop is superior due to its low risk and rewards in terms of distraction similar to the Rey, 2011 study and was less time consuming. Therefore, key advantage of drag and drop activities are: focusing the students’ attention, allowing for trial and error, and the opportunity to provide immediate feedback. Dragging and dropping concepts and propositions onto a skeleton maps with
immediate feedback should utilize the advantages of gaming and concept mapping to improve student knowledge building.

**Literature Review Summary**

With proper instructional design, concept mapping can facilitate meaningful learning. Students can use concept maps to organize and deepen their understanding of a domain. This occurs through students building on prior knowledge while reflecting on the structure of the knowledge, rather than just a memorization of facts. Concept maps shift the focus from inert, static knowledge to actively creating semantic frameworks of related information.

The key advantage to a concept map approach to organizational understanding is that not only the nodes or key titles are identified, but also the work flow through the organization in the propositions. In other words, identifying the lines shows the interactions and how organizations operate to create value for their customers. Paper and pencil concept maps are cumbersome, but computer designed concept maps are easier to modify and embellish. Low prior knowledge undergraduate business students can also benefit by manipulating a skeleton concept map through trial and error of a simple organizational structure with immediate feedback.

Therefore, an instructional method that facilitates the active learning of concept maps with immediate verification and elaborative feedback could improve student knowledge building. A computer based, concept map instructional approach to organizational understanding may therefore be beneficial for undergraduate business
students. Visual displays of semantic information in concept maps facilitates comprehension and meaningful learning (Novak, 1990a) while feedback engages and directs student learning. Undergraduate business students could therefore benefit from a concept mapping instructional approach with feedback to facilitate meaningful learning about organizational structures and interactions.

Table 3 lists the key research on concept maps as related to this study. While concept maps have been shown to improve student learning under certain conditions, researchers are investigating new applications to uncover potential opportunities. This study will explore whether three approaches to concept map instruction are beneficial and whether one is significantly better. An improved instructional approach would allow business students greater understanding of the dynamics that occur in organizations.
## Table 3

*Chronological List of Key Concept Map Research*

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>DATE</th>
<th>TITLE &amp; JOURNAL</th>
<th>STUDY DESCRIPTION</th>
<th>FINDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cronin, et al.</td>
<td>1982</td>
<td>A Procedure for Using and Evaluating Concept Maps Research in Science Education</td>
<td>310 High School students and an unspecified number of science teachers constructed concept maps on oxidation reduction. Provided 20 terms and instructions. Created scoring procedure for maps.</td>
<td>Once students understood the procedure, they could create a concept map containing between 15-20 concepts within 40 minutes without reference to a textbook. Although they created proper hierarchies, the authors suggested more attention is necessary on inter-topic connections.</td>
</tr>
<tr>
<td>Novak</td>
<td>1990</td>
<td>Concept Mapping: A useful tool for science education.</td>
<td>239 first and second grade students through senior high school created concept maps in science. 12 year longitudinal study. Observed how concept meanings changed over time by completing concept maps.</td>
<td>Concluded that primary grade children are capable of developing “very thoughtful concept maps which they can explain intelligently to others.”</td>
</tr>
</tbody>
</table>
| Wiegman, et al. | 1992 | Effects of Knowledge Map Characteristic s on Information Processing               | College students studied different structures of knowledge maps: web configured vs. map using Gestalt principles; stacked vs. whole maps; maps with simple lines vs. maps with embellishments.                                                        | 1. Maps that followed Gestalt principles were more effective than web type maps  
2. Stacked maps were more effective for high spatial ability students  
3. Maps with embellished links were more effective for high verbal students                                                                                                                                            |
<p>| Horton, et al. | 1993 | An Investigation of the                                                          | Meta-analysis of 19 studies on concept mapping.                                                                                                                                                                         | Found that concept mapping has a medium positive effect on both student achievement and attitude.                                                                                                                             |</p>
<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Title</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>Hall &amp; O’Donnell</td>
<td>Cognitive and Affective Outcomes of Learning from Knowledge Maps</td>
<td>Also found little difference in the effectiveness of teacher prepared versus student prepared concept maps in improving student achievement.</td>
</tr>
<tr>
<td>2001</td>
<td>Ruiz-Primo, et al.</td>
<td>Comparison of the Reliability and Validity of Scores from Two Concept Mapping Techniques</td>
<td>Knowledge maps were superior to text alone for retention and subordinate propositions.</td>
</tr>
<tr>
<td>2002</td>
<td>Chang, et al.</td>
<td>The Effect of Concept Mapping to Enhance Text Comprehension and Summarization.</td>
<td>1. Fill in the nodes and fill in the lines are not equivalent forms of fill in the map 2. Constructing a map from scratch best reflect students’ knowledge and had the most accurate propositions (deepest learning).</td>
</tr>
</tbody>
</table>

- Hall & O’Donnell (1996) - Science Education
- Contemporary Educational Psychology


<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Journal/Book Title</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>Farrand, et al.</td>
<td>The Efficacy of the ‘Mind Map’ Study Technique</td>
<td>50 medical students. 600 word text pretest and then applied to mind map. Recall measured after an interfering task and one week later.</td>
<td>Recall improved for both mind map and control group at immediate test. Improvement was robust only for mind map group after one week.</td>
</tr>
<tr>
<td>2006</td>
<td>Nesbit &amp; Adesope</td>
<td>Learning with Concept and Knowledge Maps: A meta-analysis</td>
<td>Meta-analysis of 55 concept map studies with posttests measuring recall and transfer. Involved 5,818 participants ranging from fourth grade to post-secondary.</td>
<td>Constructing or studying concept maps produced increased retention and transfer of knowledge when compared with control conditions in which learners worked with text passages, outlines, lists or lectures. Students also reported a positive attitude toward learning with concept maps.</td>
</tr>
<tr>
<td>2007</td>
<td>Derbentseva, et al.</td>
<td>Concept Maps: Experiments on Dynamic Thinking</td>
<td>Three experiments: cyclic vs. hierarchical maps, map header, and focus question to determine the effects on map structure, concept quantification, and dynamic thinking during a concept map construction.</td>
<td>1. Dynamic thinking within the context of concept mapping is possible 2. There are at least three ways in which dynamic thinking can be encouraged 3. Concept quantification may be the most robust way of encouraging dynamic thinking 4. Practitioner should pay close attention to the focus question</td>
</tr>
<tr>
<td>2007</td>
<td>Hay</td>
<td>Using concept maps to measure deep, surface and non-learning outcomes</td>
<td>12 post graduate students created concept maps. Required links with statements. Measure depth of learning between before and after instruction maps.</td>
<td>Defined and distinguished surface vs. deep learning vs. non-learning to assess learning quality. Concluded that concept mapping has “considerable utility for tracking change in the course of learning and has the capacity to distinguish between changes that are meaningful, and those that are not.”</td>
</tr>
<tr>
<td>2008</td>
<td>Berry &amp; Chew</td>
<td>Improving learning through interventions</td>
<td>102 undergraduate students. Two learning strategies: learner generated</td>
<td>Both learning strategies improved exam performance. Generating questions especially improved performance for the lowest performing</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year</td>
<td>Title</td>
<td>Documented Uses</td>
<td>Additional Information</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Hay, Kinchin, &amp; Baker</td>
<td>2008</td>
<td>Making Learning Visible: the role of concept mapping in higher education</td>
<td>Documents the current four primary uses of concept mapping in higher education.</td>
<td>Teachers can enhance their instruction through the use of concept maps. Concept mapping can be learned within 20 minutes and students can create a map within 20-30 minutes. Improves student achievement.</td>
</tr>
<tr>
<td>Lim, et al</td>
<td>2009</td>
<td>Does concept-mapping strategy work for everyone?</td>
<td>124 undergraduate students. 1900 text plus visuals. Tested three levels of concept map generation: expert generated, partially learner generated, fully learner generated.</td>
<td>Fully learner generated map group significantly outperformed expert and partial generation, which performed the same.</td>
</tr>
</tbody>
</table>
CHAPTER III

METHODOLOGY

Introduction

This chapter details the methods used in this study to investigate the efficacy of whether three specific concept mapping instructional approaches have a significant impact on business undergraduate student achievement over traditional instruction. The study is designed to answer the research questions presented in chapter one of this paper. This chapter begins with the details of the participants used in the study followed by the lessons learned from the six pilot studies conducted and the design of this research into four experimental groups. The four groups and the instructional materials for each group are next described followed by the specific procedures and measures used in this study. Finally, the methods for the data analysis are specified and the limitations of the study are acknowledged.

Participants

Participants for this study were recruited from the 204 undergraduate students enrolled in one section of an online principles of management course at a large, Midwestern public university. The course was offered in the fall, 2014 semester to business undergraduates and is required for their major. This was an introductory course on management and organizational design. These students are required to be at least sophomores and are otherwise fairly homogenous in their education. Work experience varied, especially among non-traditional students.
The participants were offered extra credit upon completion of the assignment. Participants had the option to opt out of the study and complete an alternate assignment for extra credit. Participants acknowledged an informed consent to proceed (Appendix A) as approved by the Kent State University Institutional Review Board (IRB). All participants first completed an online demographics questionnaire (Appendix B). All participants continued to read in their course textbook on general organization structures and terminology and complete all other online work as normally required in the course.

**Pilot Studies**

Five different pilot studies were conducted in 2012 and 2013 on undergraduate students with the target demographic to test the research design and adjust for identified problems. A final pilot study on this experimental design was conducted during the spring semester, 2014 with the same target students (enrolled in an online principles of management course). The pilot studies used a pre-posttest design.

The first two pilot studies were conducted online. In retrospect, they were too comprehensive, confusing, and complex. Students were required to complete all the requirements provided through a webquest. The third pilot study was also online, but presented as a workbook with four different concept maps to complete and a checklist. These first three pilots did not demonstrate significant improvement in student assessment scores. This was likely due to the high degree of self-directed learning expected with very difficult material and intentionally little guidance. Student feedback indicated that building a concept map was too confusing and time consuming even with
the workbook approach. The novice nature of these students demonstrated that the instruction needed to be simplified and better described.

The fourth pilot study showed modest, but not statistically significant improvement in student achievement scores. The fourth pilot study also used a workbook approach, but with the skeleton map of a hotel organizational chart in a face to face, classroom environment. Student feedback still indicated a high level of confusion and anxiety. More adjustments were made to simplify the instructions, the number of steps to complete, and the downloading of documents and presentations.

The fifth pilot study required the online students to only use the provided terms to fill in the nodes and provided propositions of a large hotel operation. This fifth pilot study was online and showed modest improvement for the concept map group. However, students still reported confusion and anxiety. The large hotel organizational chart needed to be simplified so I developed the tall and narrow organization skeleton map shown in Figure 7.

The final pilot study was conducted in the spring of 2014 and followed the same research design as described in the next section except that the pre-test was eliminated based on the recommendation of my dissertation committee. 90 students volunteered and were randomly assigned to one of the four groups. The results of this final pilot showed modest, but significant improvement for the three concept map instructional groups over the control reading group. One area of confusion reported by the students was having to discern whether the interaction was up or down in the levels of the organization. Students indicated that they would just guess and it did not help them understand
organizational dynamics. Therefore, for the final design students only needed to indicate the level of organizational interaction, not the directionality.

The incremental improvements to the pilot studies made the instructional materials less complicated and the instructions easier to understand. The result of the sixth pilot study was consistent with the literature that concept maps can be a useful instructional approach as described in meta-analyses by Horton, McConney, Gallo, Woods, Senn, and Hamelin (1993) and by Nesbit and Adescope (2006). These trials demonstrated that concept mapping can be effective to teach organizational structures and relationships when properly designed and effectively deployed.

**Research Design**

A convenience sample of students was used for this study with a between participants experimental research design. The study was an online assignment and began with a survey of subject demographics as shown in Appendix B. The participants were then randomly assigned to one of four groups. All four groups first viewed a background video on organizational structures. The control group had an additional textbook passage to read while the other three groups had a concept map instructional approach. The control group textbook passage (Appendix C) is similar to an introductory business course textbook reading assignment. The three concept map instructional approaches had the same information as the control group except that the focus was on the interactions between the levels of organizations using the skeleton concept map of organizational levels shown in Figure 7.
Figure 7. Skeleton Concept Map of Organizational Levels

Time on task was approximately 30-40 minutes for all four groups. At the conclusion of their instruction, participants completed an assessment of 20 question assessment with multiple choice and true/false questions (Appendix D) followed by an
attitude survey (Appendix E). The assessment results were analyzed for the instructional treatment effect to determine whether the concept map approaches are superior to traditional instruction. The covariates of years of work experience, primary language, and participant attitude were considered. Table 4 summarizes the research design and information provided to the groups.

Table 4

*Summary of Research Design and Information Provided to All Groups*

<table>
<thead>
<tr>
<th>Group:</th>
<th>Control Group – Reading</th>
<th>Experimental Group 1 – Passive Learning</th>
<th>Experimental Group 2 – Active Learning With basic Feedback</th>
<th>Experimental Group 3 – Active Learning With elaborative feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard course readings and work</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Images Displayed</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Text or Narration</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Use of skeleton concept map</td>
<td>No</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Propositions provided</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Treatment</td>
<td>Additional Reading</td>
<td>Participants view demonstration of placing interactions onto skeleton concept map</td>
<td>Participants drag and drop interactions onto skeleton concept with limited feedback</td>
<td>Participants drag and drop interactions onto skeleton concept map with immediate feedback</td>
</tr>
<tr>
<td>Measure</td>
<td>assessment</td>
<td>assessment</td>
<td>assessment</td>
<td>assessment</td>
</tr>
</tbody>
</table>
Instructional Materials

The participants were provided the same textbook readings and online work as assigned in the course. All participants in this study first viewed a video that provided a general explanation of organizational structures streamed through KSUTube, a restricted video sharing website. A sample of this organizational structure video is shown in Figure 8 and can be accessed at https://ksutube.kent.edu/playback.php?playthis=cmc90he0j.

Figure 8. Sample of Organizational Structures Video Shown to all Participants

The control group was then provided an additional reading of 1,670 words on organizational interactions as shown in Appendix C. The three other groups were each
provided with one of the following concept mapping instructional approaches: a passive learning demonstration, an active learning drag and drop exercise with basic feedback, or an active learning drag and drop exercise with elaborative feedback. All participants in the concept map groups were able to pause, stop, and restart at their convenience. The passive learning demonstration group viewed a video with a synchronized narrative of placing the interactions to the proper level of the organization. The cursor guided their eyes to the key points described in the narration as shown in Figure 9 and can be accessed at http://ksutube.kent.edu/playback.php?playthis=84jg5910q.
Figure 9. Sample of Passive Learning Group Proposition Placement Demonstration

The participants in the active learning with basic feedback group were provided the skeleton map and propositions as show in Figure 7. This drag and drop exercise was developed with the Adobe Captivate software. Participants clicked on an interaction and dragged it over to the box where they believed it belongs between the levels. This group used active learning while they considered where to place the interactions but received
only the basic feedback of whether their selections were correct or not as shown in Figure 10. An incorrect placement would result in an audible “doink” and the proposition would return to its original position. A correct placement would result in a “ding” and the proposition would remain in the box.

Figure 10. Sample of Active Learning Group with Basic Feedback
The fourth group was similar to the third group as the participants had to use active learning to place the interactions between the proper levels of the organization. However, these participants also received elaborative feedback for each incorrect placement. The feedback included a separate tone if they positioned the proposition correctly or incorrectly and in the event it was incorrect, a red popup box also appeared providing details about the correct interaction as shown in Figure 11.

Figure 11. Sample of Active Learning Group with Elaborative Feedback
After the participants completed their treatment, they completed an assessment. The 20 questions in the assessment (Appendix D) were validated by four business professors to be appropriate assessment questions. All materials were accessed by the participants through the Blackboard Learn course management system.

Procedures

In the third week of the semester, all of the participants watched an introductory video on organizational structures. The participants were then randomly assigned to one of four groups through the randomization function in the Blackboard Learn course management system. The four groups then completed their instructional assignment as described next and summarized in Table 5:

- **Control Group**: Participants read a 1,670 word text passage on organizational structure and interactions that has similar illustrations as the experimental groups but without a concept map.

- **Passive Learning Group**: Participants viewed a multimedia demonstration on organizational structures and interactions. This was a “guided tour” of the organizational skeleton concept map with the interactions listed (Figure 9). The narrator dragged and dropped the propositions into their proper position. The narration explained why each proposition belonged between certain levels. Participants could pause, stop, or restart the demonstration whenever they chose.

- **Active Learning with Basic Feedback Group**: Participants were provided with the skeleton concept map and interactions (Figure 10). Participants of this group dragged and dropped the propositions onto the correct level of an organization.
These participants received immediate feedback whether the attempt was correct or not.

- **Active Learning with Elaborative Feedback Group:** Participants were provided with the skeleton concept map and interactions (Figure 11). Participants of this group dragged and dropped the propositions to the correct level of an organization. These participants received immediate feedback. Correct placement was signified by a “ding” sound. Wrong placement emitted a “bonk” sound and provided a popup box with detailed feedback.

Upon completing their treatment, all participants completed a 20 question assessment (Appendix D) and then an online post-test survey of the instructional approach (Appendix E).
Table 5
Summary of Groups

<table>
<thead>
<tr>
<th>Steps</th>
<th>Reading Control Group</th>
<th>Passive Learning Group</th>
<th>Active Learning With Basic Feedback Group</th>
<th>Active Learning With Elaborate Feedback Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provided general readings and lectures on organizations as part of the course</td>
<td>Provided general readings and lectures on organizations as part of the course</td>
<td>Provided general readings and lectures on organizations as part of the course</td>
<td>Provided general readings and lectures on organizations as part of the course</td>
</tr>
<tr>
<td>2</td>
<td>Watch background multimedia presentation</td>
<td>Watch background multimedia presentation</td>
<td>Watch background multimedia presentation</td>
<td>Watch background multimedia presentation</td>
</tr>
<tr>
<td>3</td>
<td>Students read a passage on organizational interactions</td>
<td>Students view demonstration of organizational interactions placed onto skeleton concept map</td>
<td>Students place organizational interactions onto skeleton concept map with basic feedback</td>
<td>Students place organizational interactions onto skeleton concept map with elaborative feedback</td>
</tr>
<tr>
<td>4</td>
<td>Assessment</td>
<td>Assessment</td>
<td>Assessment</td>
<td>Assessment</td>
</tr>
<tr>
<td>5</td>
<td>Post Assessment Survey of Attitude Regarding Instructional Approach</td>
<td>Post Assessment Survey of Attitude Regarding Instructional Approach</td>
<td>Post Assessment Survey of Attitude Regarding Instructional Approach</td>
<td>Post Assessment Survey of Attitude Regarding Instructional Approach</td>
</tr>
<tr>
<td>Group Summary</td>
<td>Traditional instruction: providing information to students</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• “Guided tour” of concept map</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Passive, providing information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Dual coding, cognitive load theory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Self-regulation to start, stop, pause</td>
<td></td>
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<tr>
<td></td>
<td>• Template – simplicity and avoid split attention effect to focus students</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• No feedback</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Active learning as students place interactions on template</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Constructing, engaging, higher critical thinking skills (applying)</td>
<td></td>
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<td></td>
<td>• Self-regulation to start, stop, pause</td>
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</tr>
<tr>
<td></td>
<td>• Template – simplicity and avoid split attention effect to focus students</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Immediate but feedback limited to right or wrong</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Active learning as students place interactions on template</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Constructing, engaging, higher critical thinking skills (applying)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Self-regulation to start, stop, pause</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Template – simplicity and avoid split attention effect to focus students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Immediate and elaborative feedback for incorrect placement</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Data Collection and Analysis

This section details the design of measures, collection of the data, and analysis used in this study. The pre-treatment questionnaire is shown in Appendix B which was used to solicit the participants demographic information. The participants also completed a post-treatment survey of attitude regarding their instruction as shown in Appendix E. The primary consideration for this study is the effect of instructional treatments on subject post instruction achievement scores. The participants’ achievement score is the independent variable in the study. The 20 question assessment was developed from the 54 question assessment that was originally used in the first pilot study and then successively improved during the ensuing pilot studies. An item analysis provided through Blackboard Learn was used to evaluate how well the final pilot assessment questions were able to discriminate and their level of difficulty.

The item analysis pared down the number of questions to twenty that were good discriminators and at least moderately hard. Assessment question discrimination indicates how well a question differentiates between participants who comprehend the subject matter and those who do not. A question is a good discriminator when students who answer the question correctly also do well on the overall assessment. Values can range from -1.0 to 1.0. Blackboard Learn discrimination values are calculated using the Pearson correlation coefficient with X as the score of each student on the question and Y as scores of the participants on the overall assessment. The measure of difficulty on the other hand, is the percentage of students who answered the question correctly. Difficulty values can range from 0% to 100% with a high percentage indicating that the question
was easy. The results of the final pilot study assessment item analysis are shown in Table 6. The best assessment questions are good discriminators (greater than .3) and are not easy (greater than 80%).

Table 6

Assessment Item Analysis of Final Pilot Study

<table>
<thead>
<tr>
<th>Number of Questions</th>
<th>Discrimination</th>
<th>Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>Good Questions &gt; .3</td>
<td>Easy &gt; 80%</td>
</tr>
<tr>
<td>9</td>
<td>Fair Questions .1 to .3</td>
<td>Medium 30% to 80%</td>
</tr>
<tr>
<td>2</td>
<td>Poor Questions &lt; .1</td>
<td>Hard &lt; 30%</td>
</tr>
</tbody>
</table>

The item analysis indicated that 34 of the 45 questions were good discriminators as they had values greater than .3. There were also 18 questions out of the 45 that were “easy” as over 80% of the participants answered those questions correctly. Of the 34 discriminating questions, 14 could be eliminated as easy. The remaining 20 questions were discriminating and moderate or hard and used in this study. For future research, a principle components analysis can also be conducted on the results from this study to explore the factor dimensions.

To test the study research questions and hypotheses presented in chapter one of this paper, the subject achievement scores on the 20 question assessment were evaluated using the software program Statistical Package for the Social Sciences (SPSS) version 21. The data sets were evaluated for Levine’s test of homogeneity of variance and the Kolmogorov-Smirnov (K-S) test for the assumption of normality. A one way analysis of variance (ANOVA) of the achievement scores was conducted between the four
experimental groups at an alpha level of .05. Since a significant difference was observed between the instructional treatment groups and the control group, the null hypotheses was rejected and a post hoc Tukey Honestly Significant Difference (HSD) test was performed to identify which treatment groups differ significantly and the effect size determined by calculating partial eta squared.

An ANOVA was used to analyze the demographic data that was collected prior to the treatments and an ANCOVA on the participants’ post treatment attitude scores. The data sets were evaluated for Levine’s test of homogeneity of variance and the Kolmogorov-Smirnov (K-S) test for the assumption of normality. The pre-treatment subject demographic questionnaire (Appendix B) includes a question about the participants’ years of work experience which may be correlated with organizational understanding as described in chapter two of this paper. An ANOVA on the participants’ achievement scores and years of work experience (six categorical groups) were evaluated. Since a significant difference exists between the years of work experience (0, 1, 2, 3, 4, 5+) and the achievement scores was not found, the null hypotheses was not rejected.

Similarly, the participants’ instructional treatment attitude and their motivation were analyzed. The participants’ posttest survey of instructional treatment attitude (Appendix E) included ten questions. Question one was used to evaluate the introductory video (Figure 8) and question eight was used to evaluate clarity of instruction. Question four was negatively phrased and was coded in the opposite manner. The participants’ scores of questions two through seven plus questions nine and ten were averaged into a single subject attitude score.
The instructional groups’ attitude scores were analyzed with an ANOVA. If the F-ratio is significant, then the null hypotheses will be rejected and a planned comparison will be conducted of the control instructional group against the scores of the treatment groups (who all have concept map instruction). A planned comparison could then compare the mean of the control (reading) group with the means of the three concept map instructional groups. According to Dmitrov (2010), planned comparison tests are more powerful than post hoc comparisons. As noted in chapter two of this paper, the participants should have a significantly better attitude about the concept map instruction over traditional instruction.

Additionally, a one way analysis of covariance (ANCOVA) on the participants’ achievement scores and attitude scores were analyzed for the four groups with SPSS. Participants’ positive attitudes about their instruction should also result in higher assessment scores. If the ANCOVA is significant, a Tukey Honestly Significant Difference (HSD) test can be performed to identify which instructional groups differ significantly.

**Methodology Summary**

In this chapter, the methodology to be used to answer the research questions posited in chapter one are detailed. The instructional materials and experimental treatments have been piloted and refined several times to fully address the research questions. The final pilot subject achievement scores on the assessment were analyzed using item analysis to ensure a high degree of discrimination and difficulty. The final data study data was collected in the fall semester of 2014 was analyzed using a basic
between groups research design. In this study, using concept maps as an instructional approach were expected to result in significantly higher subject achievement scores.
CHAPTER IV

RESULTS

Introduction

The primary objective of this study was to determine the effectiveness of concept mapping as an instructional strategy for undergraduate business students when deployed in three formats. The results of the statistical analysis are presented in this chapter. The analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 21. The dependent variable in this study was the achievement score on a post instruction assessment. The independent variable was the instructional approach used with the four experimental groups: the control reading group and three groups who had concept mapping instructional approaches. This chapter begins with a summary of the participants’ demographics and is then organized by the research questions presented in chapter one.

Of the 204 students recruited from one section of an online introductory business course, 126 participated in the study and 92 completed the entire process. The students were offered extra credit to participate and further extra credit if they performed well on the assessment. The extra credit would improve their final grade by approximately one percent. The 204 students enrolled in the course were randomly assigned to one of the four instructional groups. The 126 participating participants were required to complete a demographics survey, their assigned instructional exercise, post instruction assessment, and an attitude survey. All but one subject who completed the study were familiar with
the Blackboard Learn course management system that was utilized for this research.

Table 7 displays a summary of the study participants’ demographics.

Table 7

Demographics of Participants in the Study

<table>
<thead>
<tr>
<th>Measures</th>
<th>Male 38 (42%)</th>
<th>Female 53 (58%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Language</td>
<td>English 80 (88%)</td>
<td>Chinese 11 (12%)</td>
</tr>
<tr>
<td>Age</td>
<td>Mean = 21.7</td>
<td>Median = 20</td>
</tr>
<tr>
<td>Academic Year</td>
<td>Freshman 1 (1%)</td>
<td>Sophomore 42 (46%)</td>
</tr>
<tr>
<td>Years of job experience</td>
<td>None=12 (13%)</td>
<td>1 year=12 (13%)</td>
</tr>
<tr>
<td>GPA Range</td>
<td>&lt; 2.0 = 0 (0%)</td>
<td>2.0–2.49=4 (4%)</td>
</tr>
</tbody>
</table>

Note: N=91

Of the 92 participants who completed the study, four were identified as outliers. An outlier is a score that is more than 1.5 times the interquartile range from the rest of the scores. Interquartile range is the middle 50% of the scores. Examination of these four outliers revealed one subject who scored very low and used less than one minute to complete the entire 20 question assessment and was therefore trimmed from the data set. A total of 91 participants were used in this analysis.

The achievement score descriptive statistics for the four groups are shown in Table 8. Note that the mean scores for the groups are successively larger. However, the
standard deviation was larger for the control group and was investigated with Levene’s Test to ensure homogeneity of variance. The number of participants in each group was approximately the same except the active learning with basic feedback group which was investigated with the Kolmogorov-Smirnov test.

Table 8

*Descriptive Statistics of Groups Achievement Scores*

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>14.50</td>
<td>4.627</td>
<td>22</td>
</tr>
<tr>
<td>Passive Learning</td>
<td>15.90</td>
<td>2.809</td>
<td>21</td>
</tr>
<tr>
<td>Active Learning with Basic Feedback</td>
<td>16.96</td>
<td>2.285</td>
<td>28</td>
</tr>
<tr>
<td>Active Learning with Elaborative Feedback</td>
<td>17.25</td>
<td>2.381</td>
<td>20</td>
</tr>
<tr>
<td>Total of Groups</td>
<td>16.19</td>
<td>3.266</td>
<td>91</td>
</tr>
</tbody>
</table>

Levene’s Test for homogeneity of variance indicated that variability of scores within each group was not equal, \(F(3,91) = 4.399, \ p = .006\). However, the F-test is robust to moderate violations in error variances when group sizes are approximately the same. ANOVA can therefore be used if the number of participants in each group is approximately equal, when equal is defined as the larger group size is not more than one and half times the size of the smallest group (Horn, 2014). In this study, the smallest group had 20 participants and the largest group had 28, which is within the 30 subject threshold.
The Kolmogorov-Smirnov test of normality between groups indicated that the achievement scores for the groups were normally distributed except for the active learning with elaborative feedback group (control group $p = .050$, passive group $p = .200$, active with basic feedback group $p = .072$, active with elaborative feedback group $p < .001$). Violation of the homogeneity of variance assumption has a negligible consequence on the chances for a Type I error when sample sizes are the same (Dimitrov, 2010). According to SPSS, the sample sizes are similar and therefore ANOVA can be used.

The data was analyzed for achievement scores of the four groups using a one way analysis of variance (ANOVA). The results from the one way ANOVA of achievement scores are shown in Table 9 and indicate that there is a statistically significant difference between the treatment groups, $F(3,91) = 4.399, MSe = 9.839, p = .006, \eta^2_p = .108$. This result supported rejecting the null hypothesis that the group means are equal ($H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$) and accepting the alternate hypothesis. Therefore, one or more of the treatment groups differs enough to be statistically significant. Further investigation was necessary with a post hoc analysis to identify which treatment group achievement score differences are significant.
Table 9

One Way ANOVA of Achievement Scores

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>103.800</td>
<td>3</td>
<td>34.600</td>
<td>3.517</td>
<td>.018*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>856.024</td>
<td>87</td>
<td>9.839</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>959.824</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05

The multiple comparison post hoc analysis of the groups’ achievement scores is shown in Table 10. The Tukey Honest Significance Difference (HSD) was selected at an alpha = .05 for this analysis as the sample sizes were approximately the same and the Tukey HSD is in the middle of the conservative-liberal continuum (Dimitrov, 2010). The results indicated that both of the active learning groups differed significantly from the control group, but not from the passive learning group.
Table 10

*Tukey HSD Post Hoc Analysis of Treatment Groups Achievement Scores*

<table>
<thead>
<tr>
<th>Group</th>
<th>Group</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Passive</td>
<td>.461</td>
</tr>
<tr>
<td></td>
<td>Active With Basic Feedback</td>
<td>.035</td>
</tr>
<tr>
<td></td>
<td>Active With Elaborative Feedback</td>
<td>.028</td>
</tr>
<tr>
<td>Passive</td>
<td>Control</td>
<td>.461</td>
</tr>
<tr>
<td></td>
<td>Active With Basic Feedback</td>
<td>.647</td>
</tr>
<tr>
<td></td>
<td>Active With Elaborative Feedback</td>
<td>.520</td>
</tr>
<tr>
<td>Active With Basic Feedback</td>
<td>Control</td>
<td>.035</td>
</tr>
<tr>
<td></td>
<td>Passive</td>
<td>.647</td>
</tr>
<tr>
<td></td>
<td>Active With Elaborative Feedback</td>
<td>.989</td>
</tr>
<tr>
<td>Active With Elaborative Feedback</td>
<td>Control</td>
<td>.028</td>
</tr>
<tr>
<td></td>
<td>Passive</td>
<td>.520</td>
</tr>
<tr>
<td></td>
<td>Active With Basic Feedback</td>
<td>.989</td>
</tr>
</tbody>
</table>
Hypothesis Testing – Research Question One

The first research question considered was whether passive learning when using concept map instruction has a significant impact on student achievement in comparison to traditional instruction. The results of the post hoc analysis (Table 10) indicated that concept map passive learning group achievement scores ($M = 15.90$) were not significantly different ($p = .461$) from the control reading group scores ($M = 14.50$). Participants who passively observed a multimedia video of the concept map construction did not score significantly better on the assessment than the control group who read about the interactions.

Hypothesis Testing – Research Question Two

The second research question was whether active learning with only basic feedback during concept map instruction has a significant impact on subject achievement in comparison to traditional instruction or passive concept map learning. The results of the post hoc analysis (Table 10) indicated that concept map active learning with basic feedback achievement scores ($M = 16.96$) were significantly better ($p = .035$) than the control reading group ($M = 14.50$) but not from the passive learning group ($M = 15.90$). Participants who had to complete the drag and drop concept map active learning with basic feedback assignment achieved significantly higher achievement scores than the participants who read about the interactions, but not the participants who passively observed a multimedia video of the concept map construction.
Hypothesis Testing – Research Question Three

The third research question was whether active learning with elaborative feedback during concept map instruction has a significant impact on subject achievement in comparison to traditional instruction, passive learning, or active learning with basic feedback. The results of the post hoc analysis (Table 10) indicated that concept map active learning with elaborative feedback achievement scores ($M = 17.25$) were significantly better than the control reading group ($M = 14.50$), but not the passive learning group ($M = 15.90$) or the active learning with basic feedback group ($M = 16.96$). Participants who had to complete the drag and drop concept map active learning with elaborative feedback assignment achieved significantly higher assessment scores than the participants who read about the interactions, but not the participants who passively observed a multimedia video of the concept map construction, or the participants who completed the drag and drop active learning with basic feedback group.

Hypothesis Testing – Research Question Four

The fourth research question was whether passive or active learning during concept map instruction promotes better subject attitudes about the learning of organizational structures and interactions in comparison to traditional instruction. The post instruction survey contained eight questions related to participants’ attitude about the instruction and two questions on the instructional design. The eight separate instructional attitude scores were summed into one total attitude score. As shown in Table 11, the ANOVA of participants’ total attitude score was not significantly related to their achievement scores, $F(15, 75) = .605$, $p = .862$. 
Table 11

Summary ANOVA of Achievement Scores and Total Attitude Scores

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>103.662</td>
<td>15</td>
<td>6.911</td>
<td>.605</td>
<td>.862*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>856.162</td>
<td>75</td>
<td>11.415</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>959.824</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05

The study design included an ANCOVA to be conducted for the achievement scores and instructional groups with the total of the eight attitude post instruction survey questions as the covariate. The data for the ANCOVA was first tested for assumptions of normality, homogeneity of variance, and assumption of independence. The assumption of homogeneity was violated as the covariate of total attitude scores was not related to participants’ achievement scores. Violations of the assumption of homogeneity of regression slopes pose a serious threat to the validity of ANCOVA results (Dimitrov, 2010). Therefore, the ANCOVA results would not be valid because the relationship between the achievement scores vary as the values of the covariate differ. In other words, the regression slopes of the dependent variable (achievement scores) need to be parallel to the covariate of total attitude scores. Because the assumptions of the ANCOVA were violated, this analysis was not performed on the post instruction attitude survey responses.

A Chi-square analysis was conducted for six of the attitude survey questions for each of the instructional groups. Table 12 summarizes these results. In all cases, the
hypothesis that the instructional groups are equal for the attitude questions \((H_0: \mu_1 = \mu_2)\) was not rejected as the p-values are all greater than .05. Therefore, these findings do not provide evidence that the participants’ attitude was significantly affected by their assignment to one of the instructional groups.

Table 12

*Chi-square of Post Instruction Attitude Surveys for Instructional Groups*

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Chi-square</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>12.18</td>
<td>12</td>
<td>.431</td>
</tr>
<tr>
<td>4</td>
<td>7.47</td>
<td>9</td>
<td>.589</td>
</tr>
<tr>
<td>5</td>
<td>6.26</td>
<td>9</td>
<td>.713</td>
</tr>
<tr>
<td>7</td>
<td>10.292</td>
<td>12</td>
<td>.590</td>
</tr>
<tr>
<td>9</td>
<td>8.256</td>
<td>9</td>
<td>.509</td>
</tr>
<tr>
<td>10</td>
<td>20.211</td>
<td>12</td>
<td>.063</td>
</tr>
</tbody>
</table>

The post instruction survey question number ten was, “The feedback provided during the assignment was helpful.” Only the two active learning groups received feedback during their exercise. The control reading and passive learning groups were not provided feedback. A Chi-square for question number ten comparing the two no feedback groups to the two feedback groups was not significant \(\chi^2 (4, N = 91) = 6.213, p = .184\). However, 33 of the 48 participants in active learning groups agreed with this statement (69%) while eight were uncertain (17%) and seven disagreed (15%).
Additional Analysis

Additional analysis was conducted on the demographic data collected to investigate whether the participants’ years of work experience, primary language, or cumulative grade point average had a significant effect on their achievement scores. An analysis of covariance (ANCOVA) was conducted for the four treatment groups’ achievement scores adjusted for the covariate of years of work experience. Testing for the assumption of homogeneity of regression slopes was not statistically significant \[F(14, 68) = 1.712, p = .073\]. This indicates that the group instructional treatment and the covariate of work experience do not interact and the assumption of homogeneity of regression slopes is met.

The ANCOVA shows that there are statistically significant differences on the achievement scores when controlling for previous years of work experience \[F(3, 86) = 3.693, p =.015, \eta^2 = .114\]. Table 13 summarizes the results of the ANCOVA. The strength of the relationship between the instructional treatments and the achievement scores was strong as assessed by the partial eta squared with treatment accounting for 11.4% of the variance in the dependent measure when adjusting for work experience. According to Dimitrov (2010), a medium effect size for partial eta squared is .06 while a large effect size is .14. The adjusted mean of the active learning with elaborative feedback was the largest \(M = 17.329\), the active learning with limited feedback was smaller \(M = 17.000\), the passive learning was smaller \(M = 15.793\), and the control reading group was the smallest \(M = 14.489\). A post hoc analysis could not be conducted since some of the subgroups had no participants.
Table 13

Summary One Way ANCOVA of Achievement Scores and Years of Work Experience

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>111.223a</td>
<td>4</td>
<td>27.806</td>
<td>2.818</td>
<td>.030</td>
<td>.116</td>
</tr>
<tr>
<td>Intercept</td>
<td>6549.393</td>
<td>1</td>
<td>6549.393</td>
<td>663.737</td>
<td>.000</td>
<td>.885</td>
</tr>
<tr>
<td>Years of Work Experience</td>
<td>7.423</td>
<td>1</td>
<td>7.423</td>
<td>.752</td>
<td>.388</td>
<td>.009</td>
</tr>
<tr>
<td>Group</td>
<td>109.307</td>
<td>3</td>
<td>36.436</td>
<td>3.693</td>
<td>.015</td>
<td>.114</td>
</tr>
<tr>
<td>Error</td>
<td>848.601</td>
<td>86</td>
<td>9.867</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>24803.000</td>
<td>91</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>959.824</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .116 (adjusted R squared = .075)

Although the pre-instruction demographics survey allowed the selection of four languages plus another choice of “other” language, the participants responded with only two primary languages: English (N = 80) and Chinese (N = 11). An ANOVA for participants’ primary language and their achievement scores was not significant, F(1, 90) = .480, p = .490. Subject assessment performance was not significantly impacted by their primary language.

An ANOVA for the participants’ cumulative grade point average (GPA) and their achievement scores was statistically significant, F(3, 87) = 3.015, p = .034. Participants with higher GPAs performed significantly better on the posttest assessment. A post hoc
Chi-square analysis of the group achievement scores by GPA was inconclusive because the participants were unevenly distributed and some cells were empty as shown in Table 14.

Table 14

*Distribution of Participants by Grade Point Average and Group*

<table>
<thead>
<tr>
<th>GPA</th>
<th>Control Group</th>
<th>Passive Learning Group</th>
<th>Active Learning with Basic Feedback</th>
<th>Active Learning with Elaborative Feedback</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 – 2.49</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
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<td>3.0 – 3.49</td>
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<td>3.5 - 4.0</td>
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CHAPTER V
DISCUSSION

Introduction

Business school graduates are entering a world of growing global competition, highly informed and demanding customers, and exponential advancements in technology. However, business school graduates achieve only a shallow understanding of how authority, responsibly, and accountability are organized within a company which will ultimately inhibit their careers while they learn on the job. This study examined whether concept mapping, as an instructional approach to organizational understanding, would have a significant impact on business undergraduate student knowledge acquisition. The findings related to the study research questions are discussed in this chapter and are followed by practical applications of the results and recommendations for future research.

Research Findings

The crucial hypotheses in this study of whether the active learning during concept map instruction improved subject achievement were supported. However, other study hypotheses were not supported. An ANOVA results indicated that the main effect of the instructional treatment was significant for the achievement scores between the four groups, $F(3,90) = 3.517, p = .018$. A post hoc analysis using a Tukey HSD indicated that both of the active learning concept map groups performed significantly better than the control reading group, but not the passive learning concept map group.
Two instructional design questions on the post instruction survey were included to ensure the study instructional design did not impede subject performance. The first question was, “The introductory video was helpful to understand organizational design” and only seven of the 91 participants disagreed with this statement. The second instructional design question was, “The instructions were hard to understand.” Only two of the 91 participants agreed with this statement. Both of these results help validate the study since the participants were apparently not confused by the introductory video and instructions provided.

**Research Question One**

The first research question in this study was whether passive learning when using concept map instruction has a significant impact on student achievement in comparison to traditional instruction. The attendant hypothesis that concept map passive instruction would be significantly better than a traditional reading assignment was not supported by the results. The control group was assigned a document to read similar to a business textbook reading assignment. An assigned textbook reading is an expository approach to teaching and refers to the transmission of information from expert to novice (Ormrod, 2005). Teachers using expository methods deploy strategies that include lectures, readings, and other homework assignments (de Jong, van Jooligen, Swaak, Veermans, Limbach, King, and Gureghian, 1998).

The participants in the passive learning group observed a video of placing the interactions on to the skeleton map with a synchronized audio narrative. The passive
learning participants could pause, stop, or restart the video for self-regulation. The results of the post hoc analysis indicated that concept map passive learning group achievement scores \((M = 15.90)\) were not statistically significantly better \((p = .461)\) than the control reading group scores \((M = 14.50)\). Participants in the passive learning group observing a video of the concept map construction and did not score significantly better on the assessment than the group who read about the interactions.

Therefore, just passively observing concept map construction that is similar to a student watching a TeacherTube.com instructional video was not statistically significantly better than a traditional reading assignment. However, this result should not be interpreted that a teacher should withhold an instructional concept map video in preference of a reading assignment. Possibly quite the contrary since the mean achievement score of the passive learning concept map group was higher than the control reading group. The absence of statistical significance may be accounted by the passive instruction design and deployment.

Further research should be conducted on whether improving the passive concept map instruction would improve student achievement. By further deploying the design concepts from the cognitive load theory of multimedia learning (Sweller, 1988, Mayer & Moreno, 2003, Kalyuga, 2011), the passive learning instruction may be improved to increase the participants’ achievement scores. Mayer’s theory (2001) posits that students experience meaningful learning when they select, attend, and integrate visual and auditory information with prior knowledge. In the current study, the video may have overloaded participants’ working memory who therefore attended only to either the
visual or auditory channels because they could not simultaneously process both. Participants could be better cued to pause or stop the video as necessary to process the information. The pace of the video could be slowed and nonessential audio information eliminated. Research could also investigate whether a higher fidelity of the audio would improve student achievement. In addition, the students could first be instructed on the overall hierarchical nature of the organization chart for better priming which would be particularly beneficial for low prior knowledge students.

Monitoring eye tracking during the multimedia concept map presentation could also provide clues as to why the mean student achievement score for the passive learning group were not significantly higher than the control reading group. For example, Ponce and Mayer (2014) measured participants’ eye tracking when highlighting text and using fill in graphic organizers to prime and cue student learning. They found that highlighting primes student selection while graphic organizers fixates eyes within the text. A future study could investigate whether first priming students’ attention with a description of the organizational interactions and then cueing them visually with the auditory descriptions would improve student achievement.

Mayer and Moreno proposed nine ways to reduce cognitive load in multimedia learning (2003) which could also be applied to future research on the passive group instruction. Although the passive learning group instruction did not include on screen captions, the large amount of text presented may have overloaded the participants’ visual channel. Diming some of the other text while signaling the interaction level of the organization with highlighting may reduce extraneous processing (coherence principle).
The instruction could also zoom into the selected interaction and level of the organization to remove extraneous material (redundancy principle) and give the appearance that they are presented near each other (spatial contiguity principle). An example of these ideas is shown in Figure 12. Zooming in would be especially helpful to students who view the instruction on small screens. Zooming and cueing will direct participants’ attention to reduce cognitive load to foster the principal knowledge creation. Each of these areas could be investigated in future research.

**Figure 12. Example of Passive Instruction Redesign**
 Nonetheless, passively viewing a concept map instructional video can be beneficial at some level for some students and should be considered. Instruction with supplemental video has been utilized extensively to illustrate, demonstrate, or simply improve student engagement. The key is to design and provide high quality multimedia instruction (Mayer & Moreno, 2003, Moreno, 2004, Ayers & Sweller, 2005) that fosters generative processing through conversational style voice and using visual cuing techniques as suggested by Mayer (2014). The passive concept map multimedia instruction should not replace the reading, but perhaps assigned as a complement to develop synergistic learning with other instruction. For example, having key parts of the instructional video embedded in the readings or vice versa and have the relevant readings embedded in the chart.

**Research Question Two**

The second research question in this study was whether concept map active learning with basic feedback has a significant impact on student achievement in comparison to traditional instruction. The attendant hypothesis that concept map active instruction with basic feedback instruction would be significantly better than a traditional reading assignment was supported by the results. Concept map instruction with basic feedback was significantly better than traditional instruction (p = .035). The active learning with basic feedback experimental group had higher mean achievement scores than the control group who had a reading assignment.
The second research question and attending hypothesis posited that concept map active learning with basic feedback instruction would be better than passive concept map learning was not supported. The participants in the passive learning group viewed a narrated video of the teacher correctly performing the drag and drop onto the skeleton concept map. The participants in the active learning with basic feedback group were required to drag and drop the propositions onto a skeleton concept map. Positive feedback was immediately provided with a “ding” and the proposition would remain on the skeleton map. If the proposition was incorrectly placed, the participants immediately heard a “doink” and the proposition returned to its original position.

The results of the post hoc analysis shown in Table 4-4 indicated that concept map active learning with basic feedback achievement scores ($M = 16.96$) were significantly better ($p = .035$) than the control reading group ($M = 14.50$), but not from the passive learning group ($M = 15.90$). Participants who had to complete the drag and drop active learning with basic feedback assignment achieved significantly higher achievement scores than the participants who just read about the interactions, but not the participants who passively observed a multimedia video of the concept map construction. The context of the passive instruction may not have facilitated the higher level cognitive processing required in active learning exercise.

The feedback provided in the active learning drag and drop exercise guided the participants’ knowledge creation. The basic feedback of correct or incorrect placement of the propositions allowed the participants to monitor and self-regulate their learning. Incorrect placement forced the participants to reflect on why their placement was
incorrect and consider the correct proposition placement. The participants were required to monitor their activities at a more sophisticated level than required for the more traditional expository approach.

The participants in this study that engaged in the active learning of concept map instruction acquired more knowledge than the participants who read about organizational structures and interactions or passively viewed the video. This outcome is consistent with the literature on the active learning nature of concept maps (Novak, 2002, Hay & Baker, 2008, Novak & Canas, 2008) and the higher order thinking during active learning (Bullard, Felder, & Raubenheimer, 2008, Armbruster, Patel, Johnson, & Weiss, 2009). Business professors should therefore be encouraged and supported to design and utilize concept map instruction. However, further research is necessary to determine the best means to deploy this instructional approach.

Active learning is the process of students engaging with the instructional material instead of passively receiving information from the teacher. Notably, the results of this study do not indicate that the active learning of a drag and drop exercise can supplant lectures and reading assignments. The participants in this study were also observing other management lectures and readings in their textbook as required in the course. This study establishes that the active learning of concept map drag and drop exercises can be an effective supplement to traditional instruction.

One area of further investigation could be to measure student time on task, interest, and enjoyment. Students who spend more time on a task generally have higher achievement (Stallings, 1980). Some studies have shown a moderate relationship
between engagement time and achievement (Cotton & Wiklund, 1990). In this study, the time on task was not measured and could be an indicator of the degree of active learning that occurred. The active learning of dragging and dropping onto concept maps may be especially engaging. Additional elements could make the drag and drop exercise even more engaging such as a timer and a scoreboard. These elements could provide more challenge and excitement while maintaining a meaningful and authentic learning task.

Concept map complexity could be adapted to students’ prior knowledge and measured with engagement time. In this study, a very simple hierarchical concept map was used as a result of the feedback from the pilot studies. However, students with higher prior knowledge through experience or academic preparation could be challenged with more complex maps that allow greater interaction and exploration. The early pilot studies used a progression of concept map complexity: from simple fill in the nodes to the highly complex task of drawing an extensive organizational chart from scratch. Future research could investigate whether participants engage longer with various types drag and drop active learning exercise and improve student outcomes.

**Research Question Three**

The third research question in this study was whether concept map active learning with elaborative feedback has a significant impact on student achievement in comparison to traditional instruction. The attendant hypothesis that concept map active instruction with elaborative feedback instruction would be significantly better than a traditional
reading assignment was supported by the results. However, the research questions and attendant hypotheses of whether concept map active learning with elaborative feedback was significantly better than concept map passive learning or active learning with basic feedback were not supported. The results of the post hoc analysis indicated that concept map active learning with elaborative feedback achievement scores ($M = 17.25$) were significantly better than the control reading group ($M = 14.50$), but not the passive learning group ($M = 15.90$) or the active learning with basic feedback group ($M = 16.96$). Participants who had to complete the drag and drop active learning with elaborative feedback exercise achieved statistically significant higher assessment scores than the participants who just read about the interactions, but not when compared to the participants who passively observed a multimedia video of the concept map construction or the participants who completed the drag and drop active learning with basic feedback group.

The elaborative feedback did not significantly improve the participants’ achievement scores over the passive learning or active learning with basic feedback learning. This result is not consistent with some findings in the literature (Butler & Winner, 1995, Kluger & DeNisi, 1996, Hattie & Timperley, 2007, Jonsson, 2012) and is contrary to the study hypothesis that elaborative feedback would preferentially improve achievement scores. The design issue of the elaborative feedback may have prohibited significantly higher outcomes. Although the active learning with elaborative feedback group did not perform statistically significantly better than the passive or active learning with basic feedback groups, this does not mean elaborative feedback should be excluded.
Again, possibly quite the contrary since the mean score of the active learning with elaborative feedback was the highest of the experimental groups.

Further research into the type of concept map feedback provided could be beneficial. Due to the limitations of the Adobe Captivate software used in this study, specific feedback for the correct and incorrect placement of the propositions could not be provided. Kluger and DeNisi (1996) found that both positive and corrective feedback can be beneficial to students. In this study, the only positive feedback was provided by a audio “ding”. Student attempting trial and error propositional placements may not understand why the drag and drop was successful and a short explanation may be beneficial.

Hattie and Timperley (2007) found that corrective feedback is most effective when it is provided immediately, addresses faulty concept interpretations, and provides cues. The corrective feedback provided in this study was not specific to the proposition but to the level of the skeleton organizational chart. The corrective feedback also included six explanations as shown in Figure 13 instead of one that was specific to the incorrect placement. This feedback may have been too extensive and not at all related to the incorrect placement. Corrective feedback that is timely, specific, and connects to students’ prior knowledge can increase student effort, motivation, and engagement to achieve learning outcomes. A better instructional approach would be to provide an explanation of why the proposition placement was incorrect. Future studies could investigate whether a text only feedback would be sufficient or whether a popup video would be superior.
Providing feedback was also supported by the post instruction survey. The participants were asked if “The feedback provided during the assignment was very helpful.” An ANOVA for the active learning with elaborative feedback group achievement scores was not significant for the feedback survey question $F(4,15) = 1.307$, $p = .312$. However, eleven of the 20 participants in this group agreed or strongly agreed that the feedback helped. Did the nine participants who were neutral or did not agree use small screens and could not read the feedback? Did the popup box block related
propositions? Did the participants not have enough time to decode and comprehend the feedback? These questions should be investigated in future research.

Additional factors may have also contributed to this finding on feedback that should be investigated in future research. Feedback can provide encouragement, constructive guidance, and information for self-regulation and metacognition (Kulhavy, White, Topp, Chan, & Adams, 1985, Kulik, 1988, Kulhavy & Stock, 1989, Butler & Winne, 1995, Kluger & DeNisi, 1996, Moreno, 2004). In this study, the corrective feedback was not specific to the interaction selected but to the level of the organization. For example, if the subject selected an interaction that was supposed to be between the bottom two levels of the organization but instead placed it between the top two levels, the feedback would be for the bottom two levels as shown in Figure 14. This feedback would be unrelated and therefore very difficult for novice learners to retain in working memory while trying to understand the connections between the levels of the organizational chart.
Furthermore, the corrective feedback in this study was provided in mass and not for one proposition. Each corrective feedback contained six separate items which appeared for ten seconds. Again, a novice learner would be highly challenged to retain all the information in working memory while sorting through the various pieces of feedback and attempting to understand what they did incorrectly within such a short time period. However, the ten second pause caused the screen to freeze which may have forced the participants to reflect and not just randomly attempt to answer by trial and error.
A better instructional method would be to provide proposition and organization level specific feedback when placed in the incorrect position. Research supports providing students with immediate, substantive, yet specific feedback that can be used to revise their work is the most engaging and effective (Hatie & Timperly, 2007, Jonsson, 2012). The mass corrective feedback method in this study was a limitation of the Adobe Captivate software and newer versions may allow lookup tables to provide individualized and specific feedback. Unfortunately to provide this feedback would currently require high level programming skills to create custom designed software.

The results of this study indicate that business professors should be encouraged and supported to design and deploy concept map instruction with elaborative feedback. However, the issue of return on investment must be considered. Teachers will have to decide whether the extensive time and effort required to create the elaborative feedback as utilized in this study is worth the limited gains. Future research could investigate whether specific corrective feedback to the proposition and node would improve student achievement. If immediate, individualized, and specific feedback can be effectively delivered without excessive efforts in learning programming, the gains in student achievement will be worth the effort.

**Research Question Four**

The fourth research question and attendant hypothesis was whether passive or active learning during concept map instruction promotes better subject attitudes about the learning of organizational structures and interactions in comparison to traditional
instruction was not supported. The results of the ANOVA showed that the main effect of the participants’ overall attitude about the instructional treatment did not significantly affect the groups’ achievement scores, \( F(15, 75) = .605, p = .862 \). Similarly, the Chi-square analysis for the six primary attitude survey questions did not provide evidence that the participants’ attitude was significantly affected by their random assignment to one of the instructional groups \( \chi^2 (12, N = 91) = 12.18, p = .431 \).

The overall mean attitude score of 3.8 out of 5 indicated that the participants generally had a good attitude about the concept map instruction even though their positive attitude did not significantly impact their achievement scores. Chiou (2008) found a similar positive post instruction survey response from 124 undergraduates regarding the use of concept maps to learn accounting. Additional support that the student attitudes were favorable to the concept mapping approach in this study was their opportunity to provide comments in the post instruction survey of attitude. Surprisingly, 46% of the participants (42/91) provided comments about the instruction. Typical comments were very favorable such as the following:

- “I thought this assignment provided clear directions and taught me a good amount about the organization of a business.”
- “I liked this assignment. It was informative, yet not too time-consuming. The assignment's purpose was developed and I learned what was expected. I could see myself using some of the aspects of this assignment if I ever am hired for a manager role in the future.”
- “The interactive portion (Step 4) was the most helpful part. It is where I learned the most.”
- “I liked this assignment. I haven't had an opportunity yet to see a diagram such as this in my education. This was very helpful since business management is my major.”

Therefore, the participants’ general positive attitude about the concept mapping instructional strategy supports this study hypothesis. A concept mapping approach could promote better subject attitudes about their learning over traditional instruction. This in turn may improve their achievement scores which is consistent with some of the literature (Laight, 2006, Armbruster, Patel, Johnson & Weiss, 2009, Hwang, Wu, & Kuo, 2013). Although the attitude analysis was not statistically significant, the results do suggest that business professors should be encouraged and supported to design and deploy concept map instruction.

**Additional analysis**

The additional analysis conducted on the demographic data investigated whether years of work experience, participants’ primary language, or cumulative grade point average had a significant effect on achievement scores. The ANCOVA for the instructional groups achievement scores using the covariate of years of work experience showed that there are statistically significant differences on the achievement scores when controlling for previous years of work experience, $F(3, 86) = 3.693, p = .015$, $\eta_p^2 = .114$. The fairly large partial eta squared for instructional treatment accounted for 11.4% of the
variance in the dependent measure when adjusting for work experience. According to Dimitrov (2010), a medium effect size for partial eta squared is .06 while a large effect size is .14. The adjusted means for both of the active learning groups were higher while both the control reading group and the passive learning group were lower. This indicates that the participants with more experience performed better due to the active learning in this study. Participants with more experience already had a greater understanding of organizational structures and interactions and therefore the active learning of dragging and dropping the interactions on a concept map provided these participants more meaningful learning.

This was further corroborated by the ANOVA for the main effect of participants’ years of job experience on achievement scores \([F(5,85) = 1.921, p = .099]\). Although this result did not achieve the traditional standard of \(p = .05\) statistical significance, there is still practical significance. Probability values between .05 and .10 indicate that there is limited evidence to reject the null hypothesis \((H_0: \mu_1 = \mu_2)\) and commit a type one error (Dimitrov, 2010). Prior work experience likely helped participants perform better on the assessment because they had greater prior knowledge to build upon. The ANCOVA demonstrated that the active learning groups performed better. A post hoc analysis could not be conducted since some of the subgroups had no participants. However, a future study with a larger sample size may yield a conclusive post hoc Chi-square analysis of the instructional groups’ achievement scores by work experience.

This result that prior work experience results in higher achievement scores with active learning is supported by research findings that concept maps activate prior
knowledge for more meaningful learning (Ausubel, 1968, Novak, 2002, Amadieu, van Gog, Pass, Tricot, & Marine, 2009). The practical application of this result is that previous work experience can be considered in instructional design. Participants with no or very little prior work experience may require more pre-training and scaffolding during initial instruction.

An ANOVA for the participants’ primary language and achievement scores was not statistically significant, $F(1, 91) = .480, p = .490$. The participants reported only two languages as primary: English and Chinese. Apparently the eleven native Chinese speaking participants (12%) were not impeded by the English instruction. The post instruction survey question asked all students whether “The instructions were hard to understand”. Only two of the 91 participants agreed with this statement. The instructions were therefore clear and did not impede the participants’ performance on the assessment.

Not surprisingly, an ANOVA for the main effect of students’ cumulative grade point average on their achievement scores was significant, $F(3,87) = 3.015, p = .034$. The volunteers in this study were likely higher performance oriented students because they were willing to do the extra work for the extra credit. Could these students also be good “test takers”? There were so few low GPA students in this sample (four of the 91 participants) that the Chi-square analysis was inconclusive and the effectiveness of the instructional approach by GPA could not be verified. Research indicates that lower performing students (low GPA) may benefit more from robust instruction (Bullard, Felder, & Raubenheimer, 2008, Weltman & Whiteside, 2010). A future research study with a larger sample of lower GPA students could be compared with the performance of
higher GPA students using the four instructional approaches in this study. The question remains of whether a student’s GPA is an important variable when designing concept map active learning instruction. For example, low GPA students may particularly benefit from an ARCS motivational instructional design (Keller, 1999) for this drag and drop concept map instruction. Gaining the attention of a low GPA student who understands the relevance of the instruction may attain performance gains as much as high GPA students. Furthermore, does the combination of a student’s GPA and work experience provide an indicator of the degree of scaffolding necessary? An instructor could fairly easily solicit this information and then adapt the instruction to individual students.

**Practical Applications of Results**

Uncovering the answers to the questions posited in this study would help provide further important insights for designing business courses and as a guide for future research. The primary finding of this study was that the participants engaged in the active learning during the drag and drop with feedback in the concept map exercises had statistically significantly higher achievement scores than the reading participants. This finding is consistent with the literature in regards to concept mapping, active learning, and feedback, but is unique in its application to undergraduate business students and the drag and drop function. The interactive nature of the drag and drop exercises in this study demonstrates how creating an active learning, individual exercise with feedback can enhance student learning.
The problem statement of this study was that business school graduates are underprepared for the responsibilities they will have to assume in their new managerial positions. A better instructional method is to supplement their instruction with a drag and drop exercise with a hierarchical concept map to better prepare graduates for the challenges they will face. Concept mapping can not only be used as an exercise, but integrated into the entire course. From the first day of classes, students can be provided with an advance organizer that corresponds to the concept map they will be constructing. When the professor teaches the concepts, the new knowledge can be connected by the propositions as discussed in the literature (Novak, 2008) and demonstrated in this study.

Furthermore, business schools could integrate the traditional siloed nature of courses by using concept maps to teach the interactions between academic disciplines. For example, in an economics class a concept map could show how a supply and demand curve shifts affect the financial statements in the accounting class which also influences the marketing decisions. The interaction between the three disciplines is illustrated in the Figure 15 concept map. Students who experience this integrated approach throughout their undergraduate business courses would likely develop a deeper understanding of the structures and interactions that are formed within organizations. Engaging students in higher level critical thinking through this approach should improve their learning outcomes and career success.
Figure 15. Using Concept Mapping to Integrate Undergraduate Business Coursework

Organizations can also successfully use this concept map approach. New employee orientation may be more meaningful if new personnel not only know the titles and levels within the organization, but how the departments interact. For example, the organizational chart can show that Betty Smith is not only the Chief Information Officer, but is also responsible for the payroll entry software. An employee with a payroll question could read the concept map to find the right person to ask. Furthermore, when organizations have to reorganize or undergo mergers or acquisitions, concept mapping can be deployed as a method to help distinguish new roles, responsibilities, and authority.
As identified in the literature review of this paper, there is only one previous study (Rey, 2011) on the success of utilizing drag and drop instruction. The results of the current study demonstrate the instructional efficacy of well-designed drag and drop exercises. The challenge for teachers is the return on investment of this approach as the current software is expensive, time consuming to learn, and has design limitations. However, software development may facilitate the design of drag and drop exercises to allow more extensive deployment in the future.

There also appears to be educational possibilities of “interactive concept maps.” Most concept map applications today are static where students can create a concept map on paper or complete teacher provided maps. An interactive concept map would have embedded links to navigate between definitions, concepts, and propositions with rich content that allows students better self-regulation and metacognition. This technology is just now emerging. Future instructional designs could include highly interactive concept maps that use artificial intelligence to guide students and adapt to their level of knowledge creation. To begin the instruction, the student could enter their cumulative GPA and years of work experience to inform the intelligent tutor how much scaffolding is necessary.

The highly interactive instructional concept maps could also provide timely cues, chunking, feedback, and personalized stimuli to help students self-regulate, increase intrinsic motivation that promotes more active and meaningful learning, and improves their metacognition. Businesses are now beginning to use interactive organizational charts to inform employees about leadership teams. Click on these links to see examples
Employee’s Responsibilities, Leadership Responsibilities which could also be linked to a video greeting. The interactive organizational chart could also be setup to allow clicking in the lines to describe various responsibilities.

A concept mapping strategy that is adopted throughout the curricula of undergraduate business programs may amalgamate the traditional course silos. By integrating the concept mapping instructional approach, students’ knowledge comprehension and acquisition may be enhanced as they progress from the foundational business courses such as introduction to accounting through their advanced managerial accounting, marketing, and finance courses. Additionally, this approach could also be used in businesses for new employee orientation, reorganization training, and merger and acquisition rollout. Ultimately, employing concept mapping may allow business schools to better achieve their educational goals, graduates to prosper, and businesses to rapidly adapt and respond to changing environmental conditions. Technological advancements could unveil the larger potential of concept mapping to improve instruction in many subject areas as well as throughout the entire educational system.

Limitations

Threats to internal validity for this study were controlled by randomly assigning students to the control or experimental groups. This increased the likelihood that the results can be interpreted by evenly distributing students with more work experience and therefore prior knowledge of organizations (Wierma & Jurs, 2009). The primary threat is to external validity and therefore lack of generalizability is due to the convenience
sampling of business students enrolled in one section of a course at a Midwestern university. These students may have particular characteristics that are not prevalent at other universities. Furthermore, nearly all of these students were traditional sophomores or juniors, so the results cannot be generalized to all other student types. Although well designed, the subject achievement scores on the assessment may not fully reflect their learning of the information due to English as a second language or other possible confounding variables that are considered and controlled in this study with the random assignment. Finally, students who participated were enticed with extra credit and may have been more interested in their academic performance over the students who did not choose to participate.

The course used in this study was 100% online and the use of particular software and the Blackboard Learn course management system imposes certain design restrictions. Degree of familiarity with Blackboard Learn may have been a confounding variable. Subject interaction with the instructional material varied by the time of day and setting. Participants may have been challenged with technical issues such as interface, hardware, and software compatibility. For example, students may use Apple computers versus Windows based or other operating system computers and even use different web browsers. The video introduction for example, may make the sound and screens appear differently depending on the hardware and settings used by the participants. A very small screen may make the font difficult to read. Although the time on instructional task is designed to be approximately the same, some students may have hurried through the exercises while others lingered. Students may also have the volume turned off or have
difficulty with the pop-up feedback windows. Nonetheless, the sound design and methods used in this study provided results that can be interpreted with a high degree of certainty.

**Recommendations for Future Research**

The results of this study have shown that an active learning concept map instructional approach can have a significant impact on undergraduate business student achievement. However, there are several additional questions that would be very beneficial to investigate. As stated earlier, would student performance improve with passive concept map instruction that is designed better? The literature suggests that better multimedia design should improve working memory utilization, encoding, and retention (Mayer & Moreno, 2003, Mayer, 2014,).

This study also leaves open the question of how much does previous work experience influence learning in business courses and how to better design concept map instruction to provide adaptive scaffolding for differences in prior knowledge. In active learning of business organization and structures, how much, if any scaffolding is necessary for students with a myriad of work experiences and at what point can it be removed? Another important research question is whether the same active learning approach used in this study would result in higher student performance with more complex organizational charts.

The issue of feedback needs to be further investigated. First, does specific, constructive feedback improve achievement with drag and drop exercises? The research
supports this idea (Valdez, 2012). In their study on 60 undergraduates, Ruf and Ploetzner (2014) found statistically significant and large effect sizes that students take advantage most of computerized learning aids that are dynamically presented, less when they are statically presented, and least when presented in collapsed form. A future study could investigate whether this effect improves student achievement on the active learning concept map organizational chart used in this study. Providing specific feedback that is adapted to the individual student utilizes artificial intelligence to create a database on students to generate future lessons. The limitations and cost of the necessary software and hardware currently dissuade this degree of tailoring, but remains an exciting frontier for educational research.

Next, a measure for the time on task could provide an indicator of interest, intrinsic motivation, and learning. A student who is attending longer to an instructional task is engaged and likely learning more. Learning takes time (Baum and McPherson, 2012). Many studies have shown a positive relationship between time on task and learning since Chickering and Ehrmann’s fifth principle for good Practice in undergraduate education (1987) is to emphasize time on task. However, time on task study results vary possibly because of other variables such as prior knowledge and quality of time spent. A future research study could investigate whether students who spent more time on the drag and drop concept map exercise had higher achievement. The action of dragging and dropping propositions to the proper level of the organizational chart appears to be engaging while stimulating higher level cognition. An important question is whether low achieving students are just trying to quickly finish the exercise
by trial and error while the higher achieving students are engaged in higher level thinking.

Another area for investigation of the drag and drop exercise on an organizational chart is whether gamification would improve student achievement. Gamification is the use of gaming theory to engage students in problem solving (Huotari & Hamari, 2012). Gaming can stimulate curiosity, provide challenge, and feedback while allowing a low risk trial and error approach (Gee, 2003, Tuzun, 2008, Rey, 2011). Adding a scorecard on the front page of the drag and drop concept map exercise may improve student performance according to gaming theory (Tüzun, Yilmaz-Sollu, Karakus, Inal, & Kizilkaya, 2008). Wrong answers might result in a penalty while correct answers increase a score. Students could also be challenged with increasing levels of difficulty as their performance improves. Students may find this intrinsically motivating which will allow students to apply their knowledge and reinforce their learning (Gamlath, 2009).

Another important question is how well do the various types of concept maps delivered through drag and drop work for low versus high performing students? This study may have attracted the higher performing students with the offer of extra credit. Research suggests that low performing students would also do well with a concept map drag and drop exercise (Moreno, 2004, Bullard, Felder, & Raubenheimer, 2008, Weltman & Whiteside, 2010). Another question is whether higher achievement on active learning concept map assignments also translates into higher final course grades. Furthermore, can the results of this study be extended to other areas of the undergraduate business curriculum or to other fields with a variety of different topics? The answers to all of
these questions may ultimately inform the research literature and provide guidance for the development of instructional materials.

**Conclusion**

This study demonstrated that concept map active learning with immediate feedback through a drag and drop exercise can be an effective instructional tool for undergraduate business majors. This study also agrees with Kincin’s (2014) review of concept mapping studies in higher education that it is an effective tool when combined with complementary instructional activities. Furthermore, the drag and drop exercise in this study did not require any pre-training and was positively received by the participants. This finding is important because no previous research has investigated whether drag and drop exercises or concept map instruction can improve business undergraduate knowledge acquisition of organization structures and interactions.

As the global pace of business continues to accelerate, a new instructional approach about business organization, structures, and the interactions is necessary to facilitate the success of business school graduates. Designing and deploying a sophisticated drag and drop exercise currently demands a high degree of programming skill and a great deal time which may be prohibitive in most circumstances. However, with continued technological developments and additional research there is a strong likelihood that in the near future there will be even more means to effective deploy the drag and drop concept map instruction. Significantly, this concept map instructional approach may help fulfill the recommendations of the AACSB (2013) that business
schools need to respond to the changing needs of businesses and provide relevant knowledge in undergraduate business student instruction. In the future, undergraduate business students will likely use dynamic drag and drop exercises as authentic learning environments to better prepare them to succeed in the rapidly evolving knowledge economy.
APPENDICES
APPENDIX A

INFORMED CONSENT FORM
Appendix A

Informed Consent Form

Informed Consent to Participate in a Research Study

Study Title: Efficacy of Concept Mapping Instructional Techniques to Teach Organizational Structures and Relationships

Principal Investigator: Scot Tribuzi

You are being invited to participate in a research study. This consent form will provide you with information on the research project, what you will need to do, and the associated risks and benefits of the research. Your participation is voluntary. Please read this form carefully. It is important that you ask questions and fully understand the research in order to make an informed decision. You may receive a copy of this document upon request.

Purpose:
This study is investigating the possible benefits of whether concept mapping as an instructional technique for organizational understanding that is deployed as passive learning, active learning with basic feedback, or active learning with elaborative feedback has a significant impact on student achievement. Concept mapping helps students clarify the concepts and their relationships by using graphic lines and boxes. By conducting this research, the researcher hopes to find evidence of the effective uses of concept mapping strategies in facilitating learning and their relationship with prior knowledge.

Procedures
If you choose to participate in this study, you will complete a 30-45 minute instructional activity on the structures of business organizations and the interactions between levels within the organization. The study will begin by asking you to complete a demographic survey. After you have completed your instruction, you will complete assessment that reflects your understanding of the material presented and a survey of your attitude concerning the instruction.

Benefits
This research will increase your knowledge of the topic of the instructional materials used in the experiment. Additionally, your participation in this study will help us to better understand how to design business student instruction.

Risks and Discomforts
There is no known risks in participating in this study beyond those encountered in everyday life. Additionally, participation in this research study will not have any negative
impact upon your relationship to any division of the University. Your participation in this study will count towards course credit. You may choose to opt out of this study and take on an alternate assignment covering similar instructional materials at any time.

**Privacy and Confidentiality**
All participant information will be kept in strict confidentiality. Participant names will be recorded for the purpose of receiving credit for participation as required by your degree program. All of your work will remain confidential.

**Compensation**
Course extra credit will be provided based upon your participation in this study. An alternative instructional task of equal value will be provided for you if you opt out of participating.

**Voluntary Participation**
Taking part in this research study is entirely up to you. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. You will be informed of any new, relevant information that may affect your health, welfare, or willingness to continue your study participation.

**Contact Information**
Please address any questions to the primary researcher, Matthew Williams. If a different individual is proctoring this experiment, you may ask them questions; address any questions that they cannot answer to Matthew Williams. If you have any questions or concerns about this research, you may contact:

Principle Investigator: Scot Tribuzi, Ph.D. Candidate
Phone: 330-350-1696 Email: stribuzi@kent.edu

This project has been approved by the Kent State University Institutional Review Board. If you have any questions about your rights as a research participant or complaints about the research, you may call the IRB at 330.672.2704.

**Consent Statement and Signature**
I have read this consent form and have had the opportunity to have my questions answered to my satisfaction. I understand that a copy of this consent will be provided to me for future reference. I agree to participate in a multimedia recorded instructional activity about conflict resolution as part of this project and for the purposes of peer review, course grading, and data analysis. I agree that Scot Tribuzi may review the records of this instructional activity for the purpose of data analysis.

_________________________________  __________________
Signature  Date
APPENDIX B

PRE-STUDY PARTICIPANTS DEMOGRAPHICS QUESTIONNAIRE
Appendix B

Pre-study Participant Demographics Questionnaire

1. Have you used Blackboard Learn in other courses at Kent State University?
   a. Yes/No

2. What is your gender?
   a. Male/Female

3. What is your age? ______

4. What is your academic year?
   Freshman, Sophomore, Junior, Senior, Other

5. How many years of job/professional experience do you have? ______

6. What is your primary language?
   a. Arabic
   b. English
   c. Spanish
   d. Chinese
   e. Other

7. What is your approximate cumulative grade point average?
   a. < 2.0
   b. 2.0 – 2.49
   c. 2.5 – 2.99
   d. 3.0 – 3.49
   e. 3.5 – 4.0
APPENDIX C

CONTROL GROUP READING
Appendix C

Control Group Reading

Understanding Organizational Structures and Interactions

The four traditional functions of management are: Planning, Organizing, Leading, and Controlling. Although these functions are interrelated, this paper is primarily about the organizing function. Organizing is defined as “A management function that involves arranging and structuring work to accomplish organizational goals” (Robbins & Coutler, 2009).

Most often, we discuss the structure of a business by looking at its organizational chart. The organizational chart depicts the positions in the firm and the way they are arranged. The organizational chart graphically shows the hierarchical authority, roles and responsibilities, functions and relations within an organization. For a new employee, the organization chart helps to understand what should happen within the firm. (The informal structure represents what is also occurring within the organization.) The boxes in the chart show the titles and the solid lines show the reporting relationships. The boxes or titles are shown in a hierarchical fashion. That means the top of the chart has the most authority and subordinates are underneath.

The sociologist Max Weber was a pioneer in organizational design with his Bureaucracy Model in 1922. Weber’s theory was that organized hierarchies are necessary to maintain order and maximize efficiency (Visitchaichan, 2003). Key to Weber’s theory is a division of labor and authority to control human resources which are arranged to achieve specific goals. Activity within the organization is therefore shaped by its formal structure. An organizational chart is used to visually depict the hierarchical structure of the business to delineate the chain of command.

It is likely that the ancient Egyptians already had a method of organizing the division of labor for their massive pyramid building projects. However the first recorded use of the organizational chart was in 1854 by Daniel McCallum, superintendent of the New York and Erie railroad company. McCallum was responsible for creating a rail line for nearly 500 miles stretching from Jersey City through Pennsylvania and New York to the shores of the Great Lakes. The essential functions of a railroad company are the coordination of the delivery of freight and people, repairing cars and track, monitoring the positions of trains. These are vastly more complicated over 500 miles than over 50 miles. Without effective organization, additional miles of track made railroads more costly to operate.

Organizational charts are helpful to show what should happen within a business. That is, who is in charge of whom and who reports to whom. They also generally show the responsibilities of all personnel and a career ladder within the organization. The lines of communication, work coordination, and decision making are also shown. Following are the uses of an organizational chart:

- Show the activities of the organization.
- Highlight subdivisions of the organization.
• Identify different types of work performed.
• Provide information about different management levels.
• Show the lines of authority in the organization and the flow of organizational communications.

However, organizational charts do not show a number of activities within a business. Following are not typically shown:
• Salary information
• Job duties and requirements
• Informal group leaders
• All jobs within a business

The levels of management in an organizational chart are indicated by the number of horizontal layers in the chart. All persons or units that are at the same rank and report to the same person are on one level. Managers are acutely aware of these levels and the interactions between the levels. Subordinates are encouraged or even required to work as part of team. The more layers in an organizational chart, the more necessary which slows down the decision making process and make the company less responsive to a changing environment. The organizational chart also shows the degree of customer focus - how removed are the decision makers from the customer.

Small organizations have simple, flat organizational charts. This means there are fewer layers in the chart. Each person in a small organization is usually responsible for a wide range of activities and responsibilities. As the organization grows, each of the employees becomes more specialized. This is considered the division of labor. As the groups of employees become more specialized, then there are more levels in an organizational chart. Each employee then reports up to a manager who is responsible for hiring, evaluating, and firing employees.

The number of employees reporting to each manager is called the span of control. Hierarchy is related to the span of control. When spans are narrow the height of the hierarchy will be large (tall). When spans are wide, the height of the hierarchy will be low (flat). Depending on the skill levels of the employees, the territory or geography covered, and the degree of specialization, the number of employees reporting to one manager can vary a great deal. Large spans of control can make one of the other functions of management, coordination very challenging. Following is a list of factors that influence the span of control:

• Competence of supervisor and subordinates
• Physical dispersion of subordinates
• Extent of non-supervisory work in manager’s job
• Degree of interaction required
• Extent of standardized procedures
• Similarity of tasks being performed
• Frequency of new problems
• Preferences of supervisors
• Organized labor contracts
The amount of authority of each employee can vary too depending on the organizational structure and the philosophy of senior management. Authority is the legitimate right to make decisions and to tell other employees what to do. For example, a boss has the authority to tell their subordinate what to do. The employee is then responsible to perform the assigned task. The job of vice president is responsible for several departments or small business units (SBU) and has authority over the managers of each of those departments or SBUs. Departmentalization is the lateral (horizontal) differentiation of the organization in departments. Departments are organizational units that share a common supervisor and common resources, are jointly responsible for performance, and tend to identify and collaborate with one another. The top management team has ultimate responsibility and authority over all activities of the business. This means the president has responsibility for ultimately deciding on all decisions including the strategic business plan, setting the vision of the company and approving all budgets.

Most often, senior management cannot perform all tasks within a business and needs to delegate. Delegation is the assignment of new or additional responsibilities to a subordinate. The employee is then required to carry out this assignment. However, if the subordinate is to be empowered, then they must be first trained to be competent is the new responsibility and then held accountable for outcomes. Most training in organizations is done by the supervisors since they have the most contact with front line employees who make up the largest group. Supervisors typically assign daily work assignments while managers have a longer time horizon.

Traditional organizational charts are still used in static, predictable business. If a business is in a fast changing environment like technology, then a flat, decentralized structure of business is used to be more responsive. If the environment is highly predictable, then a tall, centralized form of business is used. Managers today place a premium on agility or the authority to act fast to meet customer demands and respond to environmental changes. Past mistakes are quickly corrected and plans made for a rapidly changing environment. Centralized means authority and decision-making remains at the top of the organization. Decentralized authority means decision-making is delegated down to the lower levels of management. Today the trend is toward more decentralized organizations.

The fast paced global business environment today requires organizations to be nimble and responsive. Managers and staff need to deal with large, complex information loads while making decisions that have a high degree of uncertainty. Multiple stakeholders require managers to be adept at planning, organizing, directing and controlling. Constant change in technology, regulations, and consumer demand requires managers to also have agility in decision making, adaptability, and innovation. Businesses today are generally leaner, more agile, and continually reorganizing to respond to competition or gain market advantage which blurs traditional functional boundaries.

Organizational design continues to be one of an important and challenging demand on top management, because it influences and interconnects the business and corporate strategy, marketing, decision-making, communication, finance and investing, and leadership within any organization. And organization charts will continue to play a
major role in this process, although they may look quite differently from the traditional
tree-like forms of the past. Simply because people can more quickly absorb information
when it is shown in a graphical way.

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Administration, 2, 127-146.
APPENDIX D
ASSESSMENT QUESTIONS
Appendix D

Assessment Questions

1. Which of the following positions in an organization has final budget approval:
   a. Company President
   b. Vice President
   c. Manager
   d. Supervisor
   e. Front Line Employee

2. Centralized authority is commonly found in companies that ________.
   a. face stable, predictable environments
   b. face unstable, unpredictable environments
   c. are very large in size
   d. must be responsive to change

3. Tall organizations have many levels of management which slows decision making.
   True
   False

4. Everyday social interactions among employees that transcend formal jobs and job interrelationships are called the ________.
   a. formal organization
   b. informal organization
   c. gossip structure
   d. production organization

5. At Chaparral Steel, some employees transport scrap steel while others operate shredding equipment. This is an example of ________.
   a. Departmentalization
   b. Specialization
   c. Functionalization
   d. Responsibility

6. A business organization is ____________________.
   a. The physical location where people work
   b. A collection of individuals working for the same company
   c. A deliberate arrangement of people to accomplish specific purposes
   d. A group of individuals focused on profit making for their shareholders
7. Reporting relationships within the company shown on the organizational chart as solid lines are defined as the ________.
   a. mission statement
   b. chain of command
   c. lines of responsibility
   d. grapevine

8. The specification of the jobs to be done within an organization and the ways in which those jobs relate to one another is called ________.
   a. scientific management
   b. a mission statement
   c. job specialization
   d. organizational structure

9. Which of the following positions in an organization conducts most of the training and holds employees accountable:
   a. Company President
   b. Vice President
   c. Manager
   d. Supervisor
   e. Front Line Employee

10. At McDonald's, most advertising is handled at the corporate level, and any local advertising must be approved by a regional manager. McDonald's is an example of a(n) ________ organization.
    a. Authoritarian
    b. Committee
    c. Decentralized
    d. Centralized

11. Which of the following best describes responsibility?
    a. the power to make the decisions necessary to complete a task
    b. the liability of subordinates for accomplishing tasks assigned by managers
    c. the number of people supervised by one manager
    d. the duty to perform an assigned task

12. In tall organizations, span of control tends to be ________.
    a. short
    b. tall
    c. wide
    d. narrow
13. In a(n) _______ organization, most decision-making authority is held by upper-level managers.
   a. democratic
   b. free-reign
   c. centralized
   d. decentralized

14. Which of the following positions in an organization is responsible for hiring and firing most of the employees:
   a. Company President
   b. Vice President
   c. Manager
   d. Supervisor
   e. Front Line Employee

15. Which of the following clarify structure and show employees where they fit into a firm's operations?
   a. Departmentalization
   b. Delegation
   c. Organizational charts
   d. Mission Statement

16. Which of the following positions in an organization delegates daily work assignments:
   a. Company President
   b. Vice President
   c. Manager
   d. Supervisor
   e. Front Line Employee

17. The number of people managed by one person is called the manager's ________.
   a. authority
   b. responsibility
   c. span of control
   d. line authority

18. Jack Welch, former CEO of General Electric, stated, "If you don't let managers make their own decisions, you're never going to be anything more than a one-person business." Welch was likely a proponent of ________ management.
   a. authentic
   b. decentralized
   c. linear
   d. centralized
19. When an employee is delegated the authority needed to make decisions that would otherwise be made by managers, it is known as:
   a. Strategic Planning
   b. Executive Decision
   c. Cost Benefit Analysis
   d. Empowerment
   e. Bureaucracy

20. In a centralized structure, most decision-making authority is delegated to the lower levels of management of an organization.
   True
   False
APPENDIX E

POST TEST SURVEY OF INSTRUCTIONAL TREATMENT ATTITUDE
Appendix E

Post Test Survey of Instructional Treatment Attitude

Please indicate whether you disagree or agree with the following statements. Your feedback is very helpful to improve the assignment you were given.

Your answers are strictly and completely confidential.

1. The introductory video was helpful to understand organizational design.
   | Strongly | Strongly | Disagree | Disagree | Uncertain | Agree | Agree |

2. The assignment made me think deeply about how organizations are structured.
   | Strongly | Strongly | Disagree | Disagree | Uncertain | Agree | Agree |

3. I found the assignment to be a complete waste of time.
   | Strongly | Strongly | Disagree | Disagree | Uncertain | Agree | Agree |

4. After this assignment, I have a better understanding of what happens in organizations.
   | Strongly | Strongly | Disagree | Disagree | Uncertain | Agree | Agree |

5. The assignment was helpful to understand the interactions that happen in an organization.
   | Strongly | Strongly | Disagree | Disagree | Uncertain | Agree | Agree |

6. I can see how the assignment will help me in my career.
   | Strongly | Strongly | Disagree | Disagree | Uncertain | Agree | Agree |

7. I worked harder on this assignment than most assignments.
   | Strongly | Strongly | Disagree | Disagree | Uncertain | Agree | Agree |
8. The instructions were hard to understand.

   Strongly             Strongly
   Disagree             Disagree
   Uncertain            Agree
   Agree                Agree

9. The assignment helped me better understand the interactions between the management levels in an organization.

   Strongly             Strongly
   Disagree             Disagree
   Uncertain            Agree
   Agree                Agree

10. The feedback provided during the assignment was very helpful.

    Strongly             Strongly
    Disagree             Disagree
    Uncertain            Agree
    Agree                Agree

Please share any additional comments:
REFERENCES
REFERENCES


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Paul.


