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Supplemental Instruction and the Promotion of Construction of Knowledge

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Walden University
2017

Abstract

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by

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MS, Wright State University, 2010

BS, Central State University, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Supplemental instruction (SI), a peer assisted learning model, improves course

performance, retention, and graduation rates of post-secondary education students.

Researchers have questioned if the success of SI is due to students becoming more aware

of assessment demands or if SI also promotes construction of new knowledge. The

purposes of this case study were to describe techniques utilized by SI peer leaders,

explore how sociocognitive learning techniques are implemented, and explore the

perceptions of supplemental instruction program stakeholders regarding sociocognitive

learning techniques. The research questions focused on what techniques peer leaders are

trained to implement and what peer leaders' perceptions of sociocognitive learning

techniques are. Piaget's theories on cognitive conflict and construction of knowledge,

Vygotsky's theories on zone of proximal development and sociocognitive learning, and

Chi's framework on interactive learning provided the conceptual framework for the

study. The case study was conducted at a Northeast United States community college,

using interviews with SI administrators and peer leaders ($n = 8$), voice recordings of SI

sessions, and review of training material. The constant comparative method analysis of

findings suggest that peer leaders trained in traditional tutoring and sociocognitive

learning techniques promote construction of knowledge, and while programmatic and

peer leader goals align with sociocognitive learning techniques, student goals do not. One

recommendation is to clarify the distinction of SI versus traditional tutoring. This study

could lead to positive social change by contributing to expanded goals of SI resulting in

enhanced quality of learning for student participants at higher education institutions.

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Chapter 1: Introduction to the Study

Low retention rates have broad implications in higher education. For the institution, they result in decreases in finances and possible threats to federal funding. For the student, low retention can mean failure to graduate resulting in student loan debt with no return and loss of employment opportunities. For the 2004-2010 graduating cohort, the National Center for Education Statistics 6-year completion rate was only 29.4% (NCES, 2015a). At the 2-year college level, the completion rate was 59.2% within 3 years for the 2003-2006 cohort (NECS, 2015b). In response, colleges and universities have made efforts to increase the retention and graduation rates of students.

Supplemental instruction (SI) is a student support model that utilizes academically successful students as peer leaders. These peer leaders hold voluntary, structured study sessions for students enrolled in high-risk courses, such as first-year courses and courses considered gatekeeper courses, as well as courses that are more specialized. For example, many first-year math, science, or English courses are considered high-risk courses. Moreover, high-risk courses are generally defined as historically difficult courses with a rate of 30% or higher D, F, or withdrawal final grades (Arendale, 1997; Dawson, van der Meer, Skalicky, & Cowley, 2014).

Studies have linked SI to course performance, persistence, and graduation rates (Arendale, 1997; Martin & Arendale, 1993; Dawson et al. 2014). However, recent studies have shown that the positive outcomes may be due to SI peer leaders promoting more awareness of assessment demands (Ashwin, 2003) rather than promoting construction of new knowledge and critical thinking skills (Berghmans et al., 2014; Shaw & Holmes, 2014). Several studies have reported differing goals of SI programs among various

stakeholders. According to the originators of SI at the International Center for Supplemental Instruction, the goals of SI are to improve student learning, decrease attrition rates in historically difficult courses, and increase graduation rates (Harding, Engelbrecht, & Verwey, 2011; Hurley, Jacobs, & Gilbert, 2006; Jones, 2013; Price, Lumpkin, Seemann, & Bell, 2012; University of Missouri, 2007). Other programs using the SI approach have the goal of improving student success in high-risk courses by improving students' study strategies and integrative, problem-solving, and critical thinking skills (Harding, 2011; Jones, 2013; Malm et al., 2012; Ning & Downing, 2010, Price et al., 2012). Still others have included in their goals the exchange of ideas through collaborative learning, increased self-efficacy, and bridging the hierarchical gap between students and lecturers by providing access to a near pear who can assist first-year students transitioning into college (Brown, Narin, van der Meer, & Scott, 2014; Malm et al., 2012). Notably, Berghmans et al.'s (2014) study showed that students rated peer leaders higher when they used directive instructional approaches versus methods that promote construction of knowledge and critical thinking. Thus, students may have different goals than the goals of SI programs and institutions.

Although many SI programs may have goals that extend beyond student academic achievement, there may be a misalignment between the training of SI peer leaders, which may focus on quantitative measurement of student performance goals versus the goal of promoting deeper learning. Furthermore, although SI peer leaders may have training in methods to promote construction of knowledge and critical thinking, students may influence SI peer leaders to use more directive approaches. Alternatively, SI may not

only promote student performance gains, but SI leaders may actively be using methods that promote construction of knowledge and critical thinking.

In the following chapter, I summarize aspects of a study that investigated these issues. Chapter 1 includes the background, problem and purpose statements, conceptual framework, nature of the study, definitions, assumptions, scope and delimitations, limitations, significance, and a summary of the chapter.

Background

SI has been demonstrated to be an effective student support strategy by numerous researchers since its advent at the University of Missouri-Kansas City in 1973 (Arendale, 1997; Dawson, van der Meer, Skalicky, & Cowley, 2014; Martin & Arendale, 1993). The primary difference between SI and traditional tutoring is that SI peer leaders hold voluntary, out-of-class SI sessions during which SI peer leaders facilitate collaborative learning activities aimed at reinforcing key content and strengthening the study skills of students. In a recent review of the effectiveness of SI, Dawson et al. (2014) found improvements in course achievement, retention, and graduation rates as well as positive student perceptions about their experiences in SI program. Notably, although two of the goals of higher educational institutions are deep learning and promotion of critical thinking skills, Ashwin (2003) found that positive quantitative course outcomes did not necessarily align with students' depth of learning. More specifically, Ashwin (2003) found that although the SI peer leaders initially planned for sessions to consist of discussions of difficult concepts that would result in deeper learning, the peer leaders discovered that more students attended when the sessions consisted of small group

discussions of how to answer past examination questions. Moreover, a focus group discussion in Ashwin's study indicated that the peer leaders might not have had an appreciation for discussion and construction of knowledge versus the reproduction learning style (Ashwin, 2003)

Similarly, to Ashwin's (2003) findings, Shaw and Holmes (2014) found highly positive course outcomes, persistence to graduation, and student reports of increased critical thinking skills through the participation in a SI program. However, in the second part of the study, they found that SI leaders were not using pedagogy such as Bloom's cognitive taxonomy of higher level questioning methods to elicit critical thinking, but instead, most interactions utilized lower levels of Bloom's taxonomy. This may suggest that either the peer leaders were not adequately trained on the use of higher level Bloom's tutoring methods or that the peer leaders in Shaw and Holmes' study had low expectations or definitions of critical thinking. On the other hand, Arendale and Hane's (2014) study found that students attending peer assisted learning sessions grew in critical thinking skills as well as engagement, self-confidence, and interdependence with fellow students, which suggests greater results than quantitative course outcome gains from SI-like models.

Several studies have explored varied aspects of SI delivery. Dawson et al. (2014) and McCarthy, Smuts, and Crosser (1997) conducted meta-analyses on SI studies from the mid-1990's to 2010. Numerous studies since the Dawson et al. (2014) meta-analysis have examined quantitative outcomes of SI (Grillo & Leist, 2013; Malm et al., 2012; Ning & Downing, 2010; Oja, 2012; Price et al., 2012). Some studies have explored the

relationship between peer leaders and students in relation to impact on course performance or perceptions of effectiveness of SI (Brown, 2014; Chng, Yew, & Schmidt, 2011; Couchman, 2009; Jones, 2013; Kassab, Al-Shboul, Abu-Hijleh, & Hamdy, 2006). Berghmans et al. (2014) compared students' appraisals of peer leaders using directive versus facilitative approaches during SI-like sessions. Berghmans, Neckerbroeck, Dochy, and Struven (2012) developed a typology of three approaches to SI-like group tutoring: informers, who focused on giving content information and using directive approaches; questioners, who focused on using questioning and scaffolding techniques to stimulate student construction of knowledge; and motivational organizers, who utilized a combination of structural-organizational strategies and social-motivational support in effort to maintain a social and informal atmosphere.

Problem Statement

The research studies of Ashwin (2003), Shaw and Holmes (2014), and Berghmans et al. (2014) bring to light the question of whether SI peer leader training, as well as the goals of the programs and their students, influence SI peer leaders to simply promote more awareness of what information is going to be presented on course assessments or whether SI leaders facilitate the construction of new knowledge. Though Arendale and Hanes (2014) found increased critical thinking skills in students, Ashwin (2003) and Shaw and Holmes' (2014) found that SI leaders delivered sessions using superficial instructional methods. Because of these contradictory findings, it remains unclear if SI sessions commonly lack depth and are producing positive results simply because SI leaders inform the students of what specific content will be on assessments, or if SI

sessions promote deep learning in the form of construction of knowledge. Moreover, it is unclear if the use of superficial instructional techniques in SI sessions isolated instances or a discrepancy between the SI model and the training of SI leaders, goals of SI programs, goals of students, versus the common missions of higher education institutions to encourage deep learning.

Purpose of the Study

The purpose of this qualitative case study was to describe what techniques SI peer leaders are trained to utilize in SI sessions and to explore how peer leaders apply their training to implement techniques to promote construction of knowledge. In addition, the purpose is to explore the perceptions of SI peer leaders and SI program directors about techniques that promote construction of knowledge and critical thinking about the goals of SI programs, institutions, and students.

Research Questions

1. Which techniques are SI peer leaders trained to utilize at two post-secondary institutions?

2. How do SI peer leaders apply their training to implement sociocognitive learning techniques that promote construction of knowledge at two post-secondary institutions?

3. What are the SI peer leaders' and SI program directors' perceptions of the value of the sociocognitive techniques of SI for programs, institutions, and students at two post-secondary institutions?

Conceptual Framework

I constructed the foundation of the conceptual framework for this study based on Vygotsky's (1978), theories on zone of proximal development and sociocognitive learning, Piaget's (1929, 1977) theories on cognitive conflict and construction of knowledge and Chi's framework on interactive learning provide (Chi, 2009). In this section, I apply the theory of sociocognitive learning to tutoring techniques, termed *sociocognitive learning techniques*, and I discuss the implications of sociocognitive learning techniques on ideal SI sessions. Further, I briefly describe how Chi's (2009) definition of interactive activities relates to sociocognitive learning techniques and how SI addresses Tinto's (1994) theory of student attrition. I then discuss how sociocognitive techniques impact training and delivery of SI sessions.

According to Vygotskian (1978) theory, the definition of zone of proximal development is the distance between the learning of an individual without help from an outsider and the potential learning of the individual under the guidance of an adult or more abled peer. Although Vygotsky originally introduced the theory of zone of proximal development in the context of children, the theory has also been applied in the context of SI where the SI peer leader is considered the more abled peer and the SI participant is considered the learner (Jacobs, Hurley, & Unite, 2008). Ideally, SI peer leaders can effectively assist SI participants in approaching the limits of their zone of proximal development using techniques that promote cognitive conflict and sociocognitive learning. Piagetian theory describes cognitive conflict as construction of knowledge that occurs when a learner is presented with information that does not fit into their existing

knowledge base, resulting in a disequilibrium of knowledge (Falchkov, 2001; Piaget, 1929, 1977). Vygotsky (1978) advanced the theory of cognitive conflict when he described how sociocognitive learning, or cognitive conflict in group activities, uses dialogue and discrepancies in social activities to promote construction of knowledge. The concept of sociocognitive learning can be seen in ideal SI settings whenever students are challenged to work collaboratively as peers to evaluate their perceptions and assumptions of a problem, and organize an agreed upon solution based on facts, ideas, and reasoning. According to Vygotskian theory, the dialogue, either with an equal or more abled peer is key in this exchange because it allows the internalization of the thought process, the rationale, and reasoning (King, 1997; Vygotsky, 1978). Furthermore, the dialogue present in sociocognitive learning is useful for developing critical thinking skills, negotiating meaning, reflecting on ideas, and developing new skills (Falchkov, 2001; King 1997; Vygotsky, 1978). The result of the peer interaction is the co-construction of knowledge.

Several studies have demonstrated the effective use of tutoring methodologies as sociocognitive learning techniques to promote construction of knowledge and critical thinking skills, for example: scaffolding, self-explanation, interactive activities, and collaborative learning techniques (Chi et al. 2001; Chi 2009; Chi & Hausmann, 2008; Johnson, Johnson, & Smith, 1991; McArthur, Stasz, & Zmuidzinas 1991; Topping, 1996). Chi's (2009) conceptual framework and taxonomy of interactive, constructive, active, and passive activities describe how interactive activities, which by the definition synthesized above, can be defined as sociocognitive learning techniques, achieve optimal learning goals. These techniques may also contribute to social integration of SI student

participants as they decrease social isolation, assisting students as they adjust to the college environment and high academic rigor, helping students accommodate new course content to previous learning, and adding positive peer pressure from the SI social group (Tinto, 1994). These sociocognitive techniques may additionally apply directly to the SI environment because, in theory, the use of these techniques could be the foundation of training SI peer leaders on how to run SI sessions that result in increases in construction of knowledge and critical thinking. Moreover, understanding the perceptions of SI program directors and peer leaders of the value of sociocognitive learning tutoring methodologies to the goals of SI programs and the manner that SI peer leaders implement these methodologies could be an essential key to delivering SI sessions that promote construction of knowledge and critical thinking.

Nature of the Study

In this study, I utilized the qualitative case study methodology. Yin (2003) described a case study as an empirical study of a contemporary phenomenon in the natural setting where the researcher utilizes multiple sources of data to triangulate data that are collected and analyzed in a manner that is supported by conceptual frameworks. This case study followed the constant comparison method, in which I used the conceptual framework and research questions to guide in-depth study of the interview data from the first participant (Boeije, 2002; Miles, Huberman, & Saldana, 2014; Yin 2014). Then, I examined interview data from additional participants for patterns that I identified in the first interview and identified new patterns (Boeije, 2002; Miles et al., 2014; Yin 2014).

Merriam (2009) identified the most defining characteristic of a case study as the defining or bounding of the object to be studied. The bounded system of this study was the SI program at a Northeastern U.S. community college, which I refer to as NECC in this study. The phenomena of interest were the experiences, perceptions, applications of SI peer leaders SI training, and the perceptions of four SI program administrators, three SI peer leaders, and a professor of a course supported by the SI program. I interviewed all program administrators and I selected the SI peer leaders by intensity sampling. The data collected for this study included interviews with SI program administrators, SI peer leaders, and a professor, as well as reviews of SI peer leader training material. In addition, I collected voice recordings of SI sessions and analyzed to generate frequency counts of usage of sociocognitive learning techniques according to an adaptation of pre-existing codes. These multiple data sources allowed triangulation of data. The source of the pre-existing codes was a compilation of codes used by Berghmans et al. (2012) and Abrami et al. (2015). Additionally, I included codes for techniques suggested to promote construction of knowledge by Chi, (2009), Fonseca and Chi, (2011), and McArthur, Stasz, and Zmuidzinas, (1991).

Definitions

Construction of knowledge: According to Piagetian theory, knowledge is constructed when a learner first encounters information that does not fit into her or his existing mental schema, resulting in a disequilibrium of knowledge or cognitive conflict (Falchkov, 2001; Piaget, 1929, 1977). The assimilation and accommodation of this new information can be defined as construction of knowledge (Falchkov, 2001).

Sociocognitive learning techniques: Sociocognitive learning has been described as instructional methods involving cognitive conflict in which peers use dialogue to construct new knowledge (Vygotsky, 1978). Sociocognitive techniques include methods such as scaffolding, self-explanation, interactive approaches, tutoring methodologies, and collaborative learning that have been demonstrated to promote construction of knowledge and critical thinking (Chi, 2009; Fonseca & Chi, 2011; Johnson, Johnson, & Smith, 1991; McArthur, Stasz, & Zmuidzinas, 1991; Vygotsky, 1978).

Supplemental instruction: Arendale (1997) defined supplemental instruction as a model where an academically excellent peer assists a student in a course with a history of 30% or higher D, F, or W grades in out of class study sessions. Notably, Dawson et al. (2014) found that definitions of supplemental instruction varied by institution and found that several synonyms for supplemental instruction have been used in both national and international settings:

> Extending the class, facilitated study groups, meet-up, peer assisted learning, peer assisted study sessions, peer led undergraduate study, peers assisting student success, review with a peer, structured study sessions, study group learning, supplemental instruction, supplemental learning, and supported learning groups (Dawson et al. 2014, p. 613).

Assumptions

I identified three assumptions relating to this study. The first assumption was that the participants would accurately represent their training and implementation experiences, as well as perceptions of sociocognitive learning techniques. The use of

multiple interviews of SI administrators as well as SI peer leaders using the constant comparative method allowed for thick description of the phenomena. A second assumption is that all SI peer leaders at the site were trained to implement at least some sociocognitive techniques, as is standard in most SI peer leader training. The SI directors provided the training material for review to support this assumption.

A third assumption was that the SI peer leaders were aware of the missions and goals of the institutions. Knowledge of the missions and goals of the institutions is important when determining the perceptions of whether sociocognitive techniques are in alignment with the institutional goals. Therefore, I shared the mission and goal statements of the institutions with interviewees during the interview process to ensure alignment between the assumptions and the interview questions utilized in the study.

Scope and Delimitations

The current study was limited to one site. I collected data from post-secondary SI administrators, peer leaders, and a professor at one Northeastern U.S. community college. The study was focused on sociocognitive techniques that are prevalent in the peer tutoring and SI literature base, including: working in small groups or with a partner, metacognition questioning techniques, checking for understanding without directly providing answers, encouraging self-explanation, and scaffolding and redirecting questions. Because the study only used one institution, it is limited in generalizability of results. Nevertheless, the study may contribute to the existing knowledge of information regarding the quality of learning through SI, which in turn increases the depth of the

knowledge base and increase generalizability of the current body of knowledge in the field.

Limitations

One limitation of the study was that SI student population's perceptions of sociocognitive techniques were not analyzed due to constraints on access to student populations. An additional limitation was that the voice recording data for the study was only recorded during a 1-week period at the end of the semester. Arendale and Hane (2014) showed growth in student participation and engagement in SI sessions between the beginning of the term and the end of the term. Therefore, voice recordings were collected at the end of the term. Notably, the timing of the voice recordings was partially dependent on when the internal review boards granted permission for the study. This limitation was addressed by conducting interviews and voice recording sessions and triangulating the interviews data with analysis of SI training material. A further limitation was that the SI program was in the pilot phase at the institution and many of the program boundaries and training essentials had not yet been determined. Furthermore, because the program was in the initial stages student attendance to SI sessions was low and impacted which sociocognitive learning techniques could be implemented.

Significance

This study is significant because it explored what sociocognitive techniques SI peer leaders are trained in and how they implement these techniques. This research may contribute to the development of expanded goals for SI programs or it may support the positive quantitative findings of the benefits of SI. In addition, this study may add new

qualitative dimensions in terms of perceptions of sociocognitive learning techniques that are beyond the current qualitative measures. The study findings could also lead to improvements in training that could contribute to enhancing the knowledge building capacity of SI student participants and increased retention in courses that have SI components, as well as later courses that students will enroll in at the numerous academic institutions that utilize SI. This is a social impact issue in that it addresses the tensions between academic institution's focus on test performance versus educators focus on deeper learning.

Summary

A wealth of information exists in support of SI in terms of the quantitative goals for course performance, persistence, and graduation rates (Arendale, 1997; Dawson et al. 2014; Martin & Arendale, 1993). However, information on the quality of learning through SI in terms of construction of knowledge is limited. Ideally, SI peer leaders are trained in sociocognitive learning techniques that have been shown to effectively promote co-construction of knowledge and critical thinking; however, it is not known how SI peer leaders implement this training Further, according to the perceptions of SI program administrators and peer leaders it is unknown if sociocognitive learning techniques align with the goals of SI programs and the missions of post-secondary education? The current study addressed these questions through a qualitative case study methodology that followed a constant comparison method. The study could potentially influence the training, delivery, and goals of SI programs.

Chapter 2 includes the theoretical foundation of SI including a discussion of sociocognitive techniques that promote construction of knowledge and critical thinking. In addition, Chapter 2 includes an empirical literature review of meta-analyses on the effectiveness of SI, current quantitative studies on the outcomes of SI, and studies investigating what contributes to the quality of learning, in peer assisted learning environments such as SI in terms of construction of knowledge and promotion of critical thinking.

Chapter 2: Literature Review

There is conflicting evidence regarding whether the SI model encourages construction of knowledge and promotion of critical thinking skills through sociocognitive learning techniques. Shaw and Holmes (2014) and Ashwin (2003) found that students participating in SI sessions were becoming more aware of assessment demands, but the SI sessions were not necessarily contributing to their meaningful learning. On the other hand, Arendale and Hane (2014) found that SI student participants were growing in critical thinking skills and holistic learning through participation in SI.

The purpose of this qualitative study was to determine what techniques SI peer leaders are trained to utilize in SI sessions, explore how peer leaders apply their training to implement techniques to promote construction of knowledge, and explore the perceptions of SI peer leaders and SI program directors about techniques that promote construction of knowledge and critical thinking in reference to the goals of SI programs, institutions, and students.

This chapter begins with a description of my literature search strategy followed by the conceptual framework that consists of four major theories. The first theory is sociocognitive learning. I present the theory of sociocognitive learning from the work of Piaget (1929, 1977) and Vygotsky (1978), and I describe the application of sociocognitive learning to the context of peer-assisted learning and SI (Falchkov, 2001; Jacobs, Hurley, & Unite, 2008; King 1997; Ning & Downing, 2010; Zerger, 2008). Other theoretical underpinnings of SI include collaborative learning and the positive impact of collaborative learning on construction of knowledge, critical thinking, and

interdependence (Hurley & Gilbert, 2008; Johnson & Johnson, 1991; Johnson, Johnson, & Holubec, 1988; Johnson, Johnson, & Smith, 1991). Additionally, I describe how SI is theoretically influenced by Tinto's (1994) theory of social integration, as SI addresses five of Tinto's factors of student attrition. Further, I discuss how SI draws on the theory of interactive learning, which Chi (2009) as a progression of effective learning, interactive activities are more effective than constructive, followed by active, and lastly passive learning activities. Within the conceptual framework, I also address the implementation of critical thinking interventions in higher education (Abrami et al., 2015; Niu et al., 2013). Based on the theoretical underpinnings of SI, I then identify and define several techniques that are frequently trained to SI peer leaders as either sociocognitive learning techniques or non-sociocognitive learning techniques.

The conceptual framework is followed by a review of empirical SI literature, including a review of key meta-analyses on the effectiveness of SI on which many recent SI studies are founded (Dawson et al., 2014; McCarthy, Smuts, & Crosser, 1997). Also included is a description of quantitative outcomes of current SI studies in the context of the recommendations of the key SI meta-analyses (Grillo & Leist, 2013; Malm, Bryngfors & Morner, 2012; Ning & Downing, 2010; Oja, 2012; Price, 2012). I also include an in-depth discussion on important concepts that influence the quality of learning in SI sessions, including: social and cognitive congruence, facilitative versus directive peer leadership, promotion of critical thinking during SI sessions, and SI leader's level of appreciation for construction of knowledge and promotion of critical thinking skills during SI sessions. The two concluding sections include a summary of

what is known, based on the current empirical SI research, what remains to be studied,

and a literature based rationale for my selected study approach.

Literature Search Strategy

I used the EBSCO host database for the selection of articles for both the

conceptual framework and the review of empirical literature. I conducted an initial search

during using the search terms included *tutoring,* and *higher education* and the search was

not limited by year. I later conducted an updated search of 39 databases including, but not

limited to: Education Source, ERIC, Education Research Starters, and Teacher Reference

Center. I also searched the Sage Premier database, which includes 36 academic journals.

The range in years for both searches was from 2010 to 2017 and the search terms for both

searches included: *supplemental instruction* or *peer assisted study sessions* or *peer*

assisted learning, or *supplementary education.* Also included in the search terms were

higher education and *college students*. I selected articles based on the criteria of being

studies conducted at post-secondary institutions or in first year courses. I also reviewed

literature that specifically addressed critical thinking, construction of knowledge, using

qualitative methodologies, and studies that focused on SI peer leaders. Fifty empirical

sources and 10 theoretical sources contributed to saturation in the literature review.

Conceptual Framework

In the following conceptual framework section, I define construction of

knowledge through the lens of sociocognitive learning and discuss the theoretical

foundation of SI including sociocognitive learning, collaborative learning, and social

integration. I also discuss the interactive, constructive, active, passive (ICAP) framework

as it relates to SI. This is followed by a discussion of SI as a critical thinking intervention and an evaluation of how SI techniques may be considered sociocognitive techniques. Key theorists I draw on for these discussions are Piaget (1929, 1977), Vygotsky (1978), and Chi (2009).

Construction of Knowledge and Sociocognitive Learning

Piaget theorized that the construction of knowledge occurs through cognitive conflict. More specifically, when a learner encounters unknown information, the information does not fit into their existing organization system of knowledge, or, their mental schema, resulting in a disequilibrium of knowledge (Falchkov, 2001; Piaget, 1929, 1977). The learner is able to restore equilibrium by assimilating the new information into their current understanding or accommodating the new information by modifying their current understanding.

This process defines how the learner constructs new knowledge. King (1997) explained the assimilation portion of Piaget's theory of knowledge construction as gaining understanding of new material by putting the material into the context of what is already known. More specifically, building relationships between previously known information and new information allows the assimilation, or integration of new knowledge into the knowledge base. Von Glasersfeld (1989) explained that if the assimilated knowledge is then applied to a new situation and does not produce the expected result, a disequilibrium occurs that can result in an accommodation, or cognitive change in thinking, that may lead to future assimilations. According to Piagetian theory, knowledge construction through assimilation and accommodation is supported by

cooperation between peers in the form of dialogue because interchange of ideas can prompt discrepancies resulting in conceptual disequilibrium, assimilation, and accommodation (King, 1997).

Vygotskian theory aligns with the Piagetian theme of utilizing dialogue to achieve knowledge construction. According to Vygotskian theory, cognitive conflict in group activities, termed sociocognitive learning, occurs when cognitive conflict is induced by discrepancies in social interactions (King, 1997). The concept of sociocognitive learning can be seen in classroom settings whenever students are challenged to work together as peers to evaluate their perceptions and assumptions of a problem, and organize an agreed upon solution based on facts, ideas, and reasoning.

According to Vygotskian theory, the dialogue is key in this exchange because it allows the internalization of the thought process, the rationale, and reasoning (King, 1997). Furthermore, the dialogue is useful for developing critical thinking, negotiating meaning, reflecting on ideas, and developing new skills (Falchkov, 2001; King 1997). The result of the peer interaction is that the co-constructed knowledge may be assimilated and utilized independently in future situations. The critical thinking skills and problem-solving strategies can also be accommodated in future contexts as well. In this manner, the learner is said to become self-regulating in their thinking and accessing of this new knowledge (Vygotsky, 1978).

Theoretical Foundations of Sociocognitive Learning in the SI Model

The rationale for the SI model, in its development, was pragmatically related to student achievement (Martin & Arendale, 1992). However, the SI model has many

theoretical underpinnings, including work by Piaget; Vygotsky's sociocognitive learning and collaborative learning; Tinto's student attrition; critical theory; information processing model; Dale's cone of experience; and Chi's interactive, constructive, active, passive, (ICAP) framework. The following sections will examine the theoretical foundations of the SI model.

Construction of knowledge and sociocognitive learning through SI. According to Piagetian theory, learning occurs through the assimilation of concepts followed by the accommodation of concepts into new contexts due to cognitive conflict (Piaget, 1929, 1977; Zerger 2008). This relates to a SI session in that when SI student participants engage in a cognitive conflict and an existing belief is challenged, they may be disturbed by their confusion, disequilibrium, or lack of understanding (Zerger, 2008). However, the role of the SI peer leader is to facilitate them toward a restored state of equilibrium by guiding them to question, discuss, and utilize previous knowledge in order to construct new knowledge (Zerger, 2008).

Vygotsky's (1978) theory of social constructivism adds the component of interaction through dialogue between teachers, facilitators, and students to promote cognitive conflict (Jacobs, Hurley, & Unite, 2008). Ning and Downing (2010) discussed how the disequilibrium caused by cognitive conflict through peer discussion results in inquiry-based problems solving as peers resulting in construction of new knowledge, or sociocognitive learning. Moreover, collaborating with peers allows the learner to apply facts and concepts to the unique experiences of the group (Falchikov, 2001; Ladyshewsky & Gardner, 2008). Further, SI utilizes Vygotsky's theory of zone of

proximal development, or the potential difference between what a student can learn

independently versus what they can learn under the guidance of an instructor or more

experienced peer. The more experienced peer or SI peer leader can facilitate learning by

scaffolding, or providing a framework through questioning, to guide construction of new

knowledge (Zerger, 2008).

According to the SI model, SI peer leaders push SI students to the limits of their

zones of proximal development by emphasizing difficult concepts and facilitating

collaborative activities (Zerger, 2008). Further, the SI model calls for students to

interactively critically examine texts, build conceptual relationships, and apply concepts

to a new context which could result in sociocognitive learning (Zerger, 2008).

Sociocognitive learning techniques have been described as instructional methods

involving cognitive conflict in which peers use dialogue to construct new knowledge

(Vygotsky, 1978). The SI model is founded on the Piagetian and Vygotskian theories of

cognitive conflict, assimilation and accommodation, and the zone of proximal

development, all of which result in sociocognitive learning. However, some studies have

shown that SI sessions may not pragmatically utilize all of these theories to promote

construction of new knowledge and critical thinking, but instead may promote lower

level learning skills (Ashwin, 2003; Shaw & Holmes, 2014).

Collaborative learning through SI. An additional founding theory of the SI

model is collaborative learning. According to Johnson and Johnson's (1991) study,

techniques of SI resulted in greater academic gains than students achieved working alone.

Moreover, techniques that SI students gain working collaboratively could lead to students

becoming less dependent on the SI peer leader and each other resulting in students

becoming less reliant on passively receiving information and becoming more effective

independent learners (Hurley & Gilbert, 2008). Collaborative learning may engage

higher-order reasoning and problem-solving skills because it promotes the assimilation or

accommodation of knowledge in the context of the students' own, as well as, other

students' experiences (Vorster as cited by Hurley and Gilbert, 2008). However, in order

for collaborative learning to be successfully implemented in SI, both the SI peer leaders

and students must make a paradigm shift from traditional forms of instruction to the SI

model. Jacobs, Hurley, and Unite (2008) describe how this transition can often be

difficult as students are often conditioned to passively receive instruction versus to

collaborate to construct knowledge and critically think.

Johnson, Johnson, and Holubec (1988) and Johnson, Johnson, and Smith (1991)

developed five principles that successfully promote effective groups: positive

interdependence, or each member actively contributing; face-to-face interaction;

accountability of each individual; interpersonal skill development; and group processing

of activities. The SI model is designed to promote these principles of successful groups in

conjunction with the common goal of reviewing and conceptualizing difficult course

content.

Social integration through SI. The social implications of providing a safe

environment for collaborative learning are also fundamental to the SI model. Tinto

(1994) theorized that student attrition was related to the level of social integration of a

student in the college environment. Tinto identified six factors of student attrition, five of

which are addressed by SI: social isolation, difficulties adjusting to the college environment, difficulties adjusting to high academic rigor, difficulties accommodating new course content to previous learning, and negative peer pressure from social groups (Tinto, 1994). Moreover, many students make the decision to persist or depart from college within the first few weeks of college (Tinto, 1994). This factor is addressed by SI sessions beginning the first week of class.

The ICAP Framework and Construction of Knowledge

The theory of sociocognitive learning can also be derived from Chi's (2009) conceptual framework and taxonomy that defined and provided literature-based examples of interactive, constructive, active, and passive (ICAP) activities. From the vantage point of student overt activities and corresponding theoretical cognitive processes, Chi provided empirical evidence that interactive activities provide optimal learning gains followed by constructive, active, and then passive activities. Passive activities were exemplified by Chi as the student reading a text or listening to a lecture, without overtly taking notes. Notably, Chi described the caveat that although the student may not overtly be displaying active learning they could be covertly conducting self-explanations internally, which would be an example of a constructive activity, as described below.

Chi characterized active student activities as those that involved physical action such as looking, gazing, fixating, underlining, or highlighting. In the context of SI, the SI peer leader could ask participants to gesture, point, paraphrase, repeat, or manipulate objects (Chi, 2009). Thus, in Piagetian terms, active learning refers to the assimilation of new information without accommodation.

According to the Chi's (2009) taxonomy, constructive learning is different from both passive and active learning in that constructive learning produces new content-relevant ideas that exceed the information given. In other words, constructive learning involves activities associated with accommodation, or application of content into new outputs. Self-explaining is an example of constructive activity because the student is articulating the meaning of content and elaborating on ideas that were not specifically provided. Other examples referenced by Chi included: drawing concept maps (Biswas, Leelawong, Schwartz, Vye, & Teachable Agents Group at Vanderbilt, 2005), asking questions (Graesser & Person, 1994), comparing and contrasting (Schwartz & Bransford, 1998), drawing analogies (Chinn & Malhotra, 2002), generating predictions (Klahr & Nigam, 2004). Notably, all of these techniques are appropriate for SI peer leaders to utilize when working with SI participants.

The fourth type of learning activity, interactive, involves collaboration or dialogue with another person, such as a SI peer leader, fellow student, or instructor (Chi, 2009). Chi (2009) added that interactive activities can include responding to a computerized intelligent tutoring system. A key factor of interactive activities is verbal discourse, but the interaction can also include verbal intonations and physical gestures. It is notable that not all dialogue patterns are interactive. In order to be interactive, both partners need to make substantive contributions, rather than one partner dominating and the other making superficial responses such as "ok" or "uh-huh." Furthermore, the dialogue can be classified as joint dialogue or instructional dialogue. Joint dialogue can either be sequential where knowledge is built by peers sequentially adding new statements that

from meaning (Chi, 2009). Alternatively, joint dialogue can be more overlapping in the form of co-construction of knowledge where peers complete each other's thoughts and lines of reasoning (Chi, 2009). In both cases, joint dialogue could be expected in a collaborative learning SI environment. Instructional dialogue refers to student interaction with an expert such as an instructor, more knowledgeable peer, tutor, or SI peer leader (Chi, 2009). When the interaction is with a tutor or SI peer leader, the dialogue should include substantive student responses to feedback and scaffolding resulting in guided-construction (Chi, 2009).

Interactive activities, such as activities completed during collaborative learning, can be classified as constructive if they add new outputs beyond the provided information. Importantly, Chi's (2009) taxonomy places interactive activities on a higher hierarchical level than constructive activities because interactive activities have the advantage of a partner's contributions that can contribute to co-construction by providing corrective feedback, a new perspective and may result in a new line of reasoning (Chi, 2009). Roscoe and Chi (2007) found that even when a partner is unfamiliar with concepts being presented by the less knowledgeable partner, the less knowledgeable partner can enrich the construction of knowledge in both partners by asking deep questions that encourage the more-abled partner to view current knowledge from a different perspective. In this manner, peer tutoring or SI not only enhances the construction of knowledge of the participant, it also encourages accommodation and construction of knowledge in the peer leader and results in a new shared understanding. Thus, in an interactive environment both the participant and peer leader have the opportunity to gain

new perspectives, assimilate and integrate processes, and generate shared understanding

that could be deeper than either of the pair could develop independently (Fonseca & Chi,

2011). In this sense, the interactive activities defined by the ICAP framework are direct

examples of sociocognitive learning techniques because they involve individuals working

together to construct new knowledge and enhance critical thinking skills through

dialogue.

SI as a Critical Thinking Intervention

Abrami et al. (2015) conducted a meta-analysis on the impact of instructional

techniques on students' development and increase in critical thinking skills and

dispositions, and academic achievement. The meta-analysis demonstrated that critical

thinking skills and dispositions can be effectively taught in general critical thinking

teaching sessions as well as course specific teaching sessions. Abrami et al. utilized a

definition of critical thinking that was developed by a panel organized by the American

Philosophical Association (APA):

> We understand critical thinking to be purposeful, self-regulatory judgement which
>
> results in interpretation, analysis, evaluation, and inference, as well as
>
> explanation of the evidential, conceptual, methodological, criteriological, or
>
> contextual considerations upon which that judgement is based (Facione, 1990, p.
>
> 3)

Abrami et al. (2015) described how the panel not only devised six skills of critical

thinking, which included 16 subskills, they also listed 19 dispositions of critical thinking

necessary to have the inclination to utilize the skills of critical thinking. Abrami et al.

used a three-category scheme to code whether critical thinking instruction was through:

a) dialogue, i.e. learning through multiple forms of discussion; b) authentic or anchored

instruction which involves practical application through simulations, role play, case

studies, or applied problem solving; or c) mentoring which consisted of one-on-one

interaction either of teacher-to-peer, peer-led dyads, or internship of an experienced

professional and a younger colleague. Notably, each of these methodologies can be

utilized in SI sessions. An analysis of 19 studies combining dialogue, authentic, and

mentoring instructional strategies produced the highest average effect sizes ($g+ = 0.57$, p

$< .05$) when compared to authentic instruction or dialogue used alone as instructional

strategies. However, Abrami et al. found that content-specific outcomes resulted in higher

average effect sizes than generic critical thinking ($g+ = 0.57$, $p < .05$). Thus, the

imbedding of SI in specific courses may be more effective than generic SI instruction on

methods of study skills and test taking.

Similar to the focus of Abrami et al.'s (2015) meta-analysis, Niu et al. (2013)

conducted a meta-analysis with the aim of quantitatively synthesizing literature on the

effectiveness of critical thinking interventions in postsecondary education. Niu et al.

utilized Halpern's definition of critical thinking as the aptitude to analyze, synthesize, and

evaluate information and the disposition to accommodate these skills to new contexts.

Analysis of the 40 effect sizes resulted an average effect size of 0.195, which although

small, was significant ($p < 0.001$). Niu et al. found that interventions that lasted greater

than 12 weeks, such as the duration of a semester, and programs that integrated critical

thinking interventions throughout the duration of the degree program, produced higher effect sizes versus single interventions that lasted less than 12 weeks.

Sociocognitive Learning Techniques and the SI Model

According to the theoretical foundation of the SI model, students attend regularly scheduled sessions that promote deeper learning by developing information processing and problem-solving strategies resulting in increased critical thinking skills, as well as helping students accommodate course content to personal experiences resulting in knowledge construction (Ning & Downing, 2010). The SI model calls for the integration of process and content. More specifically, SI peer leaders model effective study strategies for SI students by applying them directly to the course content with the goal of helping SI students develop effective thinking and problem-solving skills (Hurley & Gilbert, 2008; Jacobs, Hurley, & Unite, 2008; Martin & Arendale, 1992). Because SI peer leaders are fellow students and SI students are classmates, the SI session environment is less threatening than the class environment, as students do not have to fear judgement of their questions and statements by the instructor.

The SI model calls for peer leaders to guide students through collaborative learning strategies and questioning methods that help them approach the limits of their zones of proximal development and reach higher levels of learning (Zerger, 2008). The following section will describe some of these techniques and evaluate whether they should be considered sociocognitive learning strategies. As stated above, Vygotsky (1978) described sociocognitive learning techniques as instructional methods involving cognitive conflict in which peers use dialogue to construct new knowledge.

Working in small groups or with a partner. According to the SI model, students are encouraged to demonstrate, articulate, debate, and critically think about content (Hurley & Gilbert, 2008; Jacobs, Hurley, & Unite, 2008). For subjects such as mathematics and science, students can solve problems in small groups or with a partner, then demonstrate their problem-solving strategy on the board for the group (Jacobs, 2008). Students are expected to directly engage in dialogue that could result in cognitive conflict through debate. Further, when students articulate their rationale or reasoning, the act of articulation, particularly if they accommodate the information by applying new insight to a personal example, could result in construction of new knowledge. However, this technique also requires that the students remain focused on the task and may necessitate that the small groups be redirected and refocused by the peer leader if they get off track.

Metacognition. Arendale (2014) described metacognition in the context of SI as the process of students thinking about their thinking. Challenging students through questioning methods that impose cognitive conflict about how they have previously studied for exams and which methods were effective versus ineffective is an example of a sociocognitive learning technique. Alternatively, if students are simply being given study strategies without the aspect of comparing to previous experiences and dialogue between students and peer leaders, this may be assimilation, but not accommodation or sociocognitive learning.

Checking for understanding. Several researchers have studied the impact of techniques such as Socratic method and tutoring questioning techniques, for instance

open ended questions, and scaffolding to promote construction of knowledge and critical thinking (Chi 1996, 2001; Hurley & Gilbert, 2008; McArthur, Stasz, & Zmuidzinas 1990). The key aspect of these methods that makes checking for understanding through questioning methods a sociocognitive learning technique is the act of peer leaders not directly providing answers. For instance, sociocognitive methods of checking for understanding include asking for examples and deeper explanation and asking students to summarize content in their own words to encourage cognitive conflict, dialogue, assimilation, accommodation.

Scaffolding. One of the foundational learning theories of peer tutoring is Vygotsky's description of guided, or scaffolded, exploration of concepts that are unfamiliar to the student through the social and cognitive interaction with a more knowledgeable peer (Topping, 1996). Scaffolding can be viewed as a process in which a higher ability individual, such as the SI peer leader, provides initial support for a SI student within their zone of proximal development then gradually withdraws the support as the student advances toward independent application of the new skill (Harland, 2003). Harland (2003) successfully tested the use of scaffolding within student's zones of proximal development when implementing a project-based learning curriculum in a zoology course. In the study student teachers of small groups of students initially provided heavy guidance in student projects, which was gradually and successfully withdrawn. The result was positive and constructive student learning experiences.

In a tutoring scenario, scaffolding actions on the part of the tutor stimulate a student response that leads to additional scaffolding from the tutor resulting in multiple

turns of dialogue between the tutor and student (Graesser & Pearson, 1994). This example can be applied to SI in that the SI peer leader may utilize scaffolding to assist the SI student in constructing new knowledge by breaking down complex problems into smaller problems. In doing this, the SI leader directs the student through the solutions of each smaller problem by prompting the student with positive affirmation of correct answers, hints, and verbal cues so that the student is also prompted to accommodate information into another context.

      Self-explanation. Chi et al. (1989) defined the self-explanation effect as the phenomenon of improved learning when students explain what they are studying to themselves, or the generating of scattered chunks of knowledge inferences. Chi et al. (2001) and Chi (2009) speculated that the act of students answering tutor questions mimics the act of self-explanation. More specifically, the act of attempting to elucidate a concept to oneself is a constructive activity that results in learning gains, problem solving, and more accurate self-assessments (Fonseca & Chi, 2011). Chi et al. (2001) and Chi (2009) proposed that that the act of students answering tutor questions that prompt and scaffold the student provides a constructive environment similar to self-explanation that is positively associated with learning. Moreover, Chi (2009) found that the student's generation of substantive contributions, for instance, a relevant response to a tutor explanation or problem solving, were positively associated with learning. Muldner, Lam, and Chi (2014) corroborated the Chi (2009) findings in their study that compared students being tutored one-on-one to dyads of students observing and constructively discussing recorded tutoring sessions. Muldner et al. (2014) found that the number of

substantive contributions from students was positively correlated with posttest scores (r = .34, p < .01). Further, by ANOVA, the effect of the substantive contributions was significant (F (2, 45) = 19.36, ρ < .01, η^2 = .46). These findings suggest that the act of responding to tutor questions or interacting in pairs results in the construction of knowledge. Furthermore, these findings suggest that under ideal conditions, SI peer leaders can use self-explanation as a sociocognitive learning technique to promote SI participants to construct new knowledge and critical thinking skills.

Redirecting questions. During question redirection, instead of SI peer leaders directly answering questions, SI peer leaders' direct questions to other students with the goal of encouraging student interaction and increasing the opportunities for students to formulate and articulate responses through sociocognitive learning methods (Hurley & Gilbert, 2008). In addition, students may be redirected to lecture notes or the text (Arendale, 2014). Although, students may initially resent the redirection of their questions instead of the SI peer leader's immediate answer, the discomfort may decrease as the students become more familiar with the SI format (Zerger, 2008).

Wait time. Wait time is a 5 to 10 second time lapse either after a SI peer leader has asked a question or after a student has made a response. After the wait time, if the student is still unable to answer the question, the peer leader may ask a different student to respond, rephrase the question, or ask students which part of the question they are able to answer (Hurley & Gilbert, 2008). The SI peer leader may also employ scaffolding, or breaking down the question into smaller pieces to guide the students to an appropriate solution (Chi, 2001). Wait time allows students the time to critically think and articulate

well-thought-out responses (Hurley & Gilbert, 2008). Wait time can create a discomfort in the student that encourages dialogue and challenge them to construct a response that may result in construction of new knowledge.

Note comparison and analysis. According to the SI model SI peer leaders demonstrate how to effectively listen to a lecture, format, and summarize key points (Hurley & Gilbert, 2008). Another example of how note taking is used as a technique in the SI model is the practice of students working in groups to read aloud and compare notes, so that each student in the group leaves with a full set of notes (Hurley & Gilbert, 2008). Although students may engage in cognitive conflict, in that they may disagree on what points were key in the lecture, and although hearing the notes read may help students assimilate lecture material, the act of reading the notes does not necessarily promote accommodation of lecture material. This is unless students are discussing incongruences in their lecture notes and debating what is actually meant according to the text or their personal understanding.

Exam preparation and debriefing. SI peer leaders focus on exam review the week prior to an exam in order to ease student anxiety and suggest test-taking strategies. A post-exam review is conducted to help students evaluate what strategies worked effectively, which areas they were deficient in, and what types of questions the instructor asks in preparation for the next exam (Hurley & Gilbert, 2008). If the peer leader is simply working out problems and providing answers to practice questions or completed test questions, this is not an example of a sociocognitive learning method. However, if peer leaders are checking for understanding and redirecting questions, this can be an

example of a sociocognitive learning technique. Further, if students break up into small groups and split the questions up then simply show each other answers, this is not an example of a sociocognitive learning technique. However, if students working in small groups are engaging in debate about solutions to questions, this could promote cognitive conflict, assimilation, accommodation, and in effect, be a sociocognitive learning technique.

Theoretical Foundation of SI in Relation to the Proposed Study

As explained earlier, SI is founded on numerous theories, including: sociocognitive learning, collaborative learning, social integration, and the ICAP framework, and critical thinking. Through the proceeding conceptual framework, I have defined the theoretical underpinnings of sociocognitive learning techniques. In the following empirical literature review, I will report and evaluate current empirical SI literature related to the theoretical lens that I have described here.

<div align="center">

Literature Review Related to Key Concepts

</div>

The SI model has been researched for over 30 years. However, several new studies have been conducted in recent years. Many of the new studies have been formulated based on the recommendations of McCarthy, Smuts, and Crosser's (1997) meta-analysis on the effectiveness of SI, and Arendale's (1997) review of the SI model at the University of Missouri-Kansas City. In the following sections, I will discuss key meta-analyses on reported SI research studies. In addition, I will describe outcomes of recent quantitative SI studies in the context of the recommendations of McCarthy et al. (1997) and Dawson et al.'s (2014) meta-analyses. Further, I will compare studies that

relate to the quality of learning during SI sessions. Specifically, I will compare studies on

social and cognitive congruence, directive versus facilitative peer leadership, promotion

of critical thinking during SI sessions, and peer leaders' level of appreciation for

construction of knowledge and critical thinking. I will then summarize what is known

about SI based on the studies described in this essay, and I will address what remains to

be studied and provide a literature based rationale for my selected study approach.

Quantitative Methods of SI Studies Based on Meta-analyses and Reviews

Dawson et al. (2014) and McCarthy, Smuts, and Crosser (1997), and Arendale

(1997) wrote the most frequently cited meta-analyses and literature review of SI.

Moreover, the Dawson et al. and McCarthy et al. (1997) studies are foundational to the

methodologies of many SI studies published between the years of 2010 to 2016. Whereas

Arendale's study is more of a description and review of the goals, methods of operation,

and evidence of effectiveness of SI, Dawson et al. and McCarthy et al.'s studies are a

meta-analysis and a critical analysis, respectively, of SI studies conducted between the

mid-1990s and 2010. The primary methods of analysis for studies that were noted by

Dawson et al. and McCarthy et al. were quantitative in nature and looked at comparisons

of success and failure rates of students who either participated or did not participate in

voluntary SI sessions.

A sub-approach to this method was to classify students according to how many SI

sessions they attended and analyze course performance results as a separate variable.

Notably, Congos and Schoeps (1993) found that five sessions were the minimum to see a

positive effect on course performance, which addressed the arbitrary assignment of the

number of SI sessions needed to have an effect. This is contradictory to Niu et al.'s study (2013) which indicated that more sizeable effect sizes in studies of increases in critical thinking skills were calculated for studies where interventions lasted greater than 12 weeks or in studies where critical thinking interventions were embedded throughout the duration of the degree program.

Another method of evaluating SI effectiveness has been to compare course outcomes in terms of grades of SI students to grades of students prior to the implementation of SI (Dawson et al., 2014). Alternatively, specific course work or quarterly assessments of SI versus non-SI students were measured (Dawson et al., 2014). McCarthy et al. (1997) utilized a multivariate regression with the final course grade of SI students as the dependent variable, and three independent variables: the number of SI sessions attended; academic ability, as measured by marks in common courses in the curriculum; and level of preparedness, as measured by high school percentile rank and American College Test (ACT) mean composite score.

Dawson et al. (2014) and McCarthy et al. (1997) also reported on the various methods of measuring the effectiveness of SI studies. The prevailing measurement of effectiveness was final course grade, course completion, and grade point average (Dawson et al., 2014). Another method of measuring effectiveness of SI has been to calculate differences in scores between two consecutive levels English reading/writing modules (Longfellow et al., 2008). Longfellow et al. explained that traditionally students' scores for the second module decrease. Longfellow et al. found that scores of SI student participants showed a significantly lower reduction than non-SI student participants ($p <$

.05). Only one study reviewed by Dawson et al. compared SI with another form of student support in that it analyzed the effectiveness of self-monitoring and scaffolding through verbal prompts on attendance of SI versus tutoring.

Dawson et al. (2014) and McCarthy et al. (1997) criticized how several of these studies were conducted by organizations that had conflicts of interest in that they could have financial gain from the success of the SI model. Another criticism is that many findings were anecdotal and the methods oversimplified the complexity of the variables of student achievement (Dawson et al., 2014; McCarthy et al., 1997). It is now commonly known that student achievement is not only due to interventions, but also self-selection, motivation, prior achievement, and self-efficacy, among other factors (Congos and Mack, 2005; Peterfreund, Rath, Xenos, & Bayliss, 2008; Price, Lumpkin, Seemann, & Bell, 2012). Further, at-risk populations often have additional factors that contribute to achievement results. In some of the later studies motivation was addressed: some studies used motivation pre-existing motivation scales and others involved simple questioning of students about their intentions to attend SI.

Another issue that the Dawson et al. (2014) study addressed was the definition of SI. Throughout the reviewed studies, several definitions and synonyms were presented or, in some cases, a clear definition was not presented at all. This lack of a clear definition could have resulted in comparison of inequivalent programs. Furthermore, many studies did not provide the basic information that would allow other researchers to confirm results, such as: *n* values, number of SI session attendance requirements; course grade

ranges, standard deviations, collegiate academic achievement data, prior academic achievement data, and significance levels (Dawson et al. 2014).

Although some qualitative studies were included in Dawson et al.'s (2014) meta-analysis, one of the most notable criticisms of Dawson et al. and McCarthy, Smuts, and Crosser (1997) was that there was a deficiency of qualitative studies that were theoretically grounded. Both Dawson et al. and McCarthy, Smuts, and Crosser suggested mixed method approaches that used qualitative methods to add meaning to statistical data. Dawson et al. also suggested cross-institutional research collaborations in order to increase credibility of findings. Another suggestion of Dawson et al. was the qualitative measurement of specific academic skills, such as skills learned through sociocognitive learning techniques.

Quantitative Outcomes of Current SI Studies

The quantitative outcomes of SI studies have been generally positive. Malm, Bryngfors, and Morner (2012) compared students who had high attendance of SI (≥ 11 sessions) and only 3% of the high attendees did not complete the credit gain requirements to complete first academic year. This compares to 22% of students who had no attendance at SI sessions. Interestingly, in Malm, Bryngfors, and Morner's study, low academic attendance did not demonstrate significant differences in academic year credit gains compared to no SI attendees. Price et al.'s (2012) study similarly found that students who failed or withdrew from a psychology course had attended only one PASS session, supporting the recommendation of McCarthy, Smuts, and Crosser (1997) that

benchmarks of numbers of SI sessions attended be included in research, as attending low numbers of SI sessions have little effect on performance.

Malm, Bryngfors, and Morner's (2012) study did not take into account prior academic achievement and other factors which was noted by McCarthy et al. (1997) to be a consistent issue with SI research. Oja (2012), however, addressed prior academic achievement by developing a significant binary logistic regression model that used cumulative GPA and hours of SI attendance to predict term GPA (F (2, 2002) =907.17, $p<.001$). Through this model, Oja found that higher term GPA was associated with higher cumulative GPA and increased SI attendance. Oja also found a correlation between hours of SI attendance and term GPA (r=.23, $p<.001$). Similarly, Malm, Bryngfors, and Morner compared credits gained by students who had had various levels of attendance of SI sessions of up to six sessions offered per quarter. They found that students who attended ($\geq$11) SI sessions over the period of an academic year earned on average 4.8 more credits out of total possible 15 credits. Likewise, Price et al. (2012) found psychology students who voluntarily attended peer assisted study sessions earned significantly higher final grades than peer assisted study session non-attendees ($p <.01$). Specifically, 21% of peer assisted study session attendees earned A grades and 15% earned D or F grades, while no PASS non-attendees earned A grades and 40% earned D or F grades.

Malm et al. (2012) sought to minimize for differences in prior academic achievement, which is a factor that according to McCarthy et al. (1997) and Dawson et al. (2014) complicates the measurement of SI effect. Malm et al. (2012) differentiated SI attendees into groups of strong, average, and weak prior academic achievement and

found that the average academic achievement group showed the greatest academic gains compared to the SI non-attendees. Malm et al.'s study demonstrated that prior academic achievement did affect total credits earned during the first year, with students with high prior academic achievement earning the greatest average percent of credits. However, in Malm et al.'s study, students with average academic achievement who attend high numbers of SI sessions minimized the prior achievement gap and several students earned as many average credits as high prior achievement students who attended no SI sessions.

Ning and Downing (2010) also sought to measure impact of SI independent of prior academic achievement and thus used student's *A-level scores*, a standardized test given prior to entering college, to control for prior academic achievement. Ning and Downing conjectured that collegiate academic achievement is a function of academic competence, motivation, and a third component, learning competence. They described learning competence as skills in studying and knowledge construction that can be learned and developed (King as cited by Ning & Downing, 2010). Ning and Downing administered the Learning and Study Strategies Inventory (LASSI), an instrument that measured different aspects of study techniques by Likert scale, to business students prior to the start of the year and after the completion of four compulsory courses that had SI components (Weinstein & Palmer, as cited by Ning & Downing, 2010). Ning and Downing applied correlation and structural equation modeling analyses to find that learning competence influences academic achievement, after controlling for prior academic achievement ($\beta = 0.38$, $p < .001$). This effect was significant in both SI attendees and non-SI attendees, which suggested a positive causal relationship between

students' learning competence and academic performance. Ning and Downing then employed structural modeling to demonstrate that SI participation had significant direct effects on academic performance ($\beta = 0.24$, $p < .001$) and learning competence ($\beta = 0.21$, $p < .001$) and attendance to SI significantly predicted GPA ($p < .001$) after one year of compulsory courses and the results were independent of prior academic achievement.

Ning and Downing (2010) and Price (2012) were interested in sustained effects of SI. Price et al. compared early performance on psychology quizzes between PASS and PASS non-attendees and found similar average scores. However, PASS attendees earned higher average grades on the three of the five next quizzes and the cumulative final exam with moderate to large Cohen's d effect sizes ($d > .50$), suggesting PASS may have improved retention of course information through the period of a semester.

To measure self-efficacy, another factor involved in SI effect, Price et al. (2012) pre-tested students using the Self-efficacy for Learning Form (SELF) (Zimmerman & Kisantas, as cited by Price et al., 2012) prior to their first psychology quiz and post-tested students on the day of the fourth quiz. The SELF instrument asks students to indicate their self-rated ability to complete a task related to reading, taking notes, completing exams, writing, and studying (Price et al. 2012). Price et al. divided samples into high, medium, and low SELF score ranges and found that at the beginning of the term students with high and low ratings of self-efficacy are more likely to attend peer assisted study sessions, but at the end of the term self-efficacy is not a determining factor in peer assisted study session attendance.

Grillo and Leist (2013) used binary regression in their analysis of 6 years of student data collected from the University of Louisville's centralized academic support unit, Resources for Academic Achievement (REACH). The data from 11,777 undergraduate students included total number of tutoring or SI visits, race, gender, financial aid status, ACT/SAT scores, high school GPA, mean cumulative college GPA, and whether or not the student graduated. Grillo and Leist determined only race ($p < .05$), mean cumulative GPA ($p < .05$), and total tutoring or SI hours ($p < .05$) were significant predictors of graduation ($r^2 = .156$). Moreover, Grillo and Leist (2013) used mediation analysis, a method of causal modeling, to develop a model that demonstrated a significant and positive association between the of log total tutoring or SI hours and increased GPA, where increases in tutoring or SI hours were associated with increases in GPA ($p=.000$). Furthermore, a significant and positive association was found between mean cumulative GPA and likelihood of graduation ($p=.000$). The mediation analysis further suggests that there is partial mediation, which maintains that GPA accounts for some of the relationship between log total tutoring or SI hours and likelihood of graduation. These results suggest a direct relationship between increases in tutoring or SI hours and increased likelihood of graduating ($p=.000$) with a medium effect size.

Much SI literature has been produced that looks at quantitative outcomes such as course performance, retention, and graduation of SI participants versus SI non-participants. Newer studies are uniquely using methods such as binary logistic regression and correlation structural modeling to analyze how much motivation and previous achievement influence the effects of SI on course outcomes (Oja, 2012; Grillo & Leist,

2013; Ning & Downing, 2010). The use of pre-and post-tests with established

instruments is also allowing researchers to take a closer look of the different factors that

may contribute to the success of SI (Ning & Downing, 2010; Price 2012).

Quality of Learning from SI Sessions

SI research has not only been conducted using quantitative measures of course

outcomes and achievement. Per the recommendations of Dawson et al. (2014) and

McCarthy et al. (1997), several researchers have adopted qualitative and mixed methods,

in addition to quantitative methods to analyze the basis of quantitative achievement gains.

Some researchers have found that achievement gains may be due to the relationships

between SI peer leaders and SI student participants. Other researchers have questioned

student's preferences and perceptions of directively or facilitatively-tutored SI-like

sessions. Further, some researches have questioned whether SI promotes critical thinking

or construction of knowledge versus simply making students more aware of assessment

demands. In the following sections, I analyze recent literature that addresses each of these

issues.

Social Congruence

Schmidt and Moust (1995) defined social congruence in the context of peer

leaders as communication that is informal and empathetic toward students' experiences

resulting in a sociocognitive learning environment. Kassab, Al-Shboul, Abu-Hijleh, and

Hamdy (2006) found that students perceived tutors as effective if the tutors respected

students' opinions, anxieties, and could assist students with learning strategies. In the

context of SI, Kassab et al.'s study suggests that effective SI leaders will have effective

social congruence with SI participants. Further, Couchman's (2009) study of narratives of

a cohort of SI peer leaders found that the SI peer leaders, who were only one year ahead

of the SI student participants, were cognizant and empathetic to the struggles and

anxieties of SI student participants resulting in positive sociocognitive learning

environments.

On the other hand, in Brown, Nairn, van der Meer, and Scott's (2014) study of

pre-service teachers who were holding peer assisted study session leader positions, they

found hierarchal roles between peer leaders and student participants. Brown et al. found

that the peer leaders struggled to negotiate between directive teaching roles versus

facilitative peer leader roles. The disruption in social congruent relationships was

evidenced by student interviews where students never referred to peer leaders as

facilitators and instead referred to them as tutors, mentors, peer assisted study session

leaders. Likewise, the peer leaders at times referred to students as kids, young ones, and

used other expressions demonstrating a hierarchal relationship. Brown et al. speculated

that the complexity in social congruence may have been partially related to the peer

leader's roles as pre-service teachers versus near-peer roles such as in the Couchman

(2009) study.

Another example of difficulties of peer leaders managing social congruent

relationships comes from Berghmans et al.'s (2012) study which categorized behaviors of

SI-like tutors. In Berghmans et al's. case, one tutor found it difficult to encourage student

participants to stay on task because of the social congruent relationship. What is clear

from each of these studies involving social congruence is that although social congruence

may be an asset to the sociocognitive learning dynamic of SI sessions, it also could place

a demand on SI peer leaders to manage a complex dual role as educator and student.

Cognitive Congruence

Whereas social congruence represents the ability to empathize and relate to

student experiences, cognitive congruence is derived from subject-matter expertise and

social congruence (Schmidt & Moust, 1995). Subject matter expertise is knowledge that

allows tutors to effectively question students and contribute during student discussions

(Chng et al., 2011; Schmidt & Moust, 1995). Cognitively congruent peer leaders

effectively convey their subject-matter expertise in a socially congruent manner, in that

they articulate information in the language and context of the students resulting into

higher student performance (Chng et al., 2011; Schmidt & Moust, 1995). Moreover,

Schmidt and Moust (1995) defined cognitive congruence as the ability of peer leaders to

articulate themselves in relatable language to students by explaining concepts in a manner

that is easily understood by students. Chng et al. suggested that peer leaders are more in

touch with the struggles of the students and are abler to respond using prompts that are

relatable and easily understood versus lecturers who may respond on a different level

than students. In Schmidt and Moust's study of structural and correlational data with a

theoretical model of problem based learning tutorial sessions, they found that social

congruence directly impacted group interactions during the problem-solving process.

They also found that subject-matter expertise had a positive influence on student

achievement. In total, the combination of subject-matter expertise and social congruence,

or cognitive congruence, resulted in increased student group functioning which impacted

student achievement due to an increase of time spent on the individual and sociocognitive learning stages of the problem based learning process which was facilitated by peer leaders.

The ideal of sociocognitive learning strategies facilitated through social and cognitive congruence of SI peer leaders was demonstrated by Couchman's (2009) study. In Couchman's study, collaborative activities encouraged inclusiveness, engagement, and co-construction of knowledge. SI peer leaders shared a social congruence that made them insiders to the struggles of students while also seeing the perspective of lecturers and SI supervisors. Furthermore, SI student participants and SI peer leaders shared the value of mutual benefit and a building a safe community for sociocognitive learning and construction of knowledge. The peer assisted study session facilitators in Brown et al.'s (2014) also shared this sense of utilizing cognitive congruence as a resource to develop learning communities and self-efficacy in peer assisted study session students. Thus, social and cognitive congruence has been shown to contribute to a sociocognitive learning environment that may result in self-efficacy, achievement, and the building of leaning communities in SI student participants. However, further study needs to be conducted to determine if these results are consistent or site specific.

Directive versus Facilitative Peer Leadership

Brown et al.'s (2014) study focused on the challenges of negotiating directive teaching roles versus facilitative roles during peer assisted study sessions. The discourse between peer leaders and students was also discussed by Roscoe and Chi (2007) and Chi et al. (2001). Roscoe and Chi and Chi discussed how interactive patterns between tutors

and tutees can affect leaning gains. In particular Roscoe and Chi reviewed how tutors had deeper learning gains when tutors engaged in *knowledge-building* constructive interactions such as scaffolding, giving hints, skill modeling, questioning, and providing examples, versus providing long didactic explanations, or *knowledge telling*. Moreover, the amount of scaffolding interactions by peer tutors was positively correlated with the reading and listening comprehension scores of student participants in a one-to-one tutoring setting, whereas, students tutored in a knowledge-telling manner were less successful on reading and listening comprehension scores. Brown et al. (2014) found that students influenced peer leaders to take on knowledge-telling, directive roles by their limited self-efficacy and desire to shortcut the knowledge-building process in order to strategically learn assessment material. Ashwin (2003) also found that students became strategic in their approach to acquiring awareness of assessment demands versus constructing meaningful knowledge, resulting in a decrease in the quality of knowledge building.

Berghmans et al.'s (2014) study examined appraisals of students in a medical procedures course that had either been tutored in a SI-like format using either directive or facilitative approaches. Facilitatively-tutored students were encouraged to demonstrate procedures without direct feedback from the tutor, but rather redirection of questions to fellow students. Directive-tutors demonstrated procedures to students and directly answered questions. While some facilitatively-tutored students stated that the approach forced them to think deeper and understand why they did the steps of each procedure, other facilitatively tutored students had negative or mixed feelings about the approach

and saw it as forced. Berghmans et al. found that 64% of the directively-tutored students reported procedural knowledge versus 33% of facilitatively-tutored students. On the other hand, 36% of directively-tutored students reported gains in procedures, clinical knowledge, and understanding, which would indicate deep learning. This is opposed to 50% of facilitatively-tutored students. It is notable, that 86% of directively-tutored students reported increased self-efficacy regarding their clinical skill proficiency. In contrast, only 57% of the facilitatively-tutored students felt more efficacious. Thus, the Berghmans et al. found that students were more positive about directive group tutoring sessions in spite of the observations that these sessions led to more superficial approaches to learning. On the other hand, students who had attended the facilitatively-tutored groups were more critical of the tutoring approach in spite of reporting having a deeper level of understanding.

One can speculate that the Berghmans et al.'s (2014) results could have also been influenced by the course being a medical procedures course versus a course that is less pragmatic and more abstract such as a general education course. However, Kassab et al. (2006) studied problem based learning students and tutors in medical fields by having students rate tutors according to the teaching style inventory modified from Leung, Lue, and Lee (as cited by Kassab et al. 2006). Kassab et al. found a strong correlation between tutor effectiveness ratings from students and tutors who used facilitative-collaborative styles. It is notable that the tutors in the Kassab et al. study were not peer tutors, but rather were M.D. or Ph.D. faculty with differing levels of tutoring experience, which could have impacted the social and cognitive relationships between students and tutors. It

is also notable that the students in the Kassab et al. study were familiar with the problem based learning tutoring style and were familiar with the expectations of their student roles. On the other hand, Berghmans et al. commented on how the students in their study were used to directive teaching and tutoring and were not used to the level of preparedness necessary for a facilitative-tutoring style.

In the Paideya and Sookrajh (2010) study two SI peer leaders were recruited from fourth year and post-graduate engineering students to tutor first year engineering students in chemistry to determine if SI promoted higher order thinking in the first year engineering students. Based on the student responses the SI leaders utilized facilitative approaches of ideal SI sessions. More specifically, the SI leaders used questioning techniques, activities, explanations, and peer learning to aid in student engagement with chemistry content. SI leaders motivated students to attempt challenging problems that may have encouraged deep learning and the SI leaders provided constant feedback during the problem-solving processes. The students in Paideya and Sookraja's study also commented on their ability to develop sociocognitive learning skills, social integration, and self-efficacy as a result of the student focused learning in the SI sessions. Paideya and Sookrajh's study was a valuable model of how to study quality of learning through SI, but it was limited by the evaluation of only two SI leaders on one campus. Further, because of the level of contradiction among Paideya and Sookrajh's, Berghmans at al.'s (2014), and Ashwin's (2003) studies, further study to elucidate the quality of learning during SI sessions is warranted.

Critical Thinking in SI Sessions

Berghmans et al. (2014) examined facilitative versus directive approaches during SI-like sessions and Paideya and Sookrajh (2010) studied higher order thinking, but what evidence has been provided about critical thinking skill development in SI sessions? Abrami et al.'s (2015) meta-analysis demonstrated that that critical thinking skills and dispositions can be effectively taught in general critical thinking teaching sessions as well as course specific teaching sessions. Abrami et al. utilized a definition of critical thinking that was developed by a panel organized by the American Philosophical Association (APA):

> We understand critical thinking to be purposeful, self-regulatory judgement which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgement is based (Facione, 1990, p. 3)

Abrami et al. (2015) described how the panel not only devised six skills of critical thinking, which included 16 subskills, they also listed 19 dispositions of critical thinking necessary to have the inclination to utilize the skills of critical thinking. Abrami et al. used a three-category scheme to code whether critical thinking instruction was through: a) dialogue, i.e. learning through multiple forms of discussion; b) authentic or anchored instruction which involves practical application through simulations, role play, case studies, or applied problem solving; or c) mentoring which consisted of one-on-one interaction either of teacher-to-peer, peer-led dyads, or internship of an experienced

professional and a younger colleague. Notably, each of these methodologies can be utilized in SI sessions. An analysis of 19 studies combining dialogue, authentic, and mentoring instructional strategies produced the highest average effect sizes ($g+ = 0.57$, p $< .05$) when compared to authentic instruction or dialogue used alone as instructional strategies. Therefore, ideal SI sessions, should implement a combination of methodologies to promote critical thinking in participants. SI instruction can be implemented either as a supplement to content specific courses or as a generic course that is independent of a specific subject. However, Abrami et al. found that content-specific outcomes resulted in higher average effect sizes than generic critical thinking ($g+ = 0.57$, $p < .05$). Thus, the imbedding of SI in specific courses may be more effective than generic SI instruction on methods of study skills and test taking.

Similar to Abrami et al.'s (2015) study, Niu et al. (2013) conducted a meta-analysis with the aim of quantitatively synthesizing literature on the effectiveness of critical thinking interventions in postsecondary education. Niu et al. utilized Halpern's definition of critical thinking as the aptitude to analyze, synthesize, and evaluate information and the disposition to accommodate these skills to new contexts. Analysis of the 40 effect sizes resulted an average effect size of 0.195, which although small, was significant ($p < 0.001$). As stated previously, Niu et al. found that single interventions that lasted greater than 12 weeks produced higher effect sizes versus single interventions that lasted less than 12 weeks or degree programs that integrated critical thinking interventions throughout the program. Thus, the design of SI programs to begin during

the first or second week of the course may be necessary for gains in critical thinking to be actualized.

The Niu et al. finding that interventions lasting greater than 12 weeks were more effective at promoting critical thinking aligns with the findings of Janiszewski Goodwin's (2005) study that called for students to attend three deliberative discussion sessions. Janiszewski Goodwin defined deliberative discussion as a method that promotes learners to analyze the cost and consequences of options leading to a collaborative final decision. Further, Janiszewski Goodwin cited Brookfield and Preskill's description of how quality discussions produce meaning and provoke thought when all participants are able to express their perceptions and respond to each other's contributions. Although these sessions were not designed to be SI sessions, they did follow a similar goal of interactive learning through high-level questioning and discussion that is characteristic of ideal SI sessions. However, in the Janiszewski Goodwin study only seven out of the 21 participants in the treatment group attended at least two sessions. Having only three sessions and the low attendance of the sessions is contrary to the McCarthy et al. study that found that a minimum of five SI sessions is required for SI to have a positive effect on student performance and may have contributed to the lack of improvement in critical thinking skills and dispositions in the students. In addition, in order for promotion of critical thinking to be effective in SI sessions SI peer leaders must be effectively trained and motivated to implement methodologies of promoting critical thinking. Moreover, SI peer leaders must be trained in sociocognitive techniques that promote critical thinking and construction of knowledge. Debatably, even if SI participants are producing

increased quantitative course outcomes, if they are not constructing new knowledge and growing in critical thinking skills the quality of the learning through SI is not ideal.

In contrast to Janiszewski Goodwin's (2005) study, Arendale and Hane (2014) studied narratives of peer assisted learning leaders regarding growth in personal or academic skills over the course of an academic term. The peer leaders in Arendale and Hane's study reported that the student participants displayed improved critical thinking which was exemplified by their ability to not only understand but to explain their reasoning about course concepts. The peer leaders also reported higher engagement with the learning process as displayed through increased comfort asking questions and addressing the group. Further, the SI participants displayed increased self-confidence, interpersonal skills, and willingness to work as a group rather than alone. Thus again, conflicting results have arisen about the quality of learning through SI-like approaches.

Peer Leaders' Appreciation for Construction of Knowledge and Critical Thinking

Ashwin (2003) found that positive quantitative course outcomes did not necessarily align with quality of learning and suggested that peer support users became strategic versus meaning oriented in their studies. Moreover, a focus group discussion in the Ashwin's study indicated that the peer leaders might have not had an appreciation for sociocognitive techniques and construction of knowledge versus the reproduction learning style. Similarly, Shaw and Holmes (2014) conducted a two-part study in which they found highly positive course outcomes, persistence, and student reports of increased critical thinking skills through the participation in a SI program. However, in the second part of the study, they used observation to measure the extent that activities within the SI

sessions aligned with a synthesis of Paulian critical thinking theory and Bloom's taxonomy and found that SI leaders were not using pedagogy such as Bloom's taxonomy higher level questioning methods to elicit critical thinking, but instead, most interactions utilized lower levels of Bloom's taxonomy.

In Couchman's (2009) study, peer leader's narrative statements of a meaningful SI session were reviewed to explore the SI peer leader's experience. Interestingly, one peer leader noted that the students wanted to focus on revision of an assignment rather than the topic exercise, and therefore, abandoned the planned exercise. This may have been an example of where students may have influenced the peer leader to use a more directive approach rather than facilitative approach. Another peer leader in Couchman's study indicated that during a session with two strong students who were aiming for high grades, the students wanted to work on a class assignment, rather than the planned activities. The peer leader responded by working on the assignment and as they came across difficult questions they went through examples from the lecture and moved on. This execution of this session could have been facilitative, based on how the peer leader addressed the students' questions or it could have been directive if the peer tutor took a more teacher-centered approach. Without, an observation of the session or interview of the peer leader it is uncertain if methods that promote construction of knowledge or critical thinking were utilized.

In a third example from Couchman's (2009) study, one peer described how students favored not doing activities and instead asking questions about assignments. The peer leader's response was to include a discussion period as a final activity regarding

student questions. Again, if the peer leader used re-directing methods to encourage fellow students to answer questions this activity could have resulted in construction of knowledge. However, if the peer leader simply answered questions, this technique would have been directive and not encouraged deep learning, as described by Berghmans et al. (2014). One additional comment from Couchman's (2009) study is that a peer leader recognized that students felt positive when they worked out the problems on their own without being told answers, which again, is a key goal of ideal SI programs and suggests that in this case the peer leader had an appreciation for facilitative tutoring.

Numerous studies acknowledge the value of SI programs in terms of quantitative gains in mean course averages, course completion, and student persistence. However, the research of Ashwin (2003), Shaw and Holmes (2014), and Couchman (2009) brought forth the question of whether peer leaders have an appreciation for construction of knowledge and promotion of critical thinking skills or whether they empathize with the goals of some students to become more aware of what information is going to be presented on course assessments. The deficiencies of the SI programs studied could be due to insufficient training of SI leaders, which may not be the case at all educational institutions using SI, but could be a significant flaw in SI programming at many institutions.

Summary of Known Information About SI

Based on the preceding review of literature we know that SI produces positive quantitative outcomes. Specifically, high SI session attendance may result in gains in academic credits, grade point average, likelihood of graduation, and retention of material

through the course of a semester (Grillo & Leist, 2013; Malm et al., 2012; Ning &

Downing, 2010; Oja, 2012; Price, 2012). Further, SI may reduce the achievement gap of

students with average prior academic achievement who attend high numbers of SI

sessions to the performance of students who have high academic achievement and attend

no SI sessions (Malm et al. 2012).

In addition, social and cognitive congruence can contribute to the effectiveness

peer leaders by allowing them to empathize with the struggles of students while also

being privy to the perspectives of instructors and SI supervisors (Brown et al., 2014;

Chng et al., 2011; Couchman, 2009; Schmidt & Moust, 1995). However, social

congruency can also make it uncomfortable for peer leaders to challenge student

participants to stay on task. Further, a disruption to cognitive congruence can result in

some students becoming strategic in approaches to assessment demands versus

constructing new knowledge and critical thinking skills (Ashwin, 2003; Couchman,

2009). Peer leaders must not only balance social and cognitive congruent relationships,

they must also balance their style of leadership as knowledge building and facilitative

versus knowledge telling and directive (Brown et al., 2014; Berghmans et al., 2014; Chi,

2001; Kassab et al., 2006; Roscoe & Chi, 2007). Although some studies have shown that

SI leaders use sociocognitive techniques that encourage social integration and self-

efficacy in students and other studies have shown gains in critical thinking, still others

have shown that SI leaders are not using methods to promote construction of knowledge

and critical thinking (Arendale & Hane, 2014; Ashwin, 2003; Paideya & Sookrajh, 2010;

Shaw & Holmes 2014).

What Remains to be Studied and Rationale for the Selected Approach

Although a great deal of SI research has been conducted, conflicting results exist regarding the quality of knowledge construction and critical thinking through SI session delivery. In accordance with the recommendations of Dawson et al. (2014), this study was a qualitative study. A unique component of this SI study was use of the conceptual framework of sociocognitive learning put forth by Piaget (1929, 1977) and Vygotsky (1978) in conjunction with the theoretical foundations of sociocognitive learning techniques that are common to the general SI model to assess if the methods SI leaders are trained in are sociocognitive learning methods. Similar to Abrami et al. (2015), Berghmans et al. (2012), and Paideya and Sookrajh's (2010) studies, this study used comparative analysis via pre-coded structures to analyze voice recordings to clarify how SI peer leaders implemented sociocognitive learning techniques during their SI sessions. One further unique component of this study was the examination of the perceptions of SI peer leaders and SI program directors regarding the use of sociocognitive techniques in relation to the goals of the SI programs, students, and the institutions.

Chapter 3: Research Method

The purposes of this qualitative case study were to determine what techniques SI peer leaders are trained to utilize in SI sessions, explore how peer leaders apply their training to implement techniques to promote construction of knowledge, and explore the perceptions of SI peer leaders and SI program directors about techniques that promote construction of knowledge and critical thinking about the goals of SI programs, institutions and students. In this chapter, I will describe the research design and rationale; role of the researcher; and methodology, including the participant selection logic, instrumentation, data analysis plan, issues of trustworthiness, and ethical procedures.

Research Design and Rationale

The research questions were as follows:

1. Which techniques are SI peer leaders trained to utilize at two post-secondary institutions?

2. How do SI peer leaders apply their training to implement sociocognitive learning techniques that promote construction of knowledge and critical thinking skills at two post-secondary institutions?

3. What are SI peer leaders' and SI program directors' perceptions of the value of the sociocognitive techniques of SI for programs, institutions, and students at two post-secondary institutions?

This qualitative case study followed Creswell's (2013) description of a study in the natural setting that uses multiple forms of detailed in-depth data to explore a single bounded case. The bounded system of the study was the SI program at a Northeastern

U.S. community college. The use of a heuristic design, as defined by Merriam (2009), enhanced the understanding of the phenomenon of interest: the experiences, perceptions, and applications of SI peer leaders and program directors at a post-secondary institution.

Another rationale for using the case study approach was to develop an in depth understanding of which techniques SI peer leaders are trained in and whether these techniques can be defined as sociocognitive learning techniques. This understanding was achieved by analyzing both SI peer leader training material, which showed what techniques SI peer leaders are trained in, and voice recording of SI sessions, which showed how SI leaders apply their training. In addition, the case study approach was ideal because it involved the use of interviews that provided insight on the perceptions of SI program directors and SI peer leaders of the alignment of sociocognitive learning methods with the goals of SI, students, and the programs and institutions.

I selected the case study design because it could add support and validity to Arendale and Hane's (2014) findings that participating in SI may contribute to students' construction of knowledge via sociocognitive learning strategies. Alternatively, the case study design could support as well as add confidence and validity to the Shaw and Holmes' (2014) and Ashwin's (2003) findings that SI peer leaders were not using methods to promote deep learning and that students were simply becoming more aware of assessment demands, rather than learning meaningfully.

A second less aligned methodology would have been phenomenology. When using the phenomenology method, the researcher focuses on understanding the essence an experience of an individual based on that person's comprehensive description of the

experience. It also involves deriving a general or universal meaning from multiple individuals who have shared the same experience (Moustakas, 1994). However, because the focal point of this study was the varied use of multiple sociocognitive learning techniques, versus a shared experience, the case study methodology was a more fitting approach.

A third methodology that could have been used is qualitative narrative. According to Czarniawska (2004), narrative provides a description of an event or action or a series of events or actions that are chronologically connected. However, because the research questions called for determining the shared perspectives of SI peer leaders, a narrative approach was not suited for this study. However, narrative data collection methods could be considered for use in a case study method. More specifically, SI peer leaders could have written a narrative statement of a key experience of trying to implement a tutoring methodology that promotes construction of knowledge and critical thinking. The narrative could have provided data as framed by the individual rather than by interview questions. However, the method of the study, including multiple interviews and voice recordings of sessions, may provide a more holistic data set than narrative statements that describe a single instance.

Role of the Researcher

My role in the research was as an interviewer and analyzer of documents and voice recordings. As the researcher, I reviewed SI peer leader training material, interviewed SI program administrators, peer leaders, and a professor, and reviewed voice recorded SI sessions. I knew the program director only on a professional level, and I had

no authoritative role over the SI peer leaders, as I am not affiliated with the institution where the research took place. Although I obtained the peer leaders' email addresses from the SI program director, I assured the SI peer leaders that the program administrators would not be informed of the responses of the interviewees so that they may maintain confidentiality in the documentation of the study. I completed member checking by providing transcripts of interviews for participants to review as accurate, and providing the participants the opportunity to opt to discontinue the interview process at any point to address the power relationship of my gaining access to SI peer leaders through the SI program director.

For the SI session voice recordings, I introduced the study to the SI student participants at the beginning of the session and I started the recording devices, but I did not attend the sessions. Because the participants of the SI session broke up into groups during the session, the SI peer leader held a recording device and carried it with him from group to group. The practice of me not attending the sessions decreased the invasiveness of the data collection process in order to reduce reactivity, the influence that my presence could have on the research setting (as stated by Maxwell, 2013).

My greatest source of personal bias was that I was previously the director of a one-to-one tutoring center. Because of this experience, I have familiarity with techniques that are considered effective in one-to-one tutoring, which could have influenced my perceptions of what techniques are considered effective in SI. My knowledge of SI is theoretical and literature based, which allowed me to apply a theoretical lens to practical approaches to SI training material and session delivery.

Methodology

I utilized the case study approach in this study. In the following methodology section, I will describe the processes of participant selection, data collection, and data analysis.

Participant Selection Logic

The setting for this case study was a large Northeastern U.S. urban community college. The |NECC SI peer leaders who I asked to participate were more advanced students who facilitate SI sessions for a variety of high risk courses.

I interviewed all program administrators and used intensity sampling to select the three SI peer leaders from the campus. The criterion for the intensity sampling was that the SI peer leaders were perceived by the program director as highly effective peer leaders. I asked the program leaders to help me identify peer leaders. The peer leaders also had varying levels of tutoring experience, which allowed me to make further comparisons between SI peer leaders.

I gained access to email addresses of possible interviewees from the SI program director. I solicited their participation through email. The process of in-depth interviewing three SI peer leaders, four SI program administrators, one professor at the site resulted in data saturation. For the SI session recordings, the students and peer leaders of two out-of-class, voluntary, scheduled, SI sessions were recorded.

Data Collection and Instrumentation

Three forms of data were collected at each site in the following order: SI peer
leader training material, SI program administrator peer leader, and professor interviews,
and SI session recordings that focused on the peer leaders.

SI peer leader training material. I received copies of the training material from
the SI program directors which I personally reviewed. The training manuals were
originally designed by and can be purchased from the University of Missouri-Kansas City
(UMKC) International Center for Supplemental Instruction.

SI program director and peer leader interviews. Aside from the interview
questions, I used the same processes for interviewing both the program administrators
and the peer leaders. I formally invited the SI program administrators and SI peer leaders
to participate in the study and asked their level of experience by email. When they
accepted, and I determined that they met the criteria for the study, we scheduled an
interview. The professor asked me, in person, if he could participate in an interview and I
agreed. I conducted interviews on the campus in person or by the Zoom online video
meeting space, according to convenience to the interviewees. If interviews are conducted
in person, I provided a hard copy of a consent form prior to the start of the interview. For
the three interviews conducted via Zoom, I emailed a consent form when the interview
was scheduled for the participant to return at the time of the interview. I used one SONY
IC voice recorder and a cell phone using the Smart Recorder app to record the interviews.
I designed a contact summary form (Appendix A) according to the suggested format of
Miles, Huberman, and Saldana (2014, p. 126). I completed a contact summary form

following each interview. Participants were invited to member check the content validity

of the interviews once transcribed. I triangulated the interviews with the training material

and SI session voice recordings. The interview protocol and specific interview questions

are, respectively, in Appendix B and C.

SI session recordings. I contacted the SI peer leaders by email, and I scheduled a

SI session recording. The timing during the semester of the SI session recordings was

dependent on when IRB permission for the study was granted and when student

attendance was likely to be highest, which in both cases was the end of the term.

At the start of the scheduled SI session, I briefly introduced the study to the

students, and provided and collected consent forms. One SONY IC voice recorder was

used to record the SI sessions. I turned on and gave the voice recorder to the peer leader

to move around from group to group for one session. In the other session, I placed the SI

recorder near the peer leader for the duration of the SI session.

Instrumentation. I designed an interview protocol and questions for the SI

program director and peer leader interviews (Appendix A and B). The interview

questions were aligned with the research questions and conceptual framework. The

interview protocols followed a combination of an interview guide and standardized open-

ended interview approach as described by Patton (2002, p. 347). To establish the

sufficiency of the peer leader instrument, the instrument was tested with four

acquaintances at other institutions: three one-to-one peer tutors, and a teaching assistant.

Data Analysis

I used the constant comparison method, in which I used the conceptual framework

and research questions to study the first interviews in depth. Then, I examined the

proceeding interviews for patterns that I identified in the previous interviews (Boeije,

2002; Miles, Huberman, & Saldana, 2014; Yin 2014).

SI Peer Leader Training Material

I reviewed the SI peer leader training material and classified the techniques by

coding them as either sociocognitive learning techniques or other techniques using

MAXQDA12 software. I subclassified specific sociocognitive learning techniques

according to the sociocognitive learning strategies identified in the literature review.

SI Session Recordings

I transcribed and analyzed the recordings using MAXQDA12 software by

completing frequency counts of usage of specific supplemental instruction techniques

according to an adaptation of the pre-existing codes developed by Berghmans et al.

(2012) and Abrami et al. (2015). The Berghmans et al. study used their codes to test and

develop a typology of tutor behaviors. The codes were tested and refined in two pilot

studies and utilized in a subsequent study (Berghmans, Struyven, Dochy and Symons, as

cited by Berghmans et al., 2012; Berghmans et al., 2014). The Abrami et al. codes were

used in a meta-analysis of 341 effect sizes from quasi- and true experiments. The Abrami

et al. coding scheme was based on Ennis' (1989) taxonomy of critical thinking

instructional approach typologies, but the Abrami et al. version of the coding scheme was

expanded to allow for a more specific analysis of critical thinking instructional

approaches. In addition, I included codes for techniques which have been suggested to promote construction of knowledge by Chi, (2009), Fonseca and Chi, (2011), and McArthur, Stasz, and Zmuidzinas, (1991).

SI Program Director and Peer Leader Interviews

I transcribed and then thematically coded the interviews with MAXQDA12 software. I began the coding and analysis after the first interview, as recommended by Maxwell (2013) and Miles, Huberman, and Saldana (2014). I used an adaptation of Boeije's (2002) description of the constant comparison method by fragmenting the first interview into pre-coding structures aligned with research questions, codes identified through the interview question testing process, and open codes. I analyzed the first interview by asking the following questions and recording my responses in the form of memos aligned with the coded segments: what is the overall message of the interview, how are the coded segments related, is the coding of the segments consistent throughout the interview or are there contradictions, and what do the segments with the same codes have in common (Boeije, 2002)?

In accordance with Boeije's (2002) method of constant comparison, once I coded each of the first interviews in the process listed above, I began the step of comparing the interviews within the case. I compared segments of separate interviews that were classified with the same code, or axial coding. I developed categories, or initial themes, that were used to make comparisons between interviews. Some codes were combined to form patterns. I asked the questions: Are the statements by the interviewees well represented by the same codes and what information can be drawn about the code based

on the interviewee's responses, what similarities and differences can be made between interviews, what defines the comparisons of similarities and differences, what combinations of codes can be made, and what interpretations can be inferred based on these combinations (Boeije, 2002)? After conducting additional interviews, I repeated the coding process using the codes identified in the first interview in addition to adding any necessary open codes.

Finally, I compared the interviews to enrich the case (Boeije, 2002). I asked the questions: what themes were common between the following interviews, which themes occurred in one interview but not in the other, why might interviewees have shared perspectives or displayed contradictions, and what nuances, details, or additional information do the interviews supply (Boeije, 2002)?

<center>**Issues of Trustworthiness**</center>

I addressed the credibility, transferability, dependability, and confirmability of the study according to the definitions of Lincoln and Guba (1985)

Credibility

I established credibility by triangulating SI program director and peer leader interviews with training material and SI session recordings. I also asked interviewees to participate in member checking of the interviews to confirm that the transcription accurately represents their meanings.

Transferability

I used the case study design and constant comparative analysis method to assist me in the development of results that may be transferable to similar post-secondary

populations. Further transferability was increased by offering thick data that could be compared to research at other institutions.

Dependability

I engaged in peer debriefing with my dissertation committee members. Furthermore, I journaled my reflections of each interview into contact summary forms that I designed according to the recommendations of Miles, Huberman, and Saldana (2014) (Appendix B).

Confirmability

Saturation of data occurred based on thick description and the number of interviews and SI session recordings in conjunction with the alignment of the interview questions and coding structures with the research questions and conceptual framework of the study. I also maintained an audit trail to ensure confirmability.

<div align="center">

Ethical Procedures

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In conjunction with the Walden University Internal Review Board (IRB), based on IRB permission #12-29-16-0419358, I required the site to sign and return participation agreements that included statements regarding the recruitment of SI peer leaders via email invitation and in-person recruitment of SI student participants. I also provided participants with consent forms according to the format discussed by Creswell (2013, p. 153). The form included the following components: participant's right to withdrawal from the study, central purpose of the study, data collection procedures, confidentiality of the participants, and spaces for signatures of the researcher and participants. IRB permissions were obtained from Walden University and the research site. I obtained

participant email information from the SI program director and I invited SI peer leaders recommended by the program directors to participate. The data for the study was stored on a password secured personal laptop and was backed up to a password secured flash drive.

Summary

This heuristic case study involved the collection and analysis of data in the form of SI peer leader training material, interviews of SI program administrators, intensity sampled SI peer leaders, and a professor, and voice recordings of SI sessions at a post-secondary institution. I evaluated the SI peer leader training material for sociocognitive learning techniques versus other techniques. The interview protocol and questions were designed in alignment with the research questions and conceptual framework and I analyzed voice recordings by qualitative content analysis based on pre-existing coding structures as well as descriptions of sociocognitive learning methods discussed in the literature review. I ensured credibility and dependability of data through member checking and triangulation and I distributed consent forms to all participants. In Chapter 4, I will discuss the analysis and results of the current study.

Chapter 4: Results

The purposes of this qualitative case study were to determine what techniques SI peer leaders are trained to utilize in SI sessions, explore how peer leaders apply their training to implement techniques to promote construction of knowledge, and explore the perceptions of SI peer leaders and SI program directors about techniques that promote construction of knowledge and critical thinking about the goals of SI programs, institutions, and students. Chapter 4 is divided into seven sections: participant demographics, data collection, data analysis, evidence of trustworthiness, setting, results, and summary. I describe the NECC program background information based on interview data. When possible, I have used participants' description of the setting, rather than my interpretation.

Participant Demographics

For the current study I conducted six interview sessions, both individual and group, with a total of 8 individuals. I conducted these interviews with two individual administrators, two administrators concurrently, two individual SI leaders, and one with a professor of a SI supported course and an SI leader who worked with students in the professor's class. I assigned pseudonyms for each of the participants.

SI Administrators

Nanette is the tutoring coordinator in the Learning Resource Center (LRC) at NECC. She was referred to as the SI program director in this study. She received training on SI at UMKC, where SI originated. It is her role to reach out to faculty and recruit SI leaders. Nanette is assisted by Gina in training both SI leaders and faculty. In addition,

Gina takes on the coordinator role in the absence of any of the subject matter coordinators. Gina is referred to as an assistant director to the SI program in this study.

I also interviewed the coordinators, Devona and Denise. Devona oversees 17 SI leaders in several subject areas. Devona serves as the communication bridge between the professors and the program director and is also an adjunct professor at NECC. She also collects SI leader timesheets, session student sign-in sheets, and session planning sheets. The SI session planning sheets detail what the SI leaders plan to cover during the session, but are subject to change based on students' need at the time of the session. The second coordinator, Denise, oversees the English as a Second Language (ESL) SI leaders. Her work parallels the role of Devona and informs SI leaders of trainings and other matters of the SI program. In the interview, she described how if any issues occurred between the ESL SI leaders and professors, the SI leaders reported the issues to her.

SI Peer Leaders

I interviewed three SI peer leaders. Mason has been an SI peer leader for two semesters and had no tutoring experience prior to the SI program. His major is business administration and he was a SI peer leader for multiple marketing classes. Abraham has been a SI peer leader for both pilot terms of the program and tutored with the LRC for several terms prior to the start of the program. Abraham is a SI leader for a developmental math class, as well as a quantitative reasoning math course. Ruby started with the SI program during the Spring 2017 semester, but has tutored with the LRC for 3 years prior. Ruby graduated from NECC and is enrolled at a 4-year local university. She is the peer leader for an introductory graphic design class.

Professor

Dr. Hamilton is the professor for the two courses that Abraham tutors and was interviewed concurrently with Abraham. Dr. Hamilton attended SI workshops and meetings for professors involved in the SI program. He has participated with the SI program for two terms.

Data Collection

I collected three forms of data: interviews with SI administrators, SI peer leaders, and one professor; a review of the SI peer leader training manual, and recordings of two SI sessions with tutors and students. A significant variation from the planned methodology was that instead of collecting data from two sites, only one site was utilized for the study. This change was made due to time constraints and the length of the IRB process for two institutions, rather than one.

Interviews

I conducted two administrator interviews and one tutor interview with the Zoom online web conferencing application. I conducted the rest of the interviews on site at the NECC learning resource center. I interviewed Devona and Gina together as well as Abraham and Dr. Hamilton. Only one interview was conducted with each participant, but each interview was followed by two to three follow-up emails with request for clarification or additional information. The interviews lasted from 38 minutes to 54 minutes.

There were a few small changes from the original plans for collecting interview data. The original methodology was a multicase study with two research sites where the

program director and three SI peer leaders were to be interviewed. However, due to the two sites being reduced to one, and because of the availability of administrators to be interviewed, more data was collected at the singe case study site where four administrators, three SI leaders, and one professor were interviewed.

I reached out to the participants by email prior to the site visit, but only Nanette and Denise responded prior to the site visit. Although Abraham and Dr. Hamilton were interviewed together, only Abraham was invited by email prior to the site visit. Dr. Hamilton was in the LRC at the time of the interview and expressed an interest in the study, so I invited him to provide consent and participate in the study. I originally planned to record the interviews on two SONY IC voice recorders. Instead, I recorded the interviews using one SONY IC voice recorder and a password protected android phone using the Smart Recorder application.

Training Material

I received the SI peer leader training manual from the program director prior to the site visit. As was stated in Chapter 3, the manual was developed by the UMKC International Center for Supplemental Instruction. I read the manual in full and coded it using MXQDA12 software. I received and reviewed other SI material that was on file, but because it is not utilized in SI peer leader training it was not included in the data analysis.

SI Session Voice Recordings

I recorded two SI sessions using a SONY IC voice recorder. At the first session five students and Abraham, the SI peer leader, participated. The session took place in a

computer lab at NECC. The session lasted 99 minutes. The second session took place at a smart board station in the learning resource center and lasted 62 minutes. One student and Ruby, the SI peer leader, participated. Both sessions occurred during the week before finals. The students were notified and asked to participate prior to the session about the recordings and were again asked to participate and provide consent at the time of the recordings. I only recorded two SI sessions instead of three because the courses that Mason, the third peer leader I intended to record, ended prior to the site visit.

Data Analysis

I transcribed the interviews and the SI session voice recordings and thematically coded using MAXQDA12 software. I reviewed the pdf formatted training manual using MAXQDA12 software. I coded the interviews, training material, and SI session data as individual sets of data.

I transcribed interviews with Nanette, Denise, and Ruby directly into a MAXQDA12 data file and I employed Transcribeme.com, an online transcription service to transcribe interviews with Mason and with Abraham and Dr. Hamilton. The Transcribeme.com transcriber signed a confidentiality agreement.

I coded the SI administrator interviews first using three pre-coding structures based on the research questions: "techniques SI leaders are trained in," "influences of what techniques are used," and "perceptions of the value of techniques." I added two additional coding structures in the initial coding process: "participants" and "program background info." Twenty-eight new subcodes emerged from the coding process. I

organized the 33 codes and subcodes into eight overriding themes in alignment with the three research questions.

In response to the first research question about what techniques SI leaders are trained in, I coded the interview and training material data. I reviewed and organized specific statements into the following two major themes:

- SI peer leaders are predominantly trained in traditional tutoring techniques versus SI tutoring techniques.

- SI leaders implemented seven sociocognitive learning or non-sociocognitive learning techniques.

In response to the second research question about how SI peer leaders implement sociocognitive learning techniques, three themes emerged:

- SI leaders apply techniques to promote sociocognitive learning,

- non-sociocognitive learning techniques are effective instructional methods,

- SI leaders are influenced to use various SI techniques based personal style and the student-set environment of the session, and

Based on the third research question about perceptions of the value of sociocognitive learning techniques, the following four themes emerged:

- student goals do not align with the use of sociocognitive learning techniques,

- SI leader goals align with the use of sociocognitive learning techniques and programmatic goals,

- SI programmatic goals align with faculty goals, and

- SI programmatic goals align with the use of sociocognitive learning techniques."

These themes illustrate what I found through the coding process and I elaborate on the triangulation of the data in the results section which follow sections pertaining to the evidence of trustworthiness and the setting

Evidence of Trustworthiness

In the following section, I discuss adjustments made during the study that may have influenced the credibility, transferability, dependability, or confirmability.

Credibility

I established credibility by triangulating SI administrator, peer leader, and professor interviews with training material and SI session recordings. In addition, all interviews were member checked by participants to confirm transcription accuracy and the true meaning of statements, except for Gina and Davona's interview.

Transferability

Unlike the original methodology, the multicase study design was not utilized for this study. Instead I treated NECC as a single case. However, the results for this study may still be transferable to other institutions that are developing or piloting SI programs.

I did not use maximum variation sampling for the participant selection. Instead, I used opportunistic sampling to interview all available administrators prior to or at the time of the site visit. Further, I used intensity sampling to select SI peer leader participants. Specifically, the program director provided names and email addresses of select SI peer leaders and I contacted them according to the methodology. Her selection

criteria were aimed at choosing effective SI leaders who would represent the school well.

Notably, the peer leaders still met the criteria of high, medium, and low experience that I

initially proposed as the sampling criteria.

Dependability

In order to ensure dependability, I journaled my reflections to create contact

summary forms, following each interview, as described in the methodology. In addition, I

debriefed with my dissertation committee members during my site visit. Further, during

the analysis process, I journaled detailed notes, in the form of memos, alongside

individual statements using the MAXQDA12 program.

Confirmability

Data saturation occurred based on thick description of the 10 interviews and two

SI session voice recordings. Additionally, I triangulated the interviews and SI session

recordings with the SI peer leader training material. Further, I aligned the interview

questions and coding structures with the research questions and conceptual framework of

the study. In addition, my dissertation committee chair read two transcripts to confer my

coding or suggest new codes. I also maintained an audit trail.

<div align="center">Setting</div>

Before moving to the results of the data analysis, I included a thorough

description of the setting of this case study to assist the reader in understanding the

results. The SI program at NECC began the pilot phase during the Fall semester of 2016.

The program continued the pilot phase with adjustments during the Winter semester of

2017. The program is housed by the Learning Resource Center (LRC) which also houses

a robust compilation of programs including spaces for tutoring for in-person tutoring for

courses, such as, ESL, math, accounting, English, online tutoring, academic coaching,

computer labs, and instructional media. In addition to supervising the 25-30 SI leaders,

the program director, Nanette, also supervises the activities of about 80 tutors and is

supported by a SI program assistant director, Gina, and SI subject coordinators. In the

following section, I discussed the program goals, courses supported by the SI program, SI

session logistics, SI versus traditional tutoring, the evolution of the NECC SI model, and

SI leader roles.

Program Goals

According to Nanette, the overall program goals are the traditional goals of SI, to

"increase retention within targeted historically difficult courses" and to "improve student

grades and overall graduation rates." The program coordinators described the goals of the

program in relation to the big picture mission and goals of the college such as retention,

graduation rates, and advancement into 4-year college programs. The coordinators added

that the goals include providing students the skills needed to succeed at NECC, future 4-

year college programs, and careers. These skills they seek to provide students with

include notetaking and other study skills, confidence building, time management,

relationship building with professors, classroom etiquette (turning off cell phones), and

language proficiency, and, according to the SI assistant director, being "overall better

prepared students for college success."

Whereas the program administrator's goals focused on the bigger picture of and

college completion, the SI leader's depiction of the goals of the program focused on the

students' personal goals and deep learning. Mason, one of the tutors, stated that a goal of the program was to not just help students academically, but to "assist students in becoming independent learners." Mason spoke of guiding SI participants into habits that would make them model students. Another SI leader, Abraham, stated that the goal was to get students to pass and to be better learners through improved methods of study and college survival skills. Ruby, the third SI leader, described the goal of the program was to educate and motivate students by providing them resources and opportunities for learning.

SI Program Support for Developmental and Gateway Courses

The SI program at NECC has 25-30 peer leaders who cover courses such as English, math, ESL, accounting, marketing, and graphic design. The SI peer leaders serve in developmental and gateway courses with high failure rates. The coordinators split the management of the SI leaders by subject. For instance, Denise manages seven ESL SI leaders. NECC has several SI programs operating through different departments. There is a separate English language learning (ELL) SI program that is separate from the LRC. There is also an accelerated program called Accelerated Study in Associate Programs (ASAP) that runs a strict SI program according to the UMKC SI training program.

Abraham and Dr. Hamilton described one of the SI courses, Quantitative Literacy, as a no-credit developmental course that is based on real world applications, readings, and interpretation of problems. After taking this class students move on to Developmental Algebra if they are in liberal arts majors. The course meets for 6 hours per week. The maximum enrollment in the course was 25 students and according to Dr.

Hamilton an average of 15 of 25 students attended per class period. According to Dr.

Hamilton, the usual pass rate in Quantitative Literacy was about 50%. On the other hand,

in the credit bearing SI course, Quantitative Reasoning, the enrollment max was 36

students and, according to Dr. Hamilton, 31 of the 36 students typically attend per class

period.

SI Session Logistics

The logistics of the SI sessions may impact whether the students stay for SI

planned activities. SI leaders hold some SI sessions in reserved rooms outside the LRC.

However, some SI leaders hold sessions within the LRC. Ruby described how she holds

her sessions in the LRC over a 3-hour period. Her sessions are designed as three 1-hour

sessions back to back, but students tend to treat SI in the same manner as drop in tutoring.

They come and asked a question, then leave, rather than staying for a prescribed time and

specific, planned session activities.

Distinctions Between SI and Traditional Tutoring

To understand the settings and the application of SI it is important to clarify the

difference between SI and traditional tutoring. The clearest distinction between SI and

traditional peer tutoring, as described by SI leaders and SI administrators, was that SI

peer leaders attend assigned classes in order to gain a first-hand view of what material is

covered in the classes. This is opposed to traditional tutoring where tutors have a general

conceptual knowledge of what is covered in a course. Gina commented on how SI leaders

are more familiar with exactly what information is presented in class by the professor

because they are there to witness the instruction. Further, Gina discussed how often

professors are unaware of the lack of college readiness skills, such as notetaking, and active reading of the text, versus "reading it like it is a novel." Mason reported that this allows the SI leader to reflect on these missing skills and how they relate to the class in addition to key topics that students do not understand which the SI leader can recognize from the number of times the concept comes up in the SI sessions. Mason shared that this is opposed to the traditional model of tutoring where many tutors have a generalized knowledge of subject matter and can tutor on specific concepts, but do not know from personal experience which concepts the professor identified as key during lecture.

Interestingly, Mason shared his different perspective on the variation between SI and traditional tutoring. Whereas Devona described the tutors' interactions with students as more class content specific in SI vs. traditional tutoring, Mason described the interactions with students as more generalized. Specifically, he stated that he not only helps students with a specific subject, he also models student skills and, in his words, "how to go about your career." Mason described how he spends the first 15 minutes of each session learning about the career aspirations of the students, so he can apply the course content specific scenarios in the student's occupation of choice.

Abraham discussed how he helps in class as well as holding SI-sessions outside of class. In the class, he encourages students to stay focused on the instructor, rather than mobile devices. He also assists the instructor by moving around the room when the class worked in groups on problem solving. The SI leaders used techniques such as redirecting questions back to the student, and wait time, frequently, however those techniques are also foundational techniques in traditional tutoring.

Evolution of Campus Model Included Instructors

During the first semester of the pilot phase, NECC used what they referred to as "strict" SI model. This model is the model presented by UMKC. However, after the first semester, a program survey was administered and focus groups were conducted and the results led to a more flexible format for the SI program. The professors wanted to be more involved in the program and some felt disconnected from the program because during the first term the relationship between SI program and professor was kept separate. For example, Devona stated that they heard from SI leaders that some professors had the perception that the SI leaders were put in their classes to spy on them.

Dr. Hamilton discussed how the strict SI model may have not worked for the NECC population because the NECC students were not independent learners. Further, Dr. Hamilton talked about how NECC students liked to be led by the hand and the strict SI model put more responsibility on the students to attend sessions independently vs. the NECC model in which professors could provide incentives for student attendance to the sessions.

Thus, one change during the second semester is that professors gained access to SI session attendance records. Some professors chose to give extra credit, or the reverse, deduct credit, if students did or did not attend SI sessions. Additional changes during the second semester of implementation included, setting strict guidelines for SI leader roles. For example, SI leaders were not to grade papers, or conduct outreach on time they were not being compensated for. In addition, professors could recommend students for SI leader positions.

Description of Roles

Each of the SI leaders described their roles differently. Mason described how at the beginning of the session he interacts with the students in a way to let them know he is not the professor. He said that students with incomplete assignments start off giving excuses that they give to the professor, but he assures them that "I'm not the professor. I'm a student with you." Mason spends the first 15 minutes of each session getting to know the students and breaking down barriers. For instance, he asks the students about their personal lives and majors. He later uses this information to provide practical examples in his responses to questions about course content.

Mason also sees his role as SI leader to exemplify model student behavior and to demonstrate good student habits. Specifically, he stated that he shows students how to pay attention in class, proper notetaking, what kinds of questions to ask, and time management. He later described a struggle between teaching model student behavior and answering content questions due to time constraints of the session times.

Abraham said his role was to guide the students and to teach them college survival skills such as taking notes, writing math formulas, and paying attention in class, rather than passively sitting in class and not assimilating information. Ruby stated her role was similar to a teaching assistant. She stated that she was an extra resource that was available to the students for tutoring outside the classroom.

Results

The results are divided into three sections that align with the three research questions. Each of the three sections details the themes related to the respective research

question. Those themes are detailed in Table 1. The three research questions pertain to

what techniques SI leaders are trained to utilize, how do SI peer leaders apply their

training to implement sociocognitive learning techniques, and what are the SI peer

leaders' and SI program directors' perceptions of the value of the sociocognitive

techniques.

Table 1

Alignment of Themes with Research Questions

Research Questions	Themes
#1 Which techniques are SI peer leaders trained to utilize	SI leaders are trained in traditional tutoring techniques versus SI techniques
	SI leaders implemented seven sociocognitive learning or non-sociocognitive learning techniques
#2 How do SI peer leaders apply their training to implement sociocognitive learning techniques	SI leaders apply techniques to promote sociocognitive learning.
	Non-sociocognitive learning techniques are also effective instructional methods.
	SI leaders are influenced to use various SI techniques based personal style and the student-set environment of the session
#3 What are the SI peer leaders' and SI program directors' perceptions of the value of the sociocognitive techniques	Student and SI programmatic goals do not align regarding techniques.
	SI leader goals aligned with techniques and programmatic goals.
	SI programmatic goals align with faculty goals.
	SI programmatic goals align with the use of sociocognitive learning techniques

Research Question One: Which Techniques are SI Peer Leaders Trained to Utilize

The first research question of this study was what techniques are SI leaders are trained to use? Nannette and Gina trained SI leaders and were aware of some of the techniques the SI leaders utilize during SI sessions. Other administrators had discussions with the SI leaders about how they carried out their sessions in order to become aware of what techniques the SI leaders implemented. It is the consensus of the program administrators and peer leaders that many collaborative learning techniques could not be used because of low attendance issues in sessions. The SI leader handbook does include SI techniques, but the techniques do not apply to every group or course.

SI leaders are trained in traditional tutoring techniques. According to the SI program administrators and peer leaders, SI trainings begin with the purpose and goals of the program, roles of SI leaders and professors, and opening and closing sessions. Only one hour of the first 5-hour training is spent on SI techniques. The techniques the SI leaders and administrators recalled that are included in the training manual were redirecting questions, wait time, informal quiz, and think-pair-share. Thirty-two techniques are described in the SI training manual. The SI trainers of the SI peer leaders provide all SI leaders with a copy of the UMKC SI manual, but as described by SI administrators and peer leaders, the emphasis in training is not placed on using the techniques described in the manual because many of those techniques are collaborative learning techniques that require groups, which may be difficult to carry out due to low attendance to SI sessions. The trainers of the ESL peer leaders teach additional techniques that are specific to ESL courses.

Although SI leaders are not thoroughly trained on SI techniques, other key SI topics are covered during the 5-hour training session. Nannette discussed how in SI trainings, the trainers teach SI leaders how to open and close their sessions. In addition, SI peer leaders roll play some of the traditional SI techniques. Devona described how during training SI leaders are taught that they are not there to do the work for the students, but rather they are expected to redirect questions back to the group in order to allow the students to "become independent learners, instead of feeding them the answers."

They spend about an hour of the 5-hour training period on techniques. According to Ruby, the initial 5-hour training includes an introduction to the SI program, the responsibilities of the SI leader and the collaborating professor, boundaries of the SI leaders and professors, what to expect in SI sessions and what to expect from students, and how to plan SI sessions. According to Abraham, SI leaders attend 2-3 additional trainings per semester. Mason, talked about how the additional training cover the purpose of the SI program as well as a feedback session where SI leaders share their experiences and brainstorm solutions to problems and concerns.

One specific technique that they are trained on is giving quizzes of prior knowledge to determine what level the students are at when they start the session. Based on the quiz results they can divide students into homogeneous or heterogeneous groups based on content knowledge level. Denise described how the ESL training focuses identifying specific types of content weaknesses of English language learner (ELL) students. Types of content include proper word choice and phrasing. Particularly, trainers

teach ESL SI peer leaders how to work with students on using academic language in writing, versus everyday language. The training also focuses on how to approach students when identifying weaknesses. Denise added that ESL SI leaders learn how to make an individual plan to help the students. If they have a group of students who have the same problem, they meet with groups rather than individually. However, ELL student attendance, as well as other SI course attendance, reportedly ranges from 1-3 students per session.

Denise also stated that another training focus is on the placement that evaluates ELL students for college readiness in terms of proficiency in writing, reading, and mathematics. The ESL SI leaders are trained on how to help students address questions on the test. Denise described how the ESL SI leaders for the test prep course start by working individually with students, so they can identify the students' weaknesses. Then, they group the students in pairs to work collaboratively.

SI leaders implemented seven techniques, both sociocognitive and non-sociocognitive learning techniques. As previously stated, research question one was which techniques are SI leaders trained to utilize? Triangulation of interview data, training material, and SI session recordings showed that SI leaders implemented seven techniques that were either sociocognitive or non-sociocognitive. Sociocognitive learning techniques include three components: assimilation of content, accommodation of content to new context, and interactive learning. Although there were 32 SI strategies described in the manual, only seven were referenced to through interviews with administrators and SI leaders or were observed in SI sessions. The administrators and peer leaders, in

consensus, stated that the most common techniques used by the SI peer leaders were redirecting questions and wait time. The peer leaders also added that they use pre-assessments in the form of an informal quiz at the beginning of a session to gauge the understanding of the students of recent course material. In the SI session recordings, direct questions to the group, visual techniques, and direct instruction were also utilized. In the following subsections I summarize the techniques described in the training manual and demonstrated in the voice recordings and analyze whether they comply with the definition of sociocognitive learning techniques.

*SI leaders use redirecting questions and scaffolding concurrently***.** As I described in the conceptual framework, redirecting questions refers to the SI peer leader not directly answering a question and instead redirecting the question to another student or course resource such as the text or lecture notes (Hurley & Gilbert, 2008; Arendale, 2014). The SI peer leader manual provides examples of how peer leaders can redirect to lecture notes or have a student work out problems on the board. In the descriptions by the SI leaders and as evidenced in the SI voice recordings, the peer leaders used the redirecting question technique in conjunction with the scaffolding technique. The following excerpt demonstrates how Abraham used scaffolding to direct students to the correct answers and redirected the students to the question they were working on. Each time Abraham asks a question of the two students he used scaffolding to lead them step by step to finding the correct answer. In addition, indicated in the excerpt below, he redirected them to the content of the problem in a manner that can also

be considered scaffolding. In the excerpt below, Abraham and the students discuss a percentage math problem:

> Abraham: The maximum amount of money he would like to spend on health care coverage each month. Be careful because this percentage is what? Per year or per month?
>
> Student 1: Per month.
>
> Abraham: What does this say? Per annual or does it say per month?
>
> Student 1: Per month.
>
> Abraham: What does it say here?
>
> Student 1: Percentage income.
>
> Student 2: But it's for the year.
>
> Abraham: But it's for the year. Correct. You always assume that's annual. How do you correct that percentage to decimal? Divide it by?
>
> Student 1: 100.
>
> Abraham: That's per year, so per month you divide it by again?
>
> Student 1: There's no numbers here. What's the number?
>
> Student 2: I think we'll use the information from the last one, right?
>
> Abraham: Right. That number is what?
>
> Student 1: 290.
>
> Student 2: 290.
>
> Abraham: What range does that fill on the left side? What range is it? Which row do you look at?

Student 2: This one.

Abraham: Which row? Circle the percentage of income that you're interested in on the right side.

Student 2: 8.8%

Abraham: Right. Now, how do you convert 8.8%?

Student 2: Divide it by 100.

Abraham: Go ahead. Write that first. Down here Student 2 because it's this problem. Eight point eight divided by 100, but now be careful because that's per year. Per month you have to divide it by what again? You have to divide it again, but by what?

Student 2: By 12.

Abraham: That's right.

Student 1: For the 100 or once you get the answer?

Abraham: Let's work that step by step. Divided by 100 equals, and then divide by 12. Then do the multiplication to figure out.

The scaffolding technique, as described in the conceptual framework, is a process where a SI peer leader provides support within a student's zone of proximal development and gradually withdraws the support as the student moves independently toward achieving a new skill (Harland, 2003). The way the peer leaders described scaffolding, and how I observed it in voice recordings, is that the student first asked a question. Instead of directly answering the question, the peer leader followed with a redirection question that, when answered by the student, brought the student a small step closer to

understanding the concept. This cycle was repeated several times until the student step-wise arrived at the final answer. This occurred in both of the SI sessions that were recorded. Notably, the SI manual included examples of redirecting that were akin to the scaffolding method described in the conceptual framework. However, in the conceptual framework I clarify the distinction between scaffolding a student step-wise to an answer and redirecting a student to a problem, course notes, the course text, or another student. I recorded the peer leaders in the SI sessions and were carrying out scaffolding and redirecting questions in parallel fashion. Combined, these techniques include the assimilation of content and interactive learning of sociocognitive learning.

Abraham used this technique 35 times in his voice recorded session. When a student asked a question, rather than answering it directly, he asked another question. The problem set that the students worked on was related to math formulas they had covered in class, but the questions also had real-world context to them with topics such as finding the slope of a line in the context of cell phone message usage. They also completed a problem using the exponential growth formula in the context of having a building that will support staff members over 6 months. The questions for the course were designed to engage the students in a real-world example that paralleled the topic that the students were working on in their math course. Abraham further scaffolded the students' questions into real-world contexts. In this manner, the students not only assimilated information and used interactive learning, they also accommodated the information to a real-world scenario. Thus, these combined techniques are sociocognitive learning techniques.

Ruby used redirecting questions and scaffolding 25 times in her voice recorded session. In her session, she first tried to scaffold the student's unanswered questions with other questions. For example, she asked a question, then paused. If the student didn't answer, she asked another question that was a smaller step to the final question. If the student answered she lead the student back to the original question based on the scaffolded answer. Alternatively, if the student did not know the answer to the first scaffolded question, she asked another scaffolded question. In some cases, scaffolding was not effective because the student was unable to answer any of the scaffolded questions. In these cases, Ruby redirected the student to his notes to find the answer. At times Ruby asked the student to accommodate a concept they were working on in one format to a different format of graphic design. In total, she was not only using interactive learning through her questioning techniques, she was also asking the student to assimilate and accommodate the information. Thus, she was using redirecting questions and scaffolding as a sociocognitive learning technique. Therefore, both tutors utilized scaffolding and redirecting questions as sociocognitive learning techniques.

SI leaders directed questions to the group. Directing the discussion to the group is described in the training manual as a redirecting question method where the SI leader does not answer a student's question and instead asks the group of students to answer the question. Only one student attended the session I recorded of Ruby's tutoring, so Ruby was unable to use the direct the discussion to a group technique. However, Abraham used direct the discussion to the group eight times in his session. When Abraham used this technique, it was because a student was unable to answer a question, so he would ask

another student to share what answer they had or he would ask a scaffolding question of another student to bring both students stepwise closer to the final answer. This method included assimilation and interactive learning. Because of the nature of the real-world problems that were accommodating math concepts this technique qualifies as a sociocognitive learning technique.

One SI leader used wait time. As is noted in the conceptual framework, Hurley and Gilbert (2008) described wait time as a 5-10 second pause to wait for a student response after a SI peer leader has asked a question. During this wait, a SI leader may redirect the question to another student or rephrase the question, but the SI leader will not directly answer the question (Hurley & Gilbert, 2008). The authors of the SI leader manual discussed how the quality of student responses improve when SI leaders wait 15-20 seconds for a verbal response from students. The authors of the peer leader manual also described how other questions can be asked in place of directly answering the question. For example: the peer leader can repeat, rephrase, simplify, or ask the student to rephrase the question (UMKC, 2014). Also, the SI leader can scaffold the question down to parts, or ask the student about which part of the question they do not understand (UMKC, 2014).

Abraham did not use wait time during his SI session recordings; he tended to respond in one to three seconds if students did immediately answer his questions. However, Ruby utilized wait time in her voice recorded SI session with the single tutee five times. In each instance, she asked a question then paused for a response. The pause seemed to allow the student time to think about his response. If he did not respond, she

used scaffolding to stepwise lead the student to the final answer. If that did not work, she redirected the student to his notes. Wait time is not a sociocognitive learning technique because while asking a question and waiting for an answer involves interactive learning, waiting does not demonstrate assimilation or accommodation. However, when used in conjunction with scaffolding and redirecting questions and can be implemented as a sociocognitive learning technique.

   Informal quiz use was reported by all SI leaders. According to the authors of the SI manual, the informal quiz technique allows the peer leader to check student understanding, encourage interactive learning and cooperative participation, and allow students to predict and interpret future test questions (UMKC, 2014). Both Mason and Ruby reported the use of informal quizzes at the beginning and sometimes at the end of sessions to gauge student understanding of previous concepts. Mason described how he gives informal quizzes at the beginning of his sessions to determine how far back he needs to review concepts from previous weeks. He said the informal quizzes are not very in depth, just enough to gauge student understanding of previous concepts.

   Ruby also uses informal quizzes to determine the students' level of understanding and recollection of previous concepts at the beginning of the session. She repeats informal quizzes at the end of the session in order to determine if the students are more confident in their responses to quiz questions. Ruby calls her quizzes "rush quizzes." She discussed how she moves quickly from question to question to check how much the student remembers and basic concepts. If the student is unfamiliar with the concepts, she takes the time to review.

In the manner that the informal quizzes were described by Ruby and Mason, they would not be considered sociocognitive techniques because, although they involved interactive learning and assimilation, they did not have an accommodation component.

Visual techniques were not mentioned in interviews, but were used in SI session voice recordings. The authors of the SI peer leader manual described visual techniques as a process of using picturing and mapping to condense material and show relationships between concepts (UMKC, 2014). Abraham and Ruby each used this technique during their sessions four times.

Abraham had a student visually organize a math problem that involved equations over a sequence of years. In another instance, Abraham combined visual techniques with scaffolding to have a student describe how he had solved a problem and why the problem was correct. Ruby used visual techniques to draw out the organization of an HTML website when a student was not responding to scaffolding. In both cases the students and the peer leaders demonstrated assimilation of material, interactive learning with each other, and accommodation of the material to visual format, thus sociocognitive learning.

Direct instruction was commonly utilized in SI sessions. Direct instruction, or the direct telling of answers or processes of getting answers, is generally not supported as an effective SI or tutoring technique. Abraham and Ruby used direct instruction a total of 40 times during their recorded sessions. In Abraham's session, he may have used direct instruction because he was working with several small groups in the class and it might have been more efficient to give the process of solving some of the problem, rather than scaffolding the students to the processes of solving the problems. In Ruby's session, she

started with several exchanges of scaffolding, but found that the single student was not

understand material enough to respond correctly to the scaffolding. Because the student

did not have a good basis of information, and because this was the last session and there

was limited time left, she may have felt the need to provide more direct instruction than

she normally would. In both cases it is unclear if this is a normal practice.

Research Question Two: How Do SI Peer Leaders Apply Their Training to

Implement Sociocognitive Learning Techniques

The SI leaders described both sociocognitive and non-sociocognitive techniques

as key instructional tools in their sessions. In the following section, I provide a

description of how both sociocognitive and non-sociocognitive techniques were used and

a description of how SI leaders were influenced in their choices of techniques.

SI leaders promote construction of knowledge by encouraging sociocognitive

learning. Although SI leaders appear to only be trained in a limited number of

techniques, they apply these techniques in a manner that was described in the conceptual

framework as techniques that promote construction of knowledge. In my interview with

Denise, the ESL SI coordinator, she described the sociocognitive technique of having the

student respond critically to a prompt. She described that the SI leader first presents a

prompt to the student. The student must identify the meaning and relate it to other things

in their daily life and create a thesis statement. The SI leader then gets the students to

identify meaning by asking reflective questions, such as "what do you think this [prompt]

is about/" The student's response allows the SI leader to check for understanding, and, if

necessary, the SI leader can ask more questions to get the student to derive the correct

meaning from the prompt. In this manner, this technique uses self-talk or some and interaction between the SI leader and the student and thus, meets the assimilation, accommodation, and interactive learning requirements for sociocognitive learning and matches with the evidence of construction of knowledge that is provided in the conceptual framework.

Denise discussed how ESL SI leaders also help their students build vocabulary by having students identify unknown words, looking up definitions, then paraphrasing and summarizing the definitions into their own words. If the student is interacting with the SI leader throughout this process, then what Denise described could be considered a sociocognitive learning technique. Denise additionally talked about the think-pair-share technique, which is a sociocognitive technique tutors are trained to use in group sessions where the students are presented a prompt, they discuss with a partner, or group of 4-5 students, what the prompt means. Then they share individually the meaning of the prompt. This technique involves interactive learning and assimilation. If the students apply the prompt to an everyday situation, for instance, what it means in their lives, then the technique meets the accommodation requirement of sociocognitive learning and construction of knowledge. Not any of the three SI peer leaders interviewed reported the use of this technique, but they also were not trained specifically as ESL peer leaders.

Mason's use of sociocognitive techniques in his marketing course SI sessions may encourage construction of knowledge. He described how he uses information obtained from the students at the beginning of the session about their career goals to create a scenario to which students are asked to apply marketing concepts. He asks students

questions such as "How would you market that?" "Who's your target market," and "what's your demographic?" This is an example of a sociocognitive learning technique because students are not only demonstrating assimilation of concepts by repeating marketing concepts, they are also applying, and therefore, accommodating concepts to their career aspirations. Further, by communicating these concepts between peers and with Mason they are using interactive learning. Mason emphasized his use of "bouncing ideas back and forth," and students working in groups to "discover on their own," which also suggests that Mason is encouraging construction of knowledge. He additionally, described one technique where he purposely states an incorrect answer to see if students can demonstrate if they understand assimilated information and correct him.

Abraham also described the use of sociocognitive learning techniques in his sessions. He said if he and a student are looking at a mathematical word problem, he scaffolds by asking "What are the key words here?" He indicates that the student should "be very careful," if they seem to miss information. He may restate what they say in the in the intonation of a question such as "increase?" He may also expand on what is being asked by saying "So does that mean addition, or does that mean exponential increase? What kind of increase is it?" Abraham repeatedly demonstrated the use of scaffolding to guide assimilation and accommodation by students in his recorded SI sessions. Scaffolding is also a form of interactive learning and can result in construction of knowledge. Therefore, in this manner, Abraham uses sociocognitive learning techniques to promote construction of knowledge

Ruby uses sociocognitive techniques to promote construction of knowledge when she has students take text information and accommodate the information into a design of a website. Further, she uses accommodation and interactive learning by using scaffolding questions to take information and program it in both HTML format and MS publisher format. In this manner students accommodate their design ideas into two separate formats of web design. She not only discussed the use of these techniques in her interview, she also utilized them in her SI session recording.

SI leaders also reported the use of non-sociocognitive learning techniques. For example, the SI leaders described the use of practical application of content, which is not necessarily considered a SI technique, but is still an effective strategy. Some non-sociocognitive learning techniques described by Gina and Nanette included wait time and informal quizzes for prior knowledge to support heterogeneous and homogeneous grouping. Wait time is a technique used in traditional tutoring, but quizzing for prior knowledge to gauge of students' understanding is a SI technique. Quizzing to gauge for understanding allows students to show assimilation, but not necessarily accommodation that would come later in the session. It does help with grouping students in preparation for collaborative learning.

Mason provided a specific example of quizzing for prior knowledge in his Marketing class. He described how concepts in the class he supports build such that concept A from 2 weeks ago must be understood prior to understanding concept B and C which may be covered in the exam during the current week. He said that, rather than assuming concept A is already known, he asks questions that allow students to

demonstrate their assimilation of concept A at the beginning of a session in the form of a basic pre-session quiz. This allows him to gauge what concepts to start with in his session. Ruby also used quizzes for prior knowledge at the beginning of her sessions to see what students recall from the last class session. Just like Mason, she quizzes on the basic prior knowledge needed to build to new content.

Gina described one non-sociocognitive technique of having students refer to their own notes. Asking students to go back and look through their notes for an answer teaches the student the study skill of referring to notes. It also increases the independent learning capacity of the student. Abraham also talked about the use of course resources. He has students refer to homework problems on computer-based learning programs that walk students through similar problems to homework problems. Abraham described the use of humor in his sessions as well as providing hints to students of topics that they will need to know in the future.

SI leaders are influenced to use various SI techniques based on personal style and the student-set environment of the session. The SI administrators and peer leaders reported several factors that influence SI leaders to use one technique over another. Gina and Devona stated that that what technique is used is influenced by personal style, learning style of the student, personality and engagement, and comfort of the students they are working with. Gina further stated that course and content also influence style, as SI for an English class where the students are getting feedback on papers may differ from a math class. Mason discussed how questioning students about their lives and reviewing their notes from class influences what content he covers. Sometimes rather than directly

covering content he discovers he needs to help students with notetaking skills, time management, or issues at home. Interestingly, some students do not feel comfortable sharing about their personal lives and seem to question his intentions. For those students, Mason directly works on content.

Abraham stated that group size influences how he runs his sessions. He said with groups he gives students time to figure out problems on their own and then he uses scaffolding as needed. Student understanding of material and content also determines how hands on or hands off he is during the sessions.

Ruby described how with web design, there are many ways of learning and expressing a single concept. She asks students which technique they are most comfortable with and tries that way first. If one technique does not work, she attempts a second or a third technique. She always provides students with examples of multiple ways to tackle one problem, then she uses the technique they are most comfortable with in proceeding problems.

Research Question Three: What are the SI Per Leaders' and SI Program Directors' Perceptions of The Value of the Sociocognitive Techniques

The third research question was, what are the SI peer leaders' and SI program directors' perceptions of the value of the sociocognitive techniques of SI for programs, institutions, and students? In response to this question, several themes emerged from the interview data. The first is that SI administrator and peer leaders perceive that student and SI programmatic goals do not align regarding sociocognitive learning techniques. Another theme is that SI administrators and peer leaders perceive sociocognitive learning

techniques and SI programmatic goals align with the goals of SI peer leaders. Also, SI

programmatic goals align with the use of sociocognitive learning techniques. In addition,

SI programmatic goals align with faculty goals.

Student and SI programmatic goals do not align regarding techniques. One

emerging theme was that SI administrators and peer leaders perceive student goals do not

align with SI programmatic goals regarding the use of sociocognitive learning techniques.

The consensus perception of the SI program administrators and SI leaders is that the

students appear to have one of three key goals: get a good grade, just receive credit for

the class, or pass an immediate exam or project. Mason described how one of the biggest

struggles is getting students into the SI sessions, at least until they received early grades

and realize their grades were poor. Mason stated that students then come to work on

projects and some come back for later projects. Mason noted that being a model student

was not necessarily a goal of the students, although demonstrating and teaching model

student behavior is a goal of the program. Only once did he witness a student who came

to a session because, in the student's words, she wanted "to see what's it about and maybe

I could learn something I didn't know." Most students come to get a good grade out of the

class. Mason stated that the students who attend the SI sessions are not seeking to be

model students, but rather they attend to receive a good grade

Abraham discussed how some students are disappointed by the sessions because

their goal in attending the session is to get the answers to work they have not completed,

or gain information shared in classes they have not attended. When Abraham has them

work collaboratively and challenges them to figure out answers on their own, they

respond "I can't believe it, you're doing exactly what he [Dr. Hamilton] does, I don't like that group learning. It doesn't work." When he follows by asking to see their notes they give excuses on why they have no notes or work. Abraham noted that students who do attend sessions regularly show great improvement. He and Dr. Hamilton mentioned a student who earned a 27% on a first exam and her exam grade on a proceeding exam after attending several sessions went up to a 90%.

Abraham and Dr. Hamilton talked about how student impressions of what should happen in a session are sometimes shaped by experiences with other resource centers. They perceived that in one NECC center, the tutors are not as well trained in tutoring techniques and the students get problems worked out for them without being challenged to assimilate or accommodate information. When this happens, students earn very high scores on homework, then fail exams. Abraham described how these students who are only fishing for answers express body language that they are not interested in being challenged to learn and that some of them then complain and give negative feedback about the session. Abraham and Dr. Hamilton agreed that sociocognitive learning techniques, such as scaffolding, align with the goals of students who come regularly and are willing to work to earn a good grade. However, the techniques do not align with the students who are interested in being spoon fed answers.

SI leader goals aligned with techniques and programmatic goals. Whereas the goals of the students are to get a good grade, just receive credit, or pass an immediate test, the goals of the peer leaders are to align content to student career goals, exemplify model student behavior, promote deep understanding and critical thinking and encourage

students to return to class and SI sessions. Mason described his ideal SI session as one where multiple students attend and helps them achieve clarity about concepts they did not know at the start of the session. He described that he wants everyone to feel comfortable and says he encourages interactive learning, collaboration, and self-discovery. According to Mason, one of his goals is to "break down their [the students] barriers, before they even get to their questions." Mason breaks these barriers by asking the students questions about their personal life so that he can place the content in the context of the students interests and career goals. Mason also has the goal of encouraging good notetaking and time management skills in students, so he reviews and questions students about their notes and ties in recommendations about note taking, and if necessary time management. He described how he ties the effect of poor student behaviors into the career goals of the students. For instance, he provided the example of a student just wanted to pass because he was getting a degree, but planned to work in his father's business. Mason observed that the student's notes were sloppy. Mason pointed out the necessity of order and good notes in a business. In this way, he uses sociocognitive learning techniques not only to practically apply course content, but also uses interactive questioning to encourage model student behaviors.

Abraham described an ideal SI session as one where he can engage the student according to their temperament. He said he gauges what kind of temperament the student has when they come in then he "employs a different way of saying things, that way they get it." Abraham relies heavily on scaffolding as a key sociocognitive learning technique. In this manner, he is testing for assimilation of material in the students through

interactive learning. Some students have different goals in mind and simply want to solve a problem, or just be given an answer, but Abraham's goal for the SI session is deep understanding and critical thinking.

Ruby's goal for an ideal session is one where more than one student attends and the students leave feeling encouraged to return to class and to return to another session because they have learned something. Ruby, like Abraham, used scaffolding in her SI sessions.

SI programmatic goals align with faculty goals. According to Nannette about 85% of the faculty who used SI during the first term, stayed with the program during the second term and, overall, responded positively in an internal survey. Gina and Devona described how SI leaders provide faculty members insight on student understanding of concepts and study habits. Further, some professors are unaware of the daily challenges of students such as balancing work family and school. Devona described how when SI leaders share these challenges, it allows professors to be less punitive and to be more flexible with assignment due dates, so long as late assignments are turned in within a reasonable amount of time.

Devona suggested that by demonstrating model student behavior, SI leaders teach students that it is alright to communicate with professors and visit professors during office hours. Some professors are unaware of the resistance that students feel in communicating with professors. These skills of feeling comfortable communicating with authority figures are transferable to the workplace or 4-year institutions.

SI programmatic goals align with the use of sociocognitive learning techniques. The sociocognitive learning techniques used appear to contribute to attainment of the SI program goals. For instance, one program goal is to improve student performance. Abraham sees gains in grades of students who attended sessions regularly. Specifically, one student went from earning a 27% on a first exam to a 90% on a second exam and another student also failed the first exam and earned a 100% on the second exam. Further, the math courses had positive outcomes. The program did a rudimentary analysis where they compared math class sections that had a SI leader to math class sections that did not have an SI leader and found higher grades in the SI leader sections. They plan to do a more statistical grade analysis in future terms. In addition, individual gains in ESL proficiency test scores were observed by Denise. For example, one CATW prep course student who was receiving assistance through the SI program moved from a score of 50 to a score of 60, which is a notable improvement.

Ruby described how at the end of a session, she quizzes students on topics, and she sees progression in the students expressed by how confidently they answered her questions. Ruby stated:

> When I question my students about a particular topic and they're not confident to answer it the first time, but when we're reviewing I hear more confidence with what they're saying. I find that very progressive from the beginning of the session to the end of the session. That already is a small confirmation of what they are learning from this point to this point and the progression of the whole thing is what is the goal of the whole program in a smaller scale.

Just as Ruby finds re-quizzing, a non-sociocognitive technique is effective in relation to SI program goals, Abraham finds scaffolding, a sociocognitive learning technique, is an effective technique in relation to program goals. Abraham stated that the more he scaffolds students into critically thinking about answers versus providing direct answers, the more the students seemed to understand. Abraham said, "the more you do, the worse it is for the students because they start relying," as opposed to thinking critically on their own.

Another program goal is for students to learn model student behaviors such as good notetaking, critical thinking, active listening and time management. Mason considers this a key focus in his SI sessions. Mason, however, finds some conflict between having enough time to tutor students in content areas while still meeting the goal of tutoring students in model student behaviors.

One of the program goals is to encourage learning skills in students so that they can be lifelong learners. Mason stated that the student goal is to "come in, get the answer, and leave," but the program is for the students to "grow and not only at this school, but hopefully you can take it with you the rest of your life." This is a common case of misalignment of student and program goals. On the other hand, the most primary goal of the program and the students is to pass the class. Mason's tutor goal of improving model student behaviors contributes to the program goal of lifelong learning. Mason stated that "when you leave an SI session, ideally, you should have better tools that you are going to apply to all classes, not just one specific class." Mason's use of practical application of course content to career goals is another contributor to the attainment of the program goal

of using skills gained through the SI program in future college and career aspirations. Ruby also stated that using the SI techniques helped students with lifelong learning because it allows SI leaders to educate students coming in with limited education to gain knowledge that would help them to "get what they need to pass a test, or pass a class, or pass college."

Summary

The first finding applies to research question one: which techniques are SI peer leaders trained to utilize. Although administrators and peer leaders specify a distinction between SI and traditional tutoring, students do not appear to see this distinction. This is demonstrated by students dropping in to SI sessions, as they would be expected to drop in for traditional tutoring, versus attending full, structured SI sessions. Part of this may be due to the limited time spent on training of SI specific sociocognitive learning techniques versus traditional tutoring techniques. As a result of this limited training in SI specific techniques, it appears that SI leaders utilize primarily traditional tutoring techniques in their sessions, and students respond by treating sessions like traditional tutoring sessions.

An additional finding that relates to research question one is that SI leaders apply both sociocognitive and non-sociocognitive techniques. Both types of techniques are valuable instructional methods in the manner they are being applied. The sociocognitive learning techniques were: redirecting questions, scaffolding, directing questions to the group, and visual techniques. The non-sociocognitive learning techniques were wait time, and informal quiz. It is notable, that the peer leaders also used the technique of direct instruction a great number of times in their SI session recordings. Direct instruction is not

a sociocognitive learning technique and is also generally not accepted as a traditional

tutoring best practices technique.

An additional finding relating to research question two regarding how SI leader

implement sociocognitive learning techniques is that SI leaders use practical application

of course content in the context of students interests and career aspirations to personally

relate the course content to students. SI leaders empathize with the students and assure

them that they are not the instructors and they are on the same level with the students,

then use the trust gained from relating to the students to engage students in sociocognitive

learning techniques.

One final finding that relates to research question three, what are the SI students',

peer leaders', and administrators' perceptions of the value of techniques, was that student

goals do not align with programmatic goals, regarding how techniques are applied. More

specifically, student goals were to get a good grade, just receive credit for the class, or

pass an immediate exam or project. Students expected this to happen by them showing up

to SI sessions and being given answers to assignments they had not completed. When

they attended sessions, and were asked to work collaboratively, or when methods such as

redirecting questions or scaffolding were applied, peer leaders report student being

disappointed. In this way, the peer leader goals of sociocognitive learning for

construction of knowledge and developing model student behaviors did not align with the

students' goals for attending sessions to pass an assignment by getting quick answers.

The application of sociocognitive learning techniques did apply to the program goals of

improving pass rates and retention, which was demonstrated by students who attended regularly improving their course grades.

In Chapter 5 I describe how these findings confirm, disconfirm, or extend the research questions of this study through analysis and interpretation of the findings in the context of the conceptual framework. In addition, I discuss the limitations of the study and the implications toward positive social change and future research.

Chapter 5: Discussion and Conclusion

The purpose of this qualitative case study was to determine what techniques SI peer leaders are trained to utilize in SI sessions and explore how peer leaders apply their training to implement techniques to promote construction of knowledge and critical thinking. In addition, the purpose was to explore the perceptions of SI peer leaders and SI program directors about techniques that promote construction of knowledge and critical thinking about the goals of SI programs, institutions, and students.

The first finding relates to research question one, and is related to which techniques SI peer leaders were trained to utilize. The findings suggest that SI leaders are trained and rely primarily on traditional tutoring techniques rather than specific SI tutoring techniques. SI techniques are different than traditional tutoring techniques because they often involve more structured collaborative learning activities.

The second finding relates to research question two, pertaining to how SI leaders apply their training to implement sociocognitive learning techniques. Analysis of the data suggested SI leaders utilize social congruence to facilitate implementation of sociocogintive learning.

The third finding, related to research question three, is that the SI administrators' goals of improved course pass rates and retention align with SI peer leaders' goals of model student behaviors and construction of knowledge. Both sets of goals are reached by SI leaders using sociocognitive learning techniques that have been suggested to promote construction of knowledge (Chi, 2009; Falchikov, 2001; Fonseca & Chi, 2011;

Jacobs, Hurley, & Unite, 2008; Ladyshewsky & Gardner, 2008; Roscoe & Chi, 2007;

Zerger, 2008).

The fourth finding also relates to research question three and pertains to the SI

students', peer leaders', and program administrators' perceptions of the value of

sociocognitive learning techniques. I found that students do not value sociocognitive

learning techniques, but peer leaders and programmatic goals align directly with the use

of sociocognitive learning techniques.

Interpretation of the Findings

This section is divided into three overarching interpretations based on analyzing

the research findings from this particular case setting in light of the conceptual

framework and review of literature for this study and the research questions. These

interpretations relate to the implemented sociocognitive learning techniques, social

congruence, and programmatic goals versus student goals.

Implemented Sociocognitive Learning Techniques

In light of the first research question regarding what techniques the SI peer

leaders are trained in, my analysis of the interviews with SI peer leaders and

administrators and SI session recordings showed four sociocognitive learning techniques

and three non-sociocognitive learning techniques were utilized. The most prevalent

sociocognitive techniques were scaffolding in conjunction with redirecting questions,

which were used 60 times during SI session recordings. The most prevalent non-

sociocognitive technique was direct instruction, which was used 40 times during SI

session recordings. Roscoe and Chi (2007) and Chi et al. (2001) described how

techniques such as scaffolding and redirecting questions, which I found were implemented in the SI sessions I recorded, are knowledge building, constructive interactions. Roscoe and Chi (2007) and Chi et al. (2001) found knowledge building activities were positively correlated with reading comprehension and listening skills scores of students participating in one-on-one tutoring. Berghmans et al. (2014) referred to techniques such as scaffolding and redirecting questions as facilitative approaches to tutoring. In Berghmans et al.'s study, students reported a deeper understanding from such facilitative approaches than from directive approaches, such as direct instruction.

Notably, the SI leaders also used direct instruction for numerous interactions with students. Roscoe and Chi (2007) and Chi et al. (2001) reported direct instruction in the form of didactic explanations as knowledge telling activities. Knowledge-telling activities were less effective at improving reading and listening comprehension scores. Furthermore, Berghmans et al.'s (2014) study demonstrated that directively-tutored students had lower gains in deep learning. This suggests that by using direct instruction in SI sessions, the SI peer leaders could be lowering the rate of construction of knowledge that could take place.

Scaffolding, redirecting questions, and direct instruction are all traditional tutoring techniques that have been addressed in the literature base for over 30 years. Although scaffolding and redirecting questions are used sociocognitively at NECC, the SI model at NECC, to the extent I was able to study it, lacks the heavy infusion of collaborative learning activities that are essential components of both the SI model and

other models similar to SI, like the peer-assisted learning (PAL) model (Arendale, 2014; UMKC, 2014).

Moreover, SI peer leaders relied heavily on scaffolding and redirecting questions, which are traditional tutoring techniques that promote sociocognitive learning versus specific SI tutoring techniques. This may be in part due to limited training of SI peer leaders on specific SI tutoring techniques that would differentiate SI sessions from traditional tutoring sessions. The result of SI leaders not using SI techniques may be that student participants do not differentiate SI sessions from traditional tutoring sessions. This is evidenced by students dropping in and out for a single question to be answered, as opposed to students attending the entire planned out session where structured activities take place. The administrators and peer leaders stated that this lack of SI collaborative learning techniques was because of poor attendance to SI sessions, making collaborative learning infeasible. Importantly, SI leaders still managed to meet the mandate of interactive learning that is a defining component of sociocognitive learning by using traditional tutoring techniques, such as scaffolding, and redirecting questions in small groups or pairs between SI leaders and individual students.

Interestingly, NECC has also included the goals of faculty members in their evolved model of SI. In the NECC model of SI, faculty members are aware of students who attend SI sessions and they are permitted to provide incentives for attending SI sessions. This differs from the strict SI model where student participants remain anonymous. This model resembles some aspects of the PAL model, an adaptation of SI. In the PAL model attendance is mandatory for students in PAL-supported courses

(Arendale, 2014). Some instructors at NECC experimented with this concept by not only granting credit for attending SI sessions, but also taking credit away for not attending SI sessions.

Social Congruence

The second research question was: How do SI leaders implement sociocognitive learning techniques to promote construction of knowledge? I observed that the SI leaders at NECC utilized social congruence between themselves and the students. Social congruence is described as communication that is informal and empathetic toward students' experiences, opinions, and anxieties (Chng, Yew, & Schmidt, 2011; Kassab et al., 2006; Schmidt & Moust, 1995). Kassab et al., (2006) suggested that social congruence resulted in tutors being perceived as effective and may have assisted with the delivery of tutoring techniques.

In the context of NECC, one peer leader reported building engagement with the students by asking them questions about their career aspirations to practically apply the content matter of the course to the student's life. By building this rapport, the peer leader was building social congruence that might have broken down barriers to trust between the student and peer leader resulting in greater acceptance of sociocognitive learning techniques and knowledge construction.

Programmatic Goals versus Student Goals

The third research question was: What are the perceptions of sociocognitive learning techniques? I found that the goals of the peer leaders and administrators and the NECC program overall were for students to learn model student behaviors, construct

knowledge, improve course pass rates, and improve college retention rates. The SI

administrators trained peer leaders were to implement traditional tutoring techniques in a

sociocognitive learning manner, which suggests that the administrators valued the use of

sociocognitive learning techniques. The peer leaders relied on sociocognitive learning

techniques with the goal of helping students construct new knowledge. This suggests that

the peer leaders also valued sociocognitive learning techniques. However, the goals of the

students attending SI sessions were to get a good grade, receive credit on an assignment,

or pass an immediate test. This is contrary to the goals of SI leaders to promote

construction of new knowledge, but related because if students construct new knowledge

they will reach their goals and the programmatic goals of retention and increased

graduation rates.

However, in the case of NECC's SI program, the peer leaders reported that some

students did not value and became frustrated with sociocognitive learning techniques

such as scaffolding and redirecting questions because they wanted an immediate response

to their questions or help with incomplete work. This is similar to Brown et al.'s (2014)

findings that students influenced tutoring techniques utilized by peer leaders because to

the students' desire to shortcut the knowledge construction process in order to

strategically learn assessment material. Ashwin (2003) also found that students preferred

to be strategic in their approach to acquiring awareness of assessment demands instead of

seeking to construct new knowledge. Berghmans et al. (2014) found that students who

were tutored using direct instruction approaches were more positive about their tutoring

sessions than students who were tutored using sociocognitive learning methods such as

scaffolding and redirecting questions. Thus, it can be inferred that in several institutions, although SI program, administrator, and peer leader goals align with the use of sociocognitive learning techniques with the intent to promote knowledge construction in students, many students have shorter term performance goals that do not match with the use of sociocognitive learning techniques.

The findings of this study suggest a resolution of the contradiction suggested by Arendale and Hane's (2014) findings of the positive influence of SI as opposed to Ashwin's (2003) and Shaw and Holmes' (2014) findings of superficial instruction used by SI tutors. The findings and interpretations of this study add support to Arendale and Hane's findings of the positive influence of SI and contradict Ashwin and Shaw and Holmes' studies that suggested superficial instructional techniques used by SI leaders.

Limitations of the Study

There were three key sources of limitations in this study: the redesign of the study as a single-case study, the novelty of the SI program at NECC, and the length of the study. In the following sections, these limitations are discussed and expanded upon.

The most notable change and limitation of this study is that it was a single-case study versus a multicase study. In the original design, I was going to collect data at two institutions from two administrators and six SI leaders, with up to 12 SI session recordings. However, due to the length of the IRB process and the coordination of two site visits, this proved to be an overly ambitious goal and the study design was reduced to a single-case study. In order to increase the thickness of the data, I conducted four interviews with SI administrators and one professor in addition to the three SI peer leader

interviews that were originally planned at that site. The SI program director provided email information for SI peer leaders according to the sampling criteria of best representation as an effective SI leader. This was a deviation from the study design of choosing SI leaders of varying experience to get a distribution of skill level. Notably, the SI leaders still had varying degrees of experience ranging from tutoring with the SI program for only two semesters, to having tutored for the school for 3 years. The case study methodology calls for the triangulation, in this case with the training material, interview, and SI session recording forms of data, thus, the data set allowed me to reach saturation in an analysis.

Although the study findings may be transferable, it is limited because it took place at an institution that was in the pilot stage of its SI program development. As a result, the administrators are still developing program protocols and boundaries. Moreover, the training curriculum and processes are still being mapped out. For that reason, it is not a surprise that traditional tutoring techniques were emphasized over SI tutoring techniques.

An additional limitation is the length of this study. Although some interviews of SI administrators took place by videoconferencing prior to the site visit, most interviews were in person by request of the interviewees. Because of this, only three SI peer leaders were interviewed. In the original study design six SI leaders were going to be interviewed and 12 SI sessions were going to be recorded between two campuses.

Furthermore, because of low attendance to SI sessions, again, because the NECC SI program is in the pilot phase, it was deemed wise to conduct sessions during the final week of the term when attendance would be highest. However, the timing may have

influenced what activities were taking place in the sessions. More specifically, SI peer

leaders conducted sessions as review and final project completion sessions, versus

sessions that may have focused on knowledge building during the term. Moreover, I only

recorded two sessions because they were the last two sessions of the term for two SI

leaders and the course supported by the third SI leader's course competed class and SI

sessions a week prior to the last week of the term, and therefore, could not be recorded.

Furthermore, only one student attended Ruby's session, which may have limited the types

of sociocognitive learning techniques that could be plausibly implemented. Again,

because the study design called for triangulation, I still reached saturation of data, despite

the limitations of the study.

Recommendations for Further Research

I recommend that future studies take place at multiple campuses. One campus is

not enough to determine if SI is being implemented in a manner that promotes

sociocognitive learning, although one campus does contribute to the body of current

knowledge. In future studies, I recommend a large multi-campus multicase study where

programs at several campuses can be compared.

I recommend that a future study uses the same premise as this study, but the

bounded systems could be established SI programs. Established programs have training

protocols in place and may more clearly demonstrate if peer leaders are trained primarily

in traditional tutoring techniques or in SI techniques. A researcher conducting a similar

study to this one could determine how many and which techniques SI leaders are trained

in including observations of training sessions. Furthermore, I advise that number of SI

session recordings be greatly increased. The greater number of session recordings would allow the researcher to quantify how many techniques the SI leaders implement. I also advise that the session recordings take place throughout the term, rather than just during the final week to give a better idea of if and how SI techniques are implemented at times during weeks when exam review is not the goal of the session.

In addition, I suggest that higher level gateway courses be examined as SI supported courses, rather than just introductory courses. Students may attend SI sessions gateway courses more readily because they are more critical to the students moving on in their major than introductory courses. Higher student attendance would allow for SI leaders to have more opportunities to use collaborative learning techniques.

Finally, I recommend that start-up programs in their pilot phase be compared to established programs. This research could focus on the difficulties faced by start-up SI programs and how they overcome these difficulties. This could be a multicase qualitative study of new and established programs are facing start up challenges or have already overcome pilot program challenges, respectively. I advise that students be interviewed to see their motivations for attending SI sessions in new and in established programs.

Recommendations for Practice for the NECC SI Program

The NECC SI program is still in the developmental phases. As such, improvements can be made to increase the effectiveness of the program. One such recommendation is to clarify the distinction between SI and traditional tutoring. The NECC students do not seem to recognize a difference between traditional tutoring and SI, as demonstrated by the way the drop in and out of sessions for one question to be

answered, rather than participating in the entire session activities. One change that can be made is that SI peer leaders can be trained to utilize more SI specific techniques. A result of increasing the awareness of SI techniques is that SI leaders can convey the difference between traditional tutoring and SI to the students when they invite the students to attend sessions. One SI leader stated that sometimes he has difficulty explaining what SI is to students. Clarification of the goals and differences of SI could encourage more students to attend.

Additionally, SI session logistics could be modified. While two of the three SI leaders interviewed told me they met in the LRC, the administrators noted that other SI sessions take place in the LRC. This again blurs the distinction between SI and traditional tutoring. I recommend SI sessions be held in separate locations from the LRC, such as a classroom setting so that the collaborative learning activities can take place without the distraction of other tutoring sessions

A further recommendation is that the NECC program increases training in SI specific sociocognitive learning techniques. If the SI peer leaders received greater amounts of training in collaborative learning activities, they may be able to differentiate between SI and traditional tutoring to the students, which may improve attendance. Furthermore, the amount of direct instruction could be decreased and the rate of construction of knowledge could be increased if SI peer leaders increased the use of SI specific techniques.

Another issue is possible saturation of tutoring programs at NECC. The LRC has several tutoring and support programs in addition to departmental tutoring programs. Part

of the issue with attendance could be based on the number of options of tutoring programs that students have access to. If student goals for attendance do not match the goals of sociocognitive learning and construction of knowledge of through the SI program, then they may more readily attend another program that does match their goals of immediate answers to unfinished assignments, as suggested by Abraham and Dr. Hamilton. To remedy this, either program in the LRC can be reduced, or a more favorable route may be to examine the training and goals of other programs to align them with the SI program goal of construction of knowledge, rather than simply providing answers to students. If students see that they are being encouraged to construct knowledge throughout all tutoring programs it can only mean gains in learning for the college.

Just as aligning the goals of other programs to the SI program goal of construction of knowledge can increase student buy-in, there are other methods of SI program delivery that could increase student buy-in. For example, modifying the model to be similar to the PAL model could increase student buy-in. In the PAL model, students are required to attend a certain number of SI sessions per week. These sessions are imbedded in the course structure and curriculum. These sessions can be before, after, or during the normal class meeting time, to encourage students' attendance. Session attendance is part of the students' grade. This idea was somewhat experimented with by Ruby's course instructor who took away credit if students did not attend SI sessions. However, SI sessions could be more deeply imbedded into the course structure from the beginning of the course to help students receive the benefits of SI session attendance.

Implications

There are several far-reaching implications of this study. The following section will discuss implications for social change, methodological implications, theoretical implications, recommendations for practice in K-12 institutions, and recommendations for practice for the NECC SI program.

Impact for Social Change

The individuals involved in this study were the administrators, peer leaders, and students. The administrators and peer leaders promoted social change because they did not simply have the goal of students' passing classes, they took on the greater goal of students constructing knowledge and developing skills that would allow them to lifelong learn at a deeper level. This is a social change issue because it involves changing how individuals look at and embrace deep learning. A challenge is to help students grow to appreciate this form of deep learning, rather that the immediate satisfaction of completing an assignment or getting a grade. Long term learning is important to many students at NECC because they have the goal of continuing their education at 4-year institutions. Further, many NECC students are gaining certifications to advance their careers. In both cases, long term learning through construction of knowledge, versus simply memorizing material for the upcoming test, could be beneficial to attaining students' educational and career goals. Thus, a social change at the individual level that can be made by the SI program at NECC is to teach students the value of construction of knowledge for long term learning.

At the organizational level, the implications of this research are that not all tutoring programs at NECC have the goal that the SI program has of construction of knowledge. This greater goal can be placed as an umbrella goal for all tutoring programs at the college by imbedding sociocognitive learning techniques that promote construction of knowledge in training of all tutors. This will increase the learning capacity of students in the college.

On the policy level, NECC is part of a large statewide system of colleges and universities. If the tutoring practices can be adjusted at NECC, then these changes can also be made in the statewide college system level. These changes can not only take place in this system but can be modeled in other statewide systems. This change will have a societal effect on how students and administrators view tutoring and construction of knowledge at colleges and universities. Further, this viewpoint does not have to be limited to colleges and universities, as it can also be shared with the K-12 arena. Specifically, tutoring programs and classroom instruction in K-12 schools can also take on the overriding goal of construction of knowledge using sociocognitive learning techniques. This could make a societal change in how learning takes place in the United States and other countries around the globe.

Methodological Implications

The case study method was an effective tool for this study. Notably, the majority of information gained was through interviews. In future studies, it may not be necessary for the researcher to review and code training information because there is already a great body of knowledge on types of tutoring and SI techniques that can be referred to. Rather

than using time and resources reviewing training, the researcher could attend trainings to observe or voice record what techniques SI leaders are trained in. The SI session recordings, were still valuable because they support what is stated in the interviews. Together the triangulation of interviews, trainings, and SI voice recordings could make a stronger study.

Theoretical Implications

This study was deeply rooted in the theory of construction of knowledge through sociocognitive learning techniques. Sociocognitive learning is not a new theory, but has gained recent attention in the movement from teacher-centered classrooms to student-centered classrooms. The findings of this show that individuals see the value of sociocognitive learning and are willing to encourage these practices in the tutoring setting.

Implications for Practice in K-12 Institutions

The theory and practice of construction of knowledge through sociocognitive learning has great implications not only in tutoring practice, but also in the context of the classroom. Although, it may be difficult to implement such practices in large college classrooms, there is room for application of these practices in smaller K-12 classrooms. In particular, high school or adult learning high school classrooms have the opportunity to become more student-centered versus teacher-centered through the use of sociocognitive learning techniques. These techniques can increase skills in critical thinking, scientific reasoning and overall learning gains.

Conclusion

The purpose statement of this study addressed whether SI peer leaders simply

made students more aware of assessment demands or whether they encouraged

construction of knowledge. Findings of this study suggest that SI leaders at NECC seek

to promote construction of knowledge by utilizing sociocognitive learning techniques in

their SI sessions. Additional findings are that SI leaders are primarily trained in

traditional tutoring techniques that they apply sociocognitively in their SI sessions. They

implement these techniques using social congruence with students and using practical

application of student interests and career goals to course content. Furthermore, while

programmatic, administrator, and peer leader goals align with sociocognitive learning

techniques, the goals of the students do not align with sociocognitive learning techniques.

Rather, students seek out the immediate satisfaction of getting answers to assignments

and receiving a good grade. The implications of this study are far reaching, in terms of

changing methods of instruction by imbedding sociocognitive learning techniques not

only in tutoring programs but also in classroom instruction.

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Appendix A: Contact Summary Form

Site:
Contact date:
Today's date:
Written by:
Contact Type: In person__   Zoom__   Phone__

What were the main themes or issues in the contact?

Which research questions and which variables in the initial framework did the contact bear on most centrally?

What struck you as salient, interesting, illuminating or important in this contact?

What new assertions, propositions, hypotheses, speculations, or hunches about the field situations were suggested by the contact?

What new (or remaining) target questions do you have in considering the next contact with this site?

Appendix B: SI Program Director Interview Protocol and Questions

Time:
Date:
Place:
Interviewee:
Position of interviewee:

- Hello and thank you for participating in the study.

- The purpose of this qualitative multicase study is to describe what techniques SI peer leaders are trained to utilize in SI sessions, explore how peer leaders apply their training to implement techniques to promote construction of knowledge and critical thinking, and explore the perceptions of SI peer leaders and SI program directors about techniques that promote construction of knowledge and critical thinking in reference to the goals of SI programs, institutions and students.

- The purpose of this interview is to gain first hand insight from the perspective of the SI program directors and peer leaders on the research questions.

- The analysis of the interview can be member validated, which means I can send transcripts of your interview responses for your confirmation that the transcripts are accurate.

- The time range of the interview will be about 30-45 minutes.

- The interview will be recorded via two voice recorders to ensure no technical difficulties interfere with data collection. I will take some general notes on my iPad regarding your responses. I will type the recorded transcript of the interview and can provide a copy of the transcript to you for you to review for accuracy following the data collection period.

- I sent a copy of the consent for by email prior to our meeting. Here is a hard copy of the consent statement.

- Do you accept all of this information or have any questions?

- I will ask you interview questions and I will type brief notes into my iPad. I may ask for elaborations and clarifications where necessary. I will also restate or summarize your statements to be sure that I am getting the true meaning of your statements

- I am now turning on the recording equipment.

SI Program Director Interview Questions

I first have some background questions just to ease us into the recorded format.

Describe your role with the SI program

What are the goals of the SI program?

How many SI tutors are there this term, and for what courses?

The next set of questions are more reflective and relate to my research questions.
I reviewed the SI peer leader training material you provided. Which techniques are the primary focus of SI peer leader training?

Are any other techniques that you consider useful for SI peer leaders?

Are you considering adding any new techniques?

If I were to observe SI sessions with you, what kinds of techniques would we see the SI leaders implement most frequently?

In your experience, what influences SI peer leaders to use one technique over another?

Have the SI leaders expressed any concerns about the techniques they use? If so, what concerns have they shared with you?

You stated earlier that the goals of the program are … In your observations of SI sessions, how effective are the techniques in relation to the goals of the program?

Can you provide examples of how you know whether or not they are effective?

How effective are the techniques in relation to the goals of the students?

The mission statement (goal statement) of the college says that the school strives to produce learners that… How effective are the techniques in relation to the mission/goals of the college?

Does the SI program (at NCCU. BMCC's program is new) have a recent assessment report? Does the SI program have additional goals in terms of ongoing assessment?

That covers the things I wanted to ask. Is there anything you'd like to add?

Appendix C: SI Peer Leader Interview Protocol and Questions

Time:
Date:
Place:
Interviewee:
Position of interviewee:

- Hello and thank you for participating in the study.

- The purpose of this qualitative multicase study is to describe what techniques SI peer leaders are trained to utilize in SI sessions, explore how peer leaders apply their training to implement techniques to promote construction of knowledge and critical thinking, and explore the perceptions of SI peer leaders and SI program directors about techniques that promote construction of knowledge and critical thinking in reference to the goals of SI programs, institutions and students.

- The purpose of this interview is to gain first hand insight from the perspective of the SI program directors and peer leaders on the research questions.

- The analysis of the interview can be member validated, which means I can send transcripts of your interview responses for your confirmation that the transcripts are accurate.

- The time range of the interview will be about 30-45 minutes.

- The interview will be recorded via two voice recorders to ensure no technical difficulties interfere with data collection. I will take some general notes on my iPad regarding your responses. I will type the recorded transcript of the interview and can provide a copy of the transcript to you for you to review for accuracy following the data collection period.

- I sent a copy of the consent form by email prior to our meeting. Here is a hard copy of the consent form.

- Do you accept all of this information or have any questions?

- I will ask you interview questions and I will type brief notes into my iPad. I may ask for elaborations and clarifications where necessary. I will also restate or summarize your statements to be sure that I am getting the true meaning of your statements

- I am now turning on the recording equipment.

SI Peer Leader Interview Questions

I first have some background questions just to ease us into the recorded format.

I am interviewing people with different levels of experience with the SI program and tutoring in general.

How long have you been with the SI program?

How much training have you received for the SI program? What forms and kinds of training have you received?

Do you have any additional tutoring or TA experience or training?

Describe your role with the SI program?

What are the goals of the SI program at your institution?

If I were a participant in a typical SI session, what might happen in that session?

Have there been any challenges that you have faced in a SI session?

    Can you provide examples?

What would you describe as a successful SI session?

In your experience, what are the key techniques necessary to conduct an effective SI session?

What influences you to use one technique versus another?

Are there any other factors that impact how you conduct your sessions?

You stated earlier that the goals of the program are … How effective are the techniques in relation to the goals of the program?

Can you provide examples of how you know whether or not they are effective?

How effective are the techniques in relation to the goals of the students?

    How much do your sessions relate directly to assessments?

    How do you address critical thinking in your sessions?

The mission statement (goal statement) of the college says that the school strives to produce learners that… How effective are the techniques in relation to the mission/goals of the college?

That covers the things I wanted to ask. Is there anything you'd like to add?