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# Development of graduate health science students' clinical reasoning: A qualitative study

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# DEVELOPMENT OF GRADUATE HEALTH SCIENCE STUDENTS' CLINICAL REASONING: A QUALITATIVE STUDY

by
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## Dedications

I dedicate this dissertation to my husband and best friend, Dan. He has always supported and encouraged me even when I didn't have confidence in myself. He willingly took on more than his fair share at home and I know I couldn't have come this far without his support.

I dedicate this dissertation to my two amazing children—Meghan and David. I am so proud to be your mom and to have the privilege to watch you grow into the amazing young adults that you are. I hope I have been a positive role model and example of determination and hard work to achieve your goals.

Last, I dedicate this dissertation to my parents, Fred and Jane, for all the sacrifices you made years ago that allowed me to go to college and begin this academic journey. You have always supported and encouraged me at every stage of my education. I hope I have made you proud! I love you all!

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## Abstract

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DEVELOPMENT OF GRADUATE HEALTH SCIENCE STUDENTS' CLINICAL REASONING: A QUALITATIVE STUDY
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Employment in health science professions requires technical skills and the ability to engage in high-level reasoning skills in order to make appropriate recommendations about the care of a patient. Developing clinical reasoning skills, then, is a central component of graduate health science training programs. The purpose of this phenomenological study is to understand how learning is structured in graduate health science courses at a comprehensive state university and how graduate health science students develop clinical reasoning skills. Situated in Vygotsky's social constructivism theory and applying Garrison's CoI framework, the aim was a discussion of themes and patterns that emerged from a qualitative analysis of student clinical reasoning in graduate health science programs. Two graduate health science instructors and 62 graduate health science students participated. Data collection included transcripts from instructor-student and student-student discourse during active learning opportunities in the classroom, transcripts from instructor semi-structured interviews, transcripts from student focus groups, and detailed field notes. Several key findings emerged. First, instructors and students viewed significant factors in developing clinical reasoning differently. Second, graduate health science students' clinical reasoning skills did not develop in gradual progression and were impacted by the classroom format, instructor expectations, and

social dynamics within the classroom. Third, instructional pedagogies were significant factors in the clinical reasoning skills graduate health science exhibited in the classroom.

## Table of Contents

**Table of Contents (Continued)**

**Table of Contents (Continued)**

## Table of Contents (Continued)

## List of Figures

## List of Tables

## List of Tables (Continued)

# Chapter I

## Introduction

Beyond the mastery of content knowledge and technical skills, employment in health care fields requires development of high-level reasoning skills, and all of these skills directly impact patients (Levett-Jones et al., 2010). Consequently, the development of clinical reasoning skills is an essential element in graduate health science training programs (Banning, 2008a; Finn, 2011; Kamhi, 2011; Levett-Jones et al., 2010). Expectations of critical thinking and high-level reasoning are among the required standards across health care disciplines (Association of American Medical Colleges, 2016; American Occupational Therapy Association, 2010; Commission on Collegiate Nursing Education, 2013; Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association, 2013; Cronenwett et al., 2007; The Federation of the State Boards of Physical Therapy, 2006). In recent years, emergence of pedagogical and theoretical frameworks for teaching high-level reasoning and problem-solving required in clinical decision-making has primarily focused on physician and nurse training (Delany & Golding, 2014; Durning, Artino, Schuwirth, & van der Bleuten, 2023; Durning & Gruppen, 2015; Irby, 2011, 2014; Rencic, 2011). Since the recommendations made by health care providers also impact patient care, these frameworks are applicable in health science education to teach graduate health science students how to develop clinical reasoning skills (Banning, 2008a; Finn, 2011; Kamhi, 2011; Levett-Jones et al., 2010).

## Conceptual Framework

Central to the conceptual framework in this study is Vygotsky's Social-Constructivist Theory. A pioneer in learning theory, Vygotsky argued that interpersonal and intrapersonal communication was pertinent in learning and that learning is facilitated through social interaction and the use of language (Nathan & Sawyer, 2014; Powell & Kalina, 2009; Vygotsky, 2012; Vygotsky & Cole, 1978). In order to develop clinical reasoning skills, verbal interaction between instructors and students is assumed during the learning process in order for instructors to provide guidance in making clinical decisions, provide supervised practice, and give feedback (Pinnock & Welch, 2014). According to Vygotsky's theories, learners have differing capabilities working alone as compared with teacher guidance or collaborative activities with peers (Stahl, Koschmann, & Suthers, 2014). The support given to learners to bridge the gap between what they know and more complex ideas is known as scaffolding (Reiser & Tabak, 2014; Sawyer, 2014). Scaffolding may take several forms including presenting, structuring, and simplifying the problem-solving process, coaching learners through critical steps, and encouraging students to explain their thinking (Lu, Bridges, & Hmelo-Silver, 2014). Throughout the process, however, as learner success increases, scaffolding gradually fades (Lu et al., 2014).

Teacher-centered lecture-based instruction may be an unproductive means of teaching clinical reasoning in health care fields (Hmelo-Silver, 2004; Sternberg, 2003) and contrast Vygotsky's social constructivist theory. Conversely, teacher strategies that employ scaffolding to increase learner understanding are more effective (Reiser & Tabak, 2014; Sawyer, 2014). In student-centered instructional approaches, social interactions

are an important component in the learning process (Crichton, 2013). When the social interaction between instructors and students is collaborative, this interaction determines the learning opportunities in the classroom (Crichton, 2013). Active learning results from collaboration between instructors and students, or from independent work. Applying social constructivist learning theories, active learning designs engage students in a collaborative learning process that results in varying ideas, opinions, and perspectives which in turn creates exchange of ideas and knowledge (Miyake & Kirschner, 2014; Nathan & Sawyer, 2014; Vygotsky, 2012).

**Defining Clinical and Expert Reasoning**

The need for high-level thinking skills in health care professions is well-documented, however a universally accepted term for these skills and an accompanying definition is lacking. Various terms referring to high-level thinking skills in health care have been discussed in the literature. These include, but are not limited to, critical thinking, problem-solving, analytical thinking, relational reasoning, and clinical reasoning. Brunt (2005), as well as Coker (2010), argue that high-level thinking and the ability to consider multiple factors in order to make appropriate clinical decisions about a patient's care is necessary in health care. Despite the lack of one universally accepted term and definition, the common theme is the ability to move past recall of basic facts (Weissberg, 2013), apply content knowledge, and engage in high-level thinking, an expectation that is consistent across fields (Association of American Medical Colleges, 2016; American Occupational Therapy Association, 2010; Commission on Collegiate Nursing Education, 2013; Council for Clinical Certification in Audiology and Speech-

Language Pathology of the American Speech-Language-Hearing Association, 2013; Cronenwett et al., 2007; The Federation of the State Boards of Physical Therapy, 2006).

Professional organizations and governing bodies set standards for minimum competencies, which include high-level reasoning. Even though the specific terms may vary, all identify high-level problem solving and reasoning as a necessary skill for employment in health care fields. Yet students or novices often struggle with weighing multiple factors to navigate the decision-making process. Pinnock and Welch (2014) found that experts in clinical reasoning often utilize processes unconsciously and may need to explain how they are thinking to their students through cognitive apprenticeship in order to be aware of them. Therefore, instructors and students must engage in discourse so that the experienced clinicians can provide guidance in making diagnostic and clinical decisions, provide supervised practice, give effective feedback and engage in meaningful discussion (Pinnock & Welch, 2014). Along the same lines, Hmelo-Silver (2004) argues that experts can initially guide novices through the learning process by scaffolding learning, modeling skills, and coaching students through the clinical decision-making process. Later, the experts can fade support as the novice's clinical reasoning skills improve (Hmelo-Silver, 2004).

**Shifts in Instructional Frameworks and Patterns of Discourse**

Instructional philosophies and practices have shifted over the past few decades from teacher-centered approaches toward student-centered approaches. Teacher-centered practices were situated in instructionism and focused on rote recall of facts (Sawyer, 2014). Teacher-centered approaches feature delivering of information to students who are passive and attentive (Sawyer, 2014; Scardamadia & Bereiter, 2014). Conversely and

positioned in constructivism, student-centered practices focus on active learning processes (Sawyer, 2014). In student-centered approaches, new ideas are constructed by learners and the instructor serves as a facilitator during the process (Brandon & All, 2010; Johnson, 2009; Liu, 2010). As instructional methods shifted toward student-centered instruction, approaches such as problem-based learning emerged (Barrows, 1983; Hmelo-Silver, 2004). These approaches were initially intended for use in medical and nursing education, but eventually they spread to other disciplines for the purposes of learning through practical experiences (Barrows, 1983; Hmelo-Silver, 2004).

Since social constructivists assert the importance of social interaction during the learning process, effectively engaging students in the learning process is paramount (Crichton, 2013). Collaboration in the classroom between instructors and students has a great influence on the learning opportunities (Crichton, 2013). Garrisons' (2016) Community of Inquiry (CoI) framework extends social constructivism theory and identifies learning as the junction between three interdependent elements—social, cognitive, and teaching presences. Garrison's framework can be adapted to various types of collaborative learning and thinking and is applicable to how graduate health science students acquire their clinical reasoning skills. Garrison posits that collaboration is a critical component of innovative thinking and learning, but warns that collaboration is more than sharing information. Collaboration, therefore, is dependent on establishing a trusting setting which refers to the social presence (Garrison, 2016). A second component of Garrison's framework is the cognitive presence which involves assisting the students to move through the process of inquiry to reflect high-level thinking and application of knowledge. A third component of Garrison's (2016) CoI framework is

teaching presence and refers to course design, facilitation, and direction of instruction. Initially, the teaching responsibilities lie with the instructor, however, as learners move toward higher-level thinking, the role of the instructor shifts toward facilitation.

Questions are common in all types of classrooms and are often used by instructors to actively engage students in the learning environment. A frequent occurrence in classrooms, though, is a process called the Initiation (I), Response (R), Evaluation (E), or Feedback (F) sequence (Greeno & Engeström, 2014). When questions are used in an IRE sequence, students are positioned as passive learners (Greeno & Engeström, 2014). Conversely, a framework which focuses on high-level thinking is Socratic questioning (Paul & Elder, 2007). High-order, divergent questions are often an effective tool for instruction and help instructors assess understanding, build conceptual knowledge, and encourage high-level thinking (Tofade, Elsner, & Haines, 2013). According to Wink (1993), using effective questioning techniques in health care settings helps student engage in high-level reasoning. Additionally, by engaging students in discourses that teach them how to ask and answer questions, students then exhibit higher level problem solving and reasoning (Gillies, 2015).

Similar to instructor-student interactions that develop through the use of high order and divergent questioning, Dumas, Alexander, Baker, Jablansky, and Dunbar (2014) and Chi and Menekse (2015) posit that analysis of student-student verbal interaction allows for a clearer understanding of the covert thought processes in which students engage. Since both instructor-student and student-student collaboration are the product of instructional practices within the learning environment, it is reasonable to

assume that the development of health science students' clinical reasoning skills is then impacted by and dependent on an active learning environment.

Several instructional strategies situated in active learning designs include case-based learning (CBL), problem-based learning (PBL), team-based learning (TBL), and simulation of skills. Common among these strategies is the application of theoretical knowledge to clinical cases. CBL is an instructional strategy that emphasizes real-world application of skills (Williams, 2005). In CBL, students are presented with patient background and medical information after which they collaborate to formulate clinical decisions (Williams, 2005). By guiding students through the learning process, mentors and instructors take an active and collaborative role in the learning process (Dupuis & Persky, 2008; Tucker, Parker, Gillham, Wright, & Cornell, 2015).

Another active learning strategy is PBL. Applying social constructivist learning theories (Hmelo-Silver & Barrows, 2008; Lu et al., 2014), PBL has its origins in medical education (Barrows, 1983). Similar to CBL, PBL was originally developed as a "whole-curriculum concept" (Taylor & Miflin, 2008, p. 742) in which students determine relevant facts, identify their own knowledge deficiencies, work through the problem-solving process, and form hypotheses about plausible solutions (Barrows, 1983; Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2008). Building on CBL strategies, in PBL, students take the primary role in the learning process while mentors monitor discussions, implement strategies as needed, then diminish scaffolding when the students assume the primary questioning role (Hmelo-Silver & Barrows, 2006).

A fourth active learning strategy is TBL. Also building on CBL during instruction, the aim of TBL is to provide opportunities for students to apply conceptual

and procedural content to solve problems (Michaelsen & Sweet, 2008). Similar to PBL, a subtle but distinguishing difference is that courses using a TBL approach are divided into modules and students are specifically assigned to a team to whom they are held accountable (Michaelsen & Sweet, 2008, 2011). Another difference is that in TBL, students are expected to study assigned resources before engaging in any in-class work, are quizzed at the beginning of the module on content, and held accountable both individually and to their group for the quality and quantity of their work (Balan, Clark, & Restall, 2015; Michaelsen & Sweet, 2008, 2011). Throughout the module, students apply content knowledge to solve problems (Michaelsen & Sweet, 2008) and finally receive peer feedback about their contribution to the group (Michaelsen & Sweet, 2011; Sisk, 2011).

Lastly, simulation of skills is another active learning strategy applicable to instruction in health science fields. Adapted from other fields, high fidelity simulators have emerged as an influential training instrument in health care because it allows students to practice skills without any risk to patients (Beaubien and Baker, 2004; Walshe, O'Brien, Murphy, & Hartigan, 2013). Crea (2011) argues that in addition to mastery of technical skills, simulation can increase a student's confidence, communication, and teamwork skills. Besides high-fidelity simulation, other types of simulation applicable to healthcare instruction are the use of case studies, role plays, and part task trainers.

Lacking technological equipment, paper case studies, which are very similar to case-based learning, allow students to apply conceptual knowledge about fictitious or anonymous patients and then discuss possible scenarios and course of actions (Beaubien

& Baker, 2004). Role plays, on the other hand, take the case studies one step further and allow students to discuss what they would have done differently and re-enact the situation (Beaubien & Baker, 2004). Both, however, allow instructor-student and student-student collaboration and interactions. Yet another form of simulation is called part-task trainers. The purpose of using this method is to break complex tasks into its smaller components, which allows students to perfect each step until mastery of the entire process (Beaubien & Baker, 2004; Durham & Alden, 2008). Part-task trainers can range from standardized patients to simulation machines and are designed to segment complex tasks into smaller components (Beaubien & Baker, 2004).

Graduate students in health science fields will often work as part of an interdisciplinary team, so in addition to clinical reasoning and development of practical skills, these students also need to develop the ability to work with others as a team and good communication skills. Simulation is one means to address students' competence and confidence in both technical (e.g., therapeutic techniques) and non-technical skills (e.g., communication and teamwork) (Crea, 2011). Regardless of the specific type of simulation, there is evidence that simulation of skills supports active learning strategies that promote development of clinical competence (Crea, 2011).

**Statement of the Problem**

Instructional strategies in health profession education shifted from teacher-centered to student-centered active learning approaches in recent decades (Sawyer, 2014). Situated within social constructivist principles, the development of clinical reasoning skills usually implies verbal interaction between instructors and students and among students and their peers. Active learning environments encourage students to actively

engage in discourse with instructors, who use purposeful questioning techniques. Further, instructional strategies that incorporate an active learning design encourage skills necessary in clinical reasoning and decision making such as high-level problem-solving and reasoning, decision-making, and reflection (Gillies, 2015; Graffam, 2007; Hoogenes et al., 2015; Kim, Sharma, Land, & Furlong, 2013; Wagner, 2014; Zare & Othman, 2015). Using a social constructivist lens, this phenomenological study focused on instructor-student and student-student verbal interactions and patterns of discourse that occur within active learning environments in order to further understand how graduate health science students develop clinical reasoning skills.

**Purpose of the Study**

The purpose of this phenomenological study was to understand how learning in graduate health science courses is structured and how graduate health science students develop clinical reasoning skills at Seaside University (a pseudonym). Drawing on Vygotsky's social constructivism theory and applying Garrison's (2016) CoI framework, the aim was an understanding of what strategies course instructors use to scaffold learning and what verbal strategies students use to make clinical decisions during active learning experiences. The term clinical reasoning will be defined as high-level problem-solving skills used to determine clinical recommendations about the care of a patient.

In phenomenological inquiry, detailed descriptions and close analysis of participants' experiences allow for a deeper understanding of the phenomenon (Starks & Trinidad, 2007). In recent decades, teacher-centered instructional approaches have given way to student-centered approaches incorporating active learning processes (Johnson, 2009; Sawyer, 2014). In active learning, students construct new ideas based on their

current or past knowledge and experiences (Brandon & All, 2010; Johnson, 2009; Liu, 2010). The emergence of pedagogical and theoretical frameworks for teaching high-level reasoning and problem-solving necessary in clinical decision making within active learning designs have primarily focused on medical education (Delany & Golding, 2014; Durning et al, 2013; Durning & Gruppen, 2015; Irby, 2011, 2014; Rencic, 2011). While these instructional frameworks can generally be applied in teaching graduate health science students how to develop both conceptual knowledge and clinical reasoning skills in health science education (Banning, 2008a; Finn, 2011; Kamhi, 2011; Levett-Jones et al., 2010), additional research is needed focusing specifically on how graduate health science students develop clinical reasoning.

Purposeful, theory-based sampling of students and their instructors within graduate health science fields of study was used for selection of the participants. Data were collected using field notes from observations, transcriptions of recorded discourse in the classroom during active learning activities, and structured interviews. The transcripts were coded and analyzed for emergent patterns during instructor-student and student-student discourse in graduate health science courses. Transcripts from structured interviews with instructors and focus groups with students, and field notes from semi-structured observations were also coded and analyzed for emergent patterns.

By examining the discourse of two cohorts of health science students engaged in active learning activities through qualitative approaches, this study may provide a deeper understanding of how learning is structured in graduate health science courses and how graduate health science students develop clinical reasoning skills. It will, therefore, add to a growing body of literature about this phenomenon. Further, results may help

instructors develop effective methods of structuring health science courses. It may also help instructors and mentors model the clinical reasoning process and engage students in meaningful discourse to assess student development and mastery of clinical reasoning skills.

**Research Questions**

Several questions and sub questions about how graduate health science students develop clinical reasoning guided this research:

1. How do graduate health science students at Seaside University (pseudonym) develop clinical reasoning skills in the classroom environment?
2. What types of frameworks of participation do instructors use to encourage participation during instruction during graduate health science classes?
    a. What strategies do course instructors use to scaffold learning to elicit clinical reasoning skills from students during active learning experiences in the classroom?
    b. What verbal strategies or processes do graduate students use to make clinical decisions during active learning experiences in the classroom?
3. What other patterns of discourse emerge when graduate health science students make clinical decisions during active learning experiences in the classroom?

**Methods**

Qualitative research provides a systematic and interpretive method of inquiry in which the researcher serves as the primary instrument within a natural context to explore an issue (Creswell, 2007; Rossman & Rallis, 2012). In qualitative inquiry, researchers

use multiple data sources and engage in an iterative and inductive process by developing patterns and themes from the data (Creswell, 2007; Miles, Huberman, & Saldaña, 2014; Rossman & Rallis, 2012). A phenomenological study is the qualitative strategy used for this study and is appropriate to describe the meaning and quintessential experiences of the phenomenon for the participants (Patton, 2002; Rossman & Rallis, 2012). This phenomenological study allowed examination of instructor-student and student-student discourse patterns in graduate health science programs at a comprehensive university over time. It also allowed analysis of field notes from semi-structured observations, and transcripts from instructor interviews about instructional frameworks and strategies that help graduate health science students develop clinical reasoning skills. Finally, transcripts from student focus groups allowed for analysis of the types experiences the students felt influenced their development of clinical reasoning.

Data were collected at Seaside University (pseudonym), a comprehensive university located in the northeastern region of the United States. It was a mid-sized undergraduate and graduate university of the arts, sciences, and professional studies chosen because it offered multiple programs in health science fields. Further, both the Communication Disorders and Occupational Therapy classes are selective in their admissions, similar in length and credit requirements, and both require fieldwork experiences as part of their program. Data collection in multiple classes across both disciplines offered a comprehensive data set and lead to a more thorough understanding of factors that influenced how graduate health science students develop clinical reasoning skills.

Theory-based, purposeful sampling, in which the researcher purposefully selects participants based on specific questions or purposes that represent theoretical constructs about a phenomenon was used (Krathwohl & Smith, 2005; Miles et al., 2014; Patton, 2002; Suri, 2011). Following approvals from the Institutional Review Board (IRB) at Rowan University, instructors who used active learning strategies that encourage instructor-student and student-student interaction were selected to participate. Additionally, graduate students enrolled in courses with selected instructors were also selected as participants. Following participant selection, I fully explained the purpose of the study and methods of data collection. Each of the participants (instructors and students) was given an opportunity to ask questions and decide whether or not to participate prior to signing an informed consent form. The informed consent form specifically stated that participation was voluntary and would not impact progression in coursework or employment status, that there were no risks nor incentives to participate. Further, security of data storage and protection of participant confidentiality was also addressed throughout the data collection, analysis, and reporting process. Once participants signed the informed consent they were given a copy of the form for their records.

For this phenomenological study, data were collected in several ways. As a non-participatory observer, the first and primary data collection occurred within graduate health science classrooms during class sessions over the course of a full semester. Instructor-student and student-student discourse were audio-recorded and transcribed. Second, data were also collected using detailed field notes from observations that include detailed descriptions of the environment and interactions, and observer comments

including insights and questions regarding meanings (Rossman & Rallis, 2012; Yin, 2014). Additionally, semi-structured interviews with course instructors were audio-recorded and transcribed. The last type of data were transcripts from focus group discussions with students from both classes. These interviews, which focused on what experiences had influenced their development of clinical reasoning, were also audio recorded and transcribed.

Data were organized and then coded using two cycles. During the first cycle, open or initial coding was used followed by pattern coding in the second cycle. Following each cycle of coding, I verified emergent findings and interpretations with the participants through a process called member checking (Miles et al., 2014; Rossman & Rallis, 2012). Analytical memos were also used to track assumptions, reflections, and identify emergent patterns and themes from the data (Miles et al., 2014; Saldaña, 2013).

Trustworthiness, the steps taken to ensure that the research is credible, dependable, confirmable, and transferable, was addressed in several ways (Miles et al., 2014; Toma, 2006). Credibility is the extent to which the research findings can be confirmed by someone other than the researcher, the degree that findings make sense, and the persuasiveness of the results (Miles et al., 2014; Toma, 2006). Credibility was addressed by including a review of the literature, thoroughly outlining the design of the study, practicing reflexivity, creating an audit trail, using member checking procedures, and prolonged participation in the study (Miles et al., 2014; Toma, 2006).

Dependability in qualitative research refers to the extent the research process accommodates changes that occur throughout the data collection process (Miles et al., 2014; Toma, 2006). Dependability was addressed by explaining the purpose and

rationale of the study, and how data were collected to participants (Miles et al., 2014; Toma, 2006). Additionally, I kept detailed notes in a research journal, created an audit trail, and triangulated data (Miles et al., 2014; Toma, 2006).

Confirmability refers to the researcher's ability to confirm and validate findings that emerge from the study (Miles et al., 2014; Toma, 2006). To establish confirmability in this study, I triangulated data, kept a detailed research journal, and created an audit trail (Toma, 2006). Lastly, transferability refers to the extent that findings can be generalized (Miles et al., 2014; Toma, 2006). Transferability was established using thick descriptions about participants, setting, and data collection and analysis procedures (Geertz, 1973).

Transferability refers to the extent that findings can be generalized or transferred to similar settings or populations (Miles et al., 2014; Toma, 2006). To establish transferability, I used a detailed research journal, which included thick descriptions of the participants, setting, and data collection and analysis procedures (Geertz, 1973; Miles et al., 2014). This allowed for comparisons of findings and other settings to which the findings may be applied.

**Role of the Researcher and Collaboration with the Participants**

Qualitative research involves researcher interpretations about a phenomenon in order to construct meaning (Miles et al., 2014; Rossman & Rallis, 2012). Yet personal assumptions and biases in the research may influence each other (Miles et al., 2014; Rossman & Rallis, 2012). As an instructor in a health science field and a supervisor of graduate interns, I am guided by a social constructivist philosophy in which discourse, social interaction, and collaborative learning are necessary to help students develop

reasoning skills. Further, as an experienced speech-language pathologist, I routinely use high-level thinking processes and collaborate with colleagues about my own clinical cases. Lastly, when I supervise graduate students, I am very aware of my influences on how students learn and use clinical reasoning skills independently.

As the researcher, I included participants in the research process in several ways. First, transcripts and detailed descriptions from observations were verified with participants through member checking (Miles et al., 2014; Rossman & Rallis, 2012). Additionally, I collaborated with instructors to verify how the small groups were structured and what instructions were specifically given (Miles et al., 2014; Rossman & Rallis, 2012).

**Ethical Considerations**

Ethical considerations have a significant impact on the trustworthiness of qualitative research (Miles et al., 2014; Patton, 2002; Rossman & Rallis, 2012). Prior to data collection, approvals by my dissertation committee and Rowan University's IRB were secured. Once participants were selected, the purpose of the study, how data would be collected, my role as a non-participatory observer, risks, methods of maintaining confidentiality, and scope and sequence of the study were fully explained to them. Participants were afforded the opportunity for questions to clarify unclear information before obtaining their voluntary consent. Last, I followed the outlined methodological design and maintained a research journal with detailed field notes to establish and maintain integrity and trustworthiness of the study (Miles et al., 2014; Toma, 2006).

**Significance of the Study**

This study has significance for instruction in graduate health science programs. Since competence in health care fields requires both mastery of technical skills and development of high-level reasoning skills, graduate health science training programs are tasked with helping graduate students to develop those skills (Banning, 2008a; Finn, 2011; Kamhi, 2011; Levett-Jones et al., 2010). In recent decades, instruction in health science fields has gradually shifted from teacher-centered to student-centered approaches (Johnson, 2009), engaging students in active learning processes in which learners construct new ideas based on their current or past knowledge and experiences (Brandon & All, 2010; Johnson, 2009; Liu, 2010). Findings from this study may impact general instructional practices in the classroom as well as course design.

This study has implications for effective instructional techniques to consider when instructors develop and design a course. The findings of this study will be shared with the participants in the hopes of illuminating what frameworks of participation instructors used to encourage student engagement in graduate health science classes during active learning experiences in the classroom. Findings of this study highlighting several key factors could be useful to graduate health science instructors planning instruction. These include: (a) creating an environment where all students feel safe to contribute their ideas and incorporate strategies in order to get more consistent participation from a larger percentage of the students in the classroom, (b) structuring class time in a way that reduces instructor talking time and lectures and allows for maximum student participation and engagement, (c) incorporating small group discourse throughout the course on a consistent basis in order to develop a collaborative group and facilitate open

communication among group members, and (d) being cognizant of the type of questions asked that engage students and asking a follow up question such as "Why?" when students offer suggestions to consider.

Further, these findings have implications for graduate health science curriculum development. By using a collaborative approach toward faculty development (Garrison, 2016), faculty and instructors can engage in professional development to support each other in effective course design and instructional strategies to facilitate high-level thinking required in health care fields across the curriculum and throughout the course sequence.

Last, this study also has implications for future research in several ways. First, the findings in this study revealed that clinical reasoning skills did not develop in a gradual and predictable way in the classroom environment. Rather, these skills were influenced by other factors, which included classroom format and structure, instructor expectations, and social dynamics. Future research in this area could shed more light on this process. Next, this study did not include analyzing discourse patterns in a Physical Therapy class. By including Physical Therapy in succeeding studies would extend the scope and would provide additional understanding about effective instructional practices that could subsequently be implemented within all three disciplines. Additionally, this study was limited to six data sessions in each of two courses in one semester. A longitudinal study with discourse samples from the beginning, middle, and end of the curricular sequence would provide invaluable awareness about the gradual development of clinical reasoning skills and other significant factors which impact it. Finally, this study focused on discourse patterns (instructor-student and student-student) during

graduate health science class sessions. Future research should include analysis of completed course assignments. This additional data set would give insight into other factors such as the structure of assignments, assignment expectations, and students' implementation of instructor feedback over time.

**Organization of the Study**

This study is organized into five chapters. Chapter I introduces the topic of interest, statement of the problem, purpose of the study, research questions, significance of the study, and the organization of the study. Chapter II provides the theoretical framework and review of the literature associated with this topic. The methodology for this study is addressed in Chapter III including researcher assumptions, and rationale for qualitative methodology. It further describes the research setting, participant selection, data collection, data analysis, trustworthiness, and ethical considerations, and limitations. In Chapter IV, I discuss the results that emerged from the data and how they are situated in the literature. Lastly, Chapter V delineates conclusions from the findings. It also identifies limitations to the study that emerged. Finally, I discuss implications for instructor practice, leadership and curriculum development, and future research.

## Chapter II

## Theoretical Framework and Review of the Literature

Preparation for employment in health science fields requires both technical and high-level reasoning skills, so developing clinical reasoning skills is a particularly important component of graduate health science training programs (Banning, 2008a; Finn, 2011; Kamhi, 2011; Levett-Jones et al., 2010). A majority of the recent research about learning clinical reasoning in health care settings, however, has primarily been limited to physician training and nursing (Banning, 2008b; Dumas et al., 2014; Howenstein, Bilodeau, Brogna, & Good, 1996; Koharchik, Caputi, Robb, & Culleiton, 2015; Popil, 2011). Research findings suggest how medical and nursing students develop high-level reasoning skills may be broadly applied to graduate health science students. Despite similarities, however, research focusing specifically on how graduate health science students develop their clinical skills and how the classroom environment contributes to that development is necessary.

The purpose of this phenomenological study is to understand how learning in graduate health science courses is structured and how students develop clinical reasoning skills at a comprehensive state university. According to Vygotsky's social constructivism theory, social interactions and use of language are a vital part of learning, which then drives cognitive development (Nathan & Sawyer, 2014; Powell & Kalina, 2009; Vygotsky, 2012; Vygotsky & Cole, 1978). Drawing on Vygotsky's work, this study will focus on instructor-student and student-student interactional processes and result in a discussion of themes and patterns that emerge from a qualitative analysis of student clinical reasoning in graduate health science programs. The use of a phenomenological study design will allow for deeper understanding of this phenomenon through the

participants' "lived experiences" (Patton, 2002; Rossman & Rallis, 2012) and add to a growing body of literature in order to better understand the cognitive processes that graduate health science students use when developing clinical reasoning skills.

In this chapter I first describe the theoretical framework that informs this study. Next, in the review of the literature, I provide a context for this study by defining clinical reasoning, discussing the process for developing expert clinical reasoning, and discussing how the learning environment, specifically discourse during social interaction, impacts the development of clinical reasoning skills. Then I turn the discussion to active learning strategies that may impact graduate health science students' development of clinical reasoning.

**Theoretical Framework**

Clinical decision-making and competence have a direct impact on patients (Levett-Jones et al., 2010). Consequently, health care providers need strong conceptual knowledge and technical skills in their discipline, as well as the ability to engage in high-level problem-solving to make sound recommendations about a patient's care. Standards and competencies across health care disciplines include expectations of critical thinking and quantitative reasoning (Association of American Medical Colleges, 2016), decision making skills and use of careful judgment (American Occupational Therapy Association, 2010), integrating best evidence for practice and application of knowledge and skills (The Federation of the State Boards of Physical Therapy, 2006), and integration and application of theoretical knowledge (Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association, 2013). Pedagogical and theoretical frameworks for teaching high-level reasoning and

clinical decision-making in medical education have emerged in recent years (Delany & Golding, 2014; Durning et al., 2013; Durning & Gruppen, 2015; Irby, 2011, 2014; Rencic, 2011) and impact the development of clinical reasoning skills. As in medical and nursing practice, the care of other humans is dependent on appropriate health care provider recommendations. These frameworks, therefore, can be generally applied to health science instruction to assist students in graduate health science training programs to develop sound conceptual and technical skills (Banning, 2008a; Finn, 2011; Kamhi, 2011; Levett-Jones et al., 2010).

**Vygotsky's social-constructivist theory**. Vygotsky was a pioneer in learning theories and central to his theory was interpersonal and intrapersonal communication during learning (Vygotsky, 2012). Vygotsky and other social constructivists argue that learning is facilitated through social interaction and the use of language (Nathan & Sawyer, 2014; Powell & Kalina, 2009; Vygotsky & Cole, 1978). According to Vygotsky's theories, when individual learners work alone, they have differing capabilities as compared to having teacher guidance or collaborative activities with peers (Stahl et al., 2014). Vygotsky referred to the measure of the differences between those capabilities as the "zone of proximal development" (Vygotsky and Cole, 1978, p. 86). Support given to learners to bridge the gap between what they know and more complex learning is commonly referred to as scaffolding (Reiser & Tabak, 2014; Sawyer, 2014). Scaffolding may take several forms such as presenting, structuring, and simplifying the problem-solving process, coaching students through critical steps, and encouraging students to explain their thinking (Lu et al., 2014). Throughout the learning process, however, scaffolding gradually fades as learner success increases (Lu et al., 2014). As a

result, this guidance which is situated within the context of real-world tasks, facilitates transfer of skills and deepens the understanding of the relationship between the target skills and application to practice (Reiser & Tabak, 2014).

Vygotsky's theories about cognitive development through a social constructivist lens are particularly relevant to instruction in health science classrooms. Teacher-centered, lecture-based methods of instruction in health science classrooms may be an unproductive method of teaching clinical reasoning and create students who have difficulty applying content knowledge to real-world clinical situations (Hmelo-Silver, 2004; Sternberg, 2003). Although some skeptics may assert the value of teacher-centered instruction, there is much support for instructional practices that emphasize social interaction and engages students in learning. This assertion further supports the argument that learning does not occur in isolation, but rather within one's context of background knowledge through active participation in the learning process (Miyake & Kirschner; Stahl et al., 2014; Sawyer, 2014; Vygotsky & Cole, 1978).

Instruction utilizing an active learning design supports Vygotsky's social-constructivist theories and involves collaboration between the instructor and students. In active learning, participants simultaneously work together on a task with the ultimate goal of learning from the task and teamwork (Miyake & Kirschner, 2014). Successful collaboration, however, goes beyond merely joining people with relevant knowledge (Miyake & Kirschner, 2014). Active learning designs, which apply the social constructivist learning theories pioneered by Vygotsky (Vygotsky & Cole, 1978), allow students to be actively engaged in the learning process and take ownership of their own learning. The interaction and discourse between group members represent the process

used in attaining agreement, understanding, and creating a shared meaning (Miyake & Kirschner, 2014; Stahl et al., 2014). Miyake and Kirschner (2014) assert that negotiation is the key in determining which kind of verbal interaction leads to learning for each participant in different ways. Applying social constructivist theories, learning results from social interaction and the use of language among members to present varying ideas, opinions, and perspectives (Miyake & Kirschner, 2014; Nathan & Sawyer, 2014; Vygotsky, 2012). Further, active and collaborative learning opportunities create an atmosphere that facilitates exchange of ideas and knowledge (Miyake & Kirschner, 2014; Nathan & Sawyer, 2014; Vygotsky, 2012).

Development of clinical reasoning assumes verbal interaction between students and their instructors in addition to students and their peers in the classroom environment during the learning process. For that reason, the types of teaching strategies employed during instruction besides the instructor-student and student-student dynamics are significant factors that impact the development of clinical reasoning because they allow instructors and students to work together to actively discuss problems, engage in deep thinking and high-level reasoning, and test hypotheses. Through this practice, students learn how to formulate appropriate recommendations, all skills required for work in health care fields (Bolton, 2015; Brunt, 2005; Coker, 2010; Norman, 2005). Consequently, the thought process in which health care workers engage to make recommendations about patient care is greatly impacted by the instructional practices instructors use and how they engage students. Therefore, training programs shoulder great responsibility to offer professional graduate programs in health-related fields that utilize effective pedagogies and instructional practices that teach students how to develop

clinical reasoning and effectively practice those skills in order to develop clinical competence (Brackenbury, Folkins, & Ginsberg, 2014; Silberman, Panzarella, & Melzer, 2013). Since much of the literature suggesting pedagogical frameworks for teaching clinical reasoning skills is positioned within medical and nursing education, additional research is needed that specifically focuses on how graduate students develop clinical reasoning in health-related fields (Kamhi, 2011). Figure 1 depicts the conceptual framework of this study.

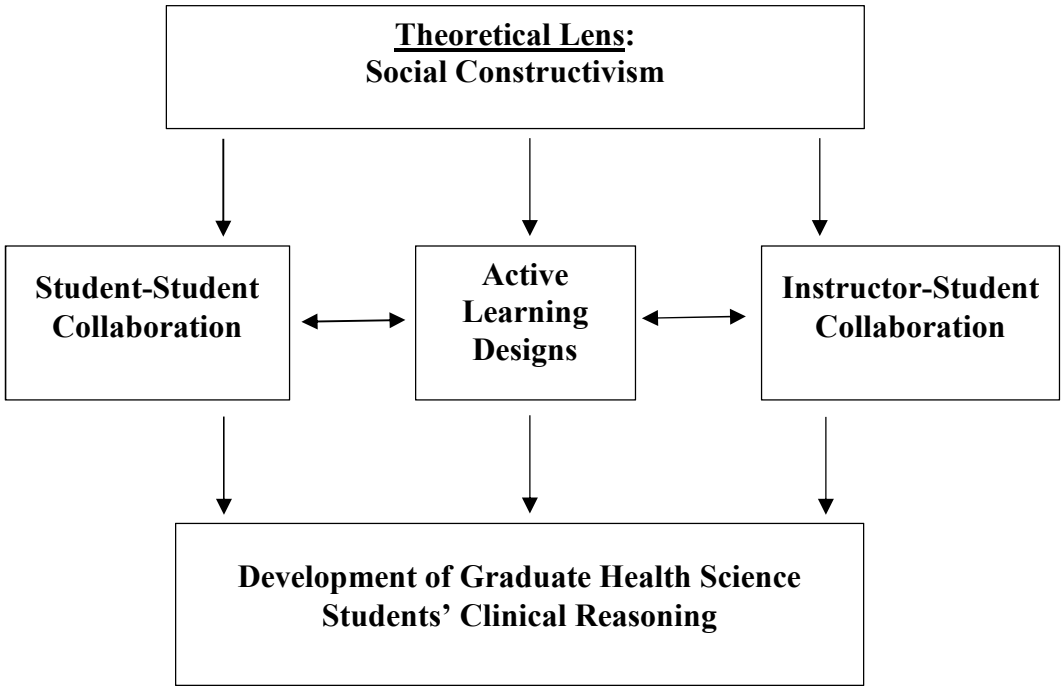


*Figure 1.* Conceptual Framework

In the following review of the literature, I first propose a working definition of clinical reasoning and discuss the process of developing expert clinical reasoning. Next, using a social constructivist lens, I discuss the impact of the learning environment and

how social interaction, specifically discourse, impacts learning clinical reasoning skills. Last, I highlight some instructional strategies that may support the development of clinical reasoning in health science students. Several questions and sub questions about how graduate health science students develop clinical reasoning guided this research:

1. How do graduate health science students at Seaside University (pseudonym) develop clinical reasoning skills in the classroom environment?
2. What types of frameworks of participation do instructors use to encourage participation during instruction during graduate health science classes?
    a. What strategies do course instructors use to scaffold learning to elicit clinical reasoning skills from students during active learning experiences in the classroom?
    b. What verbal strategies or processes do graduate students use to make clinical decisions during active learning experiences in the classroom?
3. What other patterns of discourse emerge when graduate health science students make clinical decisions during active learning experiences in the classroom?

**Review of the Literature**

Going beyond basic content knowledge and skills, professional organizations and governing bodies set standards and expectations for clinical competencies which are inclusive of the ability to make sound clinical decisions (American Occupational Therapy Association, 2010; Commission on Collegiate Nursing Education, 2013; Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association, 2013; Cronenwett et al., 2007; The Federation of

the State Boards of Physical Therapy, 2006). Yet, despite these professional standards criteria for minimal clinical expectations, further research is needed to better understand how graduate health science students develop clinical reasoning skills.

**Defining clinical reasoning**. Much has been written about the need for high-level thinking skills in health care professions yet a standardized term and associated definition is lacking. Terms that often appear in the literature include, but are not limited to, critical thinking, problem-solving, analytical reasoning, relational reasoning, and clinical reasoning. While the specific terms may vary, they all agree on the need for health care professionals to develop high-level cognitive skills. Many researchers have used the term critical thinking to refer to these high-level thinking skills. Despite decades of debate, the term critical thinking remains abstract and widely defined (Brunt, 2005; Elder, 2007; Scriven & Paul, 1987). Behar-Horenstein (2011) asserts that critical thinking requires "application of assumptions, knowledge, competence, and the ability to challenge one's own thinking" (p. 26) adding, that "when using critical thinking skills, individuals are capable of stepping back and reflecting on the quality of that thinking" (p. 26). Similarly, Elder (2007) describes critical thinking as an active process in which the learner is engaged that involves self-monitoring and self-correction. Despite differing and sometimes subtle distinctions between definitions, one common theme throughout the research is that critical thinking requires the ability to move beyond basics facts (Weissberg, 2013) and to engage in high-level thinking. Consequently, the high-level thinking skills required in health care involve questioning assumptions, drawing conclusions, weighing multiple factors, considering varying points of view, applying higher level reasoning, and engaging in reflection. Brunt (2005) further suggests that in

nursing, critical thinking is needed for nurses to think independently, to maintain and improve competence in clinical practice, and to bridge the "theory-practice gap" (p. 260). Coker (2010) seems to agree, but extends that assertion to make a subtle distinction between critical thinking and clinical reasoning. In a study examining the effects of experiential learning on the critical thinking and clinical reasoning of Occupational Therapy students, Coker (2010) found that experiential learning improved both types of skills. These results suggest that clinical reasoning skills extend beyond critical thinking when considering multiple factors in order to make appropriate clinical recommendations (Coker, 2010). Despite the subtle distinction between terms, both critical thinking and clinical reasoning in health care fields require the ability to engage in high-level thinking and problem-solving.

Norman (2005) argues that clinical problems are complex and "there is not one best way through a problem" (p. 426) but solving these problems requires "complex and multidimensional components of knowledge and skills to achieve the goal of effective care" (p. 426). Hence, clinical reasoning involves a combination of reasoning types and according to Eva (2005), includes both analytic and non-analytic reasoning. In analytic reasoning, all signs and symptoms are identified and carefully considered prior to making decisions, whereas in non-analytic reasoning, decisions are based on similarities to a prior case without specific analysis of all the signs and symptoms (Eva, 2005). Bolton (2015) makes similar distinctions about the use of varying types of reasoning in clinical work and asserts that clinical reasoning includes the use of differing types of inferences. Using Peirce's (1992) work on reasoning as a framework, Bolton (2015) applies Peirce's typology to clinical work, which distinguishes three types of inferences—deduction,

induction, and abduction. According to Bolton (2015), deduction refers to the application of general rules to particular cases that result in logical conclusions and result in "risk-free" (p. 486) conclusions. Inductive reasoning involves formulating a general summary or rule that can be applied to treatments plans and can be used to verify deductive conclusions (Bolton, 2015). Lastly, abductive reasoning involves finding explanations for surprising occurrences (Bolton, 2015).

Another type of reasoning in the literature is referred to as relational reasoning. Relational reasoning is the ability to discern meaningful patterns within unconnected information and highlight the overarching patterns of reasoning, learning, and communication between instructors and students (Dumas et al., 2014). Dumas et al. (2014) distinguish four primary patterns of relational reasoning including: (a) analogy (identifying similarities), (b) anomaly (contrasting differences), (c) antinomy (locating incompatibilities), and (d) antithesis (opposition). These overarching patterns during critical analysis of information about a patient suggest multiple forms of relational reasoning that can be applied to teacher-student discourse and student-student interactions during problem-solving activities within the context of the classroom (Dumas et al., 2014). Further, various forms of relational reasoning do not occur in isolation, but rather in unison with each other within the clinical context (Dumas et al., 2014). It is plausible, then, that students may rely on certain forms of relational reasoning more than others and because of these differences, health care educators' interactions with students during classroom discourse could impact how their students develop clinical reasoning (Dumas et al., 2014; Greeno, 2015).

Despite the subtleties and, at times, interchangeability of the terms referring to high-level cognitive processes in the literature, for the purposes of this study, the term clinical reasoning will be used and defined as the use of high-level problem-solving skills and thought processes that consider multiple factors which result in clinical recommendations about the care of a patient. Further, Epstein and Hundert (2002) define professional clinical competence as "the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served" (p. 226). The teaching and assessment of clinical reasoning skills is central to developing clinical competence and is critical for preparation for entry into health care professions (Stamper, Jones, & Thompson, 2008).

**Developing expert reasoning**. Since clinical reasoning and competence have a direct impact on the care of patients (Levett-Jones et al., 2010), the expectation is that graduates of health science programs will demonstrate the necessary clinical competencies established by professional organizations and governing bodies (American Occupational Therapy Association, 2010; Commission on Collegiate Nursing Education, 2013; Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association, 2013; Cronenwett et al., 2007; The Federation of the State Boards of Physical Therapy, 2006). Yet, health science students, or novices, often struggle with the complexity of synthesizing multiple factors in order to make sound clinical decisions, so learning how to navigate the decision-making process is paramount in the training process. Pinnock and Welch (2014) found that clinicians considered experts in clinical reasoning often use unconscious cognitive processes of

which they may not be aware unless they specifically explain how they are thinking. In order to achieve clinical reasoning, then, instructors and mentors must engage students in discourse to provide guidance on the cognitive processes involved in making appropriate diagnostic decisions, provide supervised practice, give effective feedback, and engage in meaningful discussion (Pinnock & Welch, 2014).

Supporting social interaction during the collaborative learning process, Hmelo-Silver (2004) asserts that as novices engage in meaningful tasks, experts can make their cognitive processes visible by asking questions that scaffold learning, modeling skills, and coaching students through the clinical reasoning and decision-making processes, followed by gradually fading support as clinical skills develop. Levett-Jones et al. (2010) posit there are five actions that those with developed clinical reasoning routinely practice. These include: (a) identifying and recalling facts while also synthesizing and applying knowledge in complex and novel clinical situations, (b) prioritizing patient needs, (c) providing care in a timely manner and in an appropriate sequence, (d) synthesizing facts and inferences in order to make an appropriate diagnosis and recommending an appropriate course of treatment, and (e) providing solid reasoning for the decisions that are compatible with the values and beliefs of the patient. Along the same lines, Groves, O'Rourke, and Alexander (2003) assert that experts often combine diagnostic accuracy with an efficient and streamlined clinical reasoning process. Therefore, distinguishing features of the diagnostic expert are the ability to efficiently synthesize and integrate clinical information and the ability to use highly developed patterns (Groves et al., 2003). In teaching clinical reasoning in health care fields, then, instructor-student interaction and collaboration are necessary to develop expert reasoning. Teaching students how to

engage in this type of cognitive process requires verbal interaction between the instructor and student.

**Instructional frameworks**. Shifts in instructional pedagogies from teacher-centered approaches toward student-centered approaches over the past few decades highlight the dichotomy between two divergent theories of learning – instructionism and constructivism. Preparing students for an industrialized society in the early 20th century, teaching strategies were situated in instructionism, which focused on memorization and knowledge of facts with mastery of the content, typically assessed using pre- and post-tests (Sawyer, 2014). This teacher-centered approach, which favors delivering information to passive and attentive students, presents barriers to open-ended approaches required to teach students to think creatively and generate new ideas (Sawyer, 2014; Scardamalia & Bereiter, 2014). As technology advances and the economy becomes more complex and competitive, Sawyer (2014) argues that instructionism fails to prepare students to contribute to this changing society, adding that instructionistic practices are deeply flawed and ineffective in developing "deep conceptual understanding of complex concepts and the ability to work with them creatively to generate new ideas, new theories, new products, and new knowledge" (Sawyer, 2014, p. 2). To this end, Sternberg (2003) suggests the need to specifically teach students to think analytically, creatively, and practically across disciplines. Since health care providers are customarily required to use high-level thinking to make sound clinical decisions, students training for entry into health science fields require an environment that teaches and supports the development of high-level problem-solving and creative thinking.

Converse to the passive internalization of knowledge acquired from more knowledgeable persons or the environment, constructivism is based on an active learning process in which new ideas are constructed by learners based on their current or past knowledge and experiences (Brandon & All, 2010; Johnson, 2009; Liu, 2010). Using a constructivist approach, the instructor serves as a facilitator and helps students assess their learning in process-oriented interactions that focus on deep understanding of concepts and construction of new meanings (Brandon & All, 2010; Nathan & Sawyer, 2014). In constructivism, the primary focus shifts from teacher behaviors to the learning process (Johnson, 2009). As instructional pedagogies shift from teacher-centered toward student-centered instruction, active learning strategies emerge. Approaches such as problem-based learning, initially created for medical and nursing education, eventually spread to other disciplines as a means to learn through practical experience (Barrows, 1983; Hmelo-Silver, 2004).

Supporting an interactive learning environment, Sternberg (2003) and Collins and Kapur (2012) assert that reliance on conventional, lecture-based methods of teaching may be an ineffective method of teaching. Sternberg (2003) further asserts that use of traditional lecture-based instruction may result in students whose expertise in content does not reflect the expertise needed for real-world thinking and application of knowledge to complex problems.

While many favor a constructivist approach to the learning process over instructionism, Johnson (2009) suggests that an instructionism-constructivist approach would emphasize "systematic instruction within a context of individual student meaning

and personal student interest" (p. 95). Table 1 provides a basic comparison between instructionism and constructivism.

Table 1

*Brief Comparison of Instructionism and Constructivism*

| Instructionism | Constructivism |
|---|---|
| ● Focus on memorization of facts and procedures<br>● Focus on teaching<br>● Passive participation<br>● Overlooks application to novel problems<br>● Content learned in isolation without connection to personal experiences | ● Focus on deep understanding of concepts and construction of new meanings<br>● Focus on learning and teaching<br>● Active participation<br>● Focuses on application to novel problems<br>● Content integrated with connections to prior knowledge |

Collaboration and discussion between learners allow all the participants to benefit from the discussion, which is critical in the learning process. Thus, discussions that employ scaffolding as an instructional technique to simplify elements and increase learner understanding are even more effective, making discussion and learning mutually reinforcing, encouraging learners to clarify responses, and reflect (Reiser & Tabak, 2014; Sawyer, 2014). Brandon and All (2010) emphasize that in order to meet the needs of changing health care environments, constructivist pedagogies are applicable to contemporary nursing programs. Moreover, it is reasonable to apply those assumptions to other health care programs. Because all clinical decisions are unique, encouraging instructor-student and student-student interaction provides students with the opportunity to explain their rationale and reflect on their practice. Hence, social interaction and

collaboration are particularly relevant to health science instruction making this kind of learning environment supportive of the development of clinical reasoning in the health fields.

**Instructor-Student discourse**. Social constructivists argue that social interactions are important in the learning process so instructors need to successfully engage students (Crichton, 2013). Therefore, the social interaction between instructors and students is collaborative and in the classroom this interaction determines the learning opportunities (Crichton, 2013).

***Community of Inquiry framework.*** Supporting, but extending Vygotsky's social constructivist theory, Garrison's (2016) Community of Inquiry (CoI) framework provides a perspective which identifies learning as an intersection between the "interdependent elements of cognitive, social, and teaching presence" (p.9). Originally designed for studying online learning, the CoI is a generic framework that can be adapted to any type of collaborative thinking and learning (Garrison, 2016), including understanding how graduate health science students develop clinical reasoning skills. Garrison (2016) argues that a critical element to innovative thinking and learning is thinking collaboratively, so the challenge is how to structure the environment to encourage innovative thinking.

Thinking creatively and constructing new ideas, Garrison (2016) asserts, is more than merely sharing information and is dependent on creating an engaged and trusting community within a purposeful context. Within the CoI framework, social presence, therefore, is the first element that reflects the participants' identity as part of the collaborative group within a trusting environment (Garrison, 2016). Zhao, Sullivan, & Mellenius (2014) warn, however, that interaction does not necessarily equate with

collaboration, but posit that an environment that encourages open communication is key to facilitate cooperative learning.

The second element of the CoI framework includes cognitive presence. According to Garrison (2016), cognitive presence consists of ensuring students move through the phases of inquiry of "identifying the problem, exploration, integration and resolution" (p. 14). In other words, cognitive presence reflects high level thinking and application of knowledge (Garrison, Anderson, & Archer, 2001). Since individuals maintain their present views unless challenged, thinking collaboratively involves debate and challenging of one's understanding to promote high level thinking (Garrison, 2016; Garrison et al., 2001).

The third element of collaborative thinking according to Garrison's (2016) CoI framework is teaching presence. Teaching presence includes elements of course design, facilitation, and direction (Garrison, 2016; Shea, Li, & Pickett, 2006). While initially the teaching responsibilities tend to lie with the instructor, teaching presence involves a shift resulting in various individuals eventually take on increasing responsibilities and results in the instructor's responsibilities shifting from presentation to facilitation (Garrison, 2016; Shea et al., 2006).

***Questions.*** Questions are commonplace in all classrooms and instructors routinely ask questions to actively engage students within the learning environment (Tofade et al., 2013). One framework which represents a frequent occurrence in classrooms is a process called the Initiation (I), Response (R), Evaluation (E), or Feedback (F) sequence (Greeno & Engeström, 2014). In IRE or IRF, the instructor usually begins by asking a question, followed by the student giving an answer (Greeno &

Engeström, 2014). Last, the teacher evaluates the student's response, elaborates, or provides clarification yet students are passive in the learning process (Greeno & Engeström, 2014).

Conversely, questions can be effectively used to scaffold learning (Tofade et al., 2013) and pursue higher-level thinking (Paul & Elder, 2007). A framework that focuses on high-level thinking is Socratic questioning (Paul & Elder). Socratic questioning is "systematic, disciplined, and deep" and can be effectively used to probe students' thinking and encourage students to ask questions to "cultivate deep learning" (Paul & Elder, 2007, p. 36). High-order, divergent questions are often an effective tool for actively engaging students in the learning process and are an integral part of teaching and practicing medicine (Long, Blankenberg, & Butani, 2015) that can be equally as effective in other health care fields. High-order and divergent questions help instructors assess previous familiarity with concepts, build understanding, and encourage the use of high-level thinking skills (Tofade et al., 2013). Thus, when teachers engage students in discourses that specifically teach students how to ask and answer questions, students demonstrate a higher quality reasoning and problem-solving (Gillies, 2015). Some strategies, such as progressive questioning (Gupta, 2005; Hannel & Hannel, 1998), giving time to respond (Crowe & Stanford, 2010), and question sequencing and patterns (Brown & Edmonson, 1989; Vogler, 2005) have been found to be effective in encouraging active participation and developing critical thinking, yet some types of questioning are ineffective. Instructors, therefore, need to deliberately plan their questions to effectively elicit high-level thinking from students, promote peer-peer collaboration, and build student confidence (Crowe & Stanford, 2010; Tofade et al., 2013). Using effective

questioning in healthcare fields helps students use high-level reasoning in clinical situations (Wink, 1993). Hence, when students engage in high-level problem-solving and reasoning in response to purposeful questions, instructors can help students contextualize and apply content knowledge and skills to new clinical situations.

Questions can be grouped by the types of responses they will likely elicit and may be categorized according to several cognitive frameworks (Tofade et al., 2013). McComas and Abraham (2004) characterize questions as convergent or divergent. Convergent questions, also referred to as closed questions, are used with the intention to elicit a specific response (McComas & Abraham). These types of questions are often referred to as lower level questions (McComas & Abraham). Conversely, divergent questions, also referred to as open questions, encourage a wide variety of responses that stimulate discourse or explore varying issues surrounding a topic and are referred to as higher level questions (McComas & Abraham). Another cognitive framework originally developed by Bloom placed cognitive skills in a hierarchy (Krathwohl, 2002). Bloom's Taxonomy specifies a six-level hierarchy of higher-order thinking, moving from concrete to abstract (Krathwohl, 2002). The lowest level is called knowledge, and refers to recall of information and is followed by comprehension, which refers to some level of understanding (Krathwohl). Next, application refers to carrying out a procedure in a given situation, followed by analysis, which refers to comparing and contrasting differences (Krathwohl). Highest on Bloom's hierarchy is synthesis and subsequently evaluation (Krathwohl). Synthesis refers to formulating something new from skills and knowledge, and finally evaluation refers to making judgments about the value of something (Krathwohl).

A third cognitive framework is Anderson and Krathwohl's revision of Bloom's taxonomy (Krathwohl, 2002). Remaining within a hierarchy of skills, the labels for each level were revised to reflect verbs, but still moved from lower level to higher level and concrete to abstract. These include: remember, understand, apply, analyze, evaluate, and create (Krathwohl, 2002). According to both of these frameworks, questions address various levels of cognition and range from recall of facts to higher-level thinking. Therefore, recall types of questions reflect the lowest order of cognitive process whereas questions that encourage synthesis of material reflect the higher cognitive processes (Tofade et al., 2013). Regardless of the cognitive framework, well-planned questions can guide students to use higher level thinking and problem-solving skills which is an especially important part of health science training programs. Wink (1993) asserts that effective questions that "are well-phrased, timed, and formulated help draw out thought and increase the depth and breadth of answers" (p. 12) and result in positive learning outcomes. Table 2 provides a brief summary of the three cognitive frameworks discussed and the level of questions reflected at each stage.

Table 2

*Summary of Question Levels at Each Stage of Three Cognitive Frameworks*

| Level of Question | McComas and Abraham (2004) | Bloom's Taxonomy (Krathwohl, 2002) | Revised Bloom's Taxonomy (Krathwohl, 2002) |
|---|---|---|---|
| Low | Convergent | Knowledge | Remembering |
| Low | Convergent | Comprehension | Understanding |
| Low | Convergent | Application | Applying |
| High | Divergent | Analysis | Analyzing |
| High | Divergent | Evaluation | Evaluating |
| High | Divergent | Synthesis | Creating |

**Student-Student patterns of discourse**. Similar to instructor-student interactions that evolve through the question and answer format, analysis of student-student patterns of verbal interaction may also provide a clearer understanding of the thought process in which they are engaged, a point argued by Dumas et al. (2014). They reason that when students are engaged in collaborative learning to develop clinical reasoning skills, specific reasoning patterns emerge in the discourse (Dumas et al., 2014). Similarly, Chi and Menekse (2015) posit that students' overt patterns of discourse reflect the covert cognitive processes they undertake and that each partner can contribute to the discourse in different ways. Some of the overt constructive activities that reflect these cognitive processes include generating elaborations, creating conceptual diagrams, creating new hypotheses through inference, drawing conclusions, and integrating information from various sources (Chi & Menekse, 2015). Thus, differing types of discourse sequences promote different amounts of learning that are reflected in the patterns of discourse (Chi

& Menekse, 2015; Greeno, 2015). Establishment of collaboration resulting in instructor-student and student-student discourse is dependent on the type of learning environment. Since development of clinical reasoning is dependent on social interaction, establishing an active learning environment that encourages interaction and collaboration among students is critical in the development of health science students' clinical reasoning skills.

**Active learning designs**. Central to development of clinical reasoning skills in health-related fields is active and collaborative hands-on learning. Instruction situated in an active learning design such as case-based learning, problem-based learning activities, team-based learning, and simulation of skills supports learning of content, but also challenges students to actively engage in the learning process, utilize higher level thinking necessary in clinical reasoning and decision making, and reflect on their learning (Graffam, 2007; Hoogenes et al., 2015; Kim et al., 2013; Wagner, 2014; Zare & Othman, 2015).

***Case-based learning.*** Supporting instruction situated in active learning designs, case-based learning (CBL) is a pedagogical approach that links theoretical learning with authentic clinical cases (Thistlethwaite et al., 2012). In CBL, students are presented with the background information about a patient along with other supporting information such as medical status, clinical signs, and test results after which students then collaborate to formulate clinical decisions (Williams, 2005). Mentors and instructors, however, take a more active role in the learning process in CBL, by pointing out incorrect assumptions and guiding students throughout the learning process (Dupuis & Persky, 2008; Tucker et al., 2015).

CBL is conducive to an active collaborative approach in student learning and provides opportunities for deep understanding and competence (Williams, 2005) of clinical skills. Situated within a social constructivist paradigm, students engaged in CBL make clinical decisions based on application of current knowledge (Brandon & All, 2010). Additionally, as compared to peers who were trained through a traditional approach which is dependent on lectures and discussions, Raurell- Torredà et al. (2015) agree with Yoo and Park's (2015) findings that students trained using CBL approaches developed better patient assessment skills, problem-solving abilities, and motivation for learning making it an appropriate pedagogical approach for health care programs. Finally, CBL provides a forum for "interprofessional learning" (p. e436) promoting effective learning in small groups with activities linked to clinical scenarios, and being adaptable to online learning forums (Thistlethwaite et al., 2015). Although there is much support for CBL, it is not without criticism. Thistlethwaite et al. (2015) posit that while CBL is effective in health care professions, evidence supporting its effectiveness compared to other methods is inconclusive. Yet, both instructors and students support CBL as a good use of time and an effective way to learn (Thistlethwaite et al., 2015).

***Problem-based learning.*** Another student-centered, active learning approach often applicable to health science programs is problem-based learning (PBL). Grounded in constructivist learning theories (Hmelo-Silver & Barrows, 2008; Lu et al., 2014), PBL has its origins in medical education, and was originally developed as a "whole-curriculum concept" (Taylor & Miflin, 2008, p. 742). Extending CBL strategies, in a PBL curriculum, students activate prior knowledge, recall information, engage in self-directed reasoning and theory building, and work collaboratively to determine what they

need to learn in order to solve ill-structured problems, those that do not have a single correct response (Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2008; Lu et al., 2014; Taylor & Miflin, 2008). Further, the instructor fulfills the role of expert learner who models strategies for students' learning rather than providing content expertise (Hmelo-Silver & Barrows, 2006). Facilitators continually monitor discussions, implement strategies as needed, then diminish scaffolding when the students assume the questioning role (Hmelo-Silver & Barrows, 2006). During this process using a problem scenario, students determine relevant facts and identify their own knowledge deficiencies (Barrows, 1983; Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2008). As the students work through the problem-solving process, they form hypotheses about plausible solutions (Barrows, 1983; Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2008).

Often, instruction is referred to as PBL but may not follow a true PBL design, instead adapting parts of it. The goal of instruction positioned within the PBL design is still to provide students with experience solving complex, real-world problems (Hmelo-Silver, 2004) making it adaptable to other disciplines including health care (Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006). Although there has been much support for PBL, historically, PBL has received some criticism. First, variations in interpretation and implementation have made it difficult for researchers to study its efficacy (Barrows, 1983; Hmelo-Silver, 2004; Taylor & Miflin, 2008). Next, assessment focuses on elements in clinical practice such as mastery of problem-solving processes or mastery of skills so problems emerge when instructors attempt to measure learning outcomes through traditional methods such as examination scores (Hmelo-Silver, 2004; Lu et al., 2014; Taylor & Miflin, 2008). Third, costs associated with training instructors to

effectively implement PBL along with curricular changes, which limit class sizes and shift from individual subjects to an integrated model, often become prohibitive (Hmelo-Silver, 2004; Taylor & Miflin, 2008).

For most students, PBL may be a dynamic shift from past learning experiences, but Prosser and Sze (2014) argue that PBL favors long-term retention, making it applicable in clinical situations. Thus, using instruction modeled after the PBL approach provides opportunities for students to engage with instructors and other students in an active learning environment which provides the opportunity for students to solve ill-structured problems with the guidance of their instructors. Using instruction modeled after the PBL approach in health care programs, therefore, can provide meaningful instruction and guidance so that students move from novice reasoning skills toward expert reasoning.

***Team-based learning.*** Similar to other active learning designs, team-based learning (TBL) also challenges traditional teacher-centered instructional approaches (Balan et al., 2015) and relies heavily on small group interaction (Michaelsen & Sweet, 2008). Applying social constructivist theories (Hrynchak & Batty, 2012), TBL was first developed in the early 1970s for use in business schools, however, TBL is achieving acceptance in medical education to improve active learning and high-level thinking (Burgess, McGregor, & Mellis, 2014; Parmelee & Michaelsen, 2010) and may also be applicable to graduate health science education. Similar to PBL, the objective of TBL is to provide practice applying conceptual and procedural knowledge to solve problems (Michaelsen & Sweet, 2008). Subtle but distinguishing differences from PBL, however,

is that in a TBL design course content is divided into modules and students are held accountable to their team (Michaelsen & Sweet, 2008, 2011).

Fundamental to the success of TBL strategies, instructors strategically assign students to permanent teams of five to seven students. Instructors attempt to create balanced groups that purposefully do not identify specific roles, balances students' strengths and weaknesses, and avoids coalitions within the group (Michaelsen & Sweet, 2008, 2011; Sisk, 2011). TBL requires the students to review content through course readings, videos, or other formats prior to any in-class work (Balan et al., 2015; Michaelsen & Sweet, 2008, 2011). Students are then quizzed at the beginning of the module on content and held accountable both individually and to their group for the quality and quantity of their work (Balan et al., 2015; Michaelsen & Sweet, 2008, 2011). Lastly, peer evaluation is another element of team-based learning that provides students with feedback from their peers about their contribution to the group (Michaelsen & Sweet, 2011; Sisk, 2011).

Michaelsen and Sweet (2011) assert that TBL benefits the students in several ways. First, TBL requires teams to make choices about highly complex problems to solve that may be challenged by other groups making the positions the students defend genuine (Michaelsen & Sweet). Second, TBL is consistent with best practices approaches (Michaelsen & Sweet). Third, instructors can "harness the power of real teams" (p. 50) and provide challenging tasks that would be overwhelming for individuals (Michaelsen & Sweet). Additionally, team-based learning allows large numbers of students to participate in small group learning experiences with the need for a large number of faculty. Michaelsen and Sweet (2008) further posit that when TBL is

implemented well, students gain a deep understanding of the course content and its application to complex problems. Moreover, students acquire a deep appreciation for the value of teams in solving complex problems and a deep understanding of their strengths and weaknesses as a team member in the learning process (Michaelsen & Sweet, 2008). Benefits for faculty using a TBL approach include students who are prepared for class and when students are well-prepared, instructors spend more time interacting with students rather than making formal presentations (Michaelsen & Sweet, 2008).

TBL, however, is not without criticisms. Although many faculty members have adopted a TBL approach, the evidence about its effectiveness is still unclear (Sisk, 2011). Additionally, since TBL may be a dramatic shift from traditional lecture environments, instructors need to adequately prepare students for the change in learning environment (Balan et al., 2015; Parmelee, Michaelsen, Cook, & Hudes, 2012). Finally, instructors need to redesign the grading system and course content to include meaningful activities that apply content knowledge (Balan et al., 2015; Michaelsen & Sweet, 2008). Yet, despite the challenges in shifting to a TBL approach, instruction using TBL may be an effective means in developing graduate health science students' clinical reasoning skills.

***Simulation of skills.*** Clinical competence requires sound clinical reasoning and to make judgments about appropriate recommendations about a patient's care and procedural expertise to carry out that plan. Students require hands-on experience to learn clinical skills and gain procedural expertise. Since expertise in clinical skills is vital for the provision of safe health care services, there has been a rise in the use of simulation of skills in medical training (Stamper et al., 2008). Simulation, adapted from other fields such as aviation, allows students in healthcare fields to learn skills reflective of real-life

clinical practice without risks to patients (Beyea & Kobokovich, 2004; Crea, 2011; Murray et al., 2015). Resulting from advances in technology, the development of high fidelity simulators has emerged as one powerful training tool in health care competencies (Beaubien and Baker, 2004; Walshe et al., 2013). Allowing students to practice skills under both realistic and rare conditions without any adverse risks to patients, high fidelity simulators, sometimes called full mission simulations, can be used to practice skills over and over until mastery (Beaubien & Baker, 2004). By preparing for both routine and rare occurrences in a realistic setting, the high-fidelity simulators allow students to see the consequences of their actions (Beaubien & Baker, 2004) and learn from mistakes (Blevins, 2014). Beyond mastery of technical skills, simulation can also increase students' confidence and competency in non-technical skills like communication skills and teamwork (Crea, 2011).

Despite the benefits of high fidelity simulators to student learning in healthcare, they are not without criticism. One criticism of high fidelity simulators is the prohibitive cost associated with their use that negatively impact many organizations (Beaubien & Baker, 2004). Most high-fidelity simulators tend to be specialized for use in a specific area, so costs associated with acquiring the equipment, training personnel in proper use, and maintaining the equipment may not be practical for many institutions (Beaubien & Baker, 2004; Chiniara et al., 2013). Crea (2011) notes that patient simulation scenarios may also be time consuming to develop, program, and execute. Further, although many assume higher fidelity is better, Beaubien and Baker (2004) argue that current research does not support that conclusion. Therefore, Beaubien and Baker suggest factors such as

the training needs, available resources, and number of people to be trained will influence the choice of simulation used in a particular health care training program.

Other types of simulation that are beneficial in training healthcare students, yet overlooked, are the use of paper case studies, role-plays, and part task trainers. Similar to case-based learning, paper case studies and role-plays are two basic forms of simulation (Beaubien & Baker, 2004). Void of highly sophisticated technological equipment, during paper case studies students apply factual concepts to a fictional sample patient to reinforce trained skills and teamwork (Beaubien & Baker, 2004). During the case study, students then discuss possible scenarios and course of actions (Beaubien & Baker, 2004). On the other hand, role-plays are a more advanced form of paper case studies where students discuss what they would have done differently and re-enact the situation (Beaubien & Baker, 2004). Besides allowing instructor-student and student-student collaboration and interaction, case studies and role-plays have other benefits. Both can be developed with a minimal investment in resources and usually well-received by trainees (Beaubien & Baker, 2004). Conversely, case studies and role-playing also have some weaknesses. First, they provide limited opportunities to practice behavioral skills and second, if not implemented properly, may receive criticism from the trainees (Beaubien & Baker, 2004).

Another form of simulation is called part-task trainers. Part-task trainers can range from standardized patients to simulation machines and are designed to segment complex tasks into smaller components (Beaubien & Baker, 2004). The purpose of using this method is to break complex tasks into its smaller components, allowing students to practice the initial part of the task first and once the first subtask is mastered, another is

added and both are practiced together until mastery occurs (Beaubien & Baker, 2004; Duram & Alden, 2008). This process continues until the entire complex task sequence is mastered (Beaubien & Baker, 2004; Duram & Alden, 2008). Part-task trainers have both benefits and criticisms of their use in healthcare training. While part-task trainers enable students to practice a skill to a preset competency level, are portable, and are cost effective, they often limit dual task practice (Beaubien & Baker, 2004).

In addition to clinical reasoning and development of practical skills, graduate students in health care fields will often work as part of an interdisciplinary team, which demands good communication skills and the ability to work with others as a team. Despite the type of simulation strategies used, overall there is evidence that they support active learning strategies that promote development of clinical competence. According to Crea (2011), there has been an increased focus on "communication skills, interprofessional teamwork, and patient safety" (p. 1) in health care so regardless of the level of fidelity, simulation is one means to address students' competence and confidence in both technical (e.g., therapeutic techniques) and non-technical skills (e.g., communication and teamwork). Supported by Beyea and Kobokovich (2004), Crea (2011) posits that patient simulation scenarios offer an avenue for students to learn skills in a prescribed manner while providing an effective means for instructors to assess how students develop their clinical reasoning skills. Table 3 provides a brief summary of instructional practices using a collaborative, active learning design that are appropriate for health science fields and which encourage social interaction and challenge students to use higher level thinking.

Table 3

*Overview of Benefits and Criticisms of Active Learning Practices*

| CBL | PBL | TBL | Simulation |
|---|---|---|---|
| Benefits | Benefits | Benefits | Benefits |
| ● Student-centered<br>● Students provided with background information about patient and collaborate to formulate decisions<br>● Opportunities for deep understanding<br>● Mentors and instructors point out incorrect assumptions and guide students through learning process<br>● Supports constructivism<br>● Allows for interprofessional learning | ● Student-centered<br>● Students are self-directed<br>● Students work together to solve complex problems<br>● Students determine what they need to know<br>● Students determine relevant facts and test plausible hypotheses<br>● Instructors guide student learning<br>● Supports constructivism | • Student-centered<br>• Applies conceptual and practical knowledge<br>• Students work in permanent teams<br>• Student accountability for quality and quantity of work<br>• Large numbers of students can participate in small group learning experiences<br>• Pre-learning of content expected<br>• Students are well-prepared | ● Reflective of real-life practice<br>● Low tech-case studies and role plays; high-tech-part task trainers and high-fidelity simulation<br>● Powerful training tools |
| Criticisms | Criticisms | Criticisms | Criticisms |
| ● Evidence supporting effectiveness inconclusive | ● Variations in interpretation and implementation<br>● Difficulty studying efficacy<br>● Difficulty measuring outcomes<br>● Costs associated with training<br>● Curricular changes and maintaining small class sizes | • Shift from traditional environment<br>• Student preparation for shift in instruction and grading needed<br>• Redesign grading and course content/assignments required<br>• Evidence about effectiveness unclear | ● Costs to train and maintain equipment for high fidelity simulation<br>● Focused on specialty areas for high fidelity simulation |

In summary, all decisions in health care require clinicians to compare and weigh multiple factors using varying types of reasoning that reflect the covert cognitive processes clinicians undertake (Chi & Menekse, 2015) in order to make appropriate

recommendations in the best interest of their patients (Eva, 2005). A clinician's clinical reasoning and clinical competence have a direct impact on patient care (Levett-Jones et al., 2010). Clinical reasoning, defined here is the use of high-level problem-solving skills and thought processes that consider multiple factors that result in clinical recommendations about the care of a patient, assumes verbal interaction between students and instructors during the learning process. Thus, instructor-student and student-student collaboration, instructional strategies, and discourse in the classroom environment influence the development of clinical reasoning, which ultimately impacts clinical competence (Brackenbury et al., 2014; Silberman et al., 2013). Although research findings indicative of how medical and nursing students develop clinical reasoning (Banning, 2008b; Dumas et al., 2014; Howenstein et al., 1996; Koharchik et al., 2015; Popil, 2011) may be broadly applied to instruction in health science fields, research focusing specifically on how graduate health science students develop clinical reasoning is warranted.

In recent decades, instructional pedagogies have shifted from lecture-based, teacher-centered approaches toward student-centered approaches in which students are active participants in the learning process (Sawyer, 2014). This shift has created opportunities for instructor-student and student-student verbal interactions, which are central to student-centered active learning approaches. Since development of clinical reasoning suggests dynamic verbal interaction between students and instructors and between students, it is particularly amenable to a social constructivist lens and application of Garrison's CoI framework. Further, instruction within active learning, creates an environment in which students actively engage in discourse with instructors who use

purposeful questioning techniques that encourage high-level problem-solving and reasoning, decision-making, and reflection on their learning, all of which are necessary in clinical reasoning and decision-making (Gillies, 2015; Graffam, 2007; Hoogenes et al., 2015; Kim et al; 2013; Wagner, 2014; Zare & Othman, 2015). Yet, in spite of these suggestions, understanding how students develop clinical reasoning to assure mastery of clinical competence remains vague. In response to this challenge, there is a growing body of literature that supports analysis of learning through patterns of discourse within active learning designs. Using a social constructivist lens, this phenomenological study focused on instructor-student and student-student verbal interactions and patterns of discourse that occurred within active learning environments in order to further understand how graduate health science students develop clinical reasoning skills. Further, it provides the context for the methodology described in Chapter III.

# Chapter III

## Methodology

In this chapter, I provide an overall description of the study design. I first address the purpose of the study, the research questions, and the rationale and assumptions regarding a qualitative strategy of inquiry. Next, I discuss participant selection, data collection, data analysis, and rigor. Last, I address the role of the researcher and collaboration with participants followed by ethical considerations.

### Purpose Statement

The purpose of this phenomenological study was to understand how learning in graduate health science courses is structured and how students develop clinical reasoning skills at a comprehensive state university. Drawing on Vygotsky's social constructivism theory, the aim was a discussion of themes and patterns that emerged from a qualitative analysis of student clinical reasoning in graduate health science programs at Seaside University (pseudonym). The term clinical reasoning was defined as high-level problem-solving skills used to determine clinical recommendations about the care of a patient.

Purposeful, theory-based sampling of students and their instructors within graduate health science fields of study was used for selection of the participants. Data were primarily collected from transcriptions of recorded discussions in the classroom during active learning activities. The transcripts were transcribed verbatim and then coded and analyzed for emergent patterns during instructor-student and student-student discourse in graduate health science courses that employ active learning strategies. Transcripts from semi-structured instructor interviews and student focus groups were also

coded and analyzed for emergent patterns. Detailed semi-structured observation notes were used to verify speakers and activities within the classroom.

In recent decades, teacher-centered instructional approaches have given way to student-centered approaches incorporating active learning processes (Sawyer, 2014). In active learning, students construct new ideas based on their current or past knowledge and experiences (Brandon & All, 2010; Johnson, 2009; Liu, 2010). The emergence of pedagogical and theoretical frameworks for teaching high-level reasoning and problem-solving necessary in clinical decision-making within active learning designs have primarily focused on physician training (Delany & Golding, 2014; Durning et al., 2013; Durning & Gruppen, 2015; Irby, 2011, 2014; Rencic, 2011). While these instructional frameworks can generally be applied in teaching graduate health science students how to develop both conceptual knowledge and clinical reasoning skills in health science education (Banning, 2008a; Finn, 2011; Kamhi, 2011; Levett-Jones et al., 2010), additional research is needed focusing specifically on how graduate health science students develop clinical reasoning.

By examining the discourse of health science students engaged in active learning activities through qualitative approaches, this study provides a deeper understanding of how instruction in graduate health science courses is structured and gives insight into how graduate students develop clinical reasoning. Further, it adds to a growing body of literature about this phenomenon. Further, results help instructors and mentors model the clinical reasoning process and engage students in meaningful discourse to assess student development and mastery of clinical reasoning skills.

## Research Questions

Several questions and sub questions about how graduate health science students develop clinical reasoning guided this research:

1. How do graduate health science students at Seaside University (pseudonym) develop clinical reasoning skills in the classroom environment?
2. What types of frameworks of participation do instructors use to encourage participation during instruction during graduate health science classes?
    a. What strategies do course instructors use to scaffold learning to elicit clinical reasoning skills from students during active learning experiences in the classroom?
    b. What verbal strategies or processes do graduate students use to make clinical decisions during active learning experiences in the classroom?
3. What other patterns of discourse emerge when graduate health science students make clinical decisions during active learning experiences in the classroom?

## Assumptions and Rationale for Qualitative Methodology

Qualitative research is a systematic, holistic, and interpretive method of inquiry used to explore an issue (Creswell, 2007; Rossman & Rallis, 2012). First, qualitative researchers engage in a deliberate process of making decisions so others have a clear understanding of how the research was conducted and to increase trustworthiness (Rossman & Rallis, 2012). Moreover, the researcher serves as the key instrument within a natural context by collecting multiple data sources to describe, analyze, and interpret a phenomenon in a natural setting (Creswell, 2007; Miles et al., 2014; Rossman & Rallis,

2012). Last, qualitative researchers engage in an iterative and inductive data analysis process by developing patterns, categories, and themes by organizing the data (Creswell, 2007; Miles et al., 2014; Rossman & Rallis, 2012). A qualitative strategy of inquiry is appropriate for this study as it will allow for a deeper understanding of how graduate health science students develop clinical reasoning within their classrooms.

The qualitative strategy of inquiry used for this study is a phenomenological study. Phenomenological research is a research strategy used to describe the "lived experiences" of participants (Rossman & Rallis, 2012, p. 96). Additionally, phenomenological designs are appropriate in response to research questions that focus on exploring how "human beings make sense of experience and transform experience into consciousness both individually and as shared meaning" (Patton, 2002, p. 104). The phenomenological design's unique strength is the inclusion of multiple data sources such as review of documents, artifacts, interviews, and observations to describe and interpret the phenomenon (Miles et al., 2014; Patton, 2002). In this study, a phenomenological study design allowed examination of data, particularly instructor-student and student-student patterns of discourse in graduate health science programs in the real-time context of the classroom in multiple disciplines at one university over time. It also allowed examination of semi-structured interviews of instructors and student focus groups.

**Setting**

The research for this phenomenological study was conducted at a university located in the northeastern region of the United States. Seaside University (a pseudonym) is a mid-sized public undergraduate and graduate university of the arts, sciences, and professional studies. In addition to the main campus, it operates five

smaller satellite campuses. The total student population is 8,570, which includes 866 graduate students. Seaside University was chosen because it offers programs in health science fields at the graduate levels in Physical Therapy, Occupational Therapy, and Communication Disorders. Considered a selective university, each of the graduate health science programs accepts approximately 10% of students who apply. Current class sizes range from 30-34 students and the average grade point average for admitted students ranges from 3.69-3.86 on a 4.0 scale. Two of the graduate programs were included in this study – Communication Disorders and Occupational Therapy. Both of these graduate health science programs are at least two years in length and require hands-on fieldwork in addition to coursework. The Master of Science in Communication Disorders is a two-year program which includes one summer session and requires a completion of 60 credits. Students participate in a total of three clinical placements. The Master of Science in Occupational Therapy program is completed in two and a half years. The program consists of a total of 80 credits, which includes three clinical experiences.

This site was specifically chosen for several reasons. First, it offers specific graduate programs for entry into professional health science fields (The Carnegie Classification of Institutions of Higher Education, 2010). Second, Seaside University's School of Health Science is situated within a mid-sized university and offers a wider range of graduate health care program options beyond Communication Disorders and Occupational Therapy. Third, the class sizes for both programs are similar and all require fieldwork experiences as part of the program. Collecting data in multiple programs offered a richer data set and lead to a more in-depth understanding of how graduate health science students develop clinical reasoning skills. Further, multiple programs

provided the opportunity to compare findings and test alternative explanations that arose (Saldaña, 2013).

**Participants**

I first completed Institutional Review Board (IRB) approval process at Rowan University. Next, I renewed my Collaborative Institutional Training Initiative (CITI) training to ensure that my certificate was current through the conclusion of the data collection and analysis process. Once the IRB approval was received, I began participant selection and data collection procedures.

Purposeful sampling is one of the most distinguishing characteristics of qualitative inquiry (Patton, 2002). In purposeful sampling, the researcher purposefully selects "information-rich cases" for in-depth study (Patton, 2002, p. 242). In other words, purposeful sampling is a method of selecting participants based on specific questions or purposes in the research that yields insights and in-depth understanding about the phenomenon under study (Patton, 2002; Tashakkori & Teddlie, 1998). Maxwell (2013) argues there are five objectives in selecting purposeful sampling in qualitative inquiry: (a) establish a representative sample of the setting, individuals, or activities selected, (b) capture the range in variation of the population, (c) purposefully select individuals that are important for testing themes in the study, (d) highlight differences between settings or individuals, and (e) establish connections with those whom can best help answer the research questions.

Theory-based sampling is a type of purposeful sampling that involves selecting participants that represent theoretical constructs about a phenomenon (Krathwohl & Smith, 2005; Miles et al., 2014; Suri, 2011). Since this study focuses on how graduate

health science students develop clinical reasoning to demonstrate clinical competency in the classroom, theory-based, purposeful sampling (Krathwohl & Smith, 2005; Miles et al., 2014; Suri, 2011) of graduate students and their instructors within health science fields of study including Communication Disorders and Occupational Therapy was used for selection of the participants. Two participants were instructors of courses in the second year of graduate health science programs who employed active learning designs that apply social constructivist learning theories (Vygotsky & Cole, 1978). In other words, instructors of courses that fell in the second year of the curriculum who also used active learning strategies that encouraged instructor-student and student-student interaction and collaboration were selected to participate. Additionally, the graduate students enrolled in the courses that participating instructors taught were also selected. The Communication Disorders class had 32 students, while the Occupational Therapy class had 30. Both instructors and all students participated for a total of 66 participants. Using a theory-based purposeful sampling strategy for this phenomenological study was appropriate because it provided "information-rich cases" (Patton, 2002, p. 242) from which a descriptive interpretation and explanation addressing four areas emerged: (a) how graduate health science students at a comprehensive university developed clinical reasoning skills, (b) what types of participation frameworks their instructors used to scaffold learning to elicit clinical reasoning skills in the classroom environment, (c) what verbal strategies or processes graduate students used to make clinical decisions during active learning experiences, and (d) what patterns emerged when graduate health science students make clinical decisions during active learning experiences.

**Data Collection and Instrumentation**

Prior to data collection, an informed consent form was fully explained to all participants (See Appendices A and B). The purpose of the study and methods of data collection were explained to all participants (instructors and graduate students) and participants were given an opportunity to ask questions. Participation was on a voluntary basis and the decision to participate or not did not impact progression in coursework or employment status, nor their relationship with the university. Further, it was explained that there were no risks posed to any of the participants and likewise there were no monetary or grade incentives for participating. Once participants agreed to participate, they signed the informed consent and were given a copy of the form for their records. Data, both in electronic or paper form, were stored on a secure computer that was password-protected and/or in a locking file cabinet in my home office. Further, in order to preserve participant confidentiality, the university was assigned a pseudonym. All participants self-selected a pseudonym that was used throughout the data analysis and reporting process. Upon the conclusion of data analysis and final reporting, all raw data was destroyed.

Data collection in qualitative research focuses on naturally occurring events, which takes the context into account (Miles et al., 2014). Further, qualitative data, collected over a sustained period, provides a rich and holistic description of people's lived experiences, events, and processes (Miles et al., 2014). For this phenomenological study, I collected data through several means as a non-participatory observer. The first and primary data collection occurred through transcripts of instructor-student and student-student discourse within graduate health science classrooms during active

learning activities over the course of a full semester. Each course met once weekly for a total of three hours. Data were collected over six data collection sessions per class and occurred over a period of three months. Specific data collection dates were selected in conjunction with the course instructor.

Recordings of instructor-student and student-student discussions were audio-recorded and transcribed verbatim. Using transcriptions of verbal interactions over time allowed for a richer data set and allowed for a deeper understanding of how graduate health science students' clinical reasoning skills evolved and developed. It also allowed for deep analysis of what types of participation frameworks instructors used to scaffold learning during instruction situated in active learning designs, what verbal strategies students used, and what patterns emerged when graduate health science students made clinical decisions.

Data were also collected using detailed field notes from observations (See Appendix C). Detailed field notes were collected about the class environment, (e.g., seating arrangement, physical description of classroom) and participant interactions in order to verify speakers and to augment and further interpret discussion transcripts (Rossman & Rallis, 2012; Rubin & Rubin, 2012; Yin, 2014). Field notes generally consist of two components – detailed description of the environment and interactions, and observer comments including insights and questions regarding meanings (Rossman & Rallis, 2012; Yin, 2014). Keeping careful and descriptive field notes in a journal provided thick descriptions (Geertz, 1973) about the social interactions between the participants and the classroom context (Rossman & Rallis, 2012).

A third type of data was collected through in-depth, open-ended instructor interviews (Rubin & Rubin, 2012). In qualitative inquiry, interviews allow deeper understanding of a phenomenon and allow the researcher to gather participants' insights about their perceptions (Patton, 2002; Rossman & Rallis, 2012; Rubin & Rubin, 2012; Yin, 2014). In-depth, open-ended interviews have specific questions that are asked of all participants in a preset order (Rossman & Rallis, 2012; Rubin & Rubin, 2012). In-depth, open-ended questions also allow for investigators to ask probes to clarify participant responses (Patton, 2002; Rossman & Rallis, 2012; Rubin & Rubin, 2012). In this study, interviews were conducted with instructors of health science courses who engage students during active learning activities (See Appendix D). Interviews focused on the participation frameworks and scaffolding strategies instructors used which allowed for more complete triangulation of data sources (Miles et al., 2014; Patton, 2002; Rubin & Rubin, 2012). A focus group with each group of students was completed and transcribed (See Appendix E). In qualitative inquiry, focus groups provide the opportunity for the group to produce new insights as individuals react to what others say (Rossman & Rallis, 2012; Patton, 2002). Hence, the focus groups probed the students' development of clinical reasoning skills, specifically, what their experiences had been and how those experiences influenced their development of clinical reasoning skills. Table 4 outlines the data collection techniques.

Table 4

*Data Collection Techniques*

| Research Questions | Data Source 1 | Data Source 2 | Data Source 3 | Data Source 4 |
|---|---|---|---|---|
| 1-How do graduate health science students at Seaside University (pseudonym) develop clinical reasoning skills? | Semi-structured observations | Transcription of instructor-student and student-student discourse | Transcription of instructor interviews | Transcription of student focus group |
| 2- What types of frameworks of participation do instructors use to encourage participation during instruction during graduate health science classes? | Semi-structured observations and transcriptions of instructor interviews | Transcription of instructor-student and student-student discourse | Transcription of instructor interviews | Student focus group and transcription of group discussion |
| a-What What strategies do course instructors use to scaffold learning to elicit clinical reasoning skills from students during active learning experiences in the classroom? | Semi-structured observations | Transcription of instructor-student discourse | Transcription of instructor interviews | Student focus group and transcription of group discussion |
| b-What verbal strategies or processes do graduate students use to make clinical decisions during active learning experiences in the classroom? | Semi-structured observations | Transcription of instructor-student and student-student discourse | Transcription of instructor interviews | Student focus group and transcription of group discussion |
| 3-What other patterns of discourse emerge when graduate health science students make clinical decisions during active learning experiences in the classroom? | Semi-structured observations | Transcription of classroom discourse | Review of written assignments and other course documents (e.g., syllabus) | Student focus group and transcription of group discussion |

## Data Analysis

First, I prepared the data for analysis (Miles et al., 2014; Rossman & Rallis, 2012), then organized and labeled the data according to the source, date, and location

collected. These data sources included transcripts from instructor-student interactions, student-student discourse, and field notes. Next, audio recordings from classroom interactions, interviews, and focus groups were transcribed verbatim. Then, I read through all the data to get a broad impression of the general meaning. As data collection continued, I entered this information into Dedoose, a qualitative data management system. This system assisted me in storing, coding data, analyzing relationships, and identifying emerging trends and patterns. Throughout the data collection process, collection and analysis occurred concurrently (Miles et al., 2014) and continued until saturation, or information redundancy (Gentles, Charles, Ploeg, & McKibbon, 2015).

Transcripts of classroom interactions, interviews, and focus groups were analyzed using multiple cycles of coding. In qualitative inquiry, a code "is most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for apportion of language-based or visual data" (Saldaña, 2013, p. 3). Codes are "prompts or triggers for deeper reflection" on the meaning of the data (Miles et al., 2014, p. 73). Miles et al. describe coding as a data condensation process used as a "method of discovery" (p. 73) that enables the researcher to assemble data into analyzable units. Through the coding process, then, data are organized into categories based on some shared characteristic (Saldaña, 2013). Saldaña generally divides the coding process into two cycles – the first cycle and the second cycle. Following each cycle of coding, I verified emergent findings and interpretations with the participants through a process called member checking (Miles et al., 2014; Rossman & Rallis, 2012).

In the first cycle of coding, transcripts of instructor-student and student-student discourses, instructor interviews, and focus group discussions were coded using open

coding, which is also referred to as initial coding (Saldaña, 2013). Open or initial coding "provides a starting point to provide the researcher with analytic leads for further exploration" (Saldaña, 2013, p. 101).

Following the initial cycle of coding, all data sources were coded in a second cycle. The purpose of the second cycle coding is to reorganize and reanalyze data from the first cycle of coding "to develop a sense of categorical, thematic, conceptual, and/or theoretical organization from the first cycle of codes" (Saldaña, 2013, p. 207). In the second cycle of coding, I used pattern coding (Saldaña). In pattern coding, "inferential codes" are used to "identify an emergent theme, configuration, or explanation" (Saldaña, 2013, p. 210). According to Saldaña, this method is appropriate when examining development of graduate health science students' clinical reasoning as a means to identify major themes that emerged in how graduate health science students develop clinical reasoning, what types of frameworks of participation instructors used to encourage participation during instruction in graduate health science classes, what strategies the instructors used to scaffold learning to elicit clinical reasoning from students during active learning experiences, what verbal strategies students used to make clinical decisions during active learning experiences in the classroom, and other patterns of discourse that emerged when graduate health science students make clinical decisions during active learning in the classroom.

During the analysis process, I wrote analytic memos to track assumptions and reflections during the data analysis process. Analytical memos are brief narratives that are a useful tool in documenting and reflecting on the coding process, code choices, the inquiry process, emergent patterns, and themes that lead toward conclusions (Miles et al.,

2014; Saldaña, 2013). Analytical memos are an appropriate tool in this study in order to track assumptions, reflections, and identify emergent patterns and themes from the data. Table 5 provides a summary of the data sources, analysis technique, and interpretation technique that were employed in this study.

Table 5

*Data Analysis and Interpretation Techniques*

| Data Source | Analysis Technique | Interpretation Technique |
|---|---|---|
| Transcriptions of student-student and instructor-student discourses | Reduce the data using 1st cycle coding Open/Initial to develop analytical leads (Saldaña, 2013); 2nd cycle coding (Pattern coding) to develop emergent themes and explanations (Saldaña, 2013) | Contextualize findings and relate to the literature; Develop decision modeling graphic illustrating actions/types of discourses (Miles et al., 2014); Test hypotheses/alternative explanations; Analytic memos to track assumptions, reflections, and emergent patterns (Miles et al., 2014); Member checking (Miles et al.2014; Rossman & Rallis, 2012) |
| Transcriptions of instructor interviews | Reduce the data using 1st cycle coding Open/Initial to develop analytical leads (Saldaña, 2013); 2nd cycle coding (Pattern coding) to develop emergent themes and explanations (Saldaña, 2013) | Contextualize findings and relate to the literature; Test hypotheses/alternative explanations; Analytic memos to track assumptions, reflections, and emergent patterns (Miles et al., 2014); Member checking (Miles et al., 2014; Rossman & Rallis, 2012) |
| Transcriptions of student focus groups | Reduce the data using 1st cycle coding Open/Initial to develop analytical leads (Saldaña, 2013); 2nd cycle coding (Pattern coding) to develop emergent themes and explanations (Saldaña, 2013) | Contextualize findings and relate to the literature; Test hypotheses/alternative explanations; Analytic memos to track assumptions, reflections, and emergent patterns (Miles et al., 2014); Member checking (Miles et al., 2014; Rossman & Rallis, 2012) |

**Trustworthiness.** Similar to validity in quantitative research, trustworthiness in qualitative inquiry is dependent on its integrity and judged by using systematic and rigorous data collection and analysis procedures, performing the research ethically, and opening the procedures and findings up to the inspection of others (Rossman & Rallis, 2012; Toma, 2006). Trustworthiness is demonstrated by the steps taken to ensure that the

research is credible, dependable, confirmable, and transferable (Miles et al., 2014; Toma, 2006).

**Credibility**. Credibility refers to the extent to which the findings are able to be validated and confirmed by someone other than the researcher, the degree that findings make sense, and the persuasiveness of the results (Miles et al., 2014; Toma, 2006). First, I established credibility of the study through the inclusion of the literature review, which established the need for and purpose of this research. Next, I outlined the design of the study including the strategy of inquiry, context, participants, data collection, and data analysis strategies. Other strategies that were used to establish confirmability include practicing reflexivity, creating an audit trail with explicit notes, member checking, and prolonged participation in the study (Miles et al., Saldaña, 2014; Toma, 2006). Keeping a detailed research journal allowed me to reflect on my own assumptions and biases and test plausible explanations. It also allowed me to keep thick descriptions (Geertz, 1973) and field notes about the classroom environments and the instructor-student and student-student social interactions in order to track procedures and decisions, and test competing yet plausible conclusions. Validating data analysis and interpretation through the process of member checking allowed me to verify or extend findings with participants (Miles et al., 2014; Rossman & Rallis, 2012). Lastly, my engagement throughout the data collection process was in the role of a non-participatory observer during six class sessions over the course of an entire semester in each course. Completing multiple observations over an extended time allowed the participants time to become comfortable with my presence so that data were representative of the actual classroom environment.

**Dependability**. Dependability in qualitative research refers to the extent that the research process accommodates changes that occur throughout data collection (Miles et al., 2014; Toma, 2006). I established dependability by creating transparency and providing rationales throughout the research process. To create transparency, I clearly communicated the purpose and rationale of the study and how data were collected to the participants. The use of a research journal allowed me to keep detailed notes throughout the data collection and analysis process. It also created an audit trail to track my reasoning and about how the data were interpreted. Dependability was also established through expert review of the interview protocol. A panel of experienced researchers reviewed the interview protocol to ensure that the questions appropriately elicited data in response to the research questions and sub-questions. Further, data were triangulated, meaning multiple data sources were used (Miles et al., 2014; Toma, 2006; Yin, 2014). In this study, transcripts from instructor-student and student-student verbal interactions, transcripts from instructor interviews, and transcripts from focus group discussions were used as data sources (Rossman & Rallis, 2012; Yin, 2014). Detailed field notes from observations were used to confirm speakers on recordings and verify activities in the classroom.

**Confirmability**. Confirmability in qualitative research refers to the researcher's ability to confirm and validate the findings that are reasonably free of researcher bias (Miles et al., 2014; Toma, 2006). In order to establish confirmability in this research, I employed two methods. First, I triangulated all data sources to cross-check data and confirm findings. Second, I kept a detailed research journal. Using a journal with detailed descriptions throughout the research process allowed me to be reflective on my

own assumptions and biases and how they influenced conclusions, consider rival and competing conclusions, and create an audit trail to track my rationales and reasoning in formulating decisions (Toma, 2006).

**Transferability**. Transferability refers to the extent that findings can be generalized or applied to other similar settings or populations (Miles et al., 2014; Toma, 2006). In this research, establishing transferability was accomplished through the use of a research journal with thick descriptions describing the participants, setting, and data collection and analysis processes (Geertz, 1978; Miles et al., 2014). Keeping detailed notes with thick descriptions allowed for comparisons of findings and other samples and settings to which the findings may be applied.

**Roles of the Researcher and Collaboration with the Participants**

Qualitative research is a method of inquiry that focuses on description and involves systematic data collection about naturally occurring events over time (Patton, 2002; Rossman & Rallis, 2012). It involves researcher interpretation to construct meaning about a phenomenon (Miles et al., 2014; Rossman & Rallis, 2012). In turn, personal assumptions and biases may influence the research, and at the same time, the research may influence the researcher's assumptions (Miles et al., 2014; Rossman & Rallis, 2012).

As both an instructor in a health science field and a supervisor of graduate interns, it is apparent that instruction must balance teaching content knowledge with how to apply that knowledge when making clinical decisions. Consequently, students preparing for clinical experiences need to have a solid understanding of content material, but must also learn to synthesize and analyze multiple factors using high-level problem-solving skills in

order to make appropriate clinical judgments. Guided by a social constructivist philosophy in order to help students navigate the decision-making process, discourse, social interaction, and collaborative learning are necessary to gauge the students' conceptual understanding and to help them develop rationales as they apply conceptual knowledge in making clinical decisions. Often, students need supervisors and instructors to model and discuss their thought processes during the clinical reasoning process.

My interest in this topic is three-fold. First, as an experienced speech-language pathologist, I routinely use high-level thinking processes about my own clients. Often, I collaborate with colleagues as a means to test theories and rationales. Second, as an instructor in Communication Disorders, I believe the learning environment and instructional strategies have a great impact on how my students develop clinical reasoning skills. Lastly, as a supervisor of graduate students, I am very aware of my influence in how students learn and begin to develop clinical reasoning skills in clinical practice independently.

I collaborated with the participants in several ways during the data collection and analysis process in this phenomenological study. The first two data sources were instructor-student and student-student discourse that occurred within the learning environment. A third source of data was course instructor interviews and a fourth data source were transcripts from student focus groups. Detailed descriptions from observations during which the researcher played a non-participatory role over the course of an entire semester were used to verify speakers and confirm activities that occurred in the classroom environment. I included the participants (both instructors and students) in the verification of data analysis and interpretation of discourse transcripts through

member checking (Miles et al., 2014; Rossman & Rallis, 2012). Collaborating with participants in the data collection and analysis process enabled me to construct deeper meaning about the participants' experiences and confirm findings (Miles et al., 2014).

**Ethical Considerations**

Because of the proximity of the researcher and participants in qualitative research, ethical considerations have a significant impact on the trustworthiness of the research (Miles et al., 2014; Patton, 2002; Rossman & Rallis, 2012). Respecting and protecting the rights and privacy of my participants was of paramount importance. Approvals of my dissertation committee were obtained followed by Institutional Review Board (IRB) approvals from Rowan University prior to initiation of any data collection. Following participant selection, I fully explained the purpose of the study, how data would be collected, and my role as a non-participatory observer. I also explained the risks, how confidentiality would be maintained, and the scope and sequence of the study. All participants were given an opportunity to ask questions to clarify unclear information before obtaining their written consent. Last, I followed the methodological design, maintained a research journal, and collected detailed field notes in order to maintain the integrity and trustworthiness of the study.

**Conclusion**

In conclusion, I designed this phenomenological study to further understand how graduate health science students develop clinical reasoning. Using a social constructivist perspective, this study was intended to gather data relevant to address the research questions. I also illuminated how my personal assumptions and biases may have

influenced the research and vice versa. Lastly, I described how ethical considerations were addressed.

# Chapter IV

## Findings

The purpose of this study was to understand how learning in graduate health sciences courses at a comprehensive state university is structured and how students develop their clinical reasoning skills. In this chapter, I first revisit the research questions, and the context of the study. Next, I discuss the findings, which indicated that clinical reasoning did not proceed along a gradual, linear progression in the instructional environment. Rather, the development of graduate health science students' clinical reasoning was greatly influenced by multiple factors, including classroom format, instructional strategies, and the social dynamics that developed within the classroom.

The research questions include:

1. How do graduate health science students at Seaside University (pseudonym) develop clinical reasoning skills in the classroom environment?
2. What types of frameworks of participation do instructors use to encourage participation during instruction during graduate health science classes?
    a. What strategies do course instructors use to scaffold learning to elicit clinical reasoning skills from students during active learning experiences in the classroom?
    b. What verbal strategies or processes do graduate students use to make clinical decisions during active learning experiences in the classroom?
3. What other patterns of discourse emerge when graduate health science students make clinical decisions during active learning experiences in the classroom?

**Context**

Data collection took place at Seaside University (pseudonym), a mid-sized public university located in the northeastern region of the United States. Participants in this study included two instructors – one in the Communication Disorders program and one in the Occupational Therapy program – who utilized active learning designs that encouraged instructor-student and student-student discourse, and the graduate students enrolled in their courses.

The data sources for this study included: transcriptions from audio recordings of verbal interactions (instructor-student and student-student) in the classroom during large group and small group discussions, transcripts from semi-structured interviews with both course instructors, and transcripts from a focus group with students from each class. Detailed field notes provided a thick description (Geertz, 1973) of classroom activities and served as a reference to identify speakers. Due to an extensive amount of data, Figure 2 illustrates the presentation of findings. First, instructors and graduate health science students identified different factors as significant in the development of clinical reasoning skills. Additionally, the graduate health science students' clinical reasoning did not develop gradually in the classroom and were impacted by the class format, the instructor's expectations, and the social dynamics that developed within the classroom. Finally, another factor in the clinical reasoning skills that the graduate health science students exhibited was instructional pedagogies.

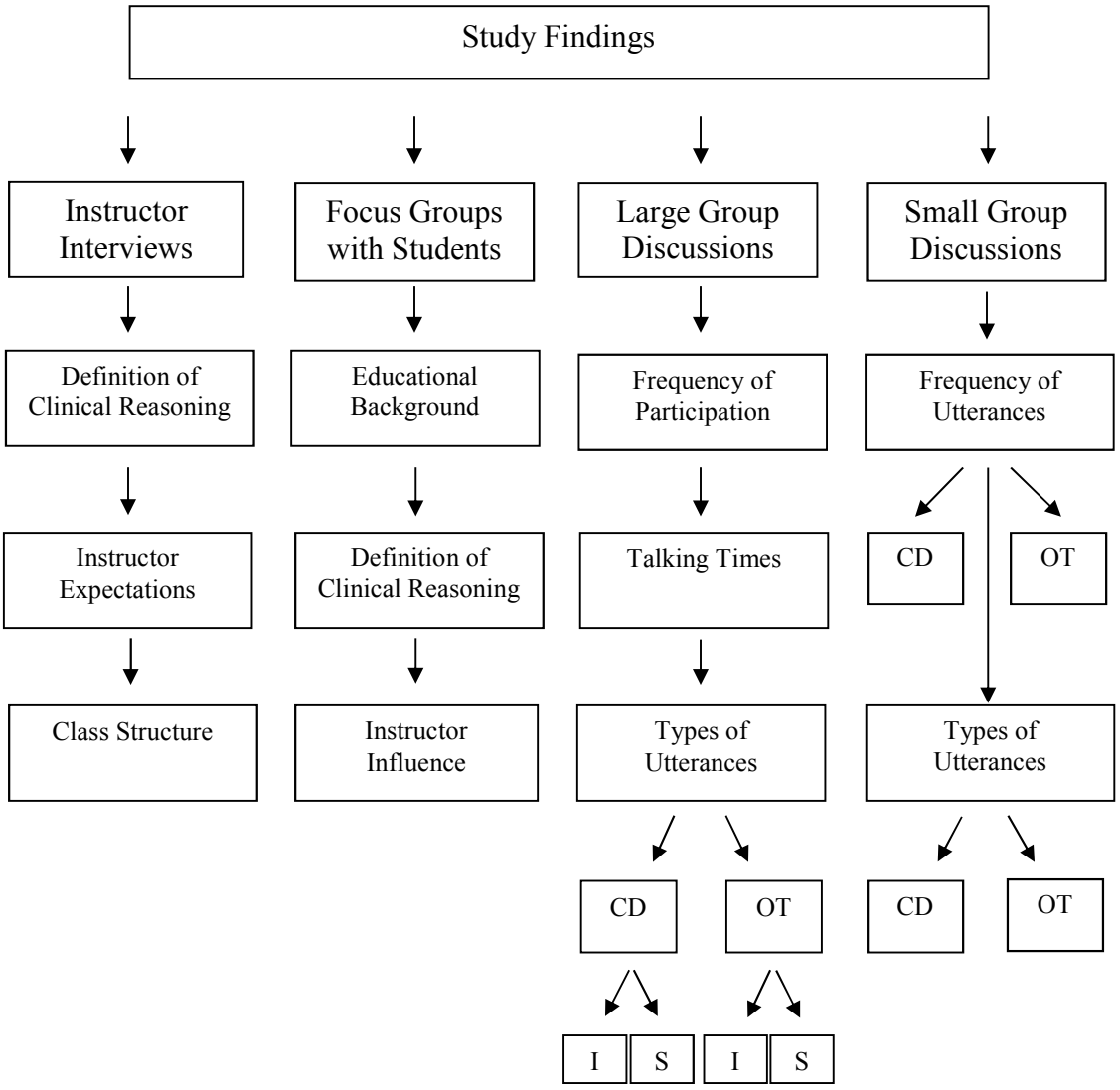


*Figure 2.* Visual Representation and Sequence of Findings. CD=Communication Disorders; OT=Occupational Therapy; I=Instructor; S=Students

**Instructor Interviews**

Both instructor interviews were conducted prior to the beginning of the semester in the instructors' respective offices on the university's campus and the recordings were transcribed verbatim. The instructors were identified using self-selected pseudonyms to

preserve confidentiality. The interview questions focused on the participation frameworks and scaffolding strategies they used in the classroom (See Appendix D).

**Definition of clinical reasoning.** Although both instructors defined clinical reasoning as integrating various factors about a patient to determine a course of action, their responses provided differing perspectives about clinical reasoning. Sue defined clinical reasoning as a thought process that students go through to approach clinical cases and make decisions about interventions resulting in a plan of care. She stated,

> Clinical reasoning…so I think it is …it is a framework that students would utilize when they approach a case so that they go through some kind of pathway in terms of assessing what do I know about this case? What questions do I have? What do I need to know? How am I going to answer those questions…and then how do I proceed?

Stella, on the other hand, defined clinical reasoning as a skill,

> …the ability to integrate different factors related to the person, the diagnosis, the context, all of that…so all of the different client factors…in order to integrate them to develop some kind of ideas or plans about … so I guess clinical reasoning in terms of like intervention planning would be like for them to integrate all the different client factors…the person, the environment, the diagnosis…all of that…to establish a plan for providing effective care for that person.

**Instructor expectations.** Both courses were offered at the end of the curricular sequence in their respective programs, so both instructors expressed expectations for students to demonstrate their skills to use high-level thought processes to integrate information they had learned throughout prior coursework and field experiences, to

express rationales as part of their clinical reasoning, and finally to apply them to new clinical cases. This suggested that rather than facilitating development of clinical reasoning skills as part of an on-going process, the instructors held the expectations that students demonstrate clinical reasoning skills they had developed in their previous courses. Sue, the instructor in Communication Disorders, noted,

> So, the graduate courses that I usually teach, especially now, this course is a second-year course. Previously, it was an elective at the end of their program, so I have expectations that they have a very strong understanding of communication development and disorders, a good understanding of the research on etiology, on evidence-based practice, how to choose an appropriate intervention…. that they have been exposed to issues around counseling families of complex disorders in their children and that they understand about cultural influences and influences of all different variables...gender, age, etc.

Stella, the instructor in the Occupational Therapy course stated, "they should be using higher level critical thinking skills at this point… they should be integrating ideas from all the previous coursework they've had, from their other fieldwork experiences…" and later added,

> …they've had all their other foundational courses. So, at this level they should be integrating all their prior knowledge and just doing a higher level of thinking as far as…like I was saying before…taking it to the next level…like…OK, so now you know enough about this diagnosis, now tell me what you are going to do with this person, and not just what you're going to do but why? What is the evidence

that supports that? What's the clinical reasoning that supports that? Where is this all coming from?...

**Classroom structure.** Both instructors indicated that they structure their classrooms similarly. In order to engage students, they both set expectations for students to complete readings about course content prior to the class period so they are prepared for discussions during the class time. While they recognized that they present some content via a lecture format, they both described how they engage students through the use of open-ended questions and hands-on activities, such as case studies and skills simulations.

Although there is no specific textbook for her class, Sue assigns research articles or other information to be read prior to class in order for the students to familiarize themselves with the weekly topic. She added that while there is some lecture, she attempts to make it engaging by initiating dialogue with the students and/or presenting a hands-on, interactive activity. Sue stated,

> …there is no text book because it's kind of a different kind of a course so there are assigned readings for every class. They are posted on Blackboard so the expectation is that the students come to class having already done the reading. And usually they are articles, sometimes there might be a chapter … So, they have done some level of reading and there might be some…I might also have given a particular assignment to think about. Maybe a question that I want them to be prepared to come to class to discuss.
>
> …And then I will usually introduce the topic and ...you know give some background. Say if we are talking about Down Syndrome, so we will talk about

what we know about DS, the causal factors, what's an actual course over the lifespan of an individual who has Downs, …especially from the lens of a Speech-language Pathologist, but not exclusively…so what are the associated problems? So, like in Downs…cardiac problems, mobility problems, feeding problems…they may have co-morbidity so sometimes they'll have a dual diagnosis of autism…what typically are the communication challenges, language and speech-related, and then what's the evidence for the best intervention or interventions in the population. So… that's how they learn about …maybe treatments for apraxia, or treatments for…you know augmentative communication. So… I get them to think, a child with Down Syndrome… would a PECS [picture exchange communication system] book be a good AC [augmentative communication] strategy? Well maybe not because of certain level of fine motor skills required. You know, why is sign often used with individuals with Down Syndrome in early intervention?

Those kinds of things…so I get them thinking critically about some of those questions. Usually there is a lecture and it is engaging…I engage them in questions back and forth and then… depending on the week, they'll be a…maybe a case that I give them either there or I've given to them in advance and they'll get into small groups and they'll answer some questions then they'll have a reporter from each group… or there might be some other kind of activity, a discussion activity, or some kind of …you know… hands on.

Further, Sue noted that she models her cognitive process and guides students through the process using open-ended questions,

…in each level what I ask them to do is step out and…so experience is what you know from just…you know…sensory input, so when you see your patient, what do they look like? You start to make some decisions to get them to recognize, what do I know? What questions do I have?... so… we stop…we do this kind of in parallel so I have them do a case and then at the same time, say OK…so I just experienced… now let's go out to the model…what do you know, what questions do you have? Now let's go to understand…you know, how are you going to begin to understand about them? In this task, so and then what other questions are you going to have, so I try to get them to check in with their own thought process so that they have an understanding about where they are in their clinical reasoning about this patient…are you ready to make a decision about an intervention or even an assessment tool…you may not be because you don't know enough yet to put you on a particular path.

Stella also structures her classroom in a way that engages students in discussion through the use of open-ended questions, case studies, and skills simulation. She stated,

I try to use open-ended questions as much as I can so, you know, but connect to whatever we were just talking about in class. So, it might be something like we'll watch a video of someone on the ISE database of someone who's had a knee replacement. So first, I might say to them…How would you describe her gait and how do you think she is walking? So, then they can use some terms. Someone like this, what do you think you would do with her in the clinic? and… I start out I think more broad and I then I kinda let them guide me on how specific I need to be. So, if my question is too broad and they're not understanding what I'm

asking, then I might start to get a little bit more specific but I like to kinda keep it open and see where their discussion leads us.

While the specific process may differ, both instructors identified the use of open-ended questions as a method for engaging students in classroom discourse.

**Instructional effectiveness.** Despite similar instructor expectations and classroom structure, the instructors described differing methods of measuring their instructional effectiveness to determine the graduate students' development of clinical reasoning. Sue engages in on-going subjective assessment during discourse in the classroom as well as formative, objective assessment of assignments and exams specifically about course content. Sue asserted,

> Well, I can do an assessment as I go so then I'm getting a sense from their answers as to whether or not they are with me, they are getting the material, they're thinking critically, they are asking particular questions, …and then of course, I assess based on the assignments that I have in class.

On the other hand, although Stella measures effectiveness through objective assessment of course content such as class assignments, practical skills, and written exams, she also measures her instructional effectiveness in a broader, more general scope within the context of program outcome data. Stella reported, "I think that overall they're learning so we do outcome assessments for accreditation where we're looking at course objectives and if we're meeting them… and consistently I am…" She added,

> …we're meeting the objectives of the course which are based on the accreditation standards which I try to also use to guide my assignments…like whenever I do an assignment, I have the objectives kinda connected to it too…so I think it's

effective in that sense…we do collect like… exit surveys and course reviews in addition to the IDEA's so we're constantly doing these outcome measures with them…and they're passing their boards and they go on fieldwork settings…

Stella added that fieldwork educators are surveyed at the completion of the students' clinical placements to gather additional outcome data. She stated, "…so we ask fieldwork educators to see if our students are adequately prepared and typically the feedback is that they are." Moreover, the instructors utilize both subjective and objective measures of assessment including programmatic outcome data to determine their instructional effectiveness and the students' development of clinical reasoning skills.

**Focus Groups with Students**

Two focus groups, one consisting of students from Communication Disorders and one from the Occupational Therapy class, were conducted prior to the fifth classroom observation in each discipline and focused on the students' experiences and how those experiences influenced the development of their clinical reasoning skills. Focus group participants were identified using self-selected pseudonyms to preserve confidentiality (See Appendix E).

**Educational background.** Both the Communication Disorders and Occupational Therapy students were near the end of their respective curricular sequences, which included both coursework and clinical fieldwork experiences. Both groups of students took the same progression of courses within their respective discipline with the exception of the option between several electives offered within the Communication Disorders curriculum.

**Defining clinical reasoning.** Students in the Communication Disorders program and the Occupational Therapy programs defined clinical reasoning in a similar way, indicating that clinical reasoning involves making decisions in the best interest of a patient by using all the information available to the clinician. Furthermore, all the students recognized that clinical experience impacts how the students arrive at their decisions about patient care. Pizza Rat (a self-selected pseudonym) stated,

> Clinical reasoning, I would describe as using everything that you've learned either through school, through hands-on experiences to make the best possible decisions for your client or patient that you can and that can come from different things... It could come from doing literature searches, your intuition, just feeling like what's right for that person... But I think overall, it's just making the best decision you feel you can make in that place and time.

Leonard continued,

> I would define clinical reasoning as decisions that you make based upon the experiences you've had and how making those decisions… and seeing them through different lenses… Like the lenses that you have when you are first starting out are different than the lenses that you've had because you have a certain number of varied experiences, the same experiences.

That sentiment was echoed by Janine,

> I think it's also being able to think on your feet, like logically, so like, sometimes in the middle of a session you'll be like, "I need to change what I'm doing to make it easier or harder… Like what's another one of their [the client's] goals…

> Can I implement two goals in the same activity? And now during my last clinic I can do that a lot more easily than Clinic I… I had to plan everything out….

Furthermore, both groups of students acknowledged that the instruction they received in the classroom combined with their clinical experiences greatly impacted development of their clinical reasoning skills.

**Instructor influence on developing clinical reasoning.** Students from both classes recognized development of clinical reasoning as a gradual process and identified application of content knowledge to clinical cases through case studies, providing rationales, application of skills, collaboration with peers, and receiving feedback from instructors as effective methods for their development of clinical reasoning throughout their respective programs. Leonard emphasized the usefulness of case studies in developing clinical reasoning skills.

> I think definitely with some of the case studies that we do… That helps because then you look at the person and try to decide what you would do…and then like… if you have a similar client in the future you can kind of go back and see what you did in class…

Willy asserted the usefulness of providing a rationale for decisions in developing clinical reasoning.

> I think that she [Stella] is always asking us to back up what we're saying in class and she likes us to go into the research... We just did a case study and we had to do an activity, a rationale of why that activity was appropriate for that client, back it up with evidence...

Gina added,

> I think that she [Stella] helps us develop clinical reasoning by giving us a lot of information through the lecture and then having us apply that knowledge with hands-on skills during the lab sessions... In groups in labs and she [Stella] comes around and asks us why are we doing it this way? ... Why did you do that? ... Did you try it this way?... So, it helps you develop that clinical reasoning.

In agreement, Jan noted,

> I wanted to add that since we've started the program we've constantly been asked "why"... So, you can have an answer but why? Why is that your answer? I think it's been a development of clinical reasoning since our first semester because if you had an answer it was never really backed up with anything, so since then, we've been developing the why portion of it in the decision...

Kathi affirmed the need for application and practice in clinical decision-making.

> This semester, she [Stella] implemented weekly treatment plan assignments where it's a different patient with a different diagnosis and we had to plan an activity, a treatment session basically, and we had to do the analysis and write the SOAP note, so it really had us break down the activity and why we chose that for a particular client... And we got better each week with a repetition of doing it each week

Marie asserted the value of collaboration with peers in developing clinical reasoning skills.

> I think a lot of our learning is from each other, well, I think that's very

vital... Especially in our group projects... We all had different ideas and thoughts to bring to the table so I think there's just an abundance of learning that exists amongst ourselves outside of professors and the books... I think we get a lot from that

Additionally, Jan highlighted the value of feedback in the development of clinical reasoning skills.

I think that a lot of our clinical reasoning, too, comes from feedback that we receive... Like throughout the program... We receive feedback on all of our assignments, we receive feedback in class conversations, we receive feedback from each other in groups... It's always, constant, some kind of feedback... Positive or negative..., or constructive, something to guide your future decision-making which I think is important... and we're constantly improving assignments about handling feedback and how you can incorporate feedback... I think that's a big part of where our growth is as future clinicians too...

Despite slight differences in educational backgrounds, both groups of students provided similar definitions for clinical reasoning. Moreover, both groups of students identified application of course content and skills to case studies, the expectation to provide rationales for decisions, collaboration with peers, and receiving instructor feedback as instrumental in developing clinical reasoning. Paradoxically, even though the instructors both emphasized the importance of engaging the students in discussion during class sessions, neither group of students identified classroom discussion as a significant factor in developing clinical reasoning. Consequently, the students valued application of content to case studies and skill simulations, peer collaboration, and the

expectations to provide a rationale for their thinking over instructor-led classroom discussions.

**Large Group Discussions**

A total of six class sessions per course were audio recorded and transcribed verbatim. Daily seating charts and detailed field notes were used to identify speakers during large group interactions. All speakers were identified via self-selected pseudonyms to maintain confidentiality. Several types of data emerged from the large group discussion transcripts. First, frequency of verbal participation between instructors and students was calculated. Next, instructor vs. student talking time vs. other activities, (e.g., video presentation, class breaks, guest speakers, transitions) were calculated for each category. Last, using a framework modeled after Garrison's (2016) CoI, student and instructor utterances were coded and analyzed to identify the frequency of utterance types.

**Frequency of verbal participation.** The frequency of verbal participation was calculated for each participant (instructor and students) over each class session. The frequency of student participation varied among students. Some students did not participate in any class discussions, while others participated frequently. Approximately half of the students in both classes participated between seven and 18 times (or an average of approximately two to three total instances of participation) over the six data sessions. This indicated that despite the instructors' perception that they regularly engaged students in classroom discussions, only a small number of students across each discipline regularly participated large group discussions. The majority of students exhibited lower rates of participation, and a few did not participate at all. Aggregated

number of students who participated in classroom discourse by frequency of utterances and discipline is displayed below in Table 6.

Table 6

*Number of Students Who Participated in Classroom Discourse by Frequency of Utterances and Discipline*

| Frequency of Utterances | Communication Disorders | Occupational Therapy |
|---|---|---|
| 0 | 2 | 0 |
| 1-6 | 3 | 6 |
| 7-12 | 8 | 4 |
| 13-18 | 5 | 11 |
| 19-24 | 4 | 5 |
| over 25 | 10 | 4 |

*Note.* Class sizes were 32 students for Communication Disorders and 30 for Occupational Therapy.

Occurrences of non-discourse activities such as video presentations, silent reading, guest speakers, and class breaks were recorded as "other." Responses made by the entire group in unison were recorded as "whole group." Audibility of utterances was occasionally impacted by environmental noise (e.g., ceiling fans), therefore, utterances in which a word or phrase was partially audible but the content and intent was still apparent were counted as partially audible and included in frequency tabulations. Utterances which were totally inaudible or the inaudible portion of the utterance made it impossible to discern the content or intent were counted as 100% inaudible and not included in frequency calculations. Despite some utterances being partially or totally inaudible, these utterances accounted for a minimal amount of the total utterances over the data collection

sessions. Table 7 indicates the frequency of "other" activities, partially audible, and 100% inaudible utterances over the course of all data sessions by discipline.

Table 7

*Frequency of Other Activities, Partially Audible, and Inaudible Utterances by Discipline*

| | | Data Sessions | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Communication Disorders | Other Activities | 3 | 1 | 6 | 2 | 2 | 6 |
| | Part. Audible | 5 | 0 | 19 | 9 | 10 | 16 |
| | 100% Inaudible | 7 | 3 | 2 | 1 | 0 | 0 |
| Occupational Therapy | Other Activities | 3 | 2 | 10 | 1 | 8 | 10 |
| | Part. Audible | 14 | 21 | 26 | 17 | 35 | 29 |
| | 100% Inaudible | 4 | 1 | 5 | 5 | 1 | 6 |

The frequency of verbal participation in the classroom was analyzed to determine the frequency of instructor vs. student utterances. During both the Communication Disorders and Occupational Therapy classes, the frequency of instructor and student utterances fluctuated across data sessions and was dependent on the class format. Despite variations in class formats from week to week however, the frequency of instructor vs. student utterances still remained essentially even.

In the Communication Disorders classes, the frequency of instructor utterances during classroom discourse ranged from 103-175 for the first three data collection sessions. Similarly, the frequency of student verbal interaction gradually increased from 68-104 instances of student utterances. During data Session 4, the instructor presented course content in a lecture format for longer periods before engaging students, which

resulted in fewer instances of instructor-student dialogue. Further, this format yielded lower frequencies of both instructor and student utterances. During Session 5, the class format included a guest speaker for approximately one third (60 minutes) of the class period, which was followed by a question and answer debriefing between the instructor and students. Student interaction during the guest speaker presentation was not included in data collection. As a result, the frequency of both instructor and student remarks decreased as compared to the first four data collection sessions. Lastly, during data Session 6, the students presented group projects, consequently, the frequency of student utterances significantly increased in contrast with the frequency of instructor utterances, which significantly decreased. Furthermore, the length of individual student utterances before engaging others in discourse was longer than typical verbal discourse.

During the Occupational Therapy classes, the frequency of instructor and student utterances were relatively even with the exception across all data sessions. During Sessions 4 and 6, however, the instructor presented videos of clinical situations after which the instructor engaged the students in discussion and critique of the presentation. This discourse resulted in higher frequencies for both instructor and student utterances. Table 8 indicates a comparison of the number of instructor vs. student utterances during the Communication Disorders and Occupational Therapy classes.

Table 8

*Comparison of the Number of Instructor vs. Student Utterances by Discipline*

| | | Data Sessions | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Communication Disorders | Instructor | 175 | 162 | 103 | 93 | 86 | 27 |
| | Students | 164 | 157 | 101 | 88 | 89 | 156 |
| | Total # | 339 | 319 | 204 | 181 | 175 | 183 |
| Occupational Therapy | Instructor | 68 | 74 | 104 | 65 | 150 | 92 |
| | Students | 61 | 86 | 100 | 58 | 146 | 80 |
| | Total # | 129 | 160 | 204 | 123 | 296 | 172 |

Further, the instructors believed that they facilitated discussions that actively engaged all students. Across both disciplines, however, the instructors did not engage all students and in fact only a small percentage of students regularly participated in discussions. During the Communication Disorders class sessions, the percentage of students who participated at least once during classroom discourse consistently ranged from 65.52% to 79.31% with the exception of one session (Session 4). Due to a primarily lecture-based format, the percentage of student participation dropped to 46.67%. Throughout the Occupational Therapy classes, the percentage of students who participated at least once during each class session gradually increased from 48.26% to 93.10% over the first five sessions. Despite an increase in frequency of student verbal participation during the sixth session, the percentage of students participating in the classroom discourse on the last session dropped to 65.52%, indicating that fewer students participated in the discourse. Regardless of the relatively even frequency of instructor and student utterances, the frequency of individual students' participation in class discussion varied. Consequently, some students were highly engaged in large group

discussions while others did not participate at all. This finding indicates that despite a similar number of utterances between instructors and students, how instructors format the classroom session impacts the percentage of students who participate during classroom discussions. Table 9 indicates the percentage of students who participated in classroom discourse over each of the six data collection sessions in both classes.

Table 9

*Percentage of Students Who Participated in Classroom Discourse by Discipline*

| | | Data Sessions | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Communication Disorders | # of Student Participants | 23 | 19 | 22 | 14 | 21 | 23 |
| | # of Students in Attendance | 32 | 29 | 32 | 30 | 31 | 29 |
| | % of Participation | 71.88 | 65.52 | 68.75 | 46.67 | 67.74 | 79.31 |
| Occupational Therapy | # of Student Participants | 14 | 23 | 23 | 21 | 27 | 19 |
| | # of Students in Attendance | 29 | 29 | 29 | 28 | 29 | 29 |
| | % of Participation | 48.26 | 79.31 | 79.31 | 75.00 | 93.10 | 65.52 |

**Talking time.** Audio recordings from each large group discussion were played back using the 2017 version of Adobe Premier program. The audio recordings were cut and assigned to one of three categories: instructor utterances, student utterances, and other activities (e.g., videos, transitions, reading silently, guest speaker, class breaks), where neither the instructor nor the students were interacting verbally in the learning environment. Sound clips were then successively stacked in respective trays to calculate total talking time for each data collection session. These times are displayed in minutes

and seconds (mm:ss). Small group discussion times, where only the students were engaged in the discussion were counted as "other" during the large group recordings.

During the semi-structured interviews, the instructors indicated that they expected students to be prepared with background knowledge about a topic in order to participate and engage in discussion during class time. The instructors also stated that they use active learning strategies as a means to facilitate discussion, yet they still spent a majority of the class sessions presenting content via a lecture format. As a result, the instructors generally emerged as the primary speaker for a majority of the class time, which limited the opportunities for the students to engage in discussion and undermined the purpose of utilizing active learning strategies in the classroom.

During the Communication Disorders classes, the instructor consistently emerged as the primary speaker during the first five class sessions despite having a guest speaker presentation on the fifth week. Instructor talking time ranged from 58 minutes, 34 seconds to 89 minutes, 40 seconds of the class periods as compared to the student talking times of 20 minutes, 2 seconds to 55 minutes, 4 seconds. On the sixth week, the students presented group projects and engaged their peers in discourse prior to the instructor introducing a short lecture presenting content knowledge. During this data collection session, the student talking time was calculated as 108 minutes, 22 seconds, a majority of the class time.

The instructor also consistently emerged as the primary speaker during all six of the Occupational Therapy classes. Talking times over the six data collection sessions ranged from 65 minutes, 45 seconds to 111 minutes, 52 seconds as compared with the student speaking times ranging from nine minutes, 18 seconds to 25 minutes, 45 seconds.

With the exception of one Communication Disorders class session during which time the students presented group projects (Session 6), the instructor talking time in both classes was significantly greater than student talking times. This indicated that although the instructors incorporated some active learning strategies such as case studies and simulation of skills, and discussion prompted by open-ended questions as instructional methods, the instructors still primarily adopted a teacher-centered, lecture format of instruction. Further, the significantly higher instructor talking time as compared to student talking time contrasted the instructors' perceptions that they format the class time to be highly engaging and frequently incorporate discourse. Table 10 displays the aggregated talking times shown in minutes and seconds for both the instructor and students, as well as other classroom activities in both the Communication Disorders and the Occupational Therapy classes.

Table 10

*Speaking Times vs. Other Activities (in Minutes and Seconds) by Discipline*

| | | Data Sessions | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Communication Disorders | Instructor | 64:00 | 89:40 | 102:57 | 82:56 | 58:34 | 32:37 |
| | Students | 41:58 | 20:02 | 36:14 | 55:04 | 20:14 | 108:22 |
| | Other | 49:05 | 40:24 | 17:46 | 12:57 | 71:30 | 24:06 |
| | Total Time | 155:30 | 150:06 | 156:57 | 150:57 | 150:18 | 165:05 |
| Occupational Therapy | Instructor | 92:44 | 87:47 | 67:00 | 65:45 | 103:14 | 111:52 |
| | Students | 9:18 | 12:37 | 20:58 | 14:50 | 25:45 | 15:38 |
| | Other | 37:15 | 37:14 | 33:58 | 19:00 | 46:42 | 47:26 |
| | Total Time | 139:14 | 137:38 | 121:56 | 99:35 | 175:41 | 174:56 |

**Types of utterances.** Transcripts of classroom discourse were coded and analyzed using multiple cycles of coding. First, the transcripts were coded using open, or initial, coding as a strategy to get a general sense of the meaning of the data (Saldaña, 2013). In the second cycle of coding, I used pattern coding in order to "identify an emergent theme, configuration, or explanation" (Saldaña, 2013, p. 210). Drawing on the work of Garrison (2016), three prominent themes emerged – social presence, cognitive presence, and teaching presence. Specific codes following these three themes were identified, defined, and applied to transcripts of instructor-student and student-student discourse (See Appendix F). Garrison (2016) referred to the social presence as the personal relationships that encourage free and open communication within the group. Garrison (2016) argues that meaningful discourse that includes debate and negotiation of understanding is fundamental in collaborative thinking. Moreover, in order for individuals to feel comfortable engaging in critical discourse, they need to feel like they are part of a collaborative group, which Garrison (2016) referred to as "group identity." All utterances were therefore, designated as "group identity" when the speaker referred to themselves as being part of the collaborative group (e.g., "we," "us"), "non-group identity" when the speaker made no reference to being part of the collaborative group, and "non-group/non-topic" when the speakers' utterance did not identify themselves as being part of the group nor did their remark relate to the formal subject matter or identify goals.

Further, all utterances were also coded as part of the cognitive and teaching presences. Cognitive presence indicates "the process of constructive and collaborative inquiry" (Garrison, 2016, p. 14) and generally fell on a continuum from lower level

processes (e.g., identifying the problem, asking questions, recall of facts, and offering suggestions for consideration) to higher processes (e.g., judgment or criticism of other's ideas and providing a rationale). Teaching presence indicated the purposeful learning transaction in which there was active engagement, proportional contribution of all participants, and distributed authority to regulate learning (Garrison, 2016). To identify teaching presence, utterances were designated as contributing to the design, facilitation, or direction of the collaborative learning process (Garrison, 2016).

The instructors indicated that they expected students to use clinical reasoning skills, but in many ways inadvertently limited it. First, instructors sabotaged the creation of an atmosphere where students felt part of a safe and cohesive group (Garrison, 2016) by typically using terms such as "I" and "you" rather than "us" or "we." Next, rather than facilitating discourse, instructors often relied on lectures, shared their own experiences, and asked convergent questions as a means to encourage student participation and engagement. When students engaged in discourse, often it was limited to the instructor and one student rather than discourse among the students; this limited the opportunities for students to engage in critical discourse in the classroom and demonstrate their own clinical reasoning skills. It further indicated a disconnect between the instructors' actions and their perceptions of how they engage students and encourage clinical reasoning.

***Communication Disorders class.*** During the Communication Disorders classes, frequency of the instructor's references to group identity (e.g., "us," "we") varied, increasing during Session 2 and 3, but dropping again during Sessions 5 and 6. The instructor's non-group identification decreased significantly over the six data collection

sessions. Further, the instructor's use of non-group/non-identify remarks decreased from 12 during the first data collection session to zero from Session 3 through 6. Garrison (2016) asserts the importance of establishing an environment where participants identify themselves as part of a collaborative group (group identity) that is situated within a trusting environment. During the six data collections sessions, the instructor's utterances most often did not include references to a group identity within the classroom and was likely influenced by the frequent reliance on a lecture-type content dispersion format vs. a collaborative discussion format.

A second parameter of Garrison's (2016) framework is called the cognitive presence and refers to the process of moving through high-level thinking. Closely related, the third parameter of Garrison's (2016) framework refers to teaching presence, which refers to the instructional design, facilitation, and direction of course material. During the group discourse, the number of convergent questions that the instructor asked gradually decreased over the six data collection sessions. Additionally, the instructor's explicit indication of expectations also decreased over the six data collection sessions, during the teaching process. During classroom discourse, the instructor primarily encouraged and acknowledged students, but prompted discussion through open-ended questions. Both of these strategies, however, decreased over the data collection sessions indicating a decrease in instructor-facilitated discourse. Further, the frequency of the instructor identifying areas of agreement and disagreement gradually rose but later decreased. This decrease corresponded with the change in class format that included a guest speaker presentation (Session 5) and student presentations (Session 6). Finally, the instructor's frequency of presenting course content, confirming understanding through

further explanation, and injecting personal knowledge into classroom discourse gradually decreased over the six data collection sessions. Although the instructor often used open-ended questions and acknowledged student responses as an instructional strategy within Garrison's (2016) teaching presence to encourage high-level thinking, these varied from session to session and varied during each class session. Table 11 indicates the frequency of instructor utterance types in Communication Disorders classes.

Table 11

*Frequency of Instructor Utterance Types During Communication Disorders Classes*

| Presence | Category | Code | Data Session 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| Social | | | | | | | | |
| | | Group Identity | 5 | 36 | 41 | 21 | 12 | 6 |
| | | Non-Group Identify | 158 | 117 | 62 | 72 | 74 | 21 |
| | | Non-Group/ Non-Topic | 12 | 9 | 0 | 0 | 0 | 0 |
| TOTAL | | | 175 | 162 | 103 | 93 | 86 | 27 |
| Cognitive | | | | | | | | |
| | Triggering Event | | | | | | | |
| | | Identifying the problem | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Sense of puzzlement | 29 | 68 | 18 | 19 | 6 | 5 |
| | Exploration | | | | | | | |
| | | Recall of facts | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Suggestions for consideration | 1 | 4 | 2 | 1 | 0 | 0 |
| | | Leaps to conclusion | 3 | 0 | 1 | 0 | 0 | 0 |
| | Integration | | | | | | | |
| | | Convergence | 2 | 0 | 1 | 0 | 0 | 0 |
| | | Judgment | 1 | 0 | 0 | 0 | 0 | 0 |
| | Resolution | | | | | | | |
| | | Application to real world | 4 | 3 | 0 | 0 | 0 | 0 |
| | | Defending solutions | 1 | 0 | 0 | 0 | 0 | 0 |
| Teaching | | | | | | | | |
| | Design | | | | | | | |
| | | Expectations | 20 | 12 | 14 | 12 | 3 | 3 |
| | | Topic Identification | 4 | 4 | 4 | 2 | 1 | 1 |
| | Facilitation | | | | | | | |
| | | Identifying areas of agreement/disagreement | 8 | 15 | 27 | 29 | 8 | 5 |
| | | Seeking to reach consensus/understanding | 0 | 0 | 3 | 0 | 0 | 0 |
| | | Encouraging, acknowledging, or reinforcing student | 91 | 81 | 27 | 19 | 60 | 14 |
| | | Prompting discussion | 64 | 48 | 25 | 33 | 30 | 6 |
| | | Assessing efficacy of the process | 0 | 0 | 0 | 1 | 0 | 0 |
| | Direction | | | | | | | |
| | | Presenting content | 33 | 17 | 8 | 16 | 0 | 4 |
| | | Summarizing the discussion | 8 | 10 | 16 | 15 | 1 | 0 |
| | | Confirmation of understanding | 36 | 35 | 21 | 24 | 13 | 4 |
| | | Diagnose misconceptions | 6 | 5 | 1 | 4 | 1 | 0 |
| | | Inject knowledge | 30 | 22 | 24 | 13 | 29 | 8 |

On the other hand, the frequency of the Communication Disorders students' use of utterances indicating group identity were relatively even with the exception of the last session, during which the students presented their group projects. During that session, the students' references to group identity increased. The students' utterances that did not indicate a direct reference to inclusion in the collaborative group (non-group identity) decreased gradually with a slight rise during Session 6, during which time the class format included student presentations. When comparing group identity to non-group identity, the students' utterances consistently favored higher incidences of non-group identity indicating that the students routinely did not refer to themselves as part of the collaborative group. The students' utterances, which did not indicate inclusion in the group and did not relate to the formal subject matter, occurred minimally during the data collection sessions.

During classroom discourse, the frequency of students asking convergent questions to gain specific information gradually increased over the data collection sessions. Additionally, the frequency of recalled factual information during the first, second, and fourth data sessions was similar to the frequency of the instructor's use of convergent questions. During the sixth session, during the students' presentations, they asked multiple convergent questions of their peers resulting in responses generating recall of facts. The occurrences of students offering suggestions for consideration gradually decreased after Session 1, but then stayed relatively consistent across all data collection sessions. The students' utterances that applied course content to their clinical experiences decreased over the six data sessions and were dependent on the students' familiarity and experience with the discussion topic. Rare disorders with which the

students had little exposure, therefore, resulted in fewer opportunities to relate their experiences to course content. The incidence of students using high-level clinical reasoning by expressing a rationale for their responses remained consistent over data Sessions 1, 2, 3, and 6. During Session 4, the class format consisted primarily of lecture, and during Session 5, a guest speaker's presentation limited the students' opportunities to provide rationales.

Finally, Garrison (2016) posits that although the teaching responsibilities in a collaborative group initially fall on the instructor, the various individuals in the group should eventually take on more responsibility for the teaching process and the instructor's role shifts to toward that of a facilitator. Yet during the large group sessions, the class design, facilitation, and direction of the discourse primarily fell on the instructor. Rather than facilitating discussion, the instructor often shared her own experiences or provided answers before students had an opportunity to offer their own ideas. Over the six data sessions, however, the students did gradually increase their encouragement and acknowledgement of other students. The significant increase in students presenting content and facilitating discussion during Session 6, however, was the result of a shift in class format due to students presenting their projects and facilitating discussion. These findings suggest that the class format directly impacted the students' overt demonstration of high-level clinical reasoning. Moreover, the class format precluded a gradual increase of these skills over the data collection sessions. The frequency of student utterance types in Communication Disorders classes is shown in Table 12.

Table 12

*Frequency of Student Utterance Types During Communication Disorders Classes*

| Presence | Category | Code | Data Session 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| Social | | | | | | | | |
| | | Group Identity | 4 | 19 | 16 | 12 | 13 | 54 |
| | | Non-Group Identify | 159 | 131 | 85 | 76 | 76 | 102 |
| | | Non-Group/ Non-Topic | 1 | 7 | 0 | 0 | 0 | 0 |
| TOTAL | | | 164 | 157 | 101 | 88 | 89 | 156 |
| Cognitive | | | | | | | | |
| | Triggering Event | | | | | | | |
| | | Identifying the problem | 0 | 1 | 0 | 0 | 0 | 0 |
| | | Sense of puzzlement | 5 | 3 | 0 | 4 | 19 | 13 |
| | Exploration | | | | | | | |
| | | Recall of facts | 33 | 70 | 1 | 21 | 1 | 58 |
| | | Suggestions for consideration | 38 | 17 | 19 | 24 | 15 | 17 |
| | | Leaps to conclusion | 13 | 3 | 3 | 2 | 4 | 2 |
| | Integration | | | | | | | |
| | | Convergence | 3 | 0 | 14 | 5 | 9 | 6 |
| | | Judgment | 0 | 0 | 1 | 0 | 0 | 1 |
| | Resolution | | | | | | | |
| | | Application to real world | 42 | 19 | 13 | 8 | 9 | 9 |
| | | Defending solutions | 23 | 28 | 23 | 10 | 15 | 22 |
| Teaching | | | | | | | | |
| | Design | | | | | | | |
| | | Expectations | 0 | 0 | 0 | 0 | 0 | 13 |
| | | Topic Identification | 0 | 0 | 0 | 0 | 0 | 9 |
| | Facilitation | | | | | | | |
| | | Identifying areas of agreement/disagreement | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Seeking to reach consensus/understanding | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Encouraging, acknowledging, or reinforcing student | 0 | 5 | 5 | 9 | 15 | 22 |
| | | Prompting discussion | 0 | 0 | 7 | 0 | 0 | 25 |
| | | Assessing efficacy of the process | 0 | 0 | 0 | 0 | 0 | 0 |
| | Direction | | | | | | | |
| | | Presenting content | 0 | 0 | 0 | 0 | 0 | 44 |
| | | Summarizing the discussion | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Confirmation of understanding | 0 | 0 | 3 | 0 | 0 | 2 |
| | | Diagnose misconceptions | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Inject knowledge | 0 | 0 | 0 | 0 | 2 | 1 |

***Occupational Therapy class*.** During the Occupational Therapy classes, the frequency of the instructor's references to group identity varied slightly over Sessions 1 to 3, but gradually decreased over data collection Sessions 4 through 6. The instructor's non-group identification varied over the six data collection sessions. There was a gradual increase of "non-group" references over the first three sessions, a decrease during Session 4, followed by a spike occurring during Session 5, and another decrease during Session 6. During Session 5, the instructor reviewed and discussed responses from a recent exam in detail, which entailed mostly factual information. Finally, the instructor's use of non-group/non-identify remarks remained low over all data collection sessions. Contrary to Garrison's (2016) assertion about the importance of creating an environment where participants feel safe and identify themselves as part of a collaborate group, the instructor's responses most often did not refer to a group identity, and were likely the result of teacher-centered lectures interspersed with some collaborative discussions.

The second and third parameters of Garrison's (2016) framework, cognitive presence and teaching presence, refer to moving through the cognitive levels toward high-level thinking and the instructional design, facilitation, and direction of course content. During classroom discourse, the number of convergent questions that the instructor asked gradually decreased with the exception of a slight increase during Session 5. During that class session, the instructor asked students convergent questions to elicit specific information from students regarding their responses on the recent exam. In reference to the class design, the instructor's expression of explicit expectations decreased gradually over the six data collection sessions with the exception of week three. During this class session, the instructor discussed expectations for an upcoming

assignment with the students. The instructor also presented several videos, which warranted multiple instructions, drawing the students' attention to specific components and how the students should assess the client-clinician interactions. Additionally, the instructor's facilitation of discourse in the classroom through the presentation of open-ended questions remained consistent over the six data collection sessions.

The instructor's reinforcement and acknowledgment of student responses varied over Sessions 1 through 4, increased significantly during Session 5, and then decreased during Session 6. The significant increase of reinforcement and acknowledgement of students occurred during Session 5, when the instructor was reviewing a recent exam in detail and engaging students in discourse about their responses (e.g., "Why did you pick that? ...OK, I see what you are saying"). Occurrences during which the instructor identified areas of agreement or disagreement were similar over the six data collection sessions, whereas instances when the instructor sought to reach a consensus decreased over the six sessions.

Finally, the instructor primarily directed the instructor-student discourse by presenting content, explaining content, and interjecting personal experiences into the discourse. Similar to the instructor in the Communication Disorders class, although the instructor often asked open-ended questions, she often shared her own experiences or provided answers to questions before the students had an opportunity to share their clinical reasoning skills. For example, when discussing challenges clinicians face with documentation in clinical settings, the instructor asked an open-ended question (e.g., "What challenges do clinicians face in that situation?"). When the student responded, instead of asking for a rationale, the instructor immediately provided one.

The occurrences of content presentations gradually decreased over data Sessions 1 through 5, but increased during data Session 6. During the sixth session, however, following an interactive activity, the instructor presented course content during a lecture format followed by several video presentations. The instances when the instructor further explained course information to confirm understanding remained consistent over each of the data collection sessions with the exception of Session 5, during which a recent exam was reviewed. During this session the instructor explained exam questions in detail. Lastly, the instructor's interjection of personal knowledge through clinical experiences varied over the six data collection sessions and was dependent on the topic. The instructor summarized the discourse on occasion over Sessions 4, 5, and 6, and identified students' misconceptions during Sessions 3, 5, and 6. Although the instructor engaged students through open-ended questions and acknowledged the students' responses to elicit high-level thinking, these varied from session to session and did not facilitate a gradual increase of high-level clinical reasoning by students. The frequency of instructor utterance types during Occupational Therapy classes is shown in Table 13.

Table 13

*Frequency of Instructor Utterance Types During Occupational Therapy Classes*

| Presence | Category | Code | Data Session 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| Social | | | | | | | | |
| | | Group Identity | 23 | 25 | 27 | 10 | 18 | 16 |
| | | Non-Group Identify | 45 | 48 | 77 | 54 | 132 | 76 |
| | | Non-Group/ Non-Topic | 0 | 1 | 0 | 1 | 0 | 0 |
| TOTAL | | | 78 | 74 | 104 | 65 | 150 | 92 |
| Cognitive | | | | | | | | |
| | Triggering Event | | | | | | | |
| | | Identifying the problem | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Sense of puzzlement | 9 | 6 | 4 | 3 | 6 | 2 |
| | Exploration | | | | | | | |
| | | Recall of facts | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Suggestions for consideration | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Leaps to conclusion | 0 | 0 | 0 | 0 | 0 | 0 |
| | Integration | | | | | | | |
| | | Convergence | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Judgment | 0 | 0 | 1 | 0 | 0 | 0 |
| | Resolution | | | | | | | |
| | | Application to real world | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Defending solutions | 0 | 0 | 0 | 0 | 0 | 0 |
| Teaching | | | | | | | | |
| | Design | | | | | | | |
| | | Expectations | 24 | 17 | 31 | 15 | 20 | 9 |
| | | Topic Identification | 3 | 1 | 2 | 2 | 1 | 1 |
| | Facilitation | | | | | | | |
| | | Identifying areas of agreement/disagreement | 5 | 3 | 3 | 4 | 8 | 2 |
| | | Seeking to reach consensus/understanding | 6 | 5 | 2 | 0 | 1 | 0 |
| | | Encouraging, acknowledging, or reinforcing student | 29 | 20 | 47 | 14 | 91 | 43 |
| | | Prompting discussion | 36 | 38 | 48 | 39 | 33 | 36 |
| | | Assessing efficacy of the process | 0 | 1 | 0 | 0 | 0 | 0 |
| | Direction | | | | | | | |
| | | Presenting content | 42 | 39 | 39 | 25 | 17 | 42 |
| | | Summarizing the discussion | 0 | 0 | 0 | 2 | 1 | 3 |
| | | Confirmation of understanding | 15 | 9 | 13 | 17 | 35 | 15 |
| | | Diagnose misconceptions | 0 | 0 | 5 | 0 | 8 | 1 |
| | | Inject knowledge | 30 | 18 | 25 | 9 | 14 | 28 |

In contrast, the frequency of Occupational Therapy students' references to being part of the collaborative group gradually increased over Sessions 1, 2, 3, and 5. During Session 4 and 6 the class format included multiple video presentations, during which the students were critiquing client-clinician interactions, and therefore reflected individual ideas rather than group ideas. Although the frequency of students' utterances not referencing inclusion in the group was significantly higher than group identity, a similar trend occurred during the same data sessions for students' utterances identified as "non-group identity." During those sessions, the students discussed their own observations as opposed to group conclusions.

During classroom sessions, the frequency of student-initiated convergent questions varied over the six data collection sessions and was dependent on the topic. On the fifth session, the instructor and students reviewed a recent exam, so students frequently asked questions requiring specific responses regarding the content. The frequency of students offering suggestions for consideration remained consistent with the exception of Session 5, during which students offered suggestions of how they could have responded to exam questions. Similarly, the frequency of students offering a justified rationale, but with a tentative hypothesis, remained consistent over all data sessions with the exception of an increase during Session 5. While reviewing responses to an exam, there were multiple instances during which the students offered tentative or incomplete justifications for their responses. Lastly, the instances of students relating course content to their clinical experiences increased over the data collection sessions, while the occurrences of students providing a rationale to defend their assertions varied depending on the class format, topic of discussion, and types of questions that were

asked. Moreover, the course design and types of questions instructors used to encourage student participation in discussion influenced the types of responses students offered. When the instructor asked convergent questions resulting in specific correct vs. incorrect responses, students offered factual information. Conversely, when the instructor asked open-ended questions and allowed students to offer their own responses before providing the answer, student responses often included a rationale for their thinking.

Similar to the Communication Disorders classes, the class design, facilitation, and direction of the discourse was primarily facilitated by the instructor. Over the six data sessions, the students' encouragement and acknowledgement of other students decreased. Furthermore, the students did not impact the design of the class sessions and only minimally influenced the direction of class discourse through the confirmation of understanding and diagnosis of misconceptions. These findings suggest that the student responses were greatly influenced by the class formats and the questions initiated by the instructor. By asking convergent questions and providing answers prematurely, the instructor unconsciously weakened the goal of facilitating discussion that encouraged clinical reasoning. Students, therefore, did not demonstrate a gradual increase of these skills over the data collection sessions. The frequency of student utterance types during the Occupational Therapy classes is presented in Table 14.

Table 14

*Frequency of Student Utterance Types During Occupational Therapy Classes*

| Presence | Category | Code | Data Session 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| Social | | | | | | | | |
| | | Group Identity | 3 | 7 | 8 | 3 | 9 | 2 |
| | | Non-Group Identify | 58 | 78 | 92 | 55 | 137 | 78 |
| | | Non-Group/ Non-Topic | 0 | 1 | 0 | 0 | 0 | 0 |
| TOTAL | | | 61 | 86 | 100 | 58 | 146 | 80 |
| Cognitive | | | | | | | | |
| | Triggering Event | | | | | | | |
| | | Identifying the problem | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Sense of puzzlement | 12 | 6 | 15 | 7 | 29 | 16 |
| | Exploration | | | | | | | |
| | | Recall of facts | 1 | 7 | 0 | 0 | 0 | 0 |
| | | Suggestions for consideration | 18 | 22 | 24 | 21 | 39 | 25 |
| | | Leaps to conclusion | 1 | 0 | 4 | 0 | 0 | 1 |
| | Integration | | | | | | | |
| | | Convergence | 6 | 5 | 5 | 4 | 10 | 4 |
| | | Judgment | 0 | 0 | 1 | 0 | 0 | 1 |
| | Resolution | | | | | | | |
| | | Application to real world | 4 | 4 | 10 | 10 | 7 | 9 |
| | | Defending solutions | 4 | 5 | 9 | 2 | 16 | 8 |
| Teaching | | | | | | | | |
| | Design | | | | | | | |
| | | Expectations | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Topic Identification | 0 | 0 | 0 | 0 | 0 | 0 |
| | Facilitation | | | | | | | |
| | | Identifying areas of agreement/disagreement | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Seeking to reach consensus/understanding | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Encouraging, acknowledging, or reinforcing student | 11 | 9 | 10 | 3 | 1 | 0 |
| | | Prompting discussion | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Assessing efficacy of the process | 0 | 0 | 0 | 0 | 0 | 0 |
| | Direction | | | | | | | |
| | | Presenting content | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Summarizing the discussion | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Confirmation of understanding | 0 | 0 | 0 | 1 | 0 | 0 |
| | | Diagnose misconceptions | 0 | 0 | 1 | 0 | 0 | 0 |
| | | Inject knowledge | 0 | 0 | 0 | 0 | 0 | 0 |

**Small Group Discussions**

During several of the class sessions, the instructors presented activities that encouraged student-student discourse in a small group format. There were three small group discourse periods during the Communication Disorders class and one during the Occupational Therapy class. All small group discussions were audio recorded and transcribed verbatim. A digital recording device was provided for each group and prior to the discussion, each participant provided a voice sample in order to accurately identify each speaker by his or her self-selected pseudonym during the recording. Detailed field notes were also used to determine participants in each group. Next, the frequency of each participant's utterances during the small group discourse were tabulated for each group. Last, student-student utterances were coded for each small group interaction using a framework drawing from the work of Garrison (2016). Student utterances were then analyzed to determine the types of utterances the students used and how frequently they occurred.

**Frequency of utterances**. The frequency of utterances was calculated for each participant during student-student discourse during small group activities. Responses during which the entire group responded at the same time with the same response were recorded as "whole group." Utterances in which a word or phrase was partially audible, but did not impact the meaning or intent of the utterance, were counted as "partially audible" and included in the frequency totals. Utterances which were totally inaudible or the inaudible portion impacted the content were designated as 100% inaudible and not included in frequency calculations.

***Communication Disorders class.*** Small group discussions occurred during three of the class sessions. During the first small group activity, all students were assigned to one of six groups, during which time they selected a rare disorder related to communication disorders for the assigned presentation later in the semester. Group sizes were five or six students each and discussion time was 10 minutes. Although Garrison (2016) recommends establishing consistent collaborative groups, the students self-selected their groups during the latter two small group discussions. At that time, they discussed case studies and answered guided discussion questions. Some groups included the same students for the second and third small group discussions, while other groups had differing group members. For the second group session, there were eight groups ranging in size from three to five students, and eight groups ranging from three to seven students for the third session. Small group discussion times were 20 minutes, 30 seconds and 39 minutes, 23 seconds, respectively. Contrasting large group discussions, where some students did not participate, all participants engaged in discourse with their peers during each small group discussion. Additionally, in several groups, one student took on a leadership role by directing the discussion process and offered more responses than other group members. For example, one student guided the group through the assigned case study questions, frequently offered suggestions, and redirected students making off-task comments back to the topic. Furthermore, in most groups, frequency of participation among members was similar. As a result, when interaction is student-centered, student participation and collaboration increased overall. Table 15 represents the frequency of student utterances during small group discussions in the Communication Disorders classes.

Table 15

*Aggregated Frequency of Student Utterances During Small Group Discussions-Communication Disorders Class*

| Session # | Group | Frequency |
|---|---|---|
| 1 | 1 | 77 |
| | 2 | 57 |
| | 3 | 86 |
| | 4 | 134 |
| | 5 | 101 |
| | 6 | 106 |
| 2 | 1 | 59 |
| | 2 | 185 |
| | 3 | 128 |
| | 4 | 97 |
| | 5 | 160 |
| | 6 | 116 |
| | 7 | 160 |
| | 8 | 94 |
| 3 | 1 | 156 |
| | 2 | 291 |
| | 3 | 178 |
| | 4 | 159 |
| | 5 | 52 |
| | 6 | 106 |
| | 7 | 88 |

***Occupational Therapy class.*** Small group discussions occurred during only one of the large group class sessions in the Occupational Therapy class. During that session, the students counted off by sevens, which designated the assigned group. During the small group interactions, the students discussed a case study and brainstormed ideas about education the students might provide to that patient. All groups had four students with the exception of one group, which had five students. All participants verbally interacted with their peers. Small group discussion time was 19 minutes, 35 seconds. Comparable to the small group discussion in the Communication Disorders classes, in some groups, one student took a leadership role and directed the discussion process, while in other groups, the students shared the leadership role. Similar to the small group

discussions in the Communication Disorders classes, the student-centered interactions encouraged collaboration and participation among group members. Table 16 represents the frequency of student utterances during small group discussions in the Occupational Therapy class.

Table 16

*Aggregated Frequency of Student Utterances During Small Group Discussion-Occupational Therapy Class*

| Session # | Group | Frequency |
|---|---|---|
| 1 | 1 | 119 |
| | 2 | 98 |
| | 3 | 99 |
| | 4 | 63 |
| | 5 | 120 |
| | 6 | 87 |
| | 7 | 91 |

**Types of utterances.** Transcripts of small group discourse were coded and analyzed using the same methods as the large group transcripts. Further, Garrison's (2016) framework was again applied to transcripts of small group discussions to analyze the types of utterances students exhibited during small group discussions.

***Communication Disorders class.*** Small group discourse occurred over three data collection sessions. The students in the groups varied during the small group interactions within the Communication Disorders classes. The frequency of utterances indicating "group identity" varied over the three data collection sessions. The references to being part of the group initially declined from the first to second session, but significantly increased on the third session. Instances of utterances that did not reference being part of the collaborative group ("non-group") steadily increased over the three small group

discussion sessions. Student remarks that were designated non-group/non-topic increased from the first to the second data collection session, but then decreased during the third session. Contrasting Garrison's (2016) framework, which highlights the importance of establishing a free and open communication in a collaborative group, when students did not readily identify themselves as part of a group, high frequencies of off-task comments resulted.

Additionally, there was an increase in the number of questions students asked each other, instances of recalling facts, and times where suggestions were offered without a rationale during student-student discourse. Furthermore, students engaged in an increase of statements where an opinion was given, but a rationale was not given (leaps to conclusion), the hypothesis remained tentative (convergence), and statements that challenged and/or criticized others' ideas (judgment). Lastly, students' utterances reflected a decrease, followed by a slight increase, in application to real life situations and a general increase in defending ideas with a rationale over the three small group discourse sessions. Although the instances when students challenged their peers' ideas which necessitated high-level thinking and clinical reasoning that required them to provide a rationale to defend their ideas increased, most often the students offered suggestions for consideration which avoided the possibility of fellow students challenging their ideas.

During the student-student discourse sessions, the students rarely influenced the design of the group interactions, but did increasingly influence the facilitation of the discourse by: (a) identifying areas of agreement and disagreement, (b) seeking to reach a consensus or understanding, (c) encouraging, acknowledging, or reinforcing their peers, and (d) directing the discussion process. On several occasions during the second and

third data sessions, students prompted discussion with their peers by asking open-ended questions. The students also influenced the direction of their small group discourses. Instances when the students summarized the group discussion, confirmed understanding, and diagnosed or explained misconceptions increased from the first to second data collection session, but decreased during the third session. This indicated that the students tended to follow the design set forth by the instructor (e.g., completion of a case study exercise or answer specific questions), but did engage each other in discourse via open-ended questions and encouraging each other. Table 17 displays the aggregated frequency of student-student utterance types during the student-student discourse during small group collaborations.

Table 17

*Aggregated Frequency of Student-Student Utterance Types-Communication Disorders Class*

| Presence | Category | Code | Data Sessions 1 | 2 | 3 |
|---|---|---|---|---|---|
| Social | | | | | |
| | | Group Identity | 86 | 69 | 166 |
| | | Non-Group Identify | 358 | 726 | 847 |
| | | Non-Group/Non-Topic | 117 | 204 | 103 |
| TOTAL | | | 561 | 999 | 1116 |
| Cognitive | | | | | |
| | Triggering Event | | | | |
| | | Identifying the problem | 2 | 1 | 0 |
| | | Sense of puzzlement | 83 | 86 | 152 |
| | Exploration | | | | |
| | | Recall of facts | 0 | 12 | 27 |
| | | Suggestions for consideration | 70 | 181 | 221 |
| | | Leaps to conclusion | 43 | 80 | 54 |
| | Integration | | | | |
| | | Convergence | 1 | 64 | 76 |
| | | Judgment | 3 | 37 | 39 |
| | Resolution | | | | |
| | | Application to real world | 8 | 0 | 3 |
| | | Defending solutions | 6 | 45 | 35 |
| Teaching | | | | | |
| | Design | | | | |
| | | Expectations | 1 | 0 | 1 |
| | | Topic Identification | 0 | 0 | 0 |
| | Facilitation | | | | |
| | | Identifying areas of agreement/disagreement | 0 | 70 | 29 |
| | | Seeking to reach consensus/understanding | 19 | 13 | 39 |
| | | Encouraging, acknowledging, or reinforcing student | 119 | 167 | 195 |
| | | Prompting discussion | 0 | 2 | 2 |
| | | Assessing efficacy of the process | 5 | 46 | 71 |
| | Direction | | | | |
| | | Presenting content | 0 | 0 | 0 |
| | | Summarizing the discussion | 3 | 49 | 19 |
| | | Confirmation of understanding | 0 | 24 | 21 |
| | | Diagnose misconceptions | 0 | 41 | 10 |
| | | Inject knowledge | 0 | 1 | 0 |

***Occupational Therapy class.*** During the small group discourse that occurred in the Occupational Therapy class, it was evident that the students did not have a sense of group identity, because they made significantly more "non-group" and "non-group/non-topic" remarks than references to being part of a collaborative group (group identity). Additionally, students asked questions of each other and offered a significant number of suggestions, however, giving possible rationales with tentative hypotheses (convergence), challenging others' ideas (judgment), and providing rationales for solutions and suggestions (defending solutions) occurred less often. Even though students perceived that they were routinely demonstrating clinical reasoning and providing rationales for their thinking during their classroom interactions, the findings suggest that students did not assert themselves by challenging and questioning others' thinking, but more often offered suggestions for consideration to gain peer approval. For example, when completing a case study assignment about a fictitious patient, students were instructed to construct a list of information about which they would need to educate a patient who had a leg amputated as a result of diabetes. Since the assignment did not specify to provide a rationale for their responses, the students typically made suggestions for their peers to consider (e.g., "Range of motion") or in the form of a question for peers' approval (e.g., "How about circulation?" or "What about energy conservation?").

Additionally, the student-student discourse did not influence the design of the teaching process, however, the students facilitated discourse within their groups through frequent acknowledging and reinforcing each other, and to a lesser degree, identifying areas of agreement/disagreement and assessing efficacy of the process. Lastly, the students directed the small group discourse mostly by confirming understanding for their

peers, diagnosing misconceptions, and by summarizing the conversation, but rarely directed the discourse to remain on task when off-task, off-topic remarks occurred. Table 18 denotes the aggregated frequency of student-student utterance types during the Occupational Therapy class.

Table 18

*Aggregated Frequency of Student-Student Utterance Types-Occupational Therapy Class*

| Presence | Category | Code | Session 1 |
|---|---|---|---|
| Social | | | |
| | | Group Identity | 72 |
| | | Non-Group Identify | 465 |
| | | Non-Group/Non-Identity | 140 |
| TOTAL | | | 677 |
| Cognitive | | | |
| | Triggering Event | | |
| | | Identifying the problem | 0 |
| | | Sense of puzzlement | 59 |
| | Exploration | | |
| | | Recall of facts | 5 |
| | | Suggestions for consideration | 221 |
| | | Leaps to conclusion | 5 |
| | Integration | | |
| | | Convergence | 19 |
| | | Judgment | 12 |
| | Resolution | | |
| | | Application to real world | 1 |
| | | Defending solutions | 14 |
| Teaching | | | |
| | Design | | |
| | | Expectations | 0 |
| | | Topic Identification | 0 |
| | Facilitation | | |
| | | Identifying areas of agreement/disagreement | 10 |
| | | Seeking to reach consensus/understanding | 0 |
| | | Encouraging, acknowledging, or reinforcing student | 125 |
| | | Prompting discussion | 3 |
| | | Assessing efficacy of the process | 13 |
| | Direction | | |
| | | Presenting content | 0 |
| | | Summarizing the discussion | 8 |
| | | Confirmation of understanding | 28 |
| | | Diagnose misconceptions | 12 |
| | | Inject knowledge | 0 |

**Summary**

The findings of this study revealed that development of graduate health science students' clinical reasoning skills did not necessarily advance along a gradual and predictable progression. Instead, the students were influenced by several significant aspects, including classroom format and structure, instructor expectations, and the social dynamics that developed within the classrooms. Furthermore, findings indicate a disconnect between instructor perceptions and practice regarding instructional frameworks they used, how they engaged students in discussion, and how they structured active learning. While the instructors incorporated some active learning activities and opportunities for students to collaborate into their class format, the instruction still incorporated many elements of teacher-centered instruction. Additionally, although the instructors engaged students in discourse throughout each class session, the instructors perceived they were engaging students more often than they were in practice. Lastly, the instructors used questioning techniques as a method to engage students in discourse, however, the type of questions did not provide as many opportunities for students to exhibit high-level thinking and clinical reasoning skills as the instructors perceived.

First, the findings from instructor interviews indicated that the instructors both defined clinical reasoning as integrating various factors to determine the course of action for a patient. As a result, they both held expectations that students would integrate knowledge from prior coursework and field experiences to demonstrate clinical reasoning. This suggested that the instructors held the expectations that students demonstrate clinical reasoning skills they had developed throughout their previous

courses and experiences, as opposed to contributing to the development of the students' clinical reasoning skills as part of an on-going process.

Next, instructors and students differed in their view about significant factors that impacted the development of clinical reasoning. While both instructors recognized that they incorporated lecture into instruction, they identified the utilization of active learning strategies such as case studies and simulation into their course format, modeling clinical reasoning, and engaging students in discourse through the use of open-ended questions as critical components of instruction in order to assist graduate health science students to develop clinical reasoning skills. Both groups of students defined clinical reasoning similarly and identified four key components as being instrumental in their development of clinical reasoning. They include: (a) application of course content and skills to case studies, (b) the expectation to provide rationales for clinical decisions, (c) collaboration with peers, and (d) receiving instructor feedback. Unexpectedly, the students did not identify classroom discourse as a significant factor in developing clinical reasoning as identified by the instructors.

Third, the findings of this study indicate that graduate health science students' development of clinical reasoning is impacted by the frameworks of participation the instructors adopt and how the active learning strategies are structured and implemented. While the frequencies of instructor vs. student utterances were relatively evenly divided across all data collection sessions, the findings contrast the instructors' perceptions that they regularly engage students in classroom discourse. The findings further suggest that only a small percentage of the students participated in large group classroom discourse regularly. In fact, some students did not participate at all, while others participated

regularly. On the average, a majority of the students participated two to three times total over the course of six data collection sessions.

Furthermore, the instructors' perceived that they regularly engaged the students in active learning in the classroom. While both instructors utilize some active learning strategies during instruction, with the exception of one class session where the format centered on students' group presentations, the instructors often relied on lectures to present course content, directed the discourse, and provided answers or examples of their own experiences before students were provided with an opportunity to respond. Consequently, the instructors consistently emerged as the primary speakers during class sessions. Contrary to the instructors' perceptions, despite attempts to incorporate active learning into their classrooms, they still espoused a teacher-centered, lecture-type instruction.

Lastly, reflecting the work of Garrison (2016), three themes emerged – social presence, cognitive presence, and teaching presence. The instructors did not overtly attempt to create an inclusive, open environment where the students felt free to share ideas and challenge each other (social presence). As a result, both the instructors and students exhibited a lack of a "group identity" referencing self-identification as part of a collaborative group (Garrison, 2016). Neither group (instructors and students) consistently referred to themselves using "us" or "we" to indicate membership of a cohesive group, but rather used references to "I" and "you."

The class format, types of questions instructors asked, and responses to students' remarks, designated as teaching presence, was largely directed by the instructor and impacted the frequency of students' high-level thinking overtly exhibited in both large

group (instructor-student) discussions and small group (student-student) discussions. When instructors asked convergent questions that limited responses to specific answers, the students' opportunities to exhibit clinical reasoning and high-level thinking were limited. The goal of active learning was unconsciously undermined in several ways. Instructors often asked open-ended questions, but provided answers before students had the opportunity to provide a rationale for their thinking. Additionally, instructors often provided examples of their own experiences, which then limited the occasions for students to demonstrate high-level thinking. Next, instructors engaged students in instructor-student discourse, rather that facilitating discourse amongst the group of students. Finally, instructors did not overtly set the expectation for the students to provide rationales for their thinking, often resulting in recall of facts or lists of suggestions.

While the instructors included some active learning opportunities, they still adopted a lecture-based format. Using this type of classroom format, however, allowed the instructors to reinforce and further explain content material to which the students had been exposed. Using a lecture format also allowed the instructors to demonstrate their thinking about clinical cases as examples for the students. Lastly, sharing personal experiences allowed students to realize the application of course content to real-life scenarios.

In small group discussions, students followed the design set forth by the instructors, but engaged each other in discourse mostly through asking questions, and acknowledging and encouraging each other. Since the students were not specifically directed to provide rationales for specific recommendations, their responses were limited

to answering specific case history discussion questions by offering suggestions for approval by their peers. Without specific instructions, students easily deviated from the assignment by engaging in off-topic social conversations until another group member redirected them back on topic.

Despite the use of some active learning strategies within graduate health science courses, development of students' clinical reasoning skills did not gradually increase as anticipated. Factors such as instructor vs. student verbal participation, instructor vs. student talking times, types of utterances, and use of other instructional activities ultimately impacted student participation and use of high-level reasoning. Subsequently, these results have further implications for instruction in graduate health science programs as well as application to leadership and instructor practice, curriculum development, and future research described in Chapter V.

# Chapter V

## Discussion of Findings

Preparing graduate students for employment in health-related fields and meeting requirements set forth by professional organizations and governing bodies to acquire clinical knowledge and competencies are two responsibilities with which graduate health science programs are charged (American Occupational Therapy Association, 2010; Commission on Collegiate Nursing Education, 2013; Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association, 2013; Cronenwett et al., 2007; The Federation of the State Boards of Physical Therapy, 2006). In recent years, research has emerged suggesting how medical and nursing students develop the high-level reasoning skills that are needed in clinical care. These findings may be generally applied to graduate health science students, yet, research specifically focusing on how graduate health science students develop these skills and how the classroom environment contributes to that development needs further study.

The purpose of this phenomenological study was to understand how learning was structured in graduate health science courses in which the instructors at a comprehensive state university utilized active learning strategies, and how the graduate students in those courses developed their clinical reasoning skills. Extending beyond Vygotsky's social constructivism theory in which social interactions and use of language are considered vital parts of the learning process (Nathan & Sawyer, 2014; Powell & Kalina, 2009; Vygotsky, 2012; Vygotsky & Cole, 1978), Garrison's (2016) Community of Inquiry (CoI) framework identifies learning as a juncture between the "interdependent elements

of cognitive, social, and teaching presence" (p. 9). Since open communication is central to communication and collaboration that encourages high-level and creative thinking, the CoI is a generic framework that can be applied to collaborative learning in any context (Garrison, 2016). This study, therefore, was guided by the following research questions and sub-questions:

1. How do graduate health science students at Seaside University (pseudonym) develop clinical reasoning skills in the classroom environment?
2. What types of frameworks of participation do instructors use to encourage participation during instruction during graduate health science classes?
    a. What strategies do course instructors use to scaffold learning to elicit clinical reasoning skills from students during active learning experiences in the classroom?
    b. What verbal strategies or processes do graduate students use to make clinical decisions during active learning experiences in the classroom?
3. What other patterns of discourse emerge when graduate health science students make clinical decisions during active learning experiences in the classroom?

In this chapter, I first discuss the study's findings. Next, I describe the limitations of this study. Last, I offer implications for using the findings of this research with recommendations for instructor practice, leadership and curriculum development, and further research.

**Developing Clinical Reasoning Skills in the Classroom Environment**

The first research question focused generally on how graduate health science students develop clinical reasoning skills in the classroom environment. Garrison (2016) asserts that a vital part of advanced thinking is thinking collaboratively with others, yet the challenge is how to appropriately structure the environment. As previously stated, Garrison's (2016) Community of Inquiry (CoI) framework identifies learning as a juncture between social, cognitive, and teaching presences. Reflective of Garrison's (2016) framework, the findings from this study indicate that clinical reasoning in graduate health science classrooms did not follow a gradual and linear progression, but instead was influenced by several factors, including social dynamics, classroom structure, and instructor expectations.

Of significance in this study's findings is the disconnect that emerged in what the instructors and graduate students identified as important factors that influenced the development of clinical reasoning skills. The graduate students described their own development of clinical reasoning as a gradual process through which they moved throughout their program. Additionally, the students identified application of knowledge, the expectation to provide rationales for their decisions, collaboration with peers, and feedback from instructors as significant factors in this progression throughout their programs. Conversely, rather than contributing to the on-going process, the instructors expected students to demonstrate the clinical reasoning skills that emerged as a result of prior coursework and field experiences. Crichton (2013) asserts that the social interactions between instructors and students determine the learning opportunities. Similarly, the instructors identified engaging students in discourse through the use of

open-ended questions and hands-on activities, such as case studies and skills simulation during active learning experiences, as significant factors in the development of graduate health science students' clinical reasoning. Students, however, did not identify instructor-student interaction as significant, but identified the application of course content and skills to case studies, the expectations to provide a rationale for clinical decisions, collaboration with peers, and instructor feedback as significant in developing their clinical reasoning skills. Overall, the development of graduate students' clinical reasoning was influenced by the way the instructors structured the class periods, the expectations for various types of activities introduced in the classroom, how instructors engaged students, and the opportunities for peer collaboration.

**Instructors' Frameworks of Participation**

The second research question focused on what types of frameworks of participation instructors used to encourage participation during instruction in graduate health science classes. In recent years, instructional pedagogies have shifted from teacher-centered toward student-centered approaches, highlighting the dichotomy between the teacher-centered methods of instructionism and constructivist approaches, which are student-centered and interactive (Sawyer, 2014; Scardamalia & Bereiter, 2014). From a constructivist lens, instructors in the active learning process function as facilitators who guide students in the construction of new understanding (Brandon & All, 2010; Johnson, 2009; Liu, 2010; Nathan & Sawyer, 2014). Brandon and All (2010) further argue that social interactions are central to the learning process.

While the instructors in this study frequently engaged students in discourse, class format emerged as a contributing factor that influenced when the graduate students

exhibited high-level thinking skills. These findings illuminate the dichotomy between instructor and student frequencies of participation and talking times. Despite the instructors' attempts to engage students in classroom discourse, only a small number of students regularly participated. In fact, a majority of the students across both disciplines exhibited low rates of participation and a few did not participate in any large group discourse in the classroom. Further, findings indicate that the frequency of both instructor and student utterances in both the Communication Disorders and Occupational Therapy classes fluctuated, depending on the class format from session to session. Despite these fluctuations, however, the frequency of instructor vs. student utterances remained evenly divided.

Sternberg (2003) and Collins and Kapur (2012) assert the ineffectiveness of lecture-based methods of teaching. Moreover, Sternberg (2003) goes on to argue that lecture-based instruction may result in a content expertise that may not be consistent with the skills needed in real-world applications to complex problems. The results of this study indicate that instructors consistently emerged as the primary speakers with significantly longer talking times than students. One exception occurred during one class period when the students presented group projects and facilitated the discussions with peers. In that situation, the students had significantly higher talking times than the instructor. Overall, the class formats generally incorporated lecture as the primary means of instruction, even though the instructors did incorporate some active learning experiences. Yet students did not identify lecture as either positive or detrimental in their development of clinical reasoning skills. Instead, they identified multiple factors including application of course content to case studies, the expectation to provide

rationales for decisions, collaboration with peers, and instructor feedback as significant positive factors.

Further, the effectiveness of active learning strategies that encourage students to actively engage in the learning process and utilize higher level thinking processes and reflection is well-documented (Graffam, 2007; Hoogenes et al., 2015; Kim et al., 2013; Wagner, 2014; Zare & Othman, 2015). Even though use of these activities invited student-student discourse in addition to the instructor-student discourse that emerged during large group sessions, they were not utilized on a regular basis. This lack of consistency did not allow for the formation of safe, collaborative groups in which participants freely shared ideas as described by Garrison (2016).

Lastly, Garrison (2016) argues that in a collaborative group, the teaching responsibilities initially fall on the instructor. Eventually that role shifts toward facilitation as the students begin to share more of the responsibility. The findings of this study indicate that the class design and facilitation of discourse was primarily the responsibility of the instructor and did not gradually shift toward facilitation as described by Garrison (2016).

**Instructors' Scaffolding Strategies**

The next research sub-question focused on how instructors scaffold learning to elicit evidence of clinical reasoning during active learning experiences in the classroom. Crichton (2013) discusses the importance of social interactions in the learning process. Similarly, Garrison (2016) acknowledges the identity of being a part of a collaborative group (social process) as one the three intersecting processes in developing advanced, high-level thinking and learning. The findings in this study indicate that although the

instructors indicated some references to inclusion as part of a collaborative group, (e.g., "we," "us"), most often the instructors' utterances did not reference a group identity. This indicated that the instructors did not overtly establish a definitive sense of safe, open communication, which invited students to openly debate their opinions.

Questions are another common instructional strategy by which instructors engage students in discourse (Tofade et al., 2013). Greeno and Engeström (2014) describe Initiation, Response, Evaluation or Feedback (IRE) questioning sequences during which the instructor asks a question, the student answers, and then the instructor evaluates or provides clarification. In this type of questioning sequence, Greeno and Engeström (2014) assert that the students are passive in the learning process. On the other hand, Paul and Elder (2007) argue that Socratic questioning can be an effective way to probe students' understanding and encourage high-level thinking.

McComas and Abraham (2004) differentiated between convergent and divergent questions. According to McComas and Abraham, convergent, or closed questions, elicit specific responses or factual information while divergent, open-ended questions encourage a variety of responses that encourage further discourse. In this study, the types of questions instructors asked influenced the type of responses that students generated. For example, when the instructors asked convergent questions, students responded with recall of specific or factual information, reflecting the IRE questioning sequence described by Greeno and Engeström (2014). Likewise, when the instructors posed divergent, open-ended questions, the students were more likely to respond with responses exhibiting high-level thought processes. The findings of this study confirm that the type of questions the instructors asked influenced the types of responses students generated

and was one factor that impacted the graduate students' development of clinical reasoning.

Instructors in both disciplines consistently encouraged, acknowledged, and reinforced student responses or identified areas of agreement or disagreement as additional strategies to facilitate discourse in the large group setting. These strategies, though, varied from session to session and did not yield a gradual increase in high-level reasoning. Like the question types instructors asked, this indicated that how instructors respond to students' responses is another factor that impacts the development of graduate health science students' clinical reasoning.

**Graduate Students' Verbal Strategies**

The next research sub-question focused on the verbal strategies that graduate health science students use to make clinical decisions in the classroom during active learning experiences. Garrison (2016) furthers Vygotsky's social constructivist theory by asserting that individuals are social and thus, learning is a social action. As a result, high-level thinking results from a process of discourse that includes frequent debate and negotiation (Garrison, 2016). Along the same lines, both Dumas et al. (2014) and Chi and Menekse (2015) argue that the thought processes students exhibit during student-student discourse may give insight into their thought processes.

During large group discussions, only a small number of students participated regularly, whereas most had limited participation or none at all. Contrasting Dumas et al. (2014) and Chi and Menekse (2015) then, the thought processes in which the students engaged was not readily apparent. Applying Garrison's (2016) CoI framework, the students' utterances can be categorized according to three presences – social, cognitive,

and teaching. Garrison (2016) advocates a strong sense of belonging to a group as an important factor in collaboration in high-level learning (social presence). Contrasting Garrison's (2016) assertions, the findings in this study reveal that the students' utterances did not routinely reflect being part of a collaborative group.

The next component of Garrison's (2016) CoI framework is called the cognitive presence and refers to the process of ensuring that students move through the phases of inquiry that is central to high-level thinking and learning. Analyzing utterance types during the large group discourse revealed that during the instructor-student discourse, students tended to ask convergent questions to obtain specific information or clarify personal understanding of content, as opposed to engaging each other in high-level thinking and discourse. Often, student responses to instructor questions yielded suggestions for instructor approval rather than assertions with accompanying rationales, which is a trademark of high-level thinking and reasoning.

The third element of the CoI framework is called the teaching presence and includes factors such as the design, facilitation of discourse, and direction of the class format and instruction (Garrison, 2016; Shea et al., 2006). During the large group class sessions, student responses reflected the instructors' expectations. For example, when the instructor presented a case study for students to consider, the discourse focused on answering specific questions, rather than debate about the course of treatment for the hypothetical patient. This type of activity limited the higher-level rationales that are reflective of the type of high-level thinking described by Dumas et al. (2014) and Chi and Menekse (2015). As a result, the design, facilitation, and direction of the class format and ensuing discourse was primarily influenced and directed by the instructor.

Active learning strategies such as case-based learning and skills simulation are two strategies observed in this study that allowed for small group interactions among students. Differing from large group interactions, dynamics between students and their peers shifted during small group interactions as compared to the large group interactions. Garrison's (2016) CoI framework was also applied to the small group (student-student) interactions that occurred during active learning experiences. Like the large group discourse, the students' utterances during small group interactions can again be categorized according to the social, cognitive, and teaching presences. Garrison's (2016) CoI framework asserts that when group membership remains consistent it helps to establish an open forum environment that is conducive to freely debating ideas. Instead, the groups of students that formed the small groups in this study varied and did not provide the consistency advocated by Garrison (2016). All participants, however, engaged in discourse with their peers during small group interactions despite the variations in the small group membership. Some students even adopted a leadership role and directed the discussion, while others shared the leadership role. Despite all students participating in small group discourse with their peers, findings in this study reveal that, like the large group interactions, the students lacked a sense of group membership and most often did not refer to being part of the collaborative group.

The cognitive presence, the second part of Garrison's (2016) CoI framework, refers to the process of moving through the phases of investigation toward high-level thinking. Closely related, the third element of Garrison's (2016) CoI framework, the teaching presence, includes elements of course design, facilitation of discourse, and direction (Garrison, 2016; Shea et al., 2006). Within the small group discourse with

peers, while the students engaged in discourse, they often asked each other questions to confirm their understanding or obtain clarification, which often resulted in recall of information. They also offered suggestions for consideration, thus, seeking the approval of their peers, rather than challenging others' thinking and asserting one's own opinions. Moreover, the students generally followed the assignment expectations set forth by the instructor, so they did not influence the design of the group discourse. They did, however, facilitate discourse with each other mostly by acknowledging and encouraging each other, identifying areas of agreement and disagreement, and seeking to reach a common understanding.

**Other Patterns of Discourse**

The final research question focuses on other patterns of discourse that emerge when graduate health science students make clinical decisions during active learning experiences in the classroom. As mentioned previously, the findings indicate that students most often did not exhibit group identity despite interacting in small groups. Additionally, when the students did not identify themselves as part of a group, they also demonstrated high frequencies of off-task comments. After a short time, however, one group member redirected the group back to task.

Second, considering the cognitive presence in Garrison's (2016) CoI framework, findings in this study suggest that as a result of engaging with each other and asking questions, students engage in giving opinions without a rationale (leaping to conclusions), propose tentative hypotheses, and begin to challenge each other. This occurred, however, to a lesser degree than offering suggestions for other group members to consider and approve.

Lastly, as previously discussed, the students did not impact the course design or assignment expectations. Instead, the students followed the instructor's design and answered specific questions related to clinical cases. Finally, during student-student discourse in groups where one student adopted a leadership role, that student usually refocused the group members engaged in off-task comments by directing the discourse back to task.

**Study Limitations**

There were four limitations in this study. First, the research was limited to two graduate health science classes. Although the classes spanned two disciplines, it did not include Physical Therapy, another health science field. Therefore, findings may not be applicable to all health science disciplines. Further, it may not be representative of how all graduate health science classes are structured or the instructional strategies all instructors use.

Second, the study was conducted near the end of the curricular sequence in both disciplines. As such, the graduate students' clinical reasoning may have already been nearly developed and may be indicative of why the students' clinical reasoning skills did not significantly increase over the course of the semester. Although findings may not be applicable to all graduate health science courses, they do give some insight into how some courses are structured and how that structure impacts the types of verbal reasoning the students demonstrate.

Third, active learning experiences such as case studies and skills simulations were not introduced regularly during both classes. It should be noted that in the Occupational Therapy classes, however, there was an additional lab experience at a separate class time.

During that lab experience, students engaged in simulation of practical skills. These class sessions were not observed as part of this study. Since the observed small group discussions did not occur on a consistent basis across both classes, comparison between classes was limited. Further, findings may not be applicable to all small group interactions.

Finally, at times, utterances transcribed from the audio recordings were either partially or totally inaudible and the content or intent could not be discerned due to background noise, such as ceiling fans or competing discourse, and were not included in the data analysis. These utterances, however, accounted for a minimal amount of the total number of utterances over the data collection sessions.

**Implications**

**Instructor practice**. Since instructors and faculty control course design and content, Garrison (2016) argues that teaching presence, not teacher presence, is critical in creating a community of inquiry. The challenge, however, is to distribute the pedagogical responsibilities among members of the collaborative community (Garrison, 2016). Crichton (2013) posits that social interactions are an important component of the learning process, so it is imperative that instructors effectively engage students. As a result, research about effective instructional techniques should be considered when instructors develop and design course. Based on this study, several key factors should be considered by graduate health science instructors when planning instruction.

First, instructors' perceptions indicated that they felt they engaged all the students in their class. Conversely, only a small percentage of students participated in discussions on a regular basis, while some participated minimally, and yet others did not participate

at all. The first principle in thinking collaboratively is establishing a supportive environment that supports open exchanges of ideas through a social presence (Garrison, 2016). Instructors often did not exhibit language that indicated a group identity. In establishing a social presence in the classroom, therefore, instructors should strive to use inclusive language (e.g., "we," "us," "our") as a model. Further, instructors should aim to create an open environment where all students feel safe to contribute their ideas and incorporate strategies in order to get more consistent participation from a larger percentage of the students in the classroom.

Second, instructional pedagogies have shifted from teacher-centered to student-centered over the past few decades. These advances highlight the contrast between instructionism and constructivism. Teacher-centered approaches present barriers to open-ended, student-centered approaches, which encourage new ideas and creativity (Sawyer, 2014; Scardamalia & Bereiter, 2014). Findings in this study revealed that while the frequency of instructor vs. student utterances was relatively even, instructors had significantly more talking time than students. Hence, instructors need to be mindful of how they structure class time and carefully plan how they will engage students more often. Moreover, instructors need to structure their class time in a way that shifts the talking time away from instructors via lecture format and toward practices that allow for maximum student participation and engagement. One suggestion would be to consider a shift toward introducing course content via a recorded presentation, which would then allow more class time to discuss clinical implications of the course content and how to apply that content to case scenarios.

Third, team-based learning (TBL) is gaining wider acceptance in medical education as a strategy to improve active learning and high-level thinking (Burgess et al., 2014; Parmelee & Michaelson, 2010) and this method could be an effective strategy in health science education as well. In TBL, the instructor strategically assigns students to permanent teams in an attempt to create groups which balance students' strengths and weaknesses (Michaelson & Sweet, 2008, 2011; Sisk, 2011). This approach is consistent with the social presence discussed by Garrison (2016). Findings in this study indicate that often the small groups were self-selected or assigned by "counting off." Further, there were limited opportunities for small group discourse, which varied in frequency and duration between the courses. The methods of group selection and limited opportunities for small group discourse undermine the ability to establish balanced groups, which is integral for open communication as a collaborative community of engaged learners that Garrison (2016), Michaelson and Sweet (2008, 2011), and Sisk (2011) all suggest. Consequently, instructors should consider assigning balanced groups for all small group collaborative discourse in their classroom. Additionally, they should plan regular opportunities on a consistent basis for small group discourse throughout the course in order to develop a collaborative group and facilitate open communication among group members.

Fourth, Paul and Elder (2007) assert that Socratic questioning is a carefully planned method of asking questions to probe students' understanding, but not necessarily active learning. Likewise, high-order divergent questions serve as an effective tool in the learning process and are an important tool in teaching (Long et al., 2015). While instructors in this study did prompt discussion via open-ended questions, it would

behoove graduate health science instructors to be cognizant of the type of questions they ask that engage students in order to probe the high-level thinking skills they expect students to demonstrate. By the same token, findings revealed that instructors in this study often encouraged and reinforced students' responses. Student participants noted the value of instructor feedback. While it is necessary to acknowledge and reinforce students' contributions, asking a follow up question such as "Why?" may have shifted students' responses from primarily suggestions for consideration to higher-level reasoning that could result in the students providing a rationale for their suggestions.

**Instructional leadership and curriculum development**. Transactional leadership focuses on order and structure (Burns, 1995; Shields, 2010) and in many ways both instructors demonstrated a transactional leadership style in their classrooms. For example, instructors controlled the content presented in their classes and dictated the means by which that content is delivered. Instructors in both disciplines also set expectations for class structure, assignments, and time schedules. Additionally, they did not explicitly express expectations for students to give a rationale for their insights during classroom discourse, which often resulted in students offering suggestions for the instructor or their peers to critique.

Conversely, in transformational leadership, the leader engages with others to work toward a common purpose which ultimately assists the group in moving from one stage of development to the next (Burns, 1995; Shields, 2010). Despite a shift in recent decades that favor student-centered over teacher-centered instruction, the findings of this study suggest that the way students are engaged matters. One key finding is the disconnect between the instructors' perception and practice. Despite instructors'

perceptions that they regularly engaged students and their attempts to incorporate active learning strategies as a means to engage students, instructors across both disciplines still primarily adopted teacher-centered, lecture-based instruction. Further, Garrison (2016) asserts that in a collaborative learning environment, the instruction initially falls on the instructor but gradually shifts toward facilitation. Findings in this study indicated that the instructors controlled the course design and facilitation of discourse with little impact from the students. Instruction, therefore, remained under the auspices of the instructors and did not shift towards facilitation.

Osterman and Kottkamp (2004) advocate the importance of reflective practice as a meaningful strategy that promotes personal learning and behavioral changes. In order to adopt transformative leadership in the classroom, instructors can use the findings of this study to engage in reflective practices to consider how best to incorporate more student-centered instruction in their classrooms. By explicitly asking divergent questions and setting the expectation for students to also explain their rationales, students may feel more comfortable and instructors should encourage students to take risks utilizing higher-level thinking and sharing their thought processes. Additionally, instructors should resist the temptation to interject their own opinions and experiences before students have engaged in critical discourse and shared their clinical recommendations and rationales.

Although instructors control the content and instructional practices within their classroom, they operate within the structure of their respective departments and in a broader context, the university. Findings of this study have implications for instructors to demonstrate leadership within their programs. The standards and competencies across health care disciplines clearly identify high-level thinking skills such as critical thinking

(Association of American Medical Colleges, 2016), judgment (American Occupational Therapy Association, 2010), application of skills and knowledge (The Federation of the State Boards of Physical Therapy, 2006), and integration and application of theory to clinical cases (Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association, 2013) as pertinent skills in health care. Since graduate health science programs have a vested stake in preparing their students for work in health fields, instructors can use the findings of this study to identify strengths and weaknesses of the curriculum and instructional practices within their programs.

According to Garrison (2016), "collaborative approaches to thinking and learning have distinct advantages when confronting organizational change" (p. 101) because they encourage diverse perspectives that challenge basic assumptions. Garrison (2016) suggests that principles of the CoI framework can effectively be applied to individuals within an organization to implement change. In addition to reflective practice, Professional learning communities (PLCs) and Communities of Practice (CoP) are integral components in creating and sustaining organizational change (Cambridge, Kaplan, & Suter, 2005; DuFour & Eaker, 1998; Osterman & Kottkamp, 2004; Putnam, Gunnings-Moton, & Sharp, 2012). As previously stated, this study highlighted that the clinical reasoning skills graduate health science students demonstrated in the classroom were directly impacted by the instructional practices that the instructors employed. In fact, in many ways, the instructional practices undermined the clinical reasoning that students exhibited in the classroom environment. Even though instructors control academic content and how it is presented in the classroom, the findings of this study can help instructors work together to implement programmatic and instructional changes to more effectively help their

students develop their technical skills as well as their clinical reasoning. The findings can also be used to establish common expectations of students and attempt to coordinate course designs to consistently facilitate discourse in the classroom and incorporate the principles of active learning. Using a collaborative approach, faculty and instructors can engage in professional development to support one another in developing effective course design (Garrison, 2016) and implementing effective instructional strategies that facilitate the high-level thinking that are ultimately required in health care disciplines.

**Future Research**

As previously mentioned, research about how clinical reasoning skills develop has focused primarily on medical and nursing education (Banning, 2008b; Dumas et al., 2014; Howenstein et al., 1996; Koharchik et al., 2015; Popil, 2011). Yet, research focusing specifically on health science disciplines is still limited. Findings in this study provide a glimpse at how graduate health science students develop clinical reasoning and add to a growing body of research. Subsequently, however, there is a need for further research in order to better understand this process in the health science fields. Student participants in this study were near the end of their curricular sequence. The findings reveal that the development of the graduate science students' clinical reasoning skills did not develop in a gradual and predictable way. Rather, they varied and were influenced by factors such as classroom format and structure, instructor expectations, and social dynamics. Future research in this area could shed more light on this process.

Second, this study included courses in Communication Disorders and Occupational Therapy. Further research should also include Physical Therapy. Even though Physical Therapy programs typically differ in length and credit requirements,

Physical Therapists work in similar environments, often working with Occupational Therapists and Speech-Language Pathologists in a team format and routinely engage in similar types of clinical decision-making. Including Physical Therapy in subsequent studies would broaden the scope and may provide more insight and a deeper understanding about effective instructional practices that could subsequently be applied across all three disciplines.

Third, this study encompassed one course in Communication Disorders and one in Occupational Therapy and extended over six class sessions in each course over one semester near the end of the curricular sequence for both disciplines. While the findings give some insight into instructor-student and student-student discourse patterns that take place in the classroom, a longitudinal study comparing instructor-student and student-student discourse throughout the curricular sequence would provide valuable insight into the gradual progression of clinical reasoning skills and the significant factors which impact them. It would also provide guidance for instructors to align effective instructional strategies and expectations throughout curricular sequences.

Finally, this study focused primarily on discourse patterns that emerged between instructor and students and students and their peers in the classroom setting. Findings, however, reveal that additional factors other than discourse in the classroom impacted the cognitive processes students exhibited. Since the students in this study maintained that multiple factors such as application of course content to case studies, the expectation to provide rationales for their clinical decisions, collaboration with peers, and instructor feedback were instrumental in developing clinical reasoning skills, future research should also include course assignments. Analysis of completed course assignments would give

insight into how assignments were structured, what expectations were included in assignments, and how students used instructor feedback over time.

**Conclusions**

The aim of this phenomenological study was to further understand how learning is structured and how graduate health science students develop their clinical reasoning skills at a comprehensive state university. Analysis of instructor-student and student-student discourse in both large group and small group forums offered an array of insights regarding how learning is structured in graduate health science courses. This study also provided insight into the patterns of discourse that emerged and other strategies used by graduate health science students in developing clinical reasoning skills.

One key finding was that instructors and students differed in what they identified as important factors in the development of clinical reasoning. Students identified opportunities to apply course content to case studies, explicit instructor expectations to provide a rationale for clinical decisions, collaboration with peers, and constructive instructor feedback as integral factors in developing clinical reasoning skills. Instructors, however, perceived engaging students in discussions within the classroom to be a significant factor.

Another key finding was that the students' clinical reasoning skills did not proceed along a gradual, linear progression in the classroom environment, but rather was impacted by multiple factors. The factors identified in this study as ultimately impacting student participation and use of high-level reasoning included: social dynamics within the classroom, class structure and format, and instructor expectations.

Finally, this study revealed that the pedagogies instructors use are highly influential on the clinical reasoning skills graduate health science students display in the classroom. Furthermore, factors such as the way instructors structure the class time, the types of questions used to facilitate instructor-student interactions and engage students, the expectations they communicated to students, and the frequency and structure of small student-student interactions determined what kind of cognitive processes students exhibited during discourse. Ultimately, the pedagogies and instructional strategies instructors adopt have a significant impact on how graduate health science students develop their clinical reasoning skills.

In a broader sense, as instructional practices continue to shift toward active learning strategies to help students develop higher level thinking skills, the findings of this study were not necessarily course-specific but rather representative of a common struggle that has emerged in all of education. Moreover, these findings highlight the tensions that emerge and the challenges that all instructors encounter when creating an environment that incorporates student-centered instruction.

## References


American Occupational Therapy Association. (2010). Occupational therapy code of ethics and standards (2010). *American Journal of Occupational Therapy, 64*(Suppl.), S17-S26. doi:10.5014/ajot.2010.64S17-64S26

Association of American Medical Colleges. (2016). Core competencies for entering medical students. Retrieved from https://www.aamc.org/initiatives/admissionsinitiative/competencies/

Balan, P., Clark, M., & Restall, G. (2015). Preparing students for flipped or team-based learning methods. *Education+Training*, *57*(6), 639 - 657. doi:10.1108/ET-07-2014-0088

Banning, M. (2008a). The think aloud approach as an educational tool to develop and assess clinical reasoning in undergraduate students. *Nurse Education Today*. doi:10.1016/j.nedt.2007.02.001

Banning, M. (2008b). Clinical reasoning and its application to nursing: Concepts and research studies. *Nurse Education in Practice, 8*(3), 177-183. doi:10.1016/j.nepr.2007.06.004

Barrows, H. S. (1983). Problem-based, self-directed learning. *Journal of the American Medical Association*, *250*(22), 3077-3080.

Beaubien, J. M., & Baker, D. P. (2004). The use of simulation for training teamwork skills in health care: How low can you go? *Quality & Safety in Health Care, 13 Suppl 1*(suppl_1), i51-i56. doi:10.1136/qhc.13.suppl_1.i51

Behar-Horenstein, L. S. (2011). Teaching critical thinking: A review of the literature. *Journal of College Teaching and Learning*, *8*(2), 25-41.

Beyea, S. C., & Kobokovich, L. J. (2004). Human patient simulation: A teaching strategy. *AORN Journal, 80*(4), 738,741-738,742. doi:10.1016/S0001-2092(06)61329-X

Blevins, S. (2014). The impact of simulation on patient care. *Medsurg Nursing: Official Journal of the Academy of Medical-Surgical Nurses, 23*(2), 120.

Bolton, J. W. (2015). Varieties of clinical reasoning. *Journal of Evaluation in Clinical Practice, 21*(3), 486-489. doi:10.1111/jep.12309

Brackenbury, T., Folkins, J. W., & Ginsberg, S. M. (2014). Examining educational challenges in communication sciences and disorders from the perspectives of signature pedagogy and reflective practice. *Contemporary Issues in Communication Science and Disorders*, *41*, 70-82.

Brandon, A. F., & All, A. C. (2010). Constructivism theory analysis and application to curricula. *Nursing Education Perspectives, 31*(2), 89.

Brown, G. A., & Edmondson, R. (1989). Asking questions. In E. Wragg (Ed.), *Classroom teaching skills: The research findings of the teacher education project* (pp. 97-120). Retrieved from http://books.google.com/books?hl=en&lr=&id=BFQkM_RUDKwC&oi=fnd&pg=PA97&ots=WWtzHu3mSp&sig=QDNu4HjP8MeivKVz2w71sZQe4-k

Brunt, B. A. (2005). Models, measurement, and strategies in developing critical-thinking skills. *Journal of Continuing Education in Nursing, 36*(6), 255.

Burgess, A. W., McGregor, D. M., & Mellis, C. M. (2014). Applying established guidelines to team-based learning programs in medical schools: A systematic review. *Academic Medicine*, *89*(4), 678-688. doi:10.1097/ACM.0000000000000162

Burns, J. (1995). Transactional and transforming leadership. In J. T. Wren (Ed.). *The leader's companion: Insights on leadership through the ages* (pp. 100-101). New York, NY: The Free Press.

Cambridge, D., Kaplan, S., & Suter, V. (2005). Community of Practice design guide: A step-by-step guide for designing & cultivating Communities of Practice in higher education. Retrieved from https://library.educause.edu/resources/2005/1/community-of-practice-design-guide-a-stepbystep-guide-for-designing-cultivating-communities-of-practice-in-higher-education

Chi, M. T. H. & Menekse, M. (2015). Discourse patterns in peer collaboration that promote learning. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing intelligence through academic talk and discourse* (pp. 263-274). Washington, DC: American Educational Research Association.

Chiniara, G., Cole, G., Brisbin, K., Huffman, D., Cragg, B., Lamacchia, M., & Canadian Network for Simulation in Healthcare, Guidelines Working Group. (2013). Simulation in healthcare: A taxonomy and a conceptual framework for instructional design and media selection. *Medical Teacher, 35*(8), e1380-e1395. doi:10.3109/0142159X.2012.733451

Coker, P. (2010). Effects of an experiential learning program on the clinical reasoning and critical thinking skills of occupational therapy students. *Journal of Allied Health, 39*(4), 280.

Collins, A., & Kapur, M. (2014). Cognitive apprenticeship. In *The Cambridge handbook of the learning sciences* (2nd ed., pp. 109-127). New York, NY: Cambridge University Press.

Commission on Collegiate Nursing Education. (2013, May). Guidelines for assessment of student achievement. Retrieved from http://www.aacn.nche.edu/ccne-accreditation/Guidelines-for-Assessing-Student-Achievement.pdf

Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association. (2013). *2014 standards for the certificate of clinical competence in speech language pathology.* Retrieved from http://www.asha.org/Certification/2014-Speech-Language-Pathology-Certification-Standards/

Crea, K. A. (2011). Practice skill development through the use of human patient simulation. *American Journal of Pharmaceutical Education, 75*(9), 188. doi:10.5688/ajpe759188

Creswell, J. W. (2007). *Qualitative inquiry & research design: Choosing among five approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Crichton, H. (2013). Production and reception formats: An alternative participation framework for analysis of classroom discourse? *British Educational Research Journal*, *39*(1), 166-181. doi:10.1080/01411926.2011.615387

Cronenwett, L., Sherwood, G., Barnsteiner, J., Disch, J., Johnson, J., Mitchell, P., Sullivan, D. T., & Warren, J. (2007). Quality and safety education for nurses. *Nursing Outlook*, *55*(3), 122-131. doi:10.1016/j.outlook.2007.02.006

Crowe, M., & Stanford, P. (2010). Questioning for quality. *The Delta Kappa Gamma Bulletin, (Summer),* 36-44.

Delany, C., & Golding, C. (2014). Teaching clinical reasoning by making thinking visible: An action research project with allied health clinical educators. *BMC Medical Education*, *14*(20), 1-10.

DuFour, R., & Eaker, R. (1998). *Professional learning communities at work: best practices for enhancing student achievement*. Bloomington, IN: Solution Tree.

Dumas, D., Alexander, P. A., Baker, L. M., Jablansky, S., & Dunbar, K. N. (2014). Relational reasoning in medical education: Patterns in discourse and diagnosis. *Journal of Educational Psychology*, *106*(3), 1-15. doi:10.1037/a0036777

Dupuis, R. E., & Persky, A. M. (2008). Use of case-based learning in a clinical pharmacokinetics course. *American Journal of Pharmaceutical Education, 72*(2), 29. doi:10.5688/aj720229

Durham, C. F, & Alden, K. R. (2008). Enhancing patient safety in nursing education through patient simulation. In R. G. Hughes (Ed.), *Patient safety and quality: An evidence-based handbook for nurses*. (Chapter 51). Rockville, MD: Agency for Healthcare Research and Quality (US). Retrieved from: http://www.ncbi.nlm.nih.gov/books/NBK2628/

Durning, S. J., Artino, A. R., Schuwirth, L., & van der Vleuten, C. (2013). Clarifying assumptions to enhance our understanding and assessment of clinical reasoning. *Academic Medicine*, *88*, 442-448. doi:10.1097/ACM.0b013e3182851b5b

Durning, S. J., & Gruppen, L. D. (2015). Learning and instruction: The world inside the head or the head inside the world? *Medical Education*, *49*, 344-354. doi:10.1111/medu.12674

Elder, L. (2007). Another brief conceptualization of critical thinking. *Proceedings of the National Council for Excellence in Critical Thinking,* USA. Retrieved from http://www.criticalthinking.org/pages/defining-critical-thinking/766

Epstein, R. M., & Hundert, E. M. (2002). Defining and assessing professional competence. *The Journal of the American Medical Association (JAMA)*, *287*(2), 226-235. doi:10.1001/jama.287.2.226

Eva, K. W. (2005). What every teacher needs to know about clinical reasoning. *Medical Education*. doi:10.1111/j.1365-2929.2004.01972.x

Finn, P. (2011). Critical thinking: Knowledge and skills for evidence-based practice. *Language, Speech, and Hearing Services in Schools*, *42*, 69-72.

Garrison, D. R. (2016). *Thinking collaboratively: Learning in a community of inquiry*. New York, NY: Routledge.

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking and computer conferencing: A model and tool to assess cognitive presence. *American Journal of Distance Education*, *15*(1), 7-23.

Geertz, C. (1973). *The interpretation of cultures: Selected essays*. New York, NY: Basic Books.

Gentles, S. J., Charles, C., Ploeg, J., & McKibbon, K. A. (2015). Sampling in qualitative research: Insights from an overview of methods literature. *The Qualitative Report*, *20*(11), 1772-1789.

Gillies, R. M. (2015). Teacher discourse that supports collaborative learning in the classroom. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing intelligence through academic talk and discourse* (pp. 335-346). Washington, DC: American Educational Research Association.

Graffam, B. (2007). Active learning in medical education: Strategies for beginning implementation. *Medical Teacher*, *29*, 38-42. doi:10.1080/01421590601176398

Greeno, J. G. (2015). Classroom talk sequences and learning. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.), *Socializing intelligence through academic talk and discourse* (pp. 255-262). Washington, DC: American Educational Research Association.

Greeno, J. G., & Engeström, Y. (2014). Learning in activity. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (2nd ed., pp. 128-147). New York, NY: Cambridge University Press.

Groves, M., O'Rourke, P., & Alexander, H. (2003). The clinical reasoning characteristics of diagnostic experts. *Medical Teacher*. doi:10.1080/01421590306814

Gupta, G. (2005). Progressive questioning. *Journal of College Science Teaching, 34*(4), 48-51.

Hannel, G. I., & Hannel, L. (1998). The seven steps to critical thinking: A practical application of critical thinking skills. *National Association of Secondary School Principals Bulletin,* 87-93.

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*. doi:10.1023/B:EDPR.0000034022.16470.f3

Hmelo-Silver, C. E., & Barrows, H. S. (2006). Goals and strategies of problem-based learning. *Interdisciplinary Journal of Problem-Based Learning*, *1*(1), 21-39. doi:10.7771/1541-5015.1004

Hmelo-Silver, C. E., & Barrows, H. S. (2008). Facilitating collaborative knowledge building. *Cognition and Instruction, 26*(1), 48-94. doi:10.1080/07370000701798495

Hoogenes, J., Mironova, P., Safir, O., McQueen, S. A., Abdelbary, H., Drexler, M., …Sonnadara, R. R. (2015). Student-led learning: A new teaching paradigm for surgical skills. *The American Journal of Surgery*, *209*(1), 107-114.

Howenstein, M. A., Bilodeau, K., Brogna, M. J., & Good, G. (1996). Factors associated with critical thinking in nurses. *The Journal of Continuing Education in Nursing*, *27*(3), 100-103.

Hyrnchak, P., & Batty, H. (2012). The educational theory basis of team-based learning. *Medical Teacher*, *34*, 796-801. doi:10.3109/0142159X.2012.687120

Irby, D. (2011). Educating physicians for the future: Carnegie's calls for reform. *Medical Teacher*, *33*, 547-650.

Irby, D. (2014). Excellence in clinical teaching: Knowledge transformation and development required. *Medical Education*, *48*, 776-784.

Johnson, G. M. (2009). Instructionism and constructivism: Reconciling two very good ideas. *International Journal of Special Education*, *24*(3), 90-98.

Kamhi, A. G. (2011). Balancing certainty and uncertainty in clinical practice. *Language, Speech, and Hearing Services in the Schools*, *42*, 59-64.

Kim, K., Sharma, P., Land, S. M., & Furlong, K. P. (2013). Effects of active learning on enhancing student critical thinking in an undergraduate general science course. *Innovative Higher Education*, *38*(3), 223-235. doi:10.1007/s10755-012-9236-x

Koharchik, L., Caputi, L., Robb, M., & Culleiton, A. L. (2015). Fostering clinical reasoning in nursing students. *American Journal of Nursing*, *115*(1), 58-61.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice*, *41*(4), 212-218.

Krathwohl, D. R., & Smith, N. L. (2005). *How to prepare a dissertation proposal: Suggestions for students in education and the social and behavioral sciences*. Syracuse University Press, NY: Syracuse University Press.

Levett-Jones, T., Hoffman, K., Dempsey, J., Jeong, S. Y. S., Noble, D., Norton, C. A., …Hickey, N. (2010). The 'five rights' of clinical reasoning: An educational model to enhance nursing students' ability to identify and manage clinically 'at risk' patients. *Nurse Education Today*, *30*(6), 515-520.

Liu, C. C. (2010). Evolution of constructivism. *Contemporary Issues in Education Research*, *3*(4), 63-66.

Long, M., Blankenburg, R., & Butani, L. (2015). Questioning as a teaching tool. *Pediatrics, 135*(3), 406-408. doi:10.1542/peds.2014-3285

Lu, J., Bridges, S., & Hmelo-Silver, C. E. (2014). Problem-based learning. In *The Cambridge handbook of the learning sciences* (2nd ed., pp. 298-318). New York, NY: Cambridge University Press.

Maxwell, J. A. (2013). *Qualitative research design: An interactive approach* (3rd ed.). Thousand Oaks, CA: Sage Publications.

McComas, W. F., & Abraham, L. (2004, October). Asking more effective questions. Retrieved from http://cet.usc.edu/resources/teaching_learning/docs/Asking_Better_Questions.pdf

Michaelsen, L. K., & Sweet, M. (2008). The essential elements of team-based learning. *New Directions for Teaching and Learning*, *116*, 7-27. doi:10.1002/tl.330

Michaelsen, L. K., & Sweet, M. (2011). Team-based learning. *New Directions for Teaching and Learning, 2011*(128), 41-51. doi:10.1002/tl.467

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Thousand Oaks, CA: SAGE Publications.

Miyake, N., & Kirschner, P. A. (2014). The social and interactive dimensions of collaborative learning. In *The Cambridge handbook of the learning sciences* (2nd ed., pp. 418-438). New York, NY: Cambridge University Press.

Murray, D. J., Freeman, B. D., Boulet, J. R., Woodhouse, J., Fehr, J. J., & Klingensmith, M. E. (2015). Decision making in trauma settings: Simulation to improve diagnostic skills. *Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare, 10*(3), 139-145. doi:10.1097/SIH.0000000000000073

Nathan, M. J., & Sawyer, R. K. (2014). Foundations of the learning sciences. In *The Cambridge handbook of the learning sciences* (2nd ed., pp. 21-43). New York, NY: Cambridge University Press.

Norman, G. (2005). Research in clinical reasoning: Past history and current trends. *Medical Education*. doi:10.1111/j.1365-2929.2005.02127.x

Osterman, K. F. & Kottkamp, R. B. (2004). Reflective practice for educators: Professional development to improve student learning. Thousand Oaks, CA: Corwin Press.

Parmelee, D., Michaelsen, L. K., Cook, S., & Hudes, P. D. (2012). Team-based learning: A practical guide: AMEE guide no. 65. *Medical Teacher, 34*(5), e275-e287. doi:10.3109/0142159X.2012.651179

Parmelee, D. X., & Michaelsen, L. K. (2010). Twelve tips for doing effective team-based learning (TBL). *Medical Teacher*, *32*, 118-122. doi:10.3109/01421590903548562

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Paul, R., & Elder, L. (2007). Critical thinking: The art of Socratic questioning. *Journal of Developmental Education*, *31*(1), 36-37.

Peirce, C. S. (1992). Deduction, induction, and hypothesis. In N. Houser & C. Kloesel (Eds.), *The essential Peirce (1867–1893)*, (pp. 186–199). Bloomington, IN: Indiana University.

Pinnock, R., & Welch, P. (2014). Learning clinical reasoning. *Journal of Paediatrics and Child Health*, *5*, 253-257. doi:10.1111/jpc.12455

Popil, I. (2011). Promotion of critical thinking by using case studies as teaching method. *Nurse Education Today, 31*(2), 204-207. doi:10.1016/j.nedt.2010.06.002

Powell, K. C., & Kalina, C. J. (2009). Cognitive and social constructivism: Developing tools for an effective classroom. *Education*, *130*(2), 241-250.

Prosser, M., & Sze, D. (2014). Problem-based learning: Student learning experiences and outcomes. *Clinical Linguistics & Phonetics*, *28*(1-2), 131-142. doi:10.3109/02699206.2013.820351

Putnam, J., Gunnings-Moton, S., & Sharp, C. (2012). *Leadership through professional learning communities*. Boston, MA: McGraw-Hill Companies, Inc.

Raurell-Torredà, M., Olivet-Pujol, J., Romero-Collado, À., Malagon-Aguilera, M. C., Patiño-Masó, J., & Baltasar-Bagué, A. (2015). Case-based learning and simulation: Useful tools to enhance nurses' education? Nonrandomized controlled trial. *Journal of Nursing Scholarship, 47*(1), 34-42. doi:10.1111/jnu.12113

Reiser, B. J., & Tabak, I. (2014). Scaffolding. In *The Cambridge handbook of the learning sciences* (2nd ed., pp. 44-62). New York, NY: Cambridge University Press.

Rencic, J. (2011). Twelve tips for teaching expertise in clinical reasoning. *Medical Teacher*, *33*, 887-892.

Rossman, G. B., & Rallis, S. F. (2012). *Learning in the field: An introduction to qualitative research* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Rubin, H. J., & Rubin, I. S. (2012). *Qualitative interviewing: The art of hearing data*. (3rd ed.). Thousand Oaks, CA: Sage.

Saldaña, J. (2013). *The coding manual for qualitative researchers*. (2nd ed.). Thousand Oaks, CA: Sage.

Sawyer, R. K. (2014). Introduction: The new science of learning. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (2nd ed., pp. 1-18). New York, NY: Cambridge University Press.

Scardamalia, M., & Bereiter, C. (2014). Knowledge building and knowledge creation: Theory, pedagogy, and technology. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (2nd ed., pp. 397-417). New York, NY: Cambridge University Press.

Scriven, N., & Paul, R. (1987). Critical thinking. Paper presented at the Eighth Annual International Conference on Critical Thinking and Education Reform, Sonoma, CA. Abstract retrieved from http://www.criticalthinking.org/pages/defining-critical-thinking/766

Shea, P., Li, C. S., & Pickett, A. (2006). A study of teaching presence and student sense of learning community in fully online and web-enhanced college courses. *Internet and Higher Education*, *9*, 175-190. doi:10.1016/j.iheduc.2006.06.005

Shields, C. M. (2010). Transformative leadership: Working for equity in diverse contexts. *Educational Administration Quarterly*, 45(4), 558-589.

Silberman, N. J., Panzarella, K. J., & Melzer, B. A. (2013). Using human simulation to prepare physical therapy students for acute care clinical practice. *Journal of Allied Health, 41*(1), 25-32.

Sisk, R. J. (2011). Team-based learning: Systematic research review. *Journal of Nursing Education*, *50*(12), 665-669. doi:10.3928/01484834-20111017-01

Stahl, G., Koschmann, T., & Suthers, D. (2014). Computer-supported collaborative learning. In *The Cambridge handbook of the learning sciences* (2nd ed., pp. 479-500). New York, NY: Cambridge University Press.

Stamper, D. H., Jones, R. S., & Thompson, J. C. (2008). Simulation in health care provider education at Brooke Army Medical Center. *Military Medicine, 173*(6), 583-587. doi:10.7205/MILMED.173.6.583

Starks, H., & Trinidad, S. B. (2007). Choose your method: A comparison of phenomenology, discourse analysis, and grounded theory. *Qualitative Health Research*, *17*(10), 1372-1380. doi:10.1177/1049732307307031

Sternberg, R. J. (2003). What is an "expert student?". *Educational Researcher*, *32*(8), 5-9.

Suri, H. (2011). Purposeful sampling in qualitative research synthesis. *Qualitative Research Journal*, *11*(2), 63-75.

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. Applied Social Science Research Methods Series, Vol, 46. Thousand Oaks, CA: Sage Publications.

Taylor, D., & Miflin, B. (2008). Problem-based learning: Where are we now? *Medical Teacher*, *30*, 742-763. doi:10.1080/01421590802217199

The Carnegie Classification of Institutions of Higher Education. (2010). *Graduate instructional program classification.* Retrieved from http://carnegieclassifications.iu.edu/descriptions/grad_program.php

The Federation of State Boards of Physical Therapy. (2006, October 19). Standards of competence. Retrieved from https://www.fsbpt.org/Portals/0/Content%20Manager/PDFs/free-resources/StandardsOfCompetence2006_10.pdf

Thistlethwaite, J. E., Davies, D., Ekeocha, S., Kidd, J. M., MacDougall, C., Matthews, P., & Clay, D. (2012). The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME guide no. 23. *Medical Teacher, 34*(6), e421-e444. doi:10.3109/0142159X.2012.680939

Tofade, T., Elsner, J., & Haines, S. T. (2013). Best practice strategies for effective use of questions as a teaching tool. *American Journal of Pharmaceutical Education, 77*(7), 155.

Toma, J. D. (2006). Approaching rigor in applied qualitative research. In C. Conrad & R. Serlin (Eds.), *Sage handbook for research in education* (pp. 405-423). Thousand Oaks, CA: Sage Publications.

Tucker, K., Parker, S., Gillham, D., Wright, V., & Cornell, J. (2015). CaseWorld: Authentic case-based learning simulating healthcare practice. *CIN: Computers, Informatics, Nursing, 33*(10), 436-442. doi:10.1097/CIN.0000000000000174

Vogler, K. (2005). Improve verbal questioning. *The Clearing House, 79*(2), 98-103.

Vygotsky, L. (2012). *Thought and language* (Rev. ed.). A. Kozulin (Ed.). Cambridge, MA: MIT Press.

Vygotsky, L. S., & Cole, M. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wagner, E. A. (2014). Using kinesthetic learning strategy to engage nursing student thinking, enhance retention, and improve critical thinking. *Journal of Nursing Education*, *53*(6), 348-351.

Walshe, N., O'Brien, S., Murphy, S., & Hartigan, I. (2013). Integrative learning through simulation and problem-based learning. *Clinical Simulation in Nursing, 9*(2), e47-e54. doi: 10.1016/j.ecns .2011.08.006.

Weissberg, R. (2013). Critically thinking about critical thinking. *Academic Questions, 26*(3), 317-328. doi:10.1007/s12129-013-9375-2

Williams, B. (2005). Case based learning--a review of the literature: Is there scope for this educational paradigm in prehospital education? *Emergency Medicine Journal: EMJ, 22*(8), 577-581. doi:10.1136/emj.2004.022707

Wink, D. M. (1993). Using questioning as a teaching strategy. *Nurse Educator, 18*(5), 11-15. doi:10.1097/00006223-199309000-00010

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: SAGE Publications.

Yoo, M., & Park, H. (2015). Effects of case-based learning on communication skills, problem-solving ability, and learning motivation in nursing students. *Nursing & Health Sciences, 17*(2), 166-172. doi:10.1111/nhs.12151

Zare, P., & Othman, M. (2015). Students' perceptions toward using classroom debate to develop critical thinking and oral communication ability. *Asian Social Science*, *11*(9), 158-170. doi:10.5539/ass.v11n9p158

Zhao, H., Sullivan, K. P. H., & Mellenius, I. (2014). Participation, interaction, and social presence: An exploratory study of collaboration in online peer review groups. *British Journal of Educational Technology*, *45*(5), 807-819. doi:10.1111/bjet.12094

## Appendix A

## Instructor Informed Consent Form


**COLLEGE OF EDUCATION**

**INSTRUCTOR CONSENT TO TAKE PART IN A RESEARCH STUDY**

**TITLE OF STUDY:** Development of Health Science Students' Clinical Reasoning: A Qualitative Study

**PRINCIPAL INVESTIGATOR:** Carol C. Thompson, PhD.

**CO-INVESTIGATOR:** Diane L. Laverty, Doctoral Candidate

This consent form is part of an informed consent process for a research study and it will provide information that will help you to decide whether you wish to volunteer for this research study. It will help you to understand what the study is about and what will happen in the course of the study.

If you have questions at any time during the research study, you should feel free to ask them and should expect to be given answers that you completely understand.

After all of your questions have been answered, if you still wish to take part in the study, you will be asked to sign this informed consent form.

The principal researcher will also sign this informed consent. You will be given a copy of the signed consent form to keep.

You are not giving up any of your legal rights by volunteering for this research study or by signing this consent form.

**A. Why is this study being done?**

This research is being conducted as a partial requirement for the degree of Doctor of Education. The purpose of this qualitative study is to understand how learning in graduate health science courses is structured and how students develop clinical reasoning skills at two comprehensive state universities.

**B. Why have you been asked to take part in this study?**

You are being asked to take part in this study because you are either an instructor or a student in a graduate health science course that was identified as using active learning instructional strategies. This kind of instructional design allows for instructor-student and student-student conversation during the learning process. The primary data source will be audio recordings of instructor-student and student-student conversations within the classroom that will be transcribed. Interviews will also be conducted with instructors of health science courses who engage students during active learning activities and will focus on frameworks of participation and strategies instructors use to scaffold learning. Other data sources will be field notes from structured observations in which the principal researchers will be a non-participatory observer. Class assignments, course syllabus, and other class materials will also be reviewed.

All data collected will be analyzed to a) identify how graduate health science students develop clinical reasoning skills, b) identify what frameworks of participation course instructors use during instruction in health science courses, c) what types of strategies instructors use to scaffold learning to elicit clinical reasoning skills from students during active learning experiences in the classroom, c) identify verbal strategies or processes graduate students use to make clinical decisions during active learning experiences in the classroom, and d) identify other patterns of discourse that emerge when graduate health science students make clinical decisions during active learning experiences in the classroom

**C. Who may take part in this study? And who may not?**

Appropriate participants include instructors and graduate students in health science fields (Physical Therapy, Occupational Therapy, Communication Disorders) currently enrolled in graduate level courses identified as using active learning instructional strategies (e.g., case-based learning, problem-based learning, team-based learning, simulation) and which encourages instructor-student and student-student interaction and discourse.

Instructors and graduate health science students who are enrolled in graduate level courses that do not use active learning strategies are not appropriate participants for this study.

**D. How many subjects will be enrolled in the study?**

The specific number of subjects enrolled in this entire study will be emergent. Eligible participants will include the instructor and all graduate students enrolled in his/her course. Data will be collected at two universities and will include a minimum of two instructors and approximately sixty graduate students.

**E. How long will my participation in this study take?**

Your participation in this study will take place during your attendance in class over a period of one semester. Instructors will be invited to also participate in one interview lasting approximately 30 minutes.

**F. Where will the study take place?**

Your participation will take place in your regularly scheduled classroom space in _____ (building name) on the campus of _____ (University name) at _____(time). The principal researcher will be present as a non-participating observer.

**G. What will you be asked to do if you take part in this research study?**

During the duration of the semester, the instructor-student and student-student classroom discussions will be audio-recorded and transcribed. The participants (instructor and students) will be observed by the principal researcher and notes will be hand-written or typed. Last, class assignments, class syllabus, or other written material will also be reviewed. Data will be collected over the course of an entire semester. Additionally, course instructors will be invited to participate in an interview. This interview will also be audio-recorded and transcribed.

**H. What are the risks and/or discomforts you might experience if you take part in this study?**

Participation in this research poses no risk to you as a participant.

**Are there any benefits for you if you choose to take part in this research study?**

You may not receive direct personal benefit from taking part in this study. Your participation, however, may help us understand how graduate health science students develop clinical reasoning skills. This information can benefit students indirectly, and may help instructors employ effective instructional strategies and develop appropriate discourse patterns in order to help graduate health science students develop sound clinical reasoning skills.

**I. What are your alternatives if you don't want to take part in this study?**

There are no alternatives available. Your alternative is not to take part in this study.

**J. How will you know if new information is learned that may affect whether you are willing to stay in this research study?**

During the course of the study, transcripts and detailed descriptions from observations will be verified with participants. Additionally, the researcher will collaborate with instructors to verify and interpret the purpose of course documents

You will be updated about any new information that may affect whether you are willing to continue taking part in the study. If new information is learned that may affect you, you will be contacted.

**K. Will there be any cost to you to take part in this study?**

There will be no financial costs to you as a participant.

**L. Will you be paid to take part in this study?**

You will not be paid, monetary or grade incentives (extra credit), for your participation in this research study. There will be no impact on employment status of course instructors.

**M. How will information about you be kept private or confidential?**

All efforts will be made to keep your personal information in your research record confidential, but total confidentiality cannot be guaranteed. Your personal information may be given out, if required by law. Presentations and publications to the public and at scientific conferences and meetings will not use your name and other personal information.

Data storage, both in electronic or paper form, will be stored on a secure computer that is password-protected and/or in a locking file cabinet in the researcher's home office. Further, in order to preserve participant confidentiality, all participants will be assigned a pseudonym that will be used throughout the data analysis and reporting process. Once data analysis and reporting of conclusions has been completed, all raw data will be destroyed.

**What will happen if you are injured during this study?**

Subjects in this study will not be exposed to any risks that pose any danger. However, if you are injured in this study and need treatment, contact the counseling center located in _____ (name of building) on the campus of _____ (name of University) and seek treatment.

We will offer the care needed to treat injuries directly resulting from taking part in this study. Rowan University may bill your insurance company or other third parties, if appropriate, for the costs of the care you get for the injury. However, you may be responsible for some of those costs. Rowan University does not plan to pay you or provide compensation for the injury. You do not give up your legal rights by signing this form.

If at any time during your participation and conduct in the study you have been or are injured, you should communicate those injuries to the research staff present at the time of injury and to the Principal Investigator, whose name and contact information is on this consent form.

**N. What will happen if you do not wish to take part in the study or if you later decide not to stay in the study?**

Participation in this study is voluntary. You may choose not to participate or you may change your mind at any time.

If you do not want to enter the study or decide to stop participating, your relationship with the study staff will not change, and you may do so without penalty and without loss of benefits to which you are otherwise entitled.

You may also withdraw your consent for the use of data already collected about you, but you must do this in writing to **Diane L. Laverty** at: **lavertyd@students.rowan.edu**

If you decide to withdraw from the study for any reason, you may be asked to participate in one meeting with the Principal Investigator.

**O. Who can you call if you have any questions?**

If you have any questions about taking part in this study or if you feel you may have suffered a research related injury, you can call the Principal Investigator:

Diane L. Laverty
Rowan University, College of Education
Educational Leadership Program
Lavertyd4@students.rowan.edu
609-703-4937

If you have any questions about your rights as a research subject, you can call:

Rowan University
Office of Research (Glassboro Campus)
(856) 256-4000

**What are your rights if you decide to take part in this research study?**

You have the right to ask questions about any part of the study at any time. You should not sign this form unless you have had a chance to ask questions and have been given answers to all of your questions.

---

**AGREEMENT TO PARTICIPATE**

I have read this entire form, or it has been read to me, and I believe that I understand what has been discussed. All of my questions about this form or this study have been answered.

Subject Name:_____

Subject Signature:_____ Date:_____

**Signature of Investigator/Individual Obtaining Consent:**

To the best of my ability, I have explained and discussed the full contents of the study including all of the information contained in this consent form. All questions of the research subject and those of his/her parent or legal guardian have been accurately answered.

Investigator/Person Obtaining Consent:_____

Signature:_____ Date: _____

**Appendix B**

**Student Informed Consent Form**


**COLLEGE OF EDUCATION**

**STUDENT CONSENT TO TAKE PART IN A RESEARCH STUDY**

**TITLE OF STUDY:** Development of Health Science Students' Clinical Reasoning: A Qualitative Study

**PRINCIPAL INVESTIGATOR:** Carol C. Thompson, PhD.

**CO-INVESTIGATOR:** Diane L. Laverty, Doctoral Candidate

This consent form is part of an informed consent process for a research study and it will provide information that will help you to decide whether you wish to volunteer for this research study. It will help you to understand what the study is about and what will happen in the course of the study.

If you have questions at any time during the research study, you should feel free to ask them and should expect to be given answers that you completely understand.

After all of your questions have been answered, if you still wish to take part in the study, you will be asked to sign this informed consent form.

The principal researcher and/or the co-investigator will also sign this informed consent. You will be given a copy of the signed consent form to keep.

You are not giving up any of your legal rights by volunteering for this research study or by signing this consent form.

**A. Why is this study being done?**

This research is being conducted as a partial requirement for the degree of Doctor of Education. The purpose of this qualitative study is to understand how learning in graduate health science courses is structured and how students develop clinical reasoning skills at two comprehensive state universities.

**B. Why have you been asked to take part in this study?**

You are being asked to take part in this study because you are a student in a graduate health science course that was identified as using active learning instructional strategies. This kind of instructional design allows for instructor-student and student-student conversation during the learning process. The primary data source will be audio recordings of instructor-student and student-student conversations within the classroom that will be transcribed. Interviews will also be conducted with instructors of health science courses who engage students during active learning activities and will focus on frameworks of participation and strategies instructors use to scaffold learning. A focus group will be conducted with graduate health science students who are enrolled in the courses that participating instructors teach. Other data sources will be field notes from structured observations in which the co-investigator will be a non-participatory observer. Blank class assignments and assessments (before completion), course syllabus, and other general class materials will also be reviewed. **No personal academic or educational records will be reviewed.**

All data collected will be analyzed to a) identify how graduate health science students develop clinical reasoning skills, b) identify what frameworks of participation course instructors use during instruction in health science courses, c) what types of strategies instructors use to scaffold learning to elicit clinical reasoning skills from students during active learning experiences in the classroom, c) identify verbal strategies or processes graduate students use to make clinical decisions during active learning experiences in the classroom, and d) identify other patterns of discourse that emerge when graduate health science students make clinical decisions during active learning experiences in the classroom

**C. Who may take part in this study? And who may not?**

Appropriate participants include instructors and graduate students in health science fields (Physical Therapy) currently enrolled in graduate level courses identified as using active learning instructional strategies (e.g., case-based learning, problem-based learning, team-based learning, simulation) and which encourage instructor-student and student-student interaction and discourse.

Instructors and graduate health science students who are enrolled in graduate level courses that do not use active learning strategies are not appropriate participants for this study.

**D. How many subjects will be enrolled in the study?**

The specific number of subjects enrolled in this entire study will be emergent. Eligible participants will include the instructor and all graduate students enrolled in his/her course. Data will be collected at two universities and will include a minimum of two instructors and approximately sixty graduate students and continue until saturation of data is reached.

**E. How long will my participation in this study take?**

As a student, your participation in this study will take place during your attendance in class over a period of one semester. Data collection will be scheduled with the course instructor and take place while active learning is facilitated in the classroom. It is anticipated that data will be collected approximately six class periods throughout the semester.

As a student, you will also be invited to participate in one focus group session lasting approximately 15 minutes.

**F. Where will the study take place?**

Your participation will take place in your regularly scheduled classroom space in _____ (building name) on the campus of _____ (University name) at _____(time). It is anticipated that data will be collected over approximately six class periods throughout the semester. The co-investigator will be present as a non-participating observer.

**G. What will you be asked to do if you take part in this research study?**

During the duration of the semester, the instructor-student and student-student classroom discussions will be audio-recorded and transcribed. The participants' (instructor and students) interactions will be observed by the co-investigator and notes will be hand-written or typed. Last, blank class assignments, class syllabus, or other general written material will also be reviewed. It is anticipated that data will be collected approximately six class periods throughout the semester.

In addition, as a student, you will also be invited to participate in one focus group session lasting approximately 15 minutes. This group discussion will also be audio-recorded and transcribed.

**H. What are the risks and/or discomforts you might experience if you take part in this study?**

Participation in this research poses no risk to you as a participant.

**Are there any benefits for you if you choose to take part in this research study?**
You may not receive direct personal benefit from taking part in this study. Your participation, however, may help us understand how graduate health science students develop clinical reasoning skills. This information can benefit students indirectly, and may help instructors employ effective instructional strategies and develop appropriate discourse patterns in order to help graduate health science students develop sound clinical reasoning skills.

**I. What are your alternatives if you don't want to take part in this study?**

There are no alternatives available. Your alternative is not to take part in this study.

**J. How will you know if new information is learned that may affect whether you are willing to stay in this research study?**

During the course of the study, transcripts and detailed descriptions from observations will be verified with participants (instructors and students). Additionally, the co-investigator will collaborate with instructors to verify and interpret the purpose of course documents

You will be updated about any new information that may affect whether you are willing to continue taking part in the study. If new information is learned that may affect you, you will be contacted.

**K. Will there be any cost to you to take part in this study?**

There will be no financial costs to you as a participant.

**L. Will you be paid to take part in this study?**

You will not be paid, monetary or grade incentives (extra credit), for your participation in this research study.

**M. How will information about you be kept private or confidential?**

All efforts will be made to keep your personal information in your research record confidential, but total confidentiality cannot be guaranteed. Your personal information may be given out, if required by law. Presentations and publications to the public and at scientific conferences and meetings will not use your name and other personal information.

Data storage, both in electronic or paper form, will be stored on a secure computer that is password-protected and/or in a locking file cabinet in the co-investigator's home office. Further, in order to preserve participant confidentiality, the universities and all participants will be assigned a pseudonym that will be used throughout the data analysis and reporting process. The pseudonym link document will be stored in a second locked file separate from the informed consents, audio transcripts, and other raw data. In the event that participants' actual names are used during audio recorded discourse, actual names will be deleted and assigned pseudonyms will immediately be substituted in all typed transcriptions that will be used during data analysis. The pseudonym link document will be stored until the close of the study at which time it will be destroyed. Once data analysis and reporting of conclusions has been completed, all raw data will be destroyed. All other research data will be maintained and stored for a period of six years after the conclusion of the research.

Responses during classroom discussions (instructor-student and/or student-student discussions) from students who choose not to participate in this study will be deleted from audio recordings and removed from all transcripts. Further, no responses from students who choose not to participate will be used in any part of the data collection or analysis process.

**What will happen if you are injured during this study?**

Subjects in this study will not be exposed to any risks that pose any danger. However, if you are injured in this study and need treatment, contact the counseling center located in _____ (name of building) on the campus of _____(name of University) and seek treatment.

We will offer the care needed to treat injuries directly resulting from taking part in this study. Rowan University may bill your insurance company or other third parties, if appropriate, for the costs of the care you get for the injury. However, you may be responsible for some of those costs. Rowan University does not plan to pay you or provide compensation for the injury. You do not give up your legal rights by signing this form.

If at any time during your participation and conduct in the study you have been or are injured, you should communicate those injuries to the research staff present at the time of injury and to the Principal Investigator, whose name and contact information is on this consent form.

**N. What will happen if you do not wish to take part in the study or if you later decide not to stay in the study?**

Participation in this study is **voluntary**. You may choose not to participate or you may change your mind at any time.

If you do not want to enter the study or decide to stop participating, your relationship with the study staff will not change, and you may do so without penalty and without loss of benefits to which you are otherwise entitled.

You may also withdraw your consent for the use of data already collected about you, but you must do this in writing to: **Diane L. Laverty** at: **Lavertyd4@students.rowan.edu**

If you decide to withdraw from the study for any reason, you may be asked to participate in one meeting with the Principal Investigator and/or Co-Investigator.

**O. Who can you call if you have any questions?**

If you have any questions about taking part in this study or if you feel you may have suffered a research related injury, you can call the Principal Investigator or Co-Investigator:

**Principal Investigator:**
Carol C. Thompson, PhD
Rowan University, College of Education
Education
Educational Leadership Program
ThompsonC@rowan.edu
856-256-4500 x3030

**Co-Investigator:**
Diane L. Laverty
Rowan University, College of

Educational Leadership Program
Lavertyd4@students.rowan.edu
609-703-4937

If you have any questions about your rights as a research subject, you can call:

Rowan University
Glassboro/CMSRU IRB
(856) 256-4078

**What are your rights if you decide to take part in this research study?**
You have the right to ask questions about any part of the study at any time. You should not sign this form unless you have had a chance to ask questions and have been given answers to all of your questions.

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**AGREEMENT TO PARTICIPATE**

I have read this entire form, or it has been read to me, and I believe that I understand what has been discussed. All of my questions about this form or this study have been answered.

Subject Name:_____

Subject Signature:_____ Date:_____

**Signature of Investigator/Individual Obtaining Consent:**

To the best of my ability, I have explained and discussed the full contents of the study including all of the information contained in this consent form. All questions of the research subject and those of his/her parent or legal guardian have been accurately answered.

Investigator/Person Obtaining Consent:_____

Signature:_____ Date: _____

**Appendix C**

**Structured Observation Form**


**COLLEGE OF EDUCATION**

**STRUCTURED OBSERVATION FORM**

**TITLE OF STUDY:** Development of Health Science Students' Clinical Reasoning: A Qualitative Study

**PRINCIPAL INVESTIGATOR:** Carol C. Thompson, PhD.

**CO-INVESTIGATOR:** Diane L. Laverty, Doctoral Candidate

Date: _____ Location: _____
Instructor: _____ Number or Students: _____

| Physical Arrangement of Classroom: (Sketch of classroom) |
| --- |
| |

## Appendix D

## Instructor Semi-Structured Interview Script

Rowan University

**COLLEGE OF EDUCATION**

**TITLE OF STUDY:** Development of Health Science Students' Clinical Reasoning: A Qualitative Study

**Principal Investigator:** Carol C. Thompson, PhD.

**Co-Investigator:** Diane L. Laverty, Doctoral Candidate

**INTERVIEW SCRIPT**

**Introduction:** I want to thank you for taking the time to meet with me today to help me conduct my research. I would like to ask you some questions about the instructional strategies you use in your graduate health science course. Specifically, I am interested to know what types of discourse occurs during instruction with your students to help them develop clinical reasoning skills.

**Background:**

1. Tell me about your professional background. What types of courses do you currently teach? What have you taught in the past?

2. How long have you been teaching at the graduate level? At what institutions have you taught?

**Main Questions:**

3. In your role as an instructor in a graduate health science courses, how do you talk to students? What kinds of discussions do you want to see? How do you set up your class in order to get those discussions?

4. Describe your perception of clinical reasoning. How would you define it? In what ways do you feel you help your students develop clinical reasoning?

5. How do you structure your classroom? How do you describe its effectiveness?

6. What types of questions do you use to elicit clinical reasoning skills?

7. What kinds of questions do you think are most effective in eliciting clinical reasoning? Why?
8. How does student collaboration look in your classroom? What types of discourse do you observe during those times?

9. Is there anything else about your teaching experiences in graduate health science courses you think is important for me to know that you would like to add? Is there anything I did not ask you that you think is important to know?

**Potential Probes:**

- Could you go back to _____? (to redirect back to the topic)
- In other words, _____? (restate what was just said to clarify)
- Could you explain that again? (to assure understanding)
- Could you give me an example of _____? (to clarify)
- Was that before or after _____? (to clarify time sequence)
- And then what? (to extend the topic)

**Conclusion:** Thank you for your time and participation! The next step will be transcribing our conversation and analyzing the information you shared. I will send you a copy of my transcript to verify that my transcription and interpretation of it is accurate. Once I report my findings, I am happy to share a copy for your review if you are interested.

**Appendix E**

**Student Focus Group Script**

Rowan University

**COLLEGE OF EDUCATION**

**TITLE OF STUDY:** Development of Health Science Students' Clinical Reasoning: A Qualitative Study

**PRINCIPAL INVESTIGTOR:** Carol C. Thompson, PhD.

**CO-INVESTIGATOR:** Diane L. Laverty, Doctoral Candidate

## STUDENT FOCUS GROUP SCRIPT

**Introduction:** I want to thank you for taking the time to meet with me today to help me conduct my research. I would like to ask you some questions about your development of clinical reasoning skills. Specifically, I am interested to know what your experiences have been and how that has influenced your development of clinical reasoning skills. Since I am recording this discussion, please make sure that only one person is speaking at a time. There are no right or wrong answers. Also, anything you say will be kept confidential and have no influence on your course grade, so please feel free to speak honestly.

**Background:**

1. Tell me about your educational background. What types of courses do you currently take? What have you taken in the past?

**Main Questions:**

2. Describe your perception of clinical reasoning. How would you define it? In what ways do you feel your instructor helps you develop clinical reasoning?

3. Describe your preparation in learning how to make clinical decisions? How would you describe its effectiveness?

4. How is your classroom structured? How do you describe its effectiveness?

5. Is there anything else about your learning experiences in graduate health science courses you think is important for me to know that you would like to add? Is there anything I did not ask you that you think is important to know?

**Potential Probes:**

- Could you go back to _____? (to redirect back to the topic)
- In other words, _____? (restate what was just said to clarify)
- Could you explain that again? (to assure understanding)
- Could you give me an example of _____? (to clarify)
- Was that before or after _____? (to clarify time sequence)
- And then what? (to extend the topic)

**Conclusion:** Thank you for your time and participation! The next step will be transcribing our conversation and analyzing the information you shared. I will send you a copy of my transcript to verify that my transcription and interpretation of it is accurate. Once I report my findings, I am happy to share a copy for your review if you are interested.

# Appendix F

## Codebook

| Presence | Category | Code | Definition | Example |
|---|---|---|---|---|
| Social Presence | | | Group identity; personal relationships that encourage free and open communication within the group (Garrison, 2016) | |
| | | Group Identity (Garrison, 2016) | References made to identify individual as part of the group, (e.g. references to "we" or "us") | We have to look it up… |
| | | Non-Group Identify | Statements that relate to formal subject matter, identify goals, and are not related to inclusion as a group member | I always do that too. |
| | | Non-group/Non-topic Identity | Statements made that do not identify individual as part of the group and do not relate to formal subject matter or identify goals. | I think it's just gonna rain… |
| Cognitive Presence | | | The process of constructive and collaborative inquiry (Garrison, 2016. pg. 14) | |
| | Triggering Event | | Start of the discussion topic or transition to a new topic | |
| | | Identifying the problem (Garrison, Anderson, Archer, 2001) | Presenting background information that culminates in a question (Garrison et al.,2001) | First, we need to know what we're covering…You know what I mean? And what we can't do |
| | | Sense of puzzlement (Garrison et al., 2001) | Asking convergent questions resulting in a specific response | How old is she? |
| | Exploration | | Information Exchange (Garrison, 2016) | |
| | | Recall of facts (Garrison et al., 2001) | Stating basic information from content material | That it was generally better than expressive… |
| | | Suggestions for consideration (Garrison et al., 2001) | Adds to the topic but does not defend or justify ideas. | Energy conservation strategies? |
| | | Leaps to conclusion (Garrison et al., 2001) | Unsupported opinions | I think she just has apraxia… |

| Presence | Category | Code | Definition | Example |
|---|---|---|---|---|
| | Integration | | Connecting Ideas (Garrison, 2016) | |
| | | Convergence (Garrison et al., 2001) | Building on others' ideas with justified rationale but hypothesis may still be tentative (Garrison et al., 2001) | so…what it's doing to her …well, it's impacting her ability to hear and communicate |
| | | Judgment | Challenging and/or criticism of others' ideas | But you wouldn't do mirror therapy for education |
| | Resolution | | Applying new ideas (Garrison, 2016) | |
| | | Application to real world (Garrison et al., 2001) | Applying ideas to practical cases | Well with my brother, we've had an ongoing fight pretty much his whole life over if he has apraxia or not …so it's something that my mom has always had to go back and forth…is it apraxia or isn't it just because of his motor involvement… |
| | | Defending solutions (Garrison et al., 2001) | Providing a rationale and/or justification for solution | Like you wanna keep it extended so you don't get a contracture at the knee… A lot of them get them |
| Teaching Presence | | | Purposeful learning transaction; Active engagement and proportional contribution of all participants; Distributed authority to regulate learning (Garrison, 2016) | |
| | Design | | Setting the curriculum and methods (Garrison, 2016) | |
| | | Expectations (Shea, Li, & Pickett, 2006) | Explicit direction of procedures and expectations. | I'll go over canes and then we'll practice… |
| | | Topic Identification (Shea et al., 2006) | Communication of pertinent topics (Shea et al., 2006) | So, now we're going to go on to talk about hearing loss… |
| | Facilitation | | Shaping the verbal exchanges (Garrison, 2016) | |
| | | Identifying areas of agreement/ disagreement (Shea et al., 2006) | Instructor or student identifies areas of agreement or disagreement between participants | So, that goes with prevention, and advocacy |

| Presence | Category | Code | Definition | Example |
|---|---|---|---|---|
| | | Seeking to reach consensus/ understanding (Shea et al., 2006) | Instructor or student expresses consensus and/or shared understanding (Shea et al., 2006) | So, you said that they do have poor pragmatics… |
| | | Encouraging, acknowledging, or reinforcing student (Shea et al., 2006) | Instructor or students recognize and encourage other students' contributions (Shea et al., 2006) | Exactly…You are absolutely right… |
| | | Prompting discussion (Shea et al., 2006) | Divergent, open-ended questions posed to elicit discussions in an attempt to include other participants | Why else? |
| | | Assessing efficacy of the process (Shea et al., 2006) | Directing the discussion to remain on topic | But, should we go to number six? |
| | Direction | | Resolving issues (Garrison, 2016) | |
| | | Presenting content (Shea et al., 2006) | Instructor or student provides clarification or factual knowledge from various sources, (e.g. textbooks, articles, internet, etc.) | So, just to introduce you to Hurler Syndrome, it is a very rare genetic disease of metabolism and it's where a person cannot breakdown longer chains of sugar molecules |
| | | Summarizing the discussion (Anderson et al., 2001) | Instructor or student summarizes discussion to identify the salient point | So, contracture education, range of motion, positioning |
| | | Confirmation of understanding (Shea et al., 2006) | Instructor or student evaluates comment and provides explanatory feedback to confirm meaning | Exactly…any kind of environmental factors that were introduced during pregnancy |
| | | Diagnose misconceptions (Shea et al., 2006) | Instructor or student identifies misconceptions and redirects participants' conceptions | But pushing and pulling is separate from what you do with your arms as far as range of motion |
| | | Inject knowledge (Shea et al., 2006) | Instructor or students offers knowledge from diverse sources (e.g., textbook, articles, internet, personal experiences) (Shea et al., 2006) | In my experience…I've never worked with children who have Down Syndrome who have gone beyond putting two signs together without developing oral speech |