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THE USE OF AN ONLINE VIDEO LIBRARY IN THE DEVELOPMENT OF CASE-BASED CLINICAL REASONING SKILLS IN OCCUPATIONAL THERAPY EDUCATION

By

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DISSERTATION APPROVAL PAGE

This is to certify that the dissertation prepared by Lynne F. Murphy entitled The Use Of An Online Video Library In The Development Of Case-Based Clinical Reasoning Skills In Occupational Therapy Education has been approved by the thesis committee as satisfactorily completing the dissertation requirements for the degree Doctor of Education in Instructional Technology

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ABSTRACT

Clinical reasoning, the cognitive process of a skilled occupational therapist, is a complex and necessary component of evaluating clients and implementing interventions that facilitate each client's achievement of relevant and meaningful participation in daily occupations. Clinical reasoning encompasses a set of skills that must be integrated into college curricula for the preparation of occupational therapists, but it is not easily taught in a classroom setting. This complementary, mixed methods study explored how specific instructional techniques, constructed on the tenants of case-based reasoning, influenced the development of clinical reasoning in occupational therapy students, and sought to understand the student experience regarding use of these instructional techniques. Students participated in either a text-based case activity or a video-based case activity with an associated clinical reasoning component. When the effects of GPA, age and experience were partialled out, the video group demonstrated statistically significantly higher scores in inductive reasoning ($p<.05$), but the text group demonstrated higher scores in self-perceived reasoning, although not statistically significant ($p=.06$). Students utilizing both case-based methods reported satisfaction with the case-based learning activities groups, and identified authenticity of videos and more explicit information gained from the text cases as strengths of the particular case-based methods. Students in the video group described their use of clinical reasoning in more explicit and defined ways than the text group. It was concluded that case-based reasoning using either method promotes clinical reasoning and student satisfaction; however, video cases and the associated learning activity facilitate inductive reasoning and explicit understanding of the reasoning process in occupational therapy.

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Chapter I: Introduction

Occupational Therapy (OT) is a health profession that assists individuals to achieve their maximum potential in their meaningful daily activities, commonly called occupations. These occupations encompass activities of daily living such as self-care and home management, work and employment, educational pursuits, play and leisure, and social participation (American Occupational Therapy Association, 2008). Occupational therapists facilitate the participation in these daily activities for individuals who may encounter difficulties due to illness, injury, disability, or developmental challenges. Occupational therapy is a profession that promotes "living life to its fullest," by remediating physical or mental challenges, preventing injury or disability, and promoting wellness (American Occupational Therapy Association, n.d., p. 1). To achieve these goals, occupational therapists analyze activities and occupations, and present the parts of these daily activities in a gradually more difficult sequence, to facilitate improvement in client skills and abilities. When a person reaches his or her optimal abilities, activities may be modified or adapted to allow this person to perform those activities in an altered way.

To become a skilled occupational therapist, the college student studying in this field must gain knowledge in a wide variety of skills, including human physical and psychosocial function, medical conditions that may cause dysfunction, and therapeutic methods to facilitate recovery and prevent further disability. Paramount to applying these skills, however, is the ability to perform effective and relevant clinical reasoning, in order to determine the needs and appropriate interventions for each individual client. Clinical reasoning can be described as the cognitive process that the therapist proceeds through to

evaluate the client's deficits and abilities, to determine appropriate interventions that are meaningful and purposeful for the client, and to direct and change the plan of care in accordance with client needs (Crepeau, Cohn, & Boyt Schell, 2009).

Rogers (1983), one of the first occupational therapists to attempt to explicitly study this skill of the clinician, describes clinical reasoning as a blend of artistry, science, and ethics which is difficult to learn by a novice in the field. It relies on a combination of inductive reasoning, deductive reasoning, ethical decision-making, knowledge, experience and interaction skills that result in competent occupational therapy service planning and delivery (Rogers, 1983). Most clinicians require experience, conscious reflection, critical analysis and self-criticism to develop this complex set of skills (Rogers, 1983).

The professional and legal standards for the practice of occupational therapy require that the therapist be a graduate of an accredited master's degree program, so all of the necessary skills and qualities for professional competence must be taught in a college classroom setting. Although teaching and learning specific manual techniques, such as performing a manual muscle test or range of motion assessment, are straightforward and can be easily demonstrated, the skill of clinical reasoning is not so easily taught.

There is consensus across the profession of occupational therapy that clinical reasoning cannot be performed without explicit consideration of each specific client and his or her particular abilities, limitations, contexts, medical condition, culture, and values (Boyt Schell & Schell, 2008; Crepeau, Cohn, & Boyt Schell, 2009; Fleming, 1991; Fleming & Mattingly, 1993; Mattingly, 1991, Rogers, 1983). Therefore, a client story or various forms of case studies have been used in instructional methods to facilitate the

development of clinical reasoning. This allows for consideration of the individual client in the development of an occupational therapy plan. Historically, the format of that cases have included written or text-based cases, videotaped patients, simulated or standardized patients, and stories elicited from former occupational therapy clients (Bazyk & Jeziorowski, 1989; Liu, Schneider & Miyazaki, 1997; Lysaght & Bent, 2005; Neistadt & Smith, 1997; Van Leit, 1995). All of these methods have similarities in their theoretical foundations in case-based instruction. Additionally, all are designed to assist students in building knowledge and skills related to the practice of occupational therapy.

The construct of case-based reasoning describes a cognitive model that may be useful for understanding the cognitive process of clinical reasoning. Case-based reasoning, as described by Kolodner and Guzdial (2000), provides a theoretical framework in which an expert uses experiences or cases to assist others to learn and reason, and facilitates the application of that knowledge to similar situations. This method utilizes the interpretation of expert cases or experiences to assist students in interpreting and understanding new situations. Learners are able to build their own knowledge in an intentional way, by means of transferring the expert's or their own experiences into knowledge that they can recall and use in flexible ways (Kolodner & Guzdial, 2000). The cases become the basis for the learner's cognitive library as he or she learns directed lessons from those cases, and can recall and utilize those lessons learned when they are applicable to future situations.

Text-based or written case studies have been a traditional teaching strategy or instructional tool in occupational therapy education for the development of clinical reasoning (Lysaght & Bent, 2005; Neistadt, Wight & Mulligan, 1998; Van Leit, 1995).

However, they do not require the realistic observation and interpretation that occurs when occupational therapists interact with actual or live clients. The use of actors who are trained to portray occupational therapy clients or live interviews of former occupational therapy clients have also been used to present cases in higher education. These actors or clients have either been invited to interact with occupational therapy students in classroom settings, or they were videotaped for student review (Bazyk & Jeziorowski, 1989; Liu, Schneider & Miyazaki, 1997; Lysaght & Bent, 2005; Neistadt & Smith, 1997; Van Leit, 1995). However, this environment is still artificial, as it does not occur in the natural setting of the occupational therapy clinic. Recently, video has been used to show occupational therapists in a more natural setting, but research on this instructional method has focused only on identification of advantages and disadvantages of this media (Lysaght & Bent, 2005).

The more contemporary instructional methods used in occupational therapy education have advanced beyond the limitations of textbooks and visits to the classroom. The actual observation of clients in a safe setting is now available through an internet platform, specifically in video case libraries of occupational therapy practice (Cook & Triola, 2009; Lysaght & Bent, 2005; Tomlin, 2005).

Statement of the Problem

Research on the use of case-based reasoning in health sciences educational programs has examined how cases should be properly structured across varied disciplines (Bagdasarov, et. al., 2012; Choi & Lee, 2009; Jonassen, 1996; Kim, et. al., 2006; Thistlewaite, et. al., 2012), student satisfaction with case-based learning methods across varied educational programs (Curran, Sharpe, Forristall, & Flynn, 2008; Kim,

Pederson, & Baldwin, 2012; Lysaght & Bent, 2005; Thistlewaite, et. al., 2012; Williams, 2009), connections of instructional methods to learning outcomes (Bagdasarov, et. al., 2012; Cook & Triola, 2009; Kaddoura, 2011; Mounsey & Reid, 2012), and how clinical reasoning or critical thinking in occupational therapy students may develop over time (Lederer, 2007; Mattingly, 1991; Rogers, 1983; Vogel, et., al., 2009). In addition, limited research exists within the profession of occupational therapy education that attempts to measure clinical reasoning using standardized measures (Lederer, 2007; Vogel, et., al., 2009) or measuring clinical reasoning related to various experiential instructional techniques (Coker, 2010; Royeen, Mu, Barrett & Luebben, 2001; Scaffa & Smith, 2004). However, there is no clear evidence that the specific instructional methods of using a video case library that is presented online with a foundation in case-based reasoning may actually facilitate the development of specific clinical reasoning skills of occupational therapy students.

Purpose and Significance of the Research

The purpose of this research study was to examine the relationship between the use of video cases presented over an online platform, combined with a clinical reasoning learning activity, and the development of clinical reasoning skills in occupational therapy students. In addition, student satisfaction and perceptions of both the learning process and their perceptions of their clinical reasoning abilities were examined, in order to fully understand the impact of case-based reasoning on the development of clinical reasoning and engagement in the instructional process.

For a classroom instructor, it is difficult to discern if the instructional methods utilized are actually assisting in the development of clinical reasoning skills in

occupational therapy students. It is also important to fully engage students in the learning process, so that they may develop these complex skills in a way that promotes their advancement to clinical practice in the profession of occupational therapy. This research examined how technology and related learning activities, utilizing case-based reasoning, facilitated clinical reasoning skills. In addition, the contributions of this instructional method to student satisfaction and student perceptions of the learning activities related to clinical reasoning were examined. Ultimately, this study aimed to assist in determining if students are well prepared for clinical and professional practice, and have the potential to become more skilled in clinical reasoning in their discipline, as a result of a structured case-based learning activity, namely using an online video library and an associated clinical reasoning activity.

Research Design

This research utilized a complementary mixed methods design, with a sequential framework of preliminary quantitative approach and follow-up qualitative approach. Students enrolled in physical rehabilitation coursework in a combined BSMS program in occupational therapy self-selected into separate sections of a clinical practice course, Adult Musculoskeletal Occupational Therapy. Different instructional methods were used in the sections, one utilizing video cases presented over an online platform with associated clinical reasoning learning activities, and one utilizing text based cases. Both sections participated in the same pre and post tests that included the Health Science Reasoning Test (HSRT) and the Self-Assessment of Clinical Reflection and Reasoning (SACRR). These instruments allowed for quantitative analysis of clinical reasoning skills, including changes between pre and post test scores within groups and changes

between groups. Following the conclusion of the academic semester, several students from each of the sections participated in interviews, to examine student satisfaction, perception of learning experience, and perception of development of clinical reasoning related to the instructional methods. These interviews allowed for qualitative analysis of student experience, following a phenomenological approach in the data analysis process.

The complementarity purpose of the mixed methods design allowed for explanation of quantitative results, namely measures of clinical reasoning, by asking students to explain their experiences through qualitative analysis. Johnson and Onwuegbuzie (2004) discussed the complementary features of mixed methods research as a means to answer research questions in a way that "offers the best chance to obtain useful answers," (p. 18). Because clinical reasoning in the context of occupational therapy does not have a purely quantitative means of measurement, and because student perceptions alone cannot fully capture their progress in developing the skills, these two types of data and associated analysis are best combined to obtain useful answers about what instructional methods may contribute to reasoning in a meaningful way. Morgan (1998) describes how decisions must be made in mixed methods research design regarding both priority and sequence, based on the research questions that guide research in health professions. This research study placed the emphasis on quantitative data as a measure of reasoning, followed with qualitative data, to understand the changes noted in these measures of reasoning, based on the experiences of the students. By conducting the quantitative measures of clinical reasoning first, the results were be used to inform and expand the interviews used for qualitative understanding of student perceptions. In addition, by performing the interviews after the conclusion of the semester, students were

able to speak more freely and openly since they had completed all graded portions of the course in which the study is situated. By following this mixed-methods methodology, and integrating the two types of results, more meaningful conclusions could be drawn about the value of the video case library and learning activities related to occupational therapy student clinical reasoning and experiences.

Research Questions

The following questions guided the research study:

1. Is there a statistically significant difference in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone?
2. Is there a statistically significant difference in self-reported, perceived clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone?
3. What are undergraduate occupational therapy student satisfaction, perceptions of learning experience and perceptions of clinical reasoning with the use of case-based learning activities, utilizing either a comprehensive online video case study with a clinical reasoning learning activity or text and video cases alone?

Limitations and Assumptions

The research design attempted to control for as many confounding or influencing factors as possible. The same instructor taught both sections of the course, learning activities were reviewed by experts, and the mixed methods approach allowed for

investigation of clinical reasoning from different perspectives. Qualitative results were used to explain and elaborate on quantitative results. However, as in any research study, there were limitations that must be acknowledged.

- The convenience sampling technique, or lack of randomized sampling, may have threatened internal validity of the study. Since students self-selected into the sections, there may have been characteristics of each group, such as personal and professional background, that may have influenced the outcomes. Characteristics such as prior experience, motivation, or outside demands on students' time were also not well controlled and may have influenced student learning and reasoning. The analysis using ANCOVA was used to attempt to control for some identified pre-existing differences between the groups.
- The time period of the study was brief, namely less than 15 weeks between administration of the pre and post tests of both the Health Science Reasoning Test (HSRT) and Self-Assessment of Clinical Reflection and Reasoning (SACRR). This may not have been enough time for complex cognitive skills to change in the students, impacting results from the HSRT and SACRR. The mixed methods design was conducted to enrich the quality of the research findings.
- The study was replicated over two different spring semesters, due to the small number of students who were permitted to enroll in the screened major and since the course in which the research was embedded is only offered during the spring. Replicating the study allowed for a larger sample size and for creation of control and intervention groups. (See further discussion of sample size in Chapter 3.) However, the SACRR was only administered to the second group of students,

after it was determined how the qualitative data could enrich data analysis and conclusions drawn from the study.

- The researcher was also the instructor for the course in which the study was conducted, so the researcher was not blind to the group participation. The researcher also conducted the interviews at the conclusion of the semester. This created a potential researcher bias that could have influenced results and conclusions. A statement of the researcher was included to address this potential bias.

Researcher's Personal Statement

This research was conducted at a public university in the mid-Atlantic region, and occupational therapy students enrolled in a Combined BS/MS program, resulting in a Master of Science degree in occupational therapy, were the subjects of this study. Since the researcher was also the instructor for the course in which the study was conducted, the implementation of the particular instructional methods, and the interpretation of results, was subject to my beliefs, biases, and perceptions.

I have been an occupational therapist, and therefore a person who relies on the effective and efficient use of clinical reasoning, for approximately 30 years. I have taught the course in which the study was situated for my entire teaching career, spanning 19 years. Improving my teaching skill and designing learning opportunities for students that are engaging, meaningful, and effective are personal priorities every time I teach the course. Therefore, I am invested in learning more about the outcomes of these teaching activities and in drawing logical and accurate conclusions from this study.

During the semester, two peer reviews were conducted during similar learning activities between the two groups. These reviews were conducted by colleagues who were also involved in the expert validation of the learning activities. Both reviewers determined that the activities and the interactions between the instructor and students were consistent between sections. The quantitative nature of two of the instruments limited personal bias during analysis. Peer review of qualitative analysis was also conducted to limit bias during analysis. Finally, the researcher engaged in the Epoche process described by Moustakas (1994), which involved explicit and systematic acknowledgement of potential bias at the onset of qualitative analysis.

Summary

Clinical reasoning is a necessary skill of the competent occupational therapist, and therefore a necessary part of the occupational therapy curriculum preparing students for practice within the discipline. However, clinical reasoning is difficult to teach and has not been sufficiently linked to instructional practices in the literature.

This research focused on the use of video case studies, presented over an online platform and combined with a clinical reasoning learning activity, to determine influence on clinical reasoning. This research also explored student perceptions of case-based learning activities, including the video cases, as they promote student satisfaction and engagement in the learning process.

Chapter II: Review of Literature

In order to fully research the process of clinical reasoning in occupational therapy, literature was examined in a number of related areas. This included examination of clinical reasoning as a theoretical underpinning of occupational therapy, case-based reasoning as a theoretical construct, instructional methods based on case-based reasoning, outcomes of instructional methods based on case-based reasoning, recommendations for construction of cases, and uses of case-based reasoning in occupational therapy. Multiple health care and educational databases were utilized for this search, including Medline, PubMed, Academic Search Complete, CINAHL, OT Search, ProQuest, ERIC and Educational Research Complete. In addition, textbooks and publications related to clinical reasoning within the context of occupational therapy had been reviewed over the course of the researcher's career.

Clinical Reasoning in Occupational Therapy

Rogers was one of the first occupational therapists who attempted to define clinical reasoning. She described clinical reasoning as a cognitive process in which "thinking [that] guides practice" (Rogers, 1983, p. 601). Rogers described competent clinical reasoning as a means to develop the best possible treatments, called interventions in contemporary occupational therapy practice, which meet the needs of each individual patient or client. These interventions allow the client to achieve the best possible life that he or she envisions. Clinical reasoning first involves the acquisition of knowledge regarding the client's strengths, problems, environment, motivations, and patterns of behavior. It involves acquisition of knowledge of the client's condition or diagnosis which is currently an impairment to function. The therapist must also reason through

what interventions are then appropriate, so both evidence and experiences are used to analyze the knowledge.

Rogers (1983) also described the process of clinical inquiry that must be used to consider the knowledge or facts in all these areas. She discussed how a frame of reference contributed to this cognitive process, but also described the contributions of cue memory, inductive reasoning, and deductive reasoning. An occupational therapist uses deductive reasoning when he or she considers the patient's skills and abilities, relevant models or theories, and scientific knowledge of the diagnoses to develop treatment options. An occupational therapist uses inductive reasoning to apply all this information to the understanding of the client's motivation, environment, and overall goals. Rogers (1983) also discussed the ethical influences on therapist decision-making, in which the patient's values, goals, and culture must be a primary driver of the reasoning process, so that the treatments chosen is based on understanding of each particular client. The final step in the reasoning process is described by Rogers (1983) as "persuasive rhetoric," (p. 609) in which the therapist seeks to motivate the patient to fully participate in the therapy process. The clinical reasoning process is a form of artistry, difficult for the novice to master, and relies on clinician experience, conscious reflection, critical analysis and self-criticism to develop this complex set of skills (Rogers, 1983).

The American Occupational Therapy Association and Occupational Therapy Foundation sponsored a landmark study of clinical reasoning within the profession that furthered understanding of the clinical reasoning process, often referred to as the Clinical Reasoning Study by occupational therapists (Fleming, 1991; Gillette & Mattingly, 1987; Mattingly, 1991). The researchers analyzed video recordings of seven occupational

therapists in Boston during their occupational therapy sessions with patients. The therapists were then interviewed individually and in a group, in order to understand their utilization of clinical reasoning skills during the occupational therapy sessions. The aims of this study were to investigate how theory informs practice and to more clearly understand the relationship between professional education and clinical reasoning in occupational therapy (Gillette & Mattingly, 1987). The researchers determined that the complex skill of clinical reasoning cannot be defined in one way or gained by clinicians in any one explicit process. Development of clinical reasoning is dependent on understanding of the client, the context, and how individuals view meaning in their daily occupations. They recommended a phenomenological approach to reasoning and discouraged a medical or purely biological view of clients (Mattingly, 1991).

Based on the Clinical Reasoning Study, Mattingly (1991) further described clinical reasoning as a "largely tacit, highly imagistic, and deeply phenomenological mode of thinking" (p. 979). The occupational therapist must consider a number of factors in order to reason effectively, which include understanding of occupational therapy theory, scientific reasoning about the medical condition or diagnosis, the technical nature of interventions and the predicted outcomes of those interventions. Reasoning also relies on the therapist's understanding of the client, including his or her motivations, goals, environments, and abilities and limitations. Finally, a thorough understanding of the therapeutic relationship between the therapist and client is necessary for effective and competent reasoning, which is individualized for each client (Mattingly, 1991).

Other occupational therapists have sought to define clinical reasoning in more categorical and explicit ways. Fleming (1991) described three key types of reasoning as

procedural, interactive, and conditional reasoning. Procedural reasoning relies on understanding of the disease or disability, and how it impacts client activities, so that problems can be appropriately identified, goals can be set, and treatments or interventions can be selected. Interactive reasoning is necessary to understand each client as an individual, and to discuss his or her experience of the disability, cultural factors that may influence the therapy process, and to establish the rapport and trust needed for building a therapeutic relationship. Finally, conditional reasoning demands that the therapist consider the particular environment, context or conditions of the client and their skills and abilities expected at the outcome of treatment. This type of reasoning must be done throughout the intervention process, in order to make changes to therapeutic activities and treatments as necessary to achieve the goals (Fleming, 1991).

The types of clinical reasoning that are widely accepted in more contemporary occupational therapy practice have been described as the following seven types of reasoning: scientific, procedural, pragmatic, narrative, interactive, conditional, and ethical (Boyt Schell & Schell, 2008; Crepeau, Cohn, & Boyt Schell, 2009). These various types have been based on the foundational concepts already described, but further delineate and clarify the specific skills and considerations used in the reasoning process, so that novice therapists can more explicitly address each area. Scientific reasoning utilizes the knowledge of the diagnosis or condition of the client and is grounded in occupational therapy theories; procedural reasoning describes the occuaptional therapy process from evaluation, to intervention planning, to intervention delivery; pragmatic reasoning considers the resources and constraints of the OT delivery setting; narrative reasoning seeks to understand the client's story, culture, motivations and goals;

interactive reasoining forms the basis for the therapeutic interactions between the client and therapist; conditional reasoning focuses on the conditions or contexts in which the client will be living and participating when therapy concludes; and finally, ethical reasoining is concerned with therapist compliance with the accepted ethical standards of the profession and according to the ethics of health care delivery (Boyt Schell & Schell, 2008; Crepeau, Cohn, & Boyt Schell, 2009).

The complexities of clinical reasoning are recognized as an area of need for further study, as it is a cognitive construct that is difficult to observe in an objective way (Boyt Schell & Schell, 2008; Ciaravino, 2006; Lederer, 2007; Mattingly, 1991; Rogers, 1983; Vogel, et., al., 2009). Specific to higher education, occupational therapy instructors are charged with the task of facilitating this complex set of reasoning skills in their students. Case-based reasoning is one method to accomplish this task, although the format of those cases is varied. Written or text-based cases, videotaped patients, simulated or standardized patients, and stories elicited from former occupational therapy clients have been traditional uses of case-based reasoning included in occupational therapy educational programs (Bazyk & Jeziorowski, 1989; Liu, Schneider & Miyazaki, 1997; Lysaght & Bent, 2005; Neistadt & Smith, 1997; Van Leit, 1995). The review of videotaped client-therapist interactions can also be utilized over internet sites, as a more contemporary example of case-based instructional methods (Cook & Triola, 2009; Lysaght & Bent, 2005; Tomlin, 2005). This also allows for more realistic observation of client abilities and limitations, the therapist's response to the client and context, and to promote classroom discussion and instruction in the interpretation of these cases. To fully explore and examine how case-based instructional methods may be an effective

method of developing clinical reasoning, the construct of case-based reasoning must be clearly understood.

Case-Based Reasoning as a Theoretical Construct

Case-based reasoning, as described by Kolodner and Guzdial (2000), provides a cognitive model in which an expert uses experiences, in the form of cases, to facilitate reasoning and learning in others by allowing the learner to apply knowledge to similar situations. This method of instruction allows novices in a particular setting or profession to interpret and understand situations in light of those expert cases. Learners are able to build their own knowledge in an intentional way, by means of transferring experiences into knowledge that can be recalled and utilized in flexible ways, as appropriate for new situations (Kolodner & Guzdial, 2000). The cases become, in essence, an individual's cognitive library, which can allow reasoning and thinking in future situations.

Kolodner and Guzdial (2000) offered several suggestions for how case libraries could be utilized in instruction, including "advice in the form of stories," (Kolodner & Guzdial, 2000, p. 223) which assists learners to understand situations and observe the results of a specific solution, within the understanding of a broader context. "Vicarious experience using a concept or skill" (Kolodner & Guzdial, 2000, p. 223) is another technique in which the learner can conceptualize how to apply or perform a specific technique by watching that expert perform or describe the skill in a specific case or for a particular individual. These specific techniques may have good applicability to classroom learning, under the appropriate circumstances of presenting the case.

Jonassen and Hernandez (2002) likened case-based learning to story-telling, and described how sharing these stories allowed people to learn and give meaning to

experiences with less cognitive energy than strict memorization of fact or learning without meaningful context. They believed "… that stories elicited from skilled problem solvers, indexed for the lessons they have to teach, and made available to learners in the form of case libraries, can support a broader range of problem solving than any other strategy or tactic," (Jonassen & Hernandez, 2002, p. 65). Since experts often infuse their stories with relevant contextual factors and practical strategies for solving problems, novices in a field or discipline can learn effective problem-solving strategies based on those expert experiences. When a person is able to compile a case library from experts in the discipline, and used in the education and preparation for that field, greater understanding of complex issues can be achieved with a stronger ability to solve real-world or ill-structured problems that a person is likely to encounter in the professional context (Jonassen & Hernandez, 2002).

Kolodner (1997) described case-based learning as situated in authentic contexts or problems, and described its use as a teaching tool when the cases are interesting to the learners. She states that "…knowledge gained through activity that is motivating and authentic is learned more deeply and is more usable than is knowledge gained through memorization, prescriptive activities, or work problems" (Kolodner, 1997, p. 57). Critical reflection on the part of the learner in analyzing the presented cases is vital to successful encoding and later retrieval of the cases. This critical reflection allows the student to determine what was relevant in the case, what solutions may be appropriate, how these solutions may be adapted for different situations, and how this approach contributes to outcomes in the field. Kolodner (1997) believed that even cases that

illustrate failures are worthwhile, if the learner critically evaluates and learns from that case.

The critical reflection process has also been cited in occupational therapy literature as a necessary condition of clinical reasoning (Boyt Schell & Schell, 2008; Crepeau, Cohn, & Boyt Schell, 2009; Fleming, 1991; Mattingly, 1991; Royeen, Mu, Barrett & Luebben, 2001). Although the specific format of the cases is variable in higher education, this type of reasoning has long been used in occupational therapy educational programs (Lysaght & Bent, 2005; Neistadt, Wight & Mulligan, 1998; Van Leit, 1995).

Instructional Methods Utilizing Case-Based Reasoning

While case-based reasoning describes the cognitive process of the learner, case based learning refers to the pedagogical method or educational paradigm founded in this theoretical construct (Bagdasarov, et al., 2012; Choi & Lee, 2009; Cifuentes, Mercer, Alverez, & Bettati, 2010; Jonassen, 1996; Kaddoura, 2011, Kim, et al., 2006; Thistlethwaite, et. al, 2012; Williams, 2005). In other words, what occurs in the learner is case-based reasoning; the technique or instructional methods and activities offered by the expert describe case-based learning. Although the terms are not synonymous, the differences are not consistently distinguished in the literature. Therefore, an examination of the individual studies using either case-based reasoning or case-based learning across various disciplines was warranted to understand the potential of this cognitive process and the associated instructional techniques.

A review of literature undertaken by Kim, Phillips, Pinsky, Brock, Phillips and Keary, (2006), examined 100 studies on case-based reasoning, to determine the effective characteristics of the cases. They explained that effective cases should be relevant to the

needs and goals of the learner, realistic or authentic to real-world settings, engaging to the learner through rich content and a gradual disclosure of information, challenging to learners by adding difficulty or with a series of incrementally graded cases, and the cases should ultimately be instructional and include feedback on the decisions that students make. The studies included in this review took a variety of forms, including text-based, video tapes, and web-based cases. Kim, et al. (2006) credited case-based teaching with the effective development of critical thinking skills and decision-making in a variety of clinical settings, because this instructional method engaged the learners in realistic situations that they are likely to encounter in their professions.

Thistlethwaite, et. al, (2012) conducted a systematic review of evidence of the effectiveness of case-based reasoning across health disciplines, which included medicine, dentistry, nursing, physiotherapy, and occupational therapy. These researchers included 104 papers that were published between 1965 and 2010, and which addressed the effectiveness of case-based learning instructional methods. Although the types and timing of cases was very diverse, all included authentic, situational cases designed to prepare students for practice in the health professions. The link of theory to practice was emphasized in all cases and problem-solving was facilitated by colleagues and experts in all cases. Student satisfaction was consistently high, rating relevance to clinical practice and motivation or engagement in the case as important factors. Group work and online cases, when available, were also rated favorably by students. Faculty reported improved student involvement in learning and positive learning outcomes, although measurement of outcomes across studies was not consistent.

Other potential learning outcomes include critical thinking, knowledge acquisition, student engagement, and student satisfaction. For example, Kaddoura (2011) describes a study in which nursing students enrolled in an undergraduate program were divided into two groups to determine if case-based learning methods promoted critical thinking. Cases and small group discussion were infused throughout the curriculum of a three year program for one group of students, but traditional instruction only was used for the other group. Use of the California Critical Thinking Skills Test at the end of program determined that the students who used the case-based learning methods scored higher in all types of critical thinking, which included analysis, evaluation, inference, deduction and induction (Kaddoura, 2011). The results of this study suggest that case-based reasoning offers meaningful contributions to critical thinking and clinical reasoning in various health professionals.

Medical students participated in an online learning environment that included learning modules of power point slides (Mounsey & Reid, 2012). The learning module randomly divided the students into two groups; one group who viewed the power point only and one group who viewed eleven cases and related questions built into the module. All students took a knowledge test immediately following completion of the module, and then again an average of nine weeks later, to investigate short-term knowledge acquisition and long-term knowledge retention. Student performance was significantly higher on the immediate test for the students who participated in case-based learning. However, by the second test, no significant difference was found between the case-based group and the power point only group. Learning efficiency was reduced in the case-based group as it took longer for them to complete the online modules when compared to

students without the cases. Mounsey and Reid (2012) concluded that case-based learning improves short-term learning, but at the expense of greater time required for the learning activity.

Even in studies that do not demonstrate statistically significant changes in knowledge, or do not address knowledge acquisition at all, learners typically indicate satisfaction with the case based learning instructional strategies. For example, international students who pursued graduate education in the United States described case-based learning modules provided online as easy to learn, easy to use, useful in delivering content, and with high user satisfaction. Knowledge acquisition across disciplines was higher for these international students using an online case-based learning module, but the scores were not statistically significant when compared to student who completed traditional modules without the case-based learning component (Kim, Pederson, & Baldwin, 2012).

A study of undergraduate students studying medicine, nursing, pharmacy and social work participated in asynchronous, online case-based learning activities, followed by face-to-face sessions to discuss the cases and expert panels to review their analysis of the cases. Student satisfaction surveys indicated that although students preferred the face-to-face learning, they did believe that the case-based method and associated group discussion promoted collaborative problem-solving (Curran, Sharpe, Forristall, & Flynn, 2008).

Williams (2009) described the use of case-based learning in an online environment for a bachelor's degree program for paramedics, in which students are first presented with lecture, and then view clinical cases presented online, and then discuss

their plan of care and decision-making rationale in small groups. A self-report questionnaire identified specific strengths of this instructional method; 80% of respondents indicated beneficial interaction between classmates, 78% reported effectiveness of case based learning in presenting material, 84% cited improvement in diagnostic and thinking skills, and 79% reported improvement in ability to develop treatment plans. In addition, a large majority of students (89%) agreed that the learning experience was enjoyable and 78% felt that the case-based leaning technique was a good fit for their learning style. Some of the negative aspects of case-based learning included increased demands on time and energy to participate in both the online and group discussion portions of the cases, difficulty with internet access or technology, and occasional difficulty with the group dynamics (Williams, 2009).

The research in allied health professions and medicine suggests that there is some evidence that instructional techniques built on case-based reasoning can increase critical thinking when presented over time, and may increase knowledge acquisition in more short-term evaluations (Kaddoura, 2011; Mounsey & Reid, 2012). Regardless of learning outcomes, students consistently report satisfaction with case-based learning activities (Curran, Sharpe, Forristall & Flynn, 2008; Kim, Pederson & Baldwin, 2012; Williams, 2009). Negative aspects of case-based learning activities focus primarily on longer time required for learning or decreased learning efficiency (Mounsey & Reid, 2012; Williams, 2009). These findings lend support to continued research in occupational therapy. Although some learning outcomes have been studied in occupational therapy, the possible connections between case-based learning activities and development of clinical reasoning have not.

Case-Based Reasoning and Instructional Methods in Occupational Therapy

The research described thus far has examined case-based reasoning across disciplines. However, there is a need to examine how this construct has contributed to the knowledge and practice of occupational therapy education as well. Traditionally, text-based or written case studies have been used to teach the skill of clinical reasoning in occupational therapy curricula (Lysaght & Bent, 2005; Neistadt, Wight & Mulligan, 1998; Van Leit, 1995). However, this type of case cannot promote observation in a realistic way, and often does much of the interpretation for the learners. The use of actors who are trained to portray occupational therapy clients or live interviews of former occupational therapy clients have also been used to present cases in the educational process. These actors or clients have either been invited to interact with occupational therapy students in classroom settings, or they were videotaped for student review (Bazyk & Jeziorowski, 1989; Liu, Schneider & Miyazaki, 1997; Lysaght & Bent, 2005; Neistadt & Smith, 1997; Van Leit, 1995).

Lysaght and Bent (2005) studied four types of cases used to facilitate clinical reasoning. These included a text-based case, videotapes of actual clients with deficits amenable to occupational therapy presented in the classroom, live interviews of former patients in the classroom, and videotapes of clients that were presented over CDs and an internet platform. The researchers concluded that all methods contributed to student learning and development of clinical reasoning skills, based on student performance on assignments. The authors used qualitative analysis to draw conclusions about the advantages and disadvantages of each of the various methods. They found text based cases to be convenient for students, and have favorable reports of instructor control from

the teachers. The videotaped clients were efficient for student time and were reported by instructors to be rich in terms of context for the reasoning process. The live interviews of clients in the classroom were rated well by students for time efficiency and insight into their clients, but were viewed negatively by instructors due to very high preparation time and efforts. Finally, cases presented in CDs over the internet were ranked high by both students and instructors in terms of control and convenience, but were viewed negatively due to difficulty in using the technology.

Tomlin (2005) examined student decision-making and fieldwork performance after using interactive video client simulations in the didactic portion of the occupational therapy curriculum. He compared students' performance on the simulations with students' grade for the course and with their score on fieldwork evaluation forms. Using multiple regression analysis, he concluded that in the first group of 42 students studied, those with higher course grades were rated higher on fieldwork, but that students who selected more potentially correct answers (more complete answers) on the simulation were rated lower on fieldwork. For the second group of 30 students studied, neither performance on the video simulation nor course grades were predictive of fieldwork success. He concluded that the video simulations offered insight into students' ability to make decisions about clients, but that the simulations alone were not predictive of success on fieldwork. A combination of completeness on the simulations and course grades accounted for approximately 42% of the variability in fieldwork grades.

A literature review conducted by Cook and Triola (2009) identified the use of virtual patients (interactive computer-based clinical scenarios) as a cost-effective tool to develop facilitate knowledge and skill acquisition in health professionals. They described

eight studies that demonstrated improved student learning over no intervention, one study that showed virtual patients are better for learning technical skills than education with standardized (human actor) patients, and one study that favored virtual patients over text-based cases.

A case-based reasoning library was created in the United Kingdom as a prototype to assist occupational therapists working in a community setting to identify the appropriate needs of their clients, and to provide recommendations regarding types of assistive technology to use in their homes (Taylor, Robertson, Wiratunga, Craw, Mitchell, & Stewart, 2007). A four-stage case-based reasoning cycle was created that comprised retrieval of the most similar case or cases to the identified need of the client served by the occupational therapist, reuse of the knowledge embedded in the case to develop solutions to problems, revision of the solutions to develop the best recommendations for the particular client, and retaining the parts of the particular case that may be useful for future needs. A total of eleven actual cases and twelve expert-created cases were programmed into a database that allowed occupational therapists to retrieve cases based on a number of search terms. Although Taylor, et. al. (2007) did not study outcomes related to this case-based reasoning model, the usefulness of the tool and reasoning process are viewed as a means for collaborative problem-solving and generating outcomes specific to client needs.

Case-based reasoning in occupational therapy educational has been used as a means of engaging students in learning and to support collaboration among students. The design of cases has included text-based cases, actors portraying clients, live interviews of clients, and videotapes of therapists and patients. These have been presented in

classrooms as well as over internet platforms (Bazyk & Jeziorowski, 1989; Liu, Schneider & Miyazaki, 1997; Lysaght & Bent, 2005; Neistadt & Smith, 1997; Neistadt, Wight & Mulligan, 1998; Van Leit, 1995). Student satisfaction has been reported with instructional methods that utilized case-based reasoning in one qualitative study (Lysaght & Bent, 2005). While these studies describe attributes of the cases and discuss how they contribute to knowledge acquisition and decision making, they do not study the impact on the cognitive process of reasoning or critical thinking that may occur in the occupational therapy students as a result of case-based learning.

Measures of Critical Thinking in Occupational Therapy Education

Lederer (2007) examined the construct of critical thinking as it related to clinical reasoning in occupational therapy students at Spalding University through use of the California Critical Thinking Disposition Inventory (CCTDI). This instrument assisted in describing student skills in truth-seeking, open mindedness, analyticity (anticipating the consequences of actions), systematicity (approaching problems in a systematic and disciplined manner), critical thinking self-confidence, inquisitiveness, and maturity of judgment. However, this was not linked to any particular content, course, or instructional methods.

Vogel, Geelhoed, Grice, and Murphy (2009) used the Watson-Glaser Critical Thinking Appraisal (WGCTA) to determine if the physical therapy (PT) and occupational therapy (OT) curricula at the University of Texas Health Science Center developed critical thinking skills in these students. The instrument was administered at the beginning and end of a two year Master's degree program for 37 PT students and 13 OT students. No significant difference was identified for PT students' pre-and post-test

scores, but there was a significant increase for OT students. Researchers explain their findings by examining the differences in the two curricula: both include problem-based learning modules, small group problem-solving, examination of case studies, and clinical observations. However, the OT curriculum included more learning activities that teach "critical thinking as a process" (Vogel, et al, 2009, p. 154).

Royeen, Mu, Barrett and Luebben (2001) developed a Self-Assessment of Clinical Reflection and Reasoning (SACRR) as a means to understand student perceptions of their reasoning skills. This instrument was based on foundational principles of Roth (1989) regarding skills required of a reflective practitioner. It consists of 26 self-report items related to reasoning and reflection, measured through a 5 point Likert-type scale. Royeen et al. (2001) describe clinical reasoning as a reflective process, and promoted the usefulness and construct validity of the SACRR as a self-report measure for students and new practitioners. A pilot study of the SACRR was conducted to establish validity and reliability, in which occupational therapy students at a Midwestern US university completed the assessment as a pre-test in their first semester of the program, and then as a post-test one week later. Statistical analysis using Cronbach's alpha demonstrated validity at 0.87 for pre-test internal consistency and 0.92 for post-test internal consistency; Spearman's rho demonstrated reliability at 0.60. Royeen et. al. (2001) then used the SACRR to provide a pre-test and post-test for practicing occupational therapists who attended a two-day clinical reasoning workshop. Statistically significant differences in scores indicated that the participants had indeed increased reasoning by the end of the workshop.

Coker (2010) set out to understand the effects of experiential learning of occupational therapy students on clinical reasoning skills, using the SACRR and CCTST instruments. One group of 25 graduate students took these tests before and after a one-week interventional camp with children with cerebral palsy. Statistically significant differences were found in overall SACRR scores and 22 of the 26 items on the SACRR. In addition, statistically significant differences were noted in three of five subscales of the CCTST, including evaluation, inductive reasoning and deductive reasoning. Coker (2010) concludes that experiential learning improved clinical reasoning skills.

Scaffa and Wooster (2004) studied the effects of problem-based learning in an occupational therapy curriculum on clinical reasoning using the SACRR. Forty-eight undergraduate students completed this assessment before and after a five-week course that used problem-based cases in pediatrics, physical rehabilitation, mental health, geriatrics and community-based practice. For these students, statistically significant improvements in clinical reasoning were identified for total scores and 11 of the 26 items of the SACRR. Scaffa and Smith (2004) also used the SACRR to measure a statistically significant improvement in clinical reasoning skills of 48 undergraduate occupational students following their participation in Level II Fieldwork experiences, in which the students are supervised in a clinical setting for 12 weeks, 40 hours per week.

These studies have examined clinical reasoning skills in occupational therapy students in more explicit ways than prior studies. They have been utilized to understand student reasoning at specific points in time (Lederer, 2007; Vogel, Geelhoed, Grice & Murphy, 2009) or related to experiential or problem-based learning (Coker, 2010; Royeen, Mu, Barrett & Luebben, 2001; Scaffa & Smith, 2004; Scaffa & Wooster, 2004).

Use of specific instruments has also proven useful as a method to measure clinical reasoning through self-report and through standardized instruments. While these instruments are useful, gains in clinical reasoning have not been linked to case-based learning methods or case-based reasoning in occupational therapy students.

Creation of Cases Based on Case-Based Reasoning across Disciplines

Literature in various disciplines can be used to inform the creation or design of learning cases that may be utilized in case-based learning activities. Bagdasarov, et. al., (2012) for example, conducted research to determine how best to design learning cases used in an ethics curriculum, specifically ethical decision-making. Graduate students were randomly assigned to four groups, who used different techniques related to the design of cases used for case-based learning. The first group was given a structured case and then asked to elaborate on the case through a series of directed questions; the second group developed their own case; the third group developed a case and then elaborated on the case by designing associated questions, and the last group was considered a control group as they simply wrote brief responses to a structured case. After analysis of pre-and post-test performance, the groups that worked with structured cases had statistically significant greater knowledge acquisition than the student who wrote their own cases, as well as highest performance on ethical decision-making strategies. This study lends support to the ability of learners to develop knowledge and skills through the use of cases that are built on the experiences of experts.

Ill-structured problem-solving is more characteristic of real-world demands, rather than very structured problems that are typical of classroom learning. Choi and Lee (2009) studied seven sub-skills of ill-structured problem solving as it applied to the

undergraduate education of pre-service teachers. The skill of problem identification included the sub-skills of consideration of multiple perspectives, justification or developing arguments, critical thinking, and linking theory to solutions. The skill of solution identification included the sub-skills of justifying solutions, critical thinking, and linking theory to practice. The researchers determined that an online case-based learning module facilitated improvement in all of these problem-solving sub-skills in cases that were repeated for learners. In addition, the transfer of learning to new cases was identified specifically in the sub-skills of developing multiple perspectives and solution identification, but not in critical thinking and linking theory to practice. Choi and Lee (2009) explain these limitations in transfer of learning by suggesting that cases promote more real-world problem solving opportunities and increase problem-solving skills; however, students need guidelines for the cognitive processing to occur, and scaffolding of skills and abilities is useful for student learning.

Scaffolding is also addressed by Jonassen (1996), in a discussion of using case-based reasoning in medical education. He introduced the concept of scaffolding based on Vygotsky's concept of zone of proximal development, in which supports are provided within a learner's readiness for skill development, but then gradually reduced as the learner develops new skills. In medical education, this process of scaffolding addressed the breadth and depth of knowledge needed to acquire the reasoning skills required to determine a patient's medical diagnosis. This approach facilitates causal modeling, in which previously learned phenomena are used to understand new situations and to solve problems. Jonassen (1996) also described how the use of computer-based cases allows for a wide variety of case development and gradual removal of instructor or expert-

provided information to foster increased use of diagnostic reasoning by the medical student.

Jonassen and Hernandez (2002) recommended designing cases that promote learning through the identification of problems, discussion of solutions used by the experts in the case, examination of outcomes of that situation and solution, and ultimately review of lessons learned. As cases are built, the author should consider what each story teaches and how it can be indexed. This cue for storage and retrieval of cases could be done according to theme, goals, plans or approaches used, outcomes, or lessons learned.

Development of Cases for Proposed Research in Occupational Therapy

Across disciplines, the literature supports the use of case-based learning as an instructional method to engage students in ill-structured problem-solving, to facilitate knowledge acquisition, and to develop the reasoning skills utilized by the student pursuing a career in occupational therapy as already discussed. Further development of the video cases, in accordance with the guidelines of the literature, could in fact improve student reasoning skills. The current structure of cases may not be utilizing the instructional method of case-based learning to its true potential; therefore development of a new video case library system is appropriate.

Authenticity of the cases, situated in real-world experiences, is cited as important by many of the authors (Kim, Phillips, Pinsky, Brock, Phillips, & Keary, 2006; Kolodner, 1997; Thistlethwaite, et. al., 2012). Therefore, the new video cases must be obtained in actual clinical settings with current clients. Ideally, these will be obtained over a number of subsequent sessions, in order to document changes in the individuals over time,

through their participation in occupational therapy services. This would also promote the ability of students to evaluate outcomes of the therapy process.

Another key aspect of the cases is that they are facilitated by experts, and clearly demonstrate the skills and abilities of the experts (Bagdasarov, et. al., 2012; Kolodner & Guzdial, 2000; Jonassen & Hernandoz-Serrano, 2002; Thistlethwaite, et. al., 2012). These videotapes will include the explanations by the treating therapists whenever possible. As occupational therapists often describe and explain the therapeutic purposes of activities to their clients, this could be explicitly captured during filming so that students could also benefit from this description. Having the treating therapist describe the context of the client's situation, diagnosis, and overall occupational therapy goals would also be valuable to capture, as the introduction of the case to students. Additional support for understanding the context and therapeutic strategies used by the therapists in the videos can be provided to students by the classroom instructor, who is an occupational therapist familiar with the treatment setting. Scaffolding, as a concept of support, is encouraged by Choi and Lee (2009) and Jonassen (1996). This could be addressed in several ways. First of all, by recording the same client in therapy over the course of several therapy sessions, scaffolding could be built in to the case. In the first session viewed, students would be able to hear more descriptive information from the treating therapist as he or she introduces the client case. Over subsequent taped sessions, these descriptions and explanations can gradually be removed, and students can be prompted to observe and reflect on the decisions of the therapist and the outcomes of the client. Another method of scaffolding could be built into the learning activities used after the video sessions. As the students begin the video cases, the questions could be very

directive and specific. Subsequent sessions could include questions or prompts that provided less specific direction, build on the answers or solutions derived from earlier sessions, and promote more open-ended discussion as the sessions progressed.

Much of the research in case-based learning supports an analytical, reflective process in which problems are identified and articulated, solutions are examined, and outcomes are considered (Jonassen & Hernandoz-Serrano, 2002; Kolodner, 1997; Williams, 2005). There are also studies that support collaborative learning and group processing of the cases (Curran, Sharpe, Forristall, & Flynn, 2008; Kaddoura, 2011; Thistlethwaite, et. al, 2012; Williams, 2009). It is recommended that as the new cases are developed, that collaborative learning be infused. Specific prompts could be included with the videos, and these learning activities could be discussed either face-to-face or in online discussions among student groups. By working collaboratively, students could be asked to identify problems, generate solutions, and propose appropriate intervention techniques. As they view subsequent occupational therapy sessions with those patients, students can assess if their solutions were used by the therapists, and if so, they can make some judgments about outcomes. The group process allows students to justify their opinions, elaborate on the ideas of other students, and reflect on the reasons for their recommendations.

In summary, the development of new video cases would utilize recommendations from the research literature to develop the best possible case-based learning tools. They will be situated in authentic, real-world occupational therapy settings, facilitated by experts in the form of the treating therapist on the video and the video editor, utilize scaffolding in the design of the cases, and use collaborative and reflective learning

practices by design. These cases, based on sound case-based learning and reasoning theory, could facilitate improve knowledge and skill acquisition by students, and thereby improve the clinical reasoning required on a competent occupational therapist. For this research, video cases were constructed following the best practices regarding the creation of video cases in the literature. Detailed information regarding the development of those video cases is included in Chapter 3.

Chapter III: Methodology

The purpose of this research study was to examine the relationship between the use of video cases presented over an online platform, combined with a clinical reasoning learning activity, and the development of clinical reasoning skills in occupational therapy students. In order to fully examine the effectiveness of the video case-based learning activity, clinical reasoning measures were compared between groups of students utilizing different instructional methods, namely video cases or text cases. Student satisfaction and perceptions of both the learning process and their perceptions of their clinical reasoning abilities were examined, in order to fully understand the impact of case-based reasoning on the development of clinical reasoning. Ultimately, this study aimed to assist in determining if occupational therapy students are well prepared for clinical and professional practice, and have advanced their ability to perform clinical reasoning in their discipline, as a result of specific case-based learning activities.

Research Questions

This complementary mixed methods research examined the use of video cases presented over an online platform and an associated clinical reasoning learning activity in an occupational therapy curriculum, focusing primarily on the influence to student clinical reasoning skills, student perceptions of clinical reasoning, and student satisfaction and perceived learning effectiveness of the instructional tools and methods.

This research aimed to answer the following research questions:

1. Is there a statistically significant difference in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online

video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone?

2. Is there a statistically significant difference in self-reported, perceived clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone?

3. What are undergraduate occupational therapy student satisfaction, perceptions of learning experience and perceptions of clinical reasoning with the use of case-based learning activities, utilizing either a comprehensive online video case study with a clinical reasoning learning activity or text and video cases alone?

Mixed Methods Research Design

The mixed methods research design was optimal for exploring these research questions fully. Clinical reasoning, as utilized in the discipline of occupational therapy, is a complex cognitive process that is difficult to measure or observe in a single, structured way (Boyt Schell & Schell, 2008; Ciaravino, 2006; Lederer, 2007; Mattingly, 1991; Rogers, 1983; Vogel, et., al., 2009). Therefore, quantitative or qualitative analysis alone is insufficient in examining how clinical reasoning may be taught or developed. Combining qualitative and quantitative inquiry allows for a deeper understanding of a complex issue (Creswell & Plano Clark, 2011; Creswell, Plano Clark, Gutman & Hanson, 2003; Hissong, Lape & Bailey, 2015). Utilizing a mixed methods approach promotes a more comprehensive examination of the issue, and could increase the legitimacy or confidence in the findings (Hissong, Lape, & Bailey, 2015). Therefore, utilizing the

mixed methods approach had the potential to more fully understand how clinical reasoning develops as a result of case-based instructional methods.

The specific mixed methods approach used for this research study was a complementary design, in which the qualitative findings were used to more fully understand the quantitative findings. Green, Caracelli, and Graham (1989) describe the complementarity reasoning for mixed methods as seeking "elaboration, enhancement, illustration and clarification of the results from one method with the results from the other method" (as cited in Creswell & Plano Clark, 2011, p. 62). Specifically, qualitative data from student interviews were conducted in order to elaborate on the quantitative data obtained from a standardized assessment of reasoning skills that was completed by occupational therapy students.

Morgan (1998) described how the complementary design is often used in health research, in which each type of data is examined with a particular priority and sequence in mind. This complementary approach is distinctly different from a mixed methods design that seeks to converge results or triangulate findings. Complementary research does not attempt to duplicate findings through different types of research. Instead, complementarity involves a division of labor between research methods, in which one type of analysis supports or explains another set of findings from a different analysis. Morgan (1998) proposes that one type of research assumes the priority for answering a specific research question, while the other type of research explains those findings, or elaborates on the results for greater understanding. This approach is consistent with the explanatory design described by Creswell and Plano Clark (2011), in which quantitative data is first collected and analyzed, and has priority in answering the study's research

questions. The qualitative data is subsequently collected and analyzed, as a means to explain or expand on the quantitative results. Creswell and Plano Clark (2011) describe mixing as the process of infusing results from the two types of data in order to answer all research questions fully.

For this research study, the quantitative data used to measure clinical reasoning were collected first in the research sequence, as well as with the highest priority. Connecting the clinical reasoning process to specific instructional methods has not been well supported in existing literature, and this gap contributed to the significance of the research conducted in this study. Therefore, it was the primary driving force for conducting this research. The qualitative data regarding student satisfaction, learning experience, and perceptions of reasoning were collected as a follow-up to the quantitative data. This was done in an attempt to elaborate on the quantitative findings for a deeper understanding of the phenomenon of clinical reasoning. This was a secondary priority for this research since there is currently some existing support in the literature for student satisfaction and perceptions of learning using case-based reasoning (Curran, Sharpe, Forristall & Flynn, 2008; Kim, Pederson & Baldwin, 2012; Williams, 2009). By utilizing the complementary mixed methods approach for this research, and in the sequence of quantitative priority and qualitative follow-up, objective measures of clinical reasoning as they related to instructional methods were first analyzed, and then interview data from students were analyzed to gain a deeper understanding of both the learning experience and the development of clinical reasoning.

For this research study, one instrument was used to measure clinical reasoning, namely the Health Science Reasoning Test. This instrument provided quantitative data

that were analyzed to determine changes in clinical reasoning that existed within groups, by examining differences between pre-test and post-test scores, and then between groups, by examining differences between a control group, using the text based cases, and intervention group, using the video based cases. A second instrument, the Self-Assessment of Clinical Reflection and Reasoning, also provided quantitative data regarding students' perceptions of their reasoning skill. This quantitative data were collected first, and with the highest priority in accordance with the complementary methods and following a sequential approach (Creswell & Plano Clark, 2011; Creswell, Plano Clark, Gutman & Hanson, 2003, Johnson & Onwuegbuzie, 2004; Morgan, 1998). To fully understand student perceptions and satisfaction, interviews were then conducted that utilized qualitative analysis to understand the phenomena of student experience. This allowed for elaboration and explanation of the quantitative data. The quantitative and qualitative phases of the mixed methods research were conducted sequentially, for several reasons. First of all, by conducting the quantitative measures of clinical reasoning first, the results were used to inform and expand the interviews used for qualitative understanding of student perceptions. In addition, by performing the interviews after the conclusion of the semester, students were able to speak more freely and openly since they had completed all graded portions of the course in which the study is situated.

By following this mixed-methods methodology, and integrating the two types of results, more meaningful conclusions were able to be drawn about the value of the video case library and learning activities related to occupational therapy student clinical reasoning.

Research Context

This research was conducted at a mid-size regional university in the mid-Atlantic United States. Students enrolled in an entry-level, Combined BS/MS program in occupational therapy at this university were recruited to participate in the study. This curriculum combines four years of undergraduate education with one years of graduate education to prepare students to become occupational therapists. Forty students are accepted to this program each fall, and move through a prescribed curriculum as a group or co-hort.

Students in the Combined BS/MS occupational therapy program are selected through a competitive screening process. Once accepted into the program, students must follow a prescribed sequence of coursework. During the spring semester of the second year of the program, the occupational therapy students must enroll in Adult Musculoskeletal Occupational Therapy. This was the course in which the research was conducted. It follows a lecture and lab format for one academic semester, approximately 16 weeks. Students were enrolled in two sections, which allowed for formation of the control and experimental groups according to section. Learning objectives in the Adult Musculoskeletal Occupational Therapy course describe preparation of students for occupational therapy service provision to clients with a variety of musculoskeletal conditions who are admitted to hospitals and similar clinical settings. Student learning is assessed through written assignments, tests, and performance of clinical competencies and skills in lab simulations. The comprehensive video case study and associated learning activity, which had already been validated by experts, was given to students in one section of the course, with the activity completed both in class under instructor

guidance and as two out-of-class student assignments. The students in the other section completed the text-based case activity and only brief classroom discussions of limited videos. These learning activities were also completed in class under guidance of the instructor, and then completed as two out-of-class student assignments.

Participants / Sampling

The students enrolled in the Adult Musculoskeletal Occupational Therapy course, who were recruited to participate in this study, were able to self select their section of the course. Enrollment was capped at 20 per section, to ensure class sizes that allow for closer interaction with instructors in accordance with department policies and curriculum design. Within the department, course selection is grouped for all courses offered in a semester, so that the same 20 students in one section of a course will stay together as a group for all courses taken that semester.

This convenience sampling technique had both advantages and disadvantages related to the research. An important advantage was that grouping students by course section allowed for two groups to complete different assignments, essentially forming a control group and an experimental group. This was important since instructor-guided case-based learning activities were presented during lab time for each individual section, in preparation for the out-of-class case-based assignments. Since students remained in their groups for all the classes during the semester, cross-contamination by other assignments or experiences was limited. The primary advantage to the use of convenience sampling is gathering a group of participants who can be easily recruited for a study, making it a practical option for sampling in educational settings (Johnson & Christensen, 2012; Portney & Watkins, 2009).

A disadvantage of the convenience sampling technique was that the two groups were not randomized, so there was no method to control for possible differences in the groups. In fact, Portney and Watkins (2009) describe that the self-selection process used in convenience sampling has the potential to create bias within the groups, as there may be other reasons the students form the specific groups. Therefore, it is important to gather data about the characteristics about the participants, so that the results can be understood in terms of the specific people included in the sample. For this study, the convenience sampling technique s necessitated gathering some information about the possible pre-existing differences in the groups, to determine any influence on statistical analysis. Basic demographic information was collected, including age, GPA, and gender, to allow for comparison of their baseline characteristics and determine if these were non-equivalent groups. Finally, convenience sampling limits generalizability, as the sample cannot be assumed to be representative of the entire population (Johnson & Christensen, 2012; Portney & Watkins, 2009).

The small sample size does not adequately detect change if the power or effect size of the intervention is small. To address this problem and potentially increase the sample size, data collection was conducted over two semesters, in the spring of 2014 and the spring of 2015, as the Adult Musculoskeletal Occupational Therapy course is only offered in the spring semester. Exploration of the 2014 data allowed for preliminary investigation of data collected and possible trends, and assisted in identification of additional areas of data collection for 2015. For example, data regarding prior experience in physical rehabilitation was collected in 2015 to better understand possible pre-existing differences among participants, even though it was not collected in 2014.

In the spring of 2014, 40 students were enrolled in Adult Musculoskeletal Occupational Therapy, specifically in two sections of 20 students. Thirteen students in each section of the course completed the quantitative pre-test and post-test, or a total of 26 students, a 65% rate of participation. In the spring of 2015, 35 students were enrolled in Adult Musculoskeletal Occupational Therapy, one section of 17 and one section of 18 students. All students enrolled in the course completed quantitative pre-tests and post-tests, for a 100% rate of participation. Once again, the comprehensive video case and associated learning activity was utilized repeatedly in one section and the text-based case activity was used repeatedly in the other section.

Although the sample size was small, it is not atypical of research in occupational therapy education. Vogel, Geelhoed, Grice, and Murphy (2009), for example, described statistically significant differences in critical thinking skills of a sample of 13 occupational therapy graduate students, as measured by the Watson-Glaser Critical Thinking Appraisal. Pilot testing for reliability of the SACRR (Royeen, et. al, 2001) utilized a sample size of 30 occupational therapy students. Coker (2010) measured clinical reasoning with the SACRR and CCTST with 25 occupational therapy graduate students, and reported statistically significant differences in specific sections of each instrument. A key difference in this research study and the studies reported in the existing occupational therapy literature is that this research utilizes a control group and intervention group, while the other studies only examined changes in one (intervention) group.

In order to determine what sample size was most appropriate for this research, literature was chosen for review that considered similar outcomes and measures. Sample

size estimations were done using G*Power software, to calculate needed sample sizes for the different types of data being collected and analyzed. All calculations assumed a significance level of 0.05 and a power of 0.80. Kaddoura (2011) used the California Critical Thinking Skills Test (CCTST) to compare the effects of case-based learning to those of traditional didactic instruction in nursing students. Based on his reported means of 10.11 (SD 3.15) for the traditional instruction group and 14.45 (SD 2.80) for the intervention group on the CCTST, the effect size is 1.4 and a total sample of 28 (2 groups of 14) is needed to detect a change in use of this reasoning, utilizing this standardized instrument. This study was chosen because items in the HSRT were taken from the CCTST item pool; in addition this study is similar to the design of the proposed research study. Coker (2010) utilized the CCTST and the SACRR to assess the effects of experiential learning on the reasoning skills of 25 graduate level occupational therapy students. The students completed these two assessments before and after their participation in a week-long day camp with children with cerebral palsy. Scores on the CCTST improved from a mean of 19.60 (SD 3.73) to a mean of 21.52 (SD 3.92), identifying an effect size of 0.51 and a total recommended sample size of 87.

These two studies using the CCTST would recommend fairly disparate sample sizes. According to the study of nursing students by Kaddoura (2011), a sample size of 28 is needed, based on an effect size of 1.4. The study of occupational therapy students by Coker (2010) would indicate a sample size of 87, based on a more reasonable effect size of 0.51.

A pilot study was conducted prior to this research study, in 2013. An effect size of 0.57 was determined between the overall post-test scores for the control and

intervention groups, with a total sample size of 12 students. In this research study, a total sample size of 61 was achieved when data was combined from 2014 and 2015. As calculated with G*Power software, this would be acceptable if the potential effect size is at least 0.57, which is consistent with the pilot study.

Research Procedures

Institutional Review Board approval was obtained prior to beginning this study (see Appendices A and B). Students enrolled in Adult Musculoskeletal Occupational Therapy, which is required in the undergraduate portion of the Combined BS/MS degree program, were invited to participate in this study. The research was conducted in two phases, in order to obtain an adequate sample size for meaningful analysis. In the spring of 2014, 13 participants were recruited from each section of the course, for a total of 26 students. In spring of 2015, 17 students participated from one section and 18 students participated from the remaining section, for a total of 35 students. The total sample size for both semesters was 61 participants. All students participated voluntarily and provided informed consent (see Appendix C). All students enrolled in the course received the same learning activities and instruction according to their section of enrollment, whether or not they agreed to participate in the study. Grades for any assignments or for the course were in no way influenced by a student's choice to participate, or not participate, in the study.

In both data collection cycles, all students were asked to provide basic demographic data (age, gender, GPA) and to complete the Health Science Reasoning Test as a pre-test, to determine baseline reasoning skills and to allow for statistical control to limit the effect of pre-existing differences (see Appendix D for HSRT sample). In the

2015 data collection cycle, students were also asked to provide data regarding their prior experience in physical rehabilitation and to complete the Self-Assessment of Clinical Reflection and Reasoning (SACRR), to understand student perceptions of their reasoning skills (see Appendix E).

Students in one section of the course acted as a control group, as they received the traditional instructional methods and activities currently used in the course. This included viewing brief video clips from an occupational therapy online video library during class time, to illustrate specific teaching points made by the instructor. The two to five minute clips were used in isolation, rather than in a comprehensive case and differed from the cases chosen for the clinical reasoning learning activity. Watching the brief clips was followed by classroom discussion of what is viewed in the tape, client characteristics observed, and understanding of the therapeutic techniques used by the therapist. Classroom discussion of written cases was conducted several times during the semester, to illustrate occupational therapy principles as provided for patients with conditions included in the course. Two out-of-class assignments utilized written cases provided in a text book (Halloran & Lowenstein, 2000) with directed questions about appropriate actions and interventions that should be undertaken by the therapist (see Appendix F). There was no explicit discussion of clinical reasoning associated with these assignments or with the brief video clips used to illustrate points made in class. The first assignment was completed in groups of two to three students; the second assignment was completed individually by each student for a different text case.

Students in the other section of the course acted as an intervention group. They first viewed comprehensive video case studies and participated in classroom discussions

facilitated by the instructor that followed the format and guidelines of the clinical reasoning learning activity (see Appendix G). This was consistent with the principle of expert guidance utilized in case-based learning (Choi & Lee, 2009; Jonassen & Hernandoz-Serrano, 2002; Kim, Phillips, Pinsky, Brock, Phillips, & Keary, 2006; Kolodner & Guzdial, 2000; Thistlethwaite, et. al, 2012). This large group review of the assignment during class time was also supported by the expert reviewers who validated the learning activity. These students then completed two out-of-class assignments utilizing the comprehensive online video cases with the clinical reasoning learning activity. The first of these out-of-class assignments was completed in groups of two to three students. Students were permitted to self-select group members, as they should feel free to discuss their reflections related to reasoning openly and comfortably. The second assignment was completed individually. This group learning was consistent with the principles of scaffolding and collaborative learning utilized in case-based learning and supported in the literature (Choi & Lee, 2009; Curran, Sharpe, Forristall, & Flynn, 2008; Jonassen, 1996; Jonassen & Hernandoz-Serrano, 2002; Kaddoura, 2011; Kim, Phillips, Pinsky, Brock, Phillips, & Keary, 2006; Kolodner & Guzdial, 2000; Thistlethwaite, et. al, 2012; Williams, 2009).

At the end of the semester, all participants again completed the Health Science Reasoning Test and Self-Assessment of Clinical Reflection and Reasoning, which allowed for data analysis, which included exploration of any change from the initial pre-test. Based on the performance of students on each of these two measures, students from each group who score in high, moderate, and low ranges were asked to participate in an in interview, to investigate their satisfaction with the learning activities, their perceptions

of the instructional methods, and self-perceptions of clinical reasoning (see Appendix H). This allowed for inclusion of all student performance levels in the interview data, and contributed to qualitative analysis that is representative of the group as a whole. In the control group, this was successful as the lowest and highest achievers on the HSRT pre-test participated, and other participants were medium achievers. However, in the intervention group, medium to low performers were the participants who agreed to be interviewed. A sample size of four students was obtained from the 18 students enrolled in the each section, for a total of eight interviews. This was consistent with recommendations of sample sizes of 5 to 25 individuals for this type of qualitative inquiry, which followed a phenomenological approach (Creswell, 2007).

Consistent with the complementary mixed methods research design, integration of the qualitative and quantitative findings were then undertaken. Qualitative findings from the interviews were used to elaborate on and enhance the quantitative findings from the Health Science Reasoning Test and the Self-Assessment of Clinical Reflection and Reasoning. This research procedure is graphically displayed in Figure 1.

Measures / Instrumentation

As introduced in the research procedures, the two primary instruments utilized for quantitative data collection were the Health Science Reasoning Test and the Self-Assessment of Critical Reflection and Reasoning. Interviews were utilized to gather qualitative data regarding student perceptions of the learning experience and activities. All instruments are further described.

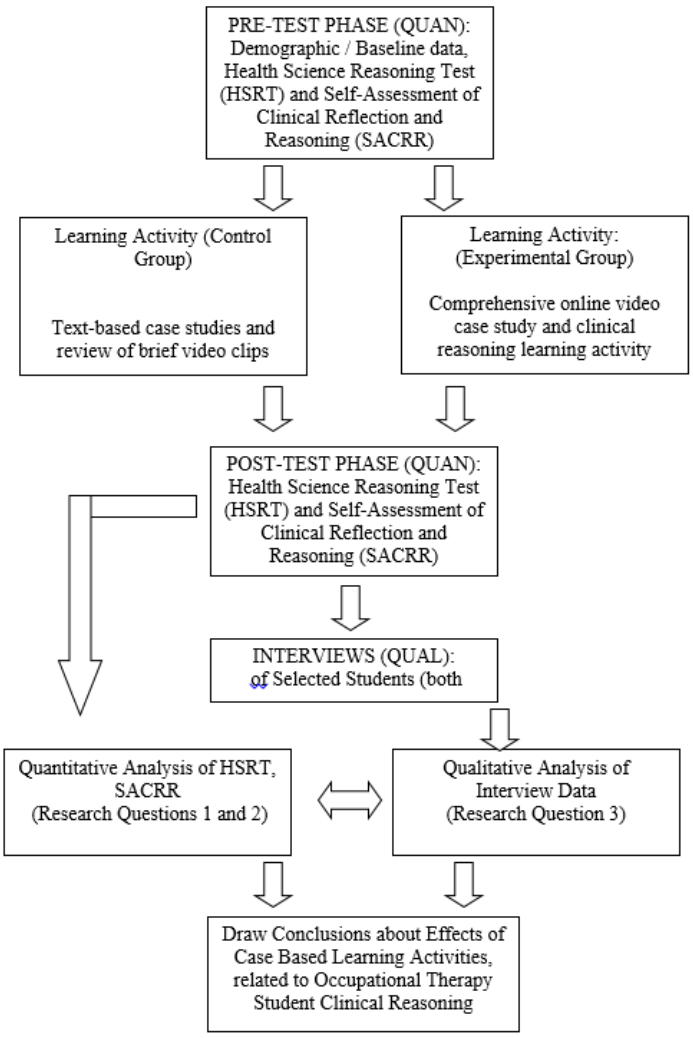


Figure 1: Overview of Complementary Mixed Methods Research Design

Health Science Reasoning Test.

The Health Science Reasoning Test (HSRT) is an instrument that is designed to measure critical thinking skills among students in undergraduate programs that prepare the students for careers in health professions (Insight Assessments, 2014). This instrument draws from the pool of questions used for the California Critical Thinking Skills test (CCTST), which has been used in many disciplines to measure critical thinking skills (Insight Assessments, 2014), including health disciplines such as nursing and occupational therapy (Coker, 2010; Kaddoura, 2011). The HSRT was developed as a

subset of the CCTST to reflect the critical thinking skills of students in health science undergraduate and graduate educational programs, while the CCTST is not specific to any discipline. It consists of 33 multiple choice questions which assess the skills of analysis, inference, evaluation, deduction and induction of the individual test takers, and which also provides overall reasoning and percentile scores that may be compared to a normative sample (See Appendix D for sample Clinical Reasoning items).

Content validity of the HSRT, and all critical thinking assessments administered by Insight Assessments, was established using the definitions and descriptions of critical thinking developed by The American Philosophical Association (1990), based on a Delphi study utilizing the opinions of 46 experts, conducted over a 2 year period. Insight Assessments (2014) cites the conclusions of these experts included in the Delphi study as an assurance of content validity. Insight Assessments (2014) reports that construct validity of the family of CCTST assessments is supported by correlation with other reasoning tests, such as the Graduate Record Examination. Criterion validity is supported by the use of the CCTST in research studies, in which critical thinking scores were predictive of certification exam success for students in nursing, pharmacy, and physical therapy programs, and clinical performance of optometry and dentistry students (Denial, 2008; Giddens & Gloeckner, 2005; McCall, MacLaughlin, Fike & Ruiz, 2007; Vendrely, 2007; Williams et al., 2003). Reliability is reported by Insight Assessments (2014) to be high, based on analysis of existing studies (Kuder-Richardson -20 analysis, comparable to Cronbach's alpha for dichotomously scored instruments, demonstrated values from 0.78 to 0.82, indicating high internal consistency).

Abrami, et al (2008), conducted a meta-analysis to examine the influence of instructional methods on the development and/or improvement of critical thinking. In the course of this meta-analysis, the authors discussed various instruments in the literature that have been used to measure critical thinking, one of which was the CCTST. The researchers determined that individual subscales of the standardized assessments were less effective in measuring critical thinking than overall or summative scores. Abrami, et al (2008) acknowledged that critical thinking is a difficult construct to measure, and recommended varied methods to understand critical thinking.

The HSRT was chosen for this research for several reasons. First, it is a subset of the CCTST, and the studies included by Insight Assessments (2014) indicate that this measure has better validity and reliability than an instrument created by the researcher. Secondly, it is a standardized assessment that has been designed to measure critical thinking specifically in the context of health care, making it relevant for occupational therapy students. Thirdly, use of the normative data set of undergraduate occupational therapy students makes it relevant for the research, as this is the target population. It is a 33 item test that in administered within one hour, so it was a reasonable expectation for completion by undergraduate students who were taking a heavy course load. The HSRT provides results as raw scores, percentile scores, and performance categories (not manifested, weak, moderate, strong and superior), so this allows for comparison of the study participants with other occupational therapy students (Insight Assessments, 2014). Finally, the types of reasoning identified and measured in the HSRT, namely analysis, inference, evaluation, induction and deduction, are the foundational types of reasoning necessary for competent clinical practice as an occupational therapist, identified in the

occupational therapy literature (Boyt Schell & Schell, 2008; Crepeau, Cohn, & Boyt Schell, 2009; Fleming, 1991; Fleming & Mattingly, 1993; Mattingly, 1991, Rogers, 1983).

Self-Assessment of Clinical Reflection and Reasoning.

The Self-Assessment of Clinical Reflection and Reasoning (SACRR) is a 26-item self-report Likert-scale questionnaire that was designed by Royeen, Mu, Barrett and Luebben (2001) to evaluate the effect of instructional methods on clinical reflection and reasoning (see Appendix E). The SACRR has been used to study problem-based and experiential learning specifically in occupational therapists and occupational therapy students (Coker, 2010; Scaffa & Smith, 2004; Scaffa & Wooster, 2004). Royeen, Mu, Barrett and Luebben (2001) developed and then pilot tested this instrument with expert occupational therapists for two years. They modified the items based on this review by experts, in order to establish content validity. To investigate reliability, the authors administered the SACRR to 30 students during their first semester in an occupational therapy program, and then again one week later. Analysis of pre-and post-test scores had high scores for internal consistency (Cronbach's alpha .87 for pre-test, .92 for post test); test-retest reliability was low to moderate (Spearman's rho .60). The SACRR was then tested with 109 health professionals who attended a continuing education conference focused on clinical reasoning skills which utilized didactic presentation, lab activities, and case-based discussions. Statistical analysis identified a statistically significant difference in pre-and post-test scores of the SACRR, indicating that the instrument is useful in detecting a change in self-perception of clinical reasoning skills used in the practice of occupational therapy.

The SACRR was chosen for this research because it was designed for use within the discipline of occupational therapy and is based on constructs of clinical reasoning that are recognized in the field. Although the reliability and validity evidence is limited, inclusion in the study offered the opportunity to compare results from this measure with results from the HSRT. By combining these two measures, there was an opportunity to address convergent validity of each of these instruments. Finally, review of both the HSRT and the SACRR contributed to further development of student interviews. By examining the outcomes of these measures, students were asked to explain their self-perceptions of the reasoning process, consistent with the complementary mixed methods research design.

Student interviews.

Literature supports student satisfaction as an outcome of case-based learning activities and online learning environments (Curran, Sharpe, Forristall & Flynn, 2008; Kim, Pederson & Baldwin, 2012; Williams, 2009). Student satisfaction and engagement in learning was an important phenomenon to study, in order to fully explore the potential benefits of the video case-based learning and the associated learning activity.

Students from both sections were asked to participate in individual interviews at the conclusion of the semester, following all quantitative data collection and brief review of quantitative analysis. The timing of the interviews allowed students to speak freely to the researcher, as the interviews occurred after final exams were been completed and semester grades were submitted. This reduced demands on the students' time and energy and ensured that their comments did not affect course grades. However, the interviews were conducted only a few days after finals, to allow students to reflect on the process

not long after completion of the learning activities. This procedure was also consistent with the complementary mixed methods design which utilizes sequential data collection.

The qualitative component of this mixed methods study followed phenomenological guidelines, in the development of the interviews and in the subsequent analysis. This approach is used to understand the essence or lived experiences of a small number of people (Creswell, 2007; Moustakas, 1994). Phenomenological inquiry is often used in both health and education research, as it seeks to reduce the experiences of a few individuals into a description of the universal essence of some occurrence or experience (Creswell, 2007). More specifically, Moustakas (1994) describes empirical phenomenology as "a return to experience in order to obtain comprehensive descriptions that provide the basis for a reflective structural analysis that portrays the essences of the experience," (p. 13).

This portion of the research study explored how students experienced the video or text case studies and the associated learning activities. Interviews were semi-structured and questions were intentionally broad and flexible, in order to draw meaning from student experiences and perceptions (Creswell, 2007; Moustakas, 1994). Questions focused on satisfaction with and perceptions of both types of learning activities and how they related to clinical reasoning. (See Appendix H for list of questions.) This relates closely to empirical phenomenology as described by Moustakas (1994), as the researcher seeks to understand the learning experiences of students. For this study, the researcher sought to understand how specific activities may contribute to the development of their complex, cognitive processes of clinical reasoning.

Data Analysis

In order to determine if there was a statistically significant difference in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone (research question 1), data from the Health Science Reasoning Test was used. All students participating in the study were scored using norm-referenced pre-test and post-test numeric scores in the areas of inductive reasoning, deductive reasoning, analytic reasoning skills, inference, and evaluative reasoning. In addition, the instrument provided an overall numeric score for critical reasoning skills. Post-test scores of students in the section with the traditional instruction were compared with the post-test scores of students in the video case study and clinical reasoning section. Use of analysis of co-variance (ANCOVA) adjusted for pre-existing differences that existed between the two intact groups.

Data was grouped and analyzed in several ways. First of all, data from the spring 2014 groups (control n=13, experimental n=13) was analyzed separately from the spring 2015 groups (control n = 18, experimental n = 17). This allowed exploration of the results to determine if the findings were replicated in subsequent semesters and to evaluate trends. Next, the data from the HSRT pre-test and post-test data were combined into one data set which includes both spring 2014 and spring 2015 (control n = 31, experimental n = 30). Combining the data into one set allowed for a larger sample size, which was useful to examine the possibility of change from the interventions in consideration of a small to moderate effect size. .

In order to explore undergraduate occupational therapy student satisfaction, perceptions of learning experience and perceptions of clinical reasoning with the use of case-based learning activities, utilizing either a comprehensive online video case study with a clinical reasoning learning activity or text and video cases alone (research question 3), interviews were conducted with students. Data collection and analysis from these interviews followed a phenomenological approach, as the experiences of the students, related to the learning experiences, were explored (Creswell, 2007; Moustakas, 1994). Transcendental or psychological phenomenology, as described by Moustakas (1994), calls upon researchers to bracket their own experiences in order to gain a new perspective of the descriptions of the experiences of the participants. Questions were developed based on a review of literature regarding student satisfaction and engagement in health professions (Curran, Sharpe, Forristall & Flynn, 2008; Kim, Pederson & Baldwin, 2012; Lysaght & Bent, 2005; Mounsey & Reid, 2012; Williams 2009). The list of questions (see Appendix H) was modified slightly for participants in each group, depending on the type of learning activity that was used for that group and to address differences identified from the results of the HSRT and SACRR. All interviews were audio recorded, so that the researcher was able to give full attention to the interviewees and no notes were necessary during the interviews. In addition, clarifying questions were added as needed. Audio recordings of the interviews were transcribed.

Prior to analysis of the interviews, the researcher engaged in the Epoche process as described by Moustakas (1994), which involves explicit and systematic efforts by the researcher to acknowledge and then set aside any pre-conceived notions or judgments about the concepts being studied. The first stage of data analysis, called

phenomenological reduction, involves identification of significant statements (horizonalization), grouping these into meaningful clusters or units, and reviewing these descriptions to create textural descriptions of those clusters (Creswell, 2007; Moustakas, 1994). The imaginative variation stage of analysis then follows, in which the textural descriptions are reviewed and refined into structural descriptions which reflect the participants' experiences (Creswell, 2007; Moustakas, 1994). The final data analysis stage of synthesis, in which the structural descriptions are further developed and explained to reflect the "essential, invariant structure or essence" of the experience for the participants (Creswell, 2007, p. 62), resulting in key themes.

Development of Intervention

Traditional text-based cases.

Written case studies have been used for several years prior to the study in the Adult Musculoskeletal Occupational Therapy course. Two assignments were routinely used which were selected from a text book (Halloran & Lowenstein, 2000) and students were directed to answer questions about appropriate actions and interventions that should be undertaken by the therapist (See Appendix F). There was no explicit discussion of clinical reasoning associated with these assignments; use of clinical reasoning was considered implicit in the assignments. These learning activities reflected the current practices used throughout the curriculum, which were reviewed and deemed to meet course learning objectives and standards of accreditation by the Accreditation Council of Occupational Therapy Education (ACOTE).

Choice of video used for cases.

This research examined the use of video cases presented over an online platform and an associated clinical reasoning learning activity to determine the effect on clinical reasoning skills, student self-report of perceived reasoning skills, and student perceptions of the learning experience. The video case studies and associated learning activities were constructed based on findings from the literature review regarding the best practices for constructing cases and the tenets of case-based reasoning. Authenticity, one of the key principles of case-based reasoning, was addressed by choosing actual cases that were filmed in a hospital, from an online video library of occupational therapy cases, namely the International Clinical Educators Learning Center (ICELC) (www.icelearningcenter.com). The ICELC is a video library of over 150 video clips showing occupational therapists working with 24 different patients. The ICELC was established and administered by Jan Davis, an experienced occupational therapist who has published nationally and presented nationally and internationally regarding principles of occupational therapy in physical rehabilitation (International Clinical Educators, 2013). The therapists and clients in the ICELC were filmed in the course of their everyday practice, and subscribers are able to use the videos as they see fit for educational purposes. Currently, over 150 colleges and universities subscribe to this video library (International Clinical Educators, 2013).

For this research, the specific video cases chosen were evaluated according to several factors. First of all, cases included multiple clips of the same patient and same therapist(s) over time and over multiple sessions, so that students viewing the clips could consider a more complete case that creates a comprehensive story, and so that learners

can view experts shown in the video, strengths of case-based reasoning (Kolodner & Guzdial, 2000). For each of the patient cases chosen, approximately 30 minutes of video clips were included. In addition, clips were included to address specific content areas that are difficult to simulate in the classroom setting, for example an intensive care unit. Finally, cases were included that focused on the care of clients who exhibited deficits that are difficult to simulate in a classroom setting, such as altered cognition or altered muscle tone and motor control. This allowed students to understand how these deficits may be presented in the clinic and view expert responses to difficult behaviors or actions, better preparing them for clinical practice. These characteristics of the video cases supported the infusion of relevant contextual factors into the case, as suggested by Jonassen & Hernandez (2002) and Kolodner (1997). The researcher in this study was a faculty member with 19 years of teaching experience and 30 years of clinical experience as an occupational therapist, and therefore was able to judge the quality of content of the videos, in order to ensure that they fit with the key principles of case-based reasoning. All of these inclusion criteria were considered with the intent of choosing the case studies from the video library that had the best potential to promote clinical reasoning for the students.

Development of learning activity.

The associated clinical reasoning learning activity to accompany the video case study was developed by the researcher, based on case-based reasoning principles and the understanding of clinical reasoning as framed by occupational therapy literature and experience (see Appendix G). After viewing the video case study, students developed the client's occupational profile and identified frames of reference used to guide their

consideration of this case. This was consistent with the process of occupational therapy service delivery, as described in the occupational therapy practice framework that is utilized throughout the curriculum (American Occupational Therapy Association, 2014). Students were then required to locate evidence in the literature to support and guide their reasoning regarding the case. Next, students explicitly described the salient points of clinical reasoning, as categorized by Boyt Schell & Schell (2008) and Crepeau, Cohn and Boyt Schell (2009). Finally, students were asked to reflect on the case as framed by their application of clinical reasoning, critiqued the case, and considered how it could be incorporated into their professional repertoire or cognitive library of cases (Jonassen & Hernandez, 2002; Kolodner, 1997; Kolodner & Guzdial, 2000).

After development of the case, it was validated by five experts. These experts were all occupational therapists with experience in physical dysfunction and rehabilitation. Two experts were academicians and researchers with doctoral degrees, one expert was a clinical associate professor who remains active in both clinical practice and academia, and the remaining two experts were primarily clinicians with limited teaching experience. They were chosen to review the activity to ensure relevance of the components of the assignment based on their clinical practice and their experience with occupational therapy curriculum and education. The experts were asked to consider the value of the cases chosen, and determine if the learning activity supported course objectives, as a measure of content validity. A form was given to each reviewer that listed the relevant learning objectives of the course or purposes of the assignment. A rating scale of 1, learning objective not met; 2, learning objective marginally addressed, or 3, learning objective marginally addressed was added. Finally, they were asked to make

comments. A summary of those scores and comments is included as Appendix I. Based on the expert opinions, a few changes were made to the learning activity. First, wording of instructions was changed to facilitate student understanding of the activity. Secondly, descriptions of the types of reasoning were added. Finally, inclusion of a sample case during class time with opportunity for discussion was added to model use of the forms and discussion of the types of clinical reasoning. These changes were provided to improve student understanding of the assignment and to ensure that the assignment met course objectives, promoted successful completion of the activity by students, and followed recommended protocols for case-based reasoning.

Limitations and Assumptions

The research design attempted to control for as many confounding or influencing factors as possible. The same instructor taught both sections of the course, learning activities were reviewed by experts, and the mixed methods approach allowed for investigation of clinical reasoning from different perspectives. However, as in any research study, there are limitations that must be acknowledged.

- The convenience sampling technique, or lack of randomized sampling, may have threatened internal validity of the study. Since students self-selected into the sections, there may have been characteristics of each group, such as personal and professional background, that may have influenced the outcomes. Characteristics such as prior experience, motivation, or outside demands on students' time were also not well controlled and may have influenced student learning and reasoning. The analysis using ANCOVA was used to attempt to control for pre-existing differences between the groups.

- The time period of the study was brief, namely less than 16 weeks between administration of the pre and post tests of both the HSRT and SACCR. This may not have been enough time for complex cognitive skills to change in the students, impacting results from the HSRT and SACRR. The mixed methods design was an attempt to enrich the quality of the research and to study different types of variables.
- The study was replicated over two different spring semesters, due to the small number of students who are allowed in the screened major and since the course is only offered during the spring. Replicating the study allowed for a larger sample size and for creation of control and intervention groups. However, the SACRR was only administered to the second group of students, after it was determined how the qualitative data could enrich data analysis and conclusions drawn from the study.
- The researcher was also the instructor for the course in which the study was conducted, so the researcher was not blind to the group participation. The researcher also conducted the interviews at the conclusion of the semester. This created a potential researcher bias that could have influenced results and conclusions. A statement of the researcher was included to address this potential bias.

Pilot Study

Description of study.

In the fall of 2013, a pilot study of the quantitative portion of the proposed research was conducted. There were a few differences in that study design, which will be

discussed. It is of note that the students who participated in the pilot study were graduate students in a Master of Science program in occupational therapy and the dissertation research was conducted with undergraduate occupational therapy students. In addition, the course that the graduate students take that contains the same content as Adult Musculoskeletal OT, is offered to graduate students as Adult and Older Adult Musculoskeletal OT. There are additional topics related to aging and rehabilitation in this graduate level course that are not found in the undergraduate course. A key difference of the pilot study is that the two case based assignments were offered in two courses, rather than only the Adult Musculoskeletal OT course, namely in a concurrent course, Physical Dysfunction Level I Fieldwork. For this research study, all of the video case-based assignments were offered in Adult Musculoskeletal OT. Finally, the pilot study included course grades and fieldwork performance as additional measures. These measures are not included in the final study, based on problems determined during the pilot study.

Participants.

For the pilot study, there were a total of 37 graduate students concurrently enrolled in OCTH 470, Adult and Older Adult Musculoskeletal Occupational Therapy and OCTH 319, Physical Dysfunction Level I Fieldwork. Following IRB approval (see Appendix A), students who provided informed consent were asked to take the HSRT online as a baseline measure of their clinical reasoning skills in the first week of the semester. Of these students, 7 students in the control group took the HSRT and 7 students in the experimental group completed the HSRT (see Table 1). One student in the experimental group did not complete the entire assessment; therefore her data was

excluded from the study. One student in the control group did not complete the post-test. This resulted in a total sample size of 12 students, 6 in the control group and 6 in the experimental group.

Baseline demographics were examined (see Figure 2). All participants were female graduate students, who had completed exactly the same courses, totaling 35 credits, prior to the fall 2013 semester. The mean age of the control group was 25.7 years (standard deviation 2.50), and the mean age of the experimental group was 25.8 years (standard deviation 4.45). The mean GPA for the control group was 3.75 (standard deviation 0.195); the mean GPA for the experimental group was 3.84 (standard deviation 0.150). Age and GPA for each group were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). As calculated by independent sample t-tests, differences in age and GPA between the groups were not statistically significant. (GPA, $t_{(10)} = -.90$, p=.39) (Age, $t_{(7.881)} = -.080$, p=.94). For the purposes of this study, the two groups had similar baseline characteristics.

Research question 1.

In order to determine if there was a statistically significant difference in clinical reasoning skills of occupational therapy students following the use of a comprehensive

Table 1

Description of Participants, Pilot Study

	Number	Gender	Age		GPA	
			Mean	SD	Mean	SD
Control	6	Female	25.7	2.50	3.75	0.195
Experimental	6	Female	25.8	4.45	3.84	0.150

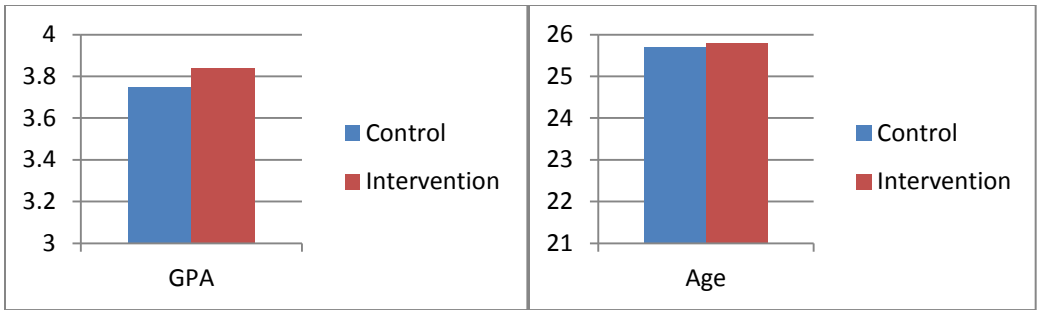


Figure 2: Characteristics of participants according to groups, in GPA and Age, Pilot Study

online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone, data from the Health Science Reasoning Test was compared for the groups. All students participating in the study generated norm-referenced pre-test and post-test numeric scores in the areas of inductive reasoning, deductive reasoning, analytic reasoning skills, inference, and evaluative reasoning. In addition, the instrument provides an overall numeric score for critical reasoning skills.

Overall scores are recommended by Insight Assessment (2014) as the best overall measure of critical thinking skills, and indicate the ability of the individual to "form reflective judgments" related to decision, beliefs and actions (Insight Assessment, 2014, p. 21). This score is used to predict educational and vocational success. Overall scores have a maximum rating of 33, the number of items scored correctly in the test. Overall scores indicate that the particular skill is not manifested for scores of 0-14, moderate for scores of 15-20, strong for scores of 21-25 and superior for scores of 26 or higher (Insight Assessment, 2014, p. 34). Percentile scores are offered in accordance with the normative group selected before test administration. In this case, the normative group of graduate students in health science programs was utilized. Scale scores are also reported, with

different scores possible in each area. In induction and deduction, scores of 0-4 indicate that the skill is not manifested, 5-7 demonstrates moderate performance of that skill, and 8 or more indicate strong performance. In analysis, inference, and evaluation, scores of 0-2 indicate that the skill is not manifested, 3-4 indicate moderate performance, and 5 or more indicate strong performance (Insight Assessment, 2014).

In statistical analysis, t-tests were used to compare the pre-test scores of the two groups, to look for pre-existing differences in the groups (see Table 2 and Figure 3). Although intervention group means were higher in all areas except evaluation, none of the differences were statistically significant at $p<.05$.

Table 2

Descriptive and Inferential Comparison of HSRT Pre-Test Scores between Groups, Pilot Study

	Control		Intervention				
	Mean	SD	Mean	SD	t	p	Effect size
Overall	21.00	6.26	24.17	2.14	1.17	.28	0.68
Percentile	44.17	39.27	60.50	19.12	0.92	.39	0.53
Induction	7.67	1.76	7.33	1.63	-0.34	.74	-0.20
Deduction	6.33	2.94	8.00	1.10	1.30	.24	0.75
Analysis	4.33	1.37	4.67	1.21	0.45	.66	0.27
Inference	3.33	1.37	4.50	0.84	1.78	.11	1.03
Evaluation	5.00	0.89	4.83	1.17	-0.28	.79	-0.16

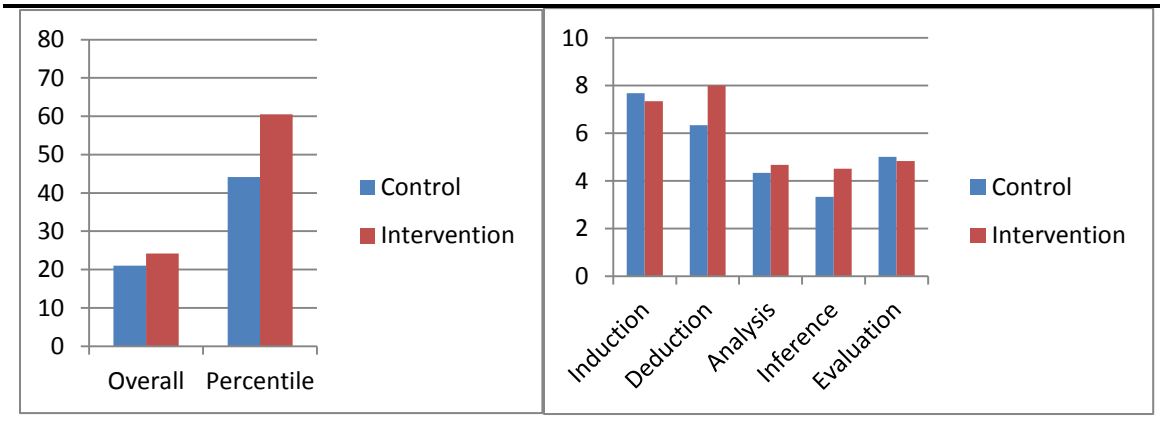


Figure 3: Comparison of HSRT Pre-Test Scores between Groups, Pilot Study

Next, t-tests were used to determine if a statistically significant change occurred between pre-and post-test scores in the control group (see Table 3 and Figure 4) and in the intervention group (see Table 4). In the control group, improvements were noted in post-test scores for overall score, percentile, deduction, analysis, and inference. A decreased post-test score was noted for induction and evaluation. The only score that was statistically significant was for the difference in percentile ($t_{(5)} = 3.44$, p=.02, critical value for $t_{(5)} = 2.572$).

Table 3

Comparison of HSRT Pre-Test Scores and Post-Test Scores for Control Group, Pilot Study

	Pre-test		Post-test				
	Mean	SD	Mean	SD	t	p	Effect size
Overall	21.00	6.26	21.83	7.00	1.19	.29	0.12
Percentile	44.17	39.27	55.17	40.04	3.44	.02*	0.28
Induction	7.67	1.75	7.17	2.40	-1.00	.36	-0.24
Deduction	6.33	2.94	6.83	2.93	0.89	.42	0.17
Analysis	4.33	1.37	4.67	1.51	0.60	.58	0.24
Inference	3.33	1.37	4.00	1.10	1.35	.24	0.54
Evaluation	5.00	0.89	4.50	1.05	-2.24	.08	-0.51

**p<.05*

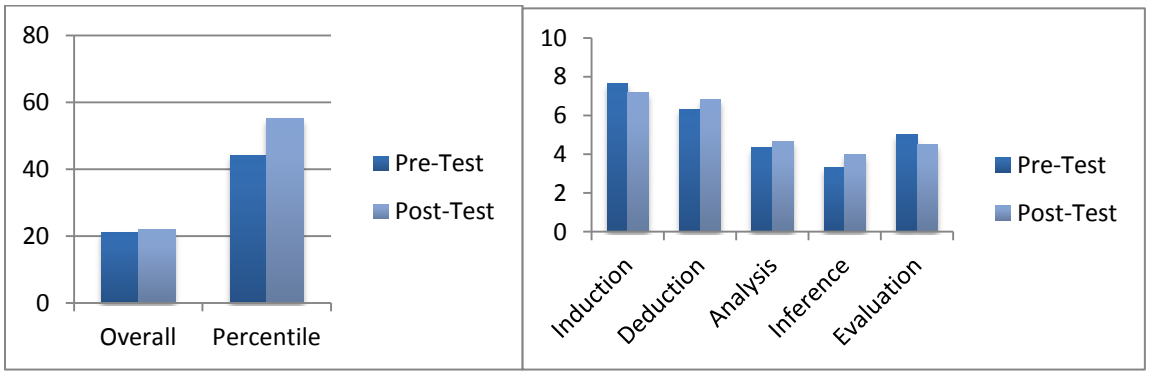


Figure 4: Comparison of HSRT Pre-Test and Post-Test Scores for Control Group, Pilot Study

In the intervention group, improvements were noted in post-test scores for overall score, percentile, induction, analysis, and evaluation (see Table 4 and Figure 5). A decreased post-test score was noted for deduction and inference. None of these changes were noted to be statistically significant at $p<.05$.

Table 4

Comparison of HSRT Pre-Test Scores and Post-Test Scores for Intervention Group, Pilot Study

	Pre-test		Post-test				
	Mean	SD	Mean	SD	t	p	Effect size
Overall	24.17	2.14	24.67	2.16	0.44	.68	0.23
Percentile	60.50	19.12	65.00	18.24	0.46	.67	0.24
Induction	7.33	1.63	8.00	0.63	1.09	.33	0.54
Deduction	8.00	1.10	7.83	1.33	-0.35	.74	-0.14
Analysis	4.67	1.21	5.17	0.41	1.17	.30	0.55
Inference	4.50	0.84	4.17	0.75	-1.00	.36	-0.41
Evaluation	4.83	1.17	5.33	0.52	1.00	.36	0.55

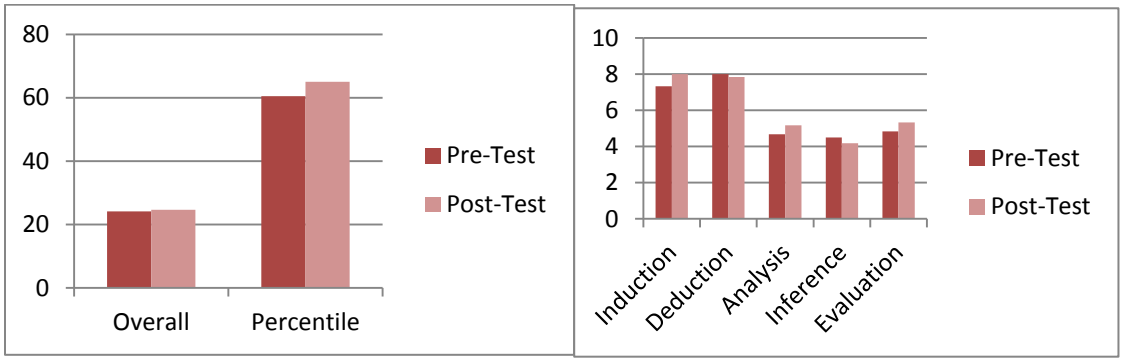


Figure 5: Comparison of HSRT Pre-Test and Post-Test Scores for Intervention Group, Pilot Study

Post-test scores of the two groups were compared to determine if differences existed in the reasoning scores of the two groups after use of the videotapes and clinical reasoning activity (see Table 5 and Figure 6). The intervention group scored higher than

the control group in all areas of the Health Science Reasoning Test. However, none of these differences were statistically significant.

Table 5

Descriptive and Inferential Comparison of HSRT Post-Test Scores between Groups, Pilot Study

	Control		Intervention				
	Mean	SD	Mean	SD	t	p	Effect size
Overall	21.83	7.00	24.67	0.88	0.95	.38	0.57
Percentile	55.17	40.04	65.00	18.24	0.55	.60	0.32
Induction	7.17	2.40	8.00	0.63	0.82	.43	0.47
Deduction	6.83	2.93	7.83	1.33	0.76	.46	0.44
Analysis	4.67	1.50	5.17	0.41	0.79	.45	0.45
Inference	4.00	1.10	4.17	0.75	0.31	.77	0.18
Evaluation	4.50	1.05	5.33	0.52	1.75	.11	0.79

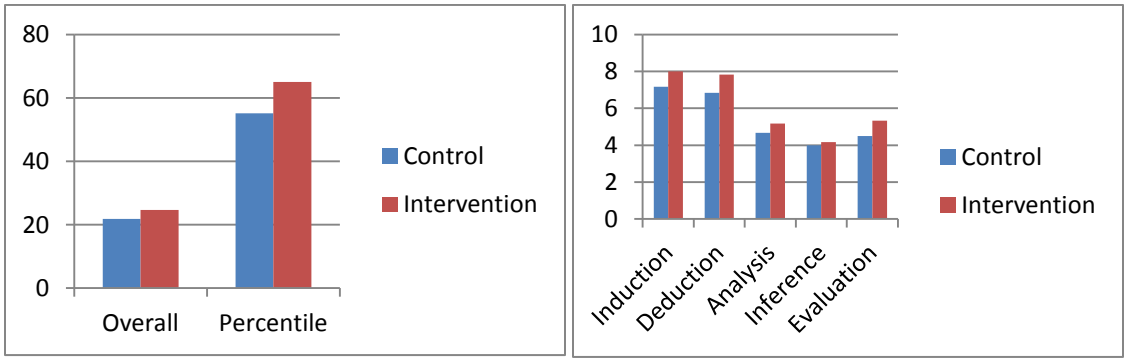


Figure 6: Comparison of HSRT Post-Test Scores between Groups, Pilot Study

Research question 2.

In order to determine if there was a statistically significant difference in content knowledge of occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone, final course grades were examined for the two courses in which the learning activities were presented. These consisted of

OCTH 470 Adult and Older Adult Musculoskeletal Occupational Therapy and OCTH 319 Physical Dysfunction Level I Fieldwork.

For the 6 students in each of the control and intervention groups, there were minimal differences in grades. Mean course grades were 90.22 (SD 3.15) and 91.48 (SD 3.74) in the control group, and mean course grades were 91.35 (SD 2.93) and 92.17 (SD 1.74) for the intervention group. Using an independent samples t-test at $p<.05$, these differences were not statistically significant (see Table 6 and Figure 7).

Research Question 3.

In order to determine if there was a statistically significant difference in fieldwork performance of occupational therapy students following the use of a comprehensive online video case study and associated learning activity, when compared to students who

Table 6

Descriptive and Inferential Comparison of Course Grades between Groups, Pilot Study

	Control		Intervention				
	Mean	SD	Mean	SD	t	p	Effect size
OCTH 470	90.22	3.15	91.35	2.93	0.65	.53	0.37
OCTH 319	91.48	3.74	92.17	1.74	0.41	.69	0.24

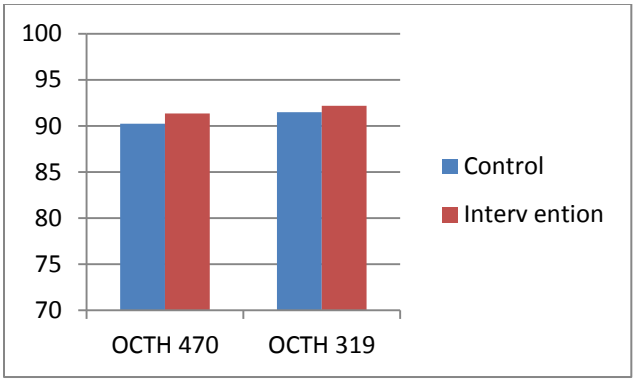


Figure 7: Comparison of Course Grades between Groups, Pilot Study

are presented with text or brief video clips alone, scores on the Level I Evaluation form already used on fieldwork were used. Students are rated according to a scale of unsatisfactory, satisfactory, or outstanding.

First, descriptive statistics were used to better understand the data. All students, across groups, scored in either the satisfactory or outstanding categories in all 20 items rated (see Table 7 and Figure 8). The control group had a mean of 5.33 outstanding scores (SD 6.09) and a mean score of 14.67 satisfactory scores (SD 6.09). Students in the intervention group had a mean of 9.00 outstanding ratings (SD 4.43) and a mean of 11.00 satisfactory scores (SD 4.43).

Table 7

Ratings of Items on Fieldwork Evaluation Form, Pilot Study

	Outstanding Rating		Satisfactory Rating	
	Mean	SD	Mean	SD
Control	5.33	6.09	14.67	6.09
Experimental	9.00	4.43	11.00	4.43

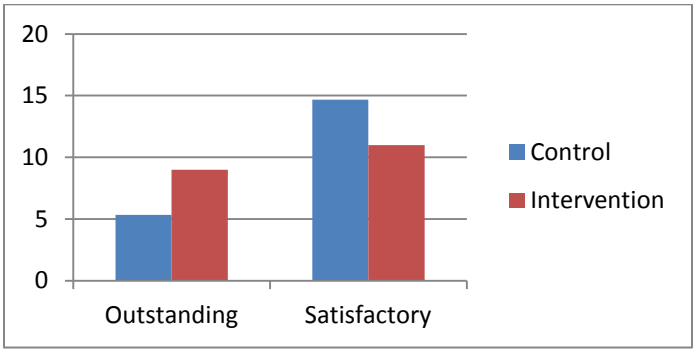


Figure 8: Comparison of Fieldwork Ratings between Groups (raw scores for 20 items), Pilot Study

For the purposes of statistical analysis, students were categorized according to the majority of their individual fieldwork scores. In the control group, one student was rated as outstanding while five were rated as satisfactory. In the intervention group, three

students were rated as outstanding and three students were rated as satisfactory. A chi-square test for association was conducted between group (control or intervention) and fieldwork performance category (outstanding or satisfactory). There was not a statistically significant association between group (and therefore learning activity) and fieldwork performance ($\chi 2(1) = 1.500$, $p = .221$).

Review of Results.

This pilot test was conducted to determine if the use of video cases presented over an online platform, when paired with a clinical reasoning learning activity in an occupational therapy curriculum, had any influence on the development of student clinical reasoning skills, content knowledge, and fieldwork performance. Results of the Health Science Reasoning Test, examination of course grades, and explorations of fieldwork performance were used to understand this phenomenon.

A total of 12 students participated in the research (six in control group and six in intervention group). No significant differences in their baseline characteristics of age and GPA were identified. There was also no statistically significant difference in pre-test performance of the two groups.

Use of the Health Science Reasoning Test identified that both groups improved in overall reasoning score, percentile score, and three of five sub-groups of reasoning between the pre-test and post-test data points. The only statistically significant change was in post-test overall percentile as compared to pre-test overall percentile for the control group; however this significance was not determined in the raw score data. Examination of post-test reasoning performance identified higher scores in all areas in the intervention group, as compared to the control group, but without statistical significance.

Course grades between students in the two groups were only minimally higher in the intervention group, without statistical significance. Additionally, both groups had the same instructional methods, assignments, and exams for multiple topics throughout the course of the semester that contribute to course grades. Finally, fieldwork scores, using the current fieldwork assessment tool, provided limited data for analysis. Although more students in the intervention group were rated as outstanding, as compared to the control group, no statistically significant association was found between the video case studies and learning activity and the fieldwork ranking.

Revisions to Final Research

The small sample size was a clear limitation in this pilot study. Six students in each of the two groups is clearly not enough for quantitative statistical analysis to identify significant differences in the groups. However, when comparing post-test scores of the control and intervention groups, calculations for this very small pilot study determined that the effect size for overall scores of the HSRT is 0.57, and the effect size for percentile scores is 0.32. From the review of literature undertaken earlier and calculations of effect sizes that have been generated from estimations using G*Power software, an effect size of 0.57 could be effectively identified with the proposed sample size of 60. This indicates that the proposed sample size is adequate to detect change in the pre-and post-test scores using the HSRT, if the effect size from the pilot study remains consistent.

The time period studied was brief, namely less than 15 weeks between administration of the HSRT pre and post tests. Although it is hypothesized that the video case study and associated learning activity will be valuable in improving reasoning skills,

this may not have been enough time for complex cognitive skills to change in the students, and results from the HSRT alone may not be significant. Effect sizes of the changes were considered to address this concern. Although statistical significance was not reached in the results, there were clearly some effect sizes that were worthy of note. In the control group, changes between pre and post-test scores indicated effect sizes of 0.12 to 0.54 for those sub-skills of reasoning indicating positive differences. In the intervention group, changes between pre and post-test scores indicated effect sizes of 0.23 to 0.55 for those areas indicating positive differences. And in comparison of post-test scores, effect sizes of 0.57 were noted in improved overall scores, and 0.44 to 0.79 in six of the seven positive scores for reasoning sub-skills. There is a trend of positive change according to effect sizes, even if statistical significance was not established.

Measures used for content knowledge and fieldwork performance were problematic. Course grades, for example, are determined not only by the learning activity and instructional method used for this study, but by exam grades, assignments and activities that were consistent between sections. The video case study and reasoning activity were used to calculate less than 10% of the course grade. Therefore, they did not prove to be useful measures of clinical reasoning or content knowledge and were not meaningful in answering the research questions. Therefore, they were not included in the final research study. The fieldwork performance rating was utilized by multiple raters, or fieldwork supervisors, in multiple settings. Inter-rater reliability has not been established. Validity of the tool is also unknown. Therefore, it was not included in the final research study.

Future directions.

The pilot study did not determine any statistically significant differences in reasoning skills, content knowledge, or fieldwork performance of occupational therapy students, based on their use of an online video case study and an associated reasoning learning activity. However, there were findings of interest to the researcher. For example, students who participated in the video case study and clinical reasoning activity scored higher in all areas of reasoning than did students who used traditional instructional methods. As problems with sample size and methodology are addressed, this research is expected to have relevance for occupational therapy education.

The pilot study also indicated that changes to methodology were needed. Course grades and fieldwork performance measures were problematic and have been excluded from the final research study. A mixed methods approach was recommended, which included the SACRR to examine student self-perception of clinical reasoning, and interviews were conducted to examine students' perceptions of clinical reasoning, learning experience, and overall student satisfaction. IRB approval was obtained for these changes prior to moving forward with the final research study (see Appendix B). Gaining insight from the pilot study contributed to the understanding of the worth of the learning activity and its impact on the development of occupational therapy students' clinical reasoning.

Summary

This complementary mixed methods research, conducted with a preliminary quantitative component and a follow-up qualitative component, was designed to examine the use of video cases presented over an online platform and an associated clinical

reasoning learning activity in an occupational therapy curriculum, focusing primarily on the influence to student clinical reasoning skills, student perceptions of clinical reasoning, and student satisfaction regarding the instructional tools and methods. The mixed methods approach allowed for integration of various types of data to better understand how instructional methods with a foundation in case-based reasoning contributed to the development of clinical reasoning skills in occupational therapy students. The instruments used in the research included the Health Science Reasoning Test, the Self-Assessment of Clinical Reflection and Reasoning, and student interviews regarding satisfaction and perceptions of the learning activity as it relates to clinical reasoning. The key theoretical construct of case-based reasoning was used to frame the research study.

Clinical reasoning is a key skill of the occupational therapist which is often reported in occupational therapy literature, but it is a difficult skill to teach in a classroom, as it is largely a skill demonstrated in clinical practice. It is a challenge to the occupational therapy educator to design learning that clearly supports this skill.

This study of occupational therapy students has relevance and significance to the discipline of occupational therapy and to occupational therapy educators, to enable students to be competent and skilled practitioners who are able to facilitate positive change in the performance of daily occupations of their clients.

Chapter IV: Results and Findings

This complementary mixed methods research examined the use of video cases presented over an online platform and an associated clinical reasoning learning activity in an occupational therapy curriculum, focusing primarily on the influence to student clinical reasoning skills, student perceptions of clinical reasoning, and student satisfaction and perceived learning effectiveness of the instructional tools and methods.

This research investigated if a statistically significant difference existed in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone. This was explored through the use of the Health Science Reasoning Test, which was given to students in the Adult Musculoskeletal Occupational Therapy course as a pre-test and post-test. Students in separate sections of the course participated in different learning activities, which were equivalent to a control group (traditional, text-based cases and isolated video clips) and an intervention group (video case studies and associated clinical reasoning learning activity).

The Self-Assessment of Clinical Reflection and Reasoning was used to investigate if a statistically significant difference existed in self-reported, perceived clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone.

Finally, interviews and qualitative analysis were used to investigate undergraduate occupational therapy student satisfaction, perceptions of learning experience and

perceptions of clinical reasoning with the use of case-based learning activities, utilizing either a comprehensive online video case study with a clinical reasoning learning activity or text and video cases alone.

Description of Respondents

This research utilized a total sample size of 61 students, who were recruited during two academic semesters. These students were divided into a control group of 31 students, who utilized the text based case study, and an intervention group of 30 students, who utilized the video based case study and learning activity (see Table 8 for description of participants). In addition, four students from each of these groups (a total number of eight students) participated in the interviews and subsequent qualitative analysis.

There is limited diversity in demographics for the students enrolled in the occupational therapy program at the school in which the study was conducted. Typically, students accepted into the combined BS/MS occupational therapy program are traditional college students, aged 18-24 (see Figure 9). Since grade point average (GPA) is one of the screening criteria for acceptance into the program, this is often similar among students (see Figure 10). The majority of students are female, which is consistent with the demographic characteristics of the profession of occupational therapy. Also, the majority of the students have historically been Caucasian. Data regarding prior experience were collected in 2015 (see Figure 11).

Students were enrolled in one of two sections of the Adult Musculoskeletal Occupational Therapy course in their second year of the occupational therapy program, which follows a prescribed curricular sequence. These students remained in these groups for all courses taken in the semester in which the research was conducted. They were

informed of the overall purpose of the research, and were aware that different learning activities were used in the two sections.

The first cycle of data collection occurred in the spring of 2014, and 13 students in each section of the Adult Musculoskeletal Occupational Therapy course participated in this research. Complete descriptions of this group and associated data analysis are included in Appendix J. The second cycle of data collection occurred in the spring of 2015, with participation of 18 students in the control group and 17 students in the intervention group. Complete descriptions of this group and associated data analysis are included in Appendix L. When the two cycles of data collection were combined, there were a total of 31 participants in the control group and 30 participants in the intervention group. The mean age of the combined control group was 20.74 (SD 0.77) and the mean age of the combined intervention group was 22.47 (SD 3.38). The mean GPA of the combined control group was 3.67 (SD 0.19) and the mean GPA of the combined intervention group was 3.59 (SD 0.23).

Age and GPA were tested for normality of variance using the Shapiro-Wilk's test ($p > .05$). Data was divided according to year of data collection as well as aggregate or combined data. In all situations, GPA was found to be normally distributed; however age was not. Therefore, ANCOVA data analysis is indicated to control for the pre-existing differences in age between the control and intervention groups.

Table 8

Description of Participants, 2014 + 2015

	Number	Gender	Age		GPA	
			Mean	SD	Mean	SD
Control	31	31 Female	20.74	0.77	3.67	0.19
Intervention	30	28 Female	22.47	3.38	3.59	0.23

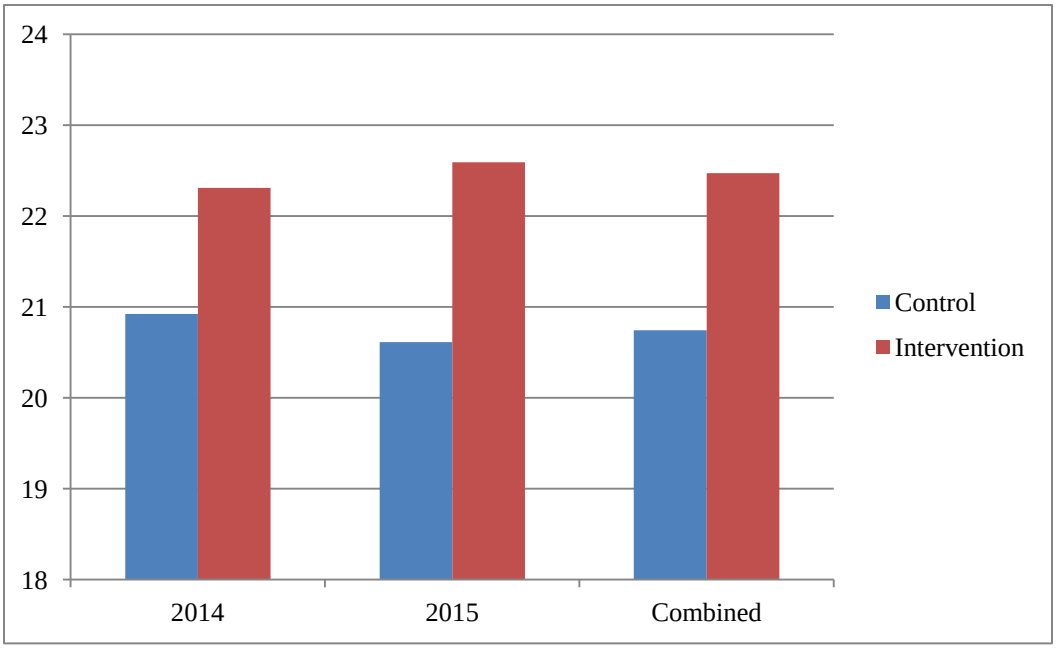


Figure 9: Age of participants according to group

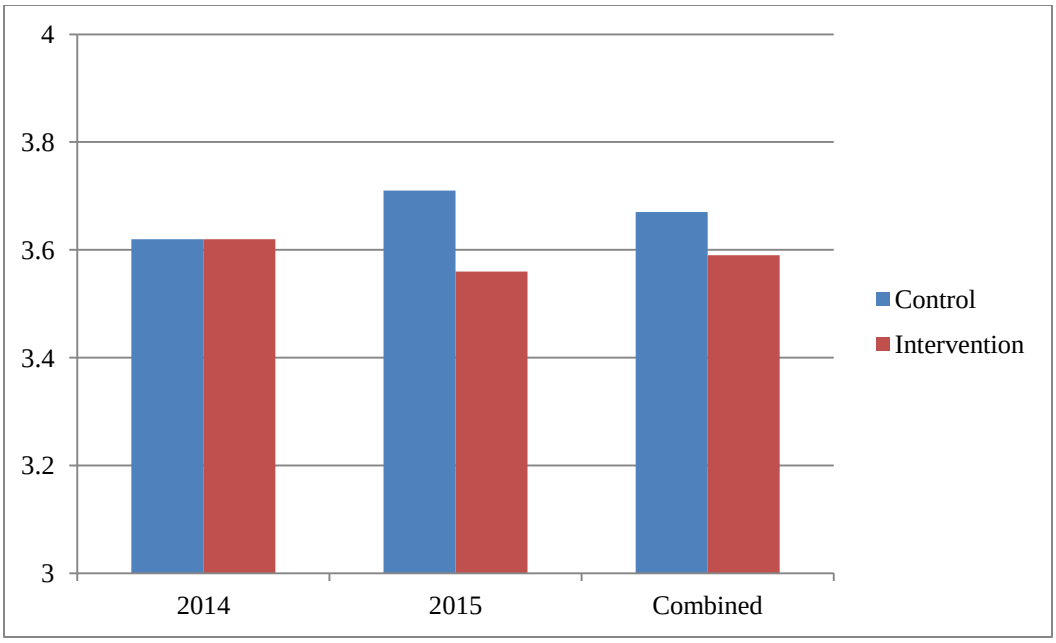


Figure 10: GPA of participants according to groups

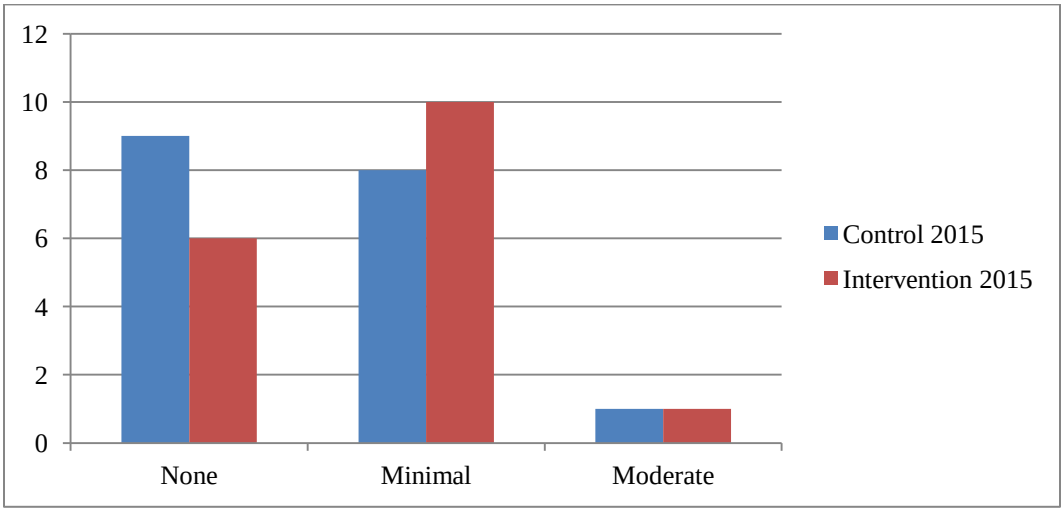


Figure 11: Prior experience of participants according to groups

Research Question 1

The first research question focused on an objective score of reasoning in the two groups, to examine if one type of case study and instructional method was superior to the other. In order to determine if a statistically significant difference existed in clinical reasoning skills of undergraduate occupational therapy students following the use of a

comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone, data from the Health Science Reasoning Test was compared for the groups. All students participating in the study generated norm-referenced pre-test and post-test numeric scores in the areas of inductive reasoning, deductive reasoning, analytic reasoning skills, inference, and evaluative reasoning. In addition, the instrument provided an overall numeric score and percentile for clinical reasoning skills.

Overall scores are recommended by Insight Assessment (2014) as the best inclusive measure of critical thinking skills, and indicate the ability of the individual to "form reflective judgments" related to decisions, beliefs and actions (p. 21). This score is used to predict educational and vocational success. Overall scores have a maximum rating of 33, the number of items scored correctly in the test. Overall scores indicate that the particular skill is not manifested for scores of 0-14, moderate for scores of 15-20, strong for scores of 21-25 and superior for scores of 26 or higher (Insight Assessment, 2014, p. 34). Percentile scores are offered in accordance with the normative group selected before test administration. In this case, the normative group of undergraduate students in occupational therapy programs was utilized. Scale scores were also reported, with different scores possible in each category of reasoning. In induction and deduction, scores of 0-4 indicate that the skill is not manifested, 5-7 demonstrates moderate performance of that skill, and 8 or more indicate strong performance. In analysis, inference, and evaluation, scores of 0-2 indicate that the skill is not manifested, 3-4 indicate moderate performance, and 5 or more indicate strong performance (Insight Assessment, 2014).

Data collection overview

For further examination of the data, results were compared for each cycle of data collection, namely 2014 and 2015 data collection cycles. Then, the data was combined into one data set to allow for analysis of larger sample sizes. This allowed the researcher to examine trends over time, and to determine if results were repeated in each year of data collection.

Two types of analysis were conducted in each group of data. First, paired t-tests were used to examine changes between pre-test scores and post-test scores within each group, namely the control and intervention group for each data collection cycle (2014, 2015 and combined data). Next, Analysis of Co-Variance (ANCOVA) was used to compare the results between the control and intervention groups for all data collection cycles, since there were some pre-existing differences in age between the groups. Complete information on the analysis for the 2014 data collection cycle is included in Appendix J and Appendix K; complete information on the analysis for the 2015 data collection cycle is included in Appendix L and Appendix M. Aggregate data is included below, so that results demonstrate the largest sample size and are most meaningful for full review.

Trends in 2014 and 2015 individual year data

There was a statistically significant influence of GPA on the HSRT post-test scores in 2014, but this was not repeated in the 2015 cycle. There was a statistically significant difference for HSRT post-test induction between the control and intervention groups in 2014, but again this was not repeated in 2015.

However, the trends were similar. The control group demonstrated improvements in HSRT overall scores and percentile scores in both years. In 2014, the control group demonstrated improvements in three of five sub-tests, in 2015 the control group demonstrated improvements in four of five subtests. Common to both control groups was a decreased score (estimated marginal mean) in induction. However, this decrease was very slight in 2015. In both 2014 and 2015, examination of estimated marginal means demonstrated improvements in overall score, percentile score, and all five sub-tests for the intervention groups, as measured by the Health Science Reasoning Test

Combined data collection (2014 + 2015)

Comparisons within groups. Combining the data from both the 2014 and 2015 data collection cycles rendered a sample size of 31 students in the control group and 30 students in the intervention group. First, paired t-tests were used for the control group and the intervention group to determine if a statistically significant change occurred from pre-test to post-test in scores of the Health Science Reasoning Test (HSRT). For the control group (Table 9), improved post-test scores were noted in overall score, percentile, deduction, analysis, inference, and evaluation; a decreased score was noted in induction. None of these changes were statistically significant. For the intervention group (Table 10), improvements were noted in all areas. Statistically significant changes were noted in overall score ($t_{(29)}$ =4.07, p<.01), percentile ($t_{(29)}$ = 3.82, p<.01), induction ($t_{(29)}$ = 2.39, p=.02), deduction ($t_{(29)}$ = 3.16, p<.01) and evaluation ($t_{(29)}$ = 2.048, p=.05). The changes in analysis and inference were not statistically significant, but they were approaching the significance level (analysis $t_{(29)}$ = 2.009, p=.054) (inference $t_{(29)}$ = 2.037, p=.051). Graphic representations of these scores are listed in Appendix N.

Table 9

Comparison of HSRT Pre-Test and Post-Test Scores (2014+2015, Control Group)

	Pre-Test		Post-Test				
	Mean	SD	Mean	SD	Difference	t	p
Overall	22.00	3.84	22.87	4.56	0.87	1.43	0.17
Percentile	72.45	20.68	76.48	23.12	4.03	1.28	0.21
Induction	7.97	1.43	7.68	1.92	-0.29	1.18	0.25
Deduction	6.71	1.97	7.26	2.03	0.55	1.79	0.08
Analysis	4.26	1.09	4.55	1.21	0.29	1.22	0.23
Inference	4.06	1.24	4.23	1.09	0.17	0.63	0.53
Evaluation	4.94	1.18	4.97	1.33	0.03	0.18	0.86

Table 10

Comparison of HSRT Pre-Test and Post-Test Scores (2014+2015, Intervention Group)

	Pre-test		Post-test				
	Mean	SD	Mean	SD	Difference	t	p
Overall	20.90	3.90	23.27	3.52	2.37	4.07	**<0.001***
Percentile	65.83	23.20	77.90	18.36	12.07	3.82	**0.001***
Induction	7.43	1.14	7.97	1.16	0.54	2.39	**0.024***
Deduction	6.47	2.11	7.40	1.75	0.93	3.16	**0.004***
Analysis	4.17	1.37	4.53	1.17	0.36	2.01	0.054
Inference	3.77	1.17	4.20	1.24	0.43	2.04	0.051
Evaluation	4.70	1.06	5.10	0.99	0.40	2.05	**0.050***

**p<.05*

Comparisons between groups. ANCOVA was then conducted to adjust for pre-existing differences between the groups. Levene's Test of Equality of Error Variances was calculated for each test and sub-test of the HSRT, with no statistically significant differences identified in the variances of the scores between the groups, demonstrating homogeneity of variance in all measures of the HSRT. Internal consistency was good for the HSRT, as demonstrated by Cronbach's alpha of 0.81 for the pre-test and 0.83 for the

post test. This was consistent with the range of 0.78 to 0.82 reported by Insight Assessments (2014).

HSRT means, adjusted for age and GPA, are listed in Table 11, for overall, percentile and all sub-test categories. Analysis of co-variance was used to identify how age and GPA may have influenced the HSRT scores within all subjects. Prior experience was not included in this round of analysis as this was only collected for the 2015 participants. Age did not have a statistically significant effect on any measure of the HSRT. GPA did have a statistically significant effect on HSRT scores within subjects in the areas of overall scores ($F_{(1,59)} = 4.00$, $p = 0.05$), percentile scores ($F_{(1,59)} = 4.26$, $p = 0.04$) and induction scores ($F_{(1,59)} = 4.44$, $p = 0.04$).

There was a statistically significant difference in induction between the control and intervention groups ($F_{(1,59)} = 5.08$, $p = .03$) when adjusted post-test means were compared using ANCOVA (Table 12). Although the control group had a higher pre-test score in induction, the intervention group had a higher post-test induction score. The post-test mean of 7.62 for the control group scored in the moderate range, while the post-test mean of 8.03 for the intervention group scored in the strong range. There were no other statistically significant differences between the post-test scores of the two groups. Graphic representations of this data in included in Appendix N.

Table 11

Health Science Reasoning Test (HSRT) Estimated Marginal Means, Combined 2014+2015

	Control Group		Intervention Group		
	Mean	SE	Mean	SE	Effect size
Overall Score					
Pre-Test	21.54	0.69	21.38	0.70	
Post-Test	22.34	0.74	23.77	0.76	0.35
Percentile					
Pre-Test	69.79	3.90	68.59	3.97	
Post-Test	73.83	3.78	80.64	3.84	0.33
Induction					
Pre-Test	7.90	0.24	7.51	0.24	
Post-Test	7.62	0.30	8.03	0.31	0.25
Deduction					
Pre-Test	6.43	0.36	6.76	0.37	
Post-Test	7.07	0.35	7.59	0.35	0.27
Analysis					
Pre-Test	4.05	0.21	4.39	0.22	
Post-Test	4.37	0.21	4.71	0.21	0.30
Inference					
Pre-Test	4.05	0.23	3.78	0.23	
Post-Test	4.20	0.22	4.22	0.22	0.02
Evaluation					
Pre-Test	4.86	0.21	4.78	0.21	
Post-Test	4.92	0.22	5.15	0.23	0.19

Table 12

Health Science Reasoning Test (HSRT) ANCOVA, 2014 + 2015

	F-value	Significance (p)
Overall Score	2.92	0.09
Percentile	2.83	0.10
Induction	5.08	**0.03***
Deduction	0.17	0.68
Analysis	0.00	1.00
Inference	0.69	0.41
Evaluation	1.11	0.30

*$p<.05$

Trends in data. Examination of estimated marginal means revealed expected trends, based on review of the individual year data. In the combined control group for 2014 and 2015, improved post-test scores were noted in overall score, percentile score, and 4 of the 5 sub-tests (deduction, analysis, inference, and evaluation). The only skill that did not demonstrate improvement was the sub-test of induction. In the combined intervention group for 2014 and 2015, post-test scores improved for overall score, percentile, and all 5 sub-tests of the HSRT. These trends did not indicate statistical significance, but may be of interest for future directions for this research.

Relationship to research question. Data from the Health Science Reasoning test was used to determine if a statistically significant difference existed in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone. The largest sample size was obtained by combining data from 2014 and 2015 (n = 61). There were no statistically significant changes identified when comparing pre-test to post-test means for the control group. A statistically significant change was identified between pre-test and post-test scores in overall scores, percentile scores, induction, deduction, and evaluation for the intervention group. This was consistent with results from 2014.

When comparing the two groups, and partialling out the effects of GPA and age, there was a statistically significant difference in induction between the control and intervention groups (see Figure 12). Therefore, the students who participated in the video case study and clinical reasoning learning activity demonstrated statistically significant improvements in induction, when compared to those students who participated in text or

brief video clip activities. However, there were no statistically significant differences in overall score, percentile scores, or other types of reasoning. A review of the graphic representation of each type of data is valuable, to identify positive changes in most areas of reasoning for both groups, even though difference in the groups were not statistically significant. Figures 12 through 18 identify the trends in data for visual comparison of the control and intervention group comparisons in overall scores, percentile scores, and each sub-scale (i.e., induction, deduction, analysis, inference and evaluation).

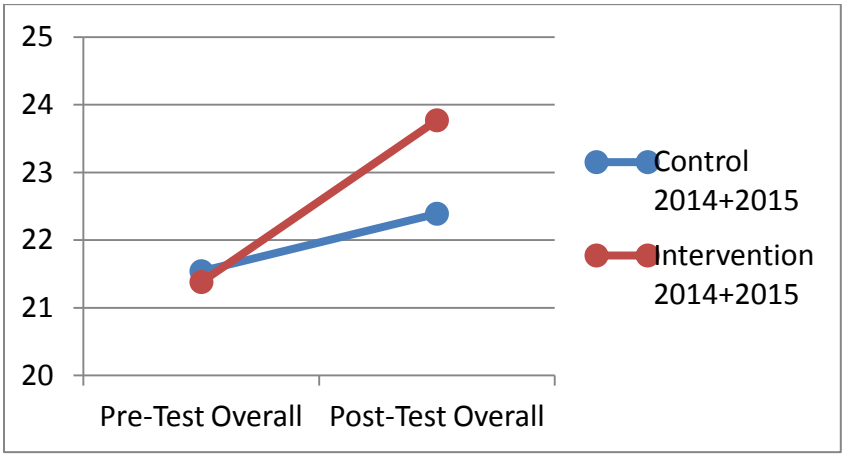


Figure 12: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2014 + 2015, Overall

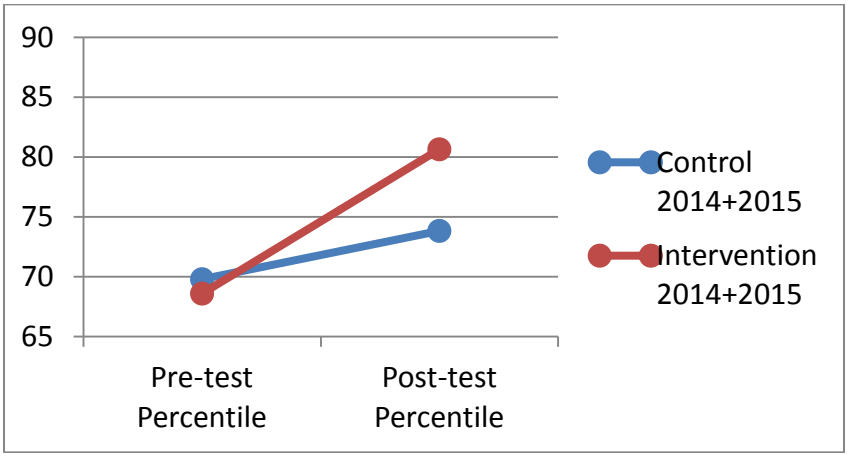


Figure 13: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2014 + 2015, Percentile

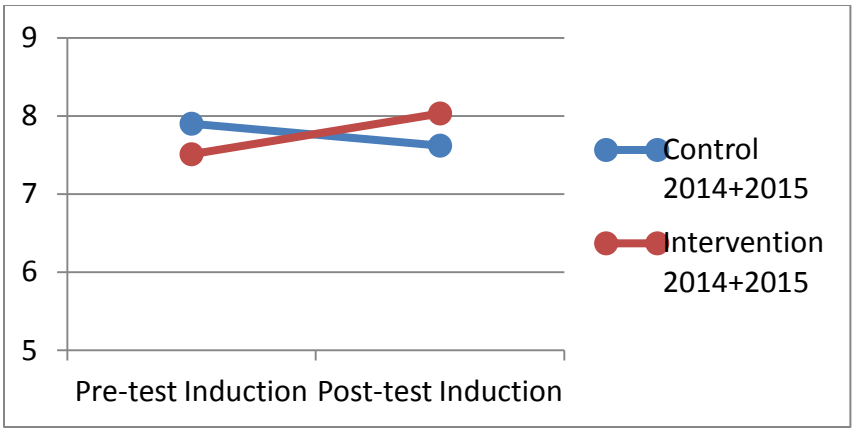


Figure 14: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2014 + 2015, Induction

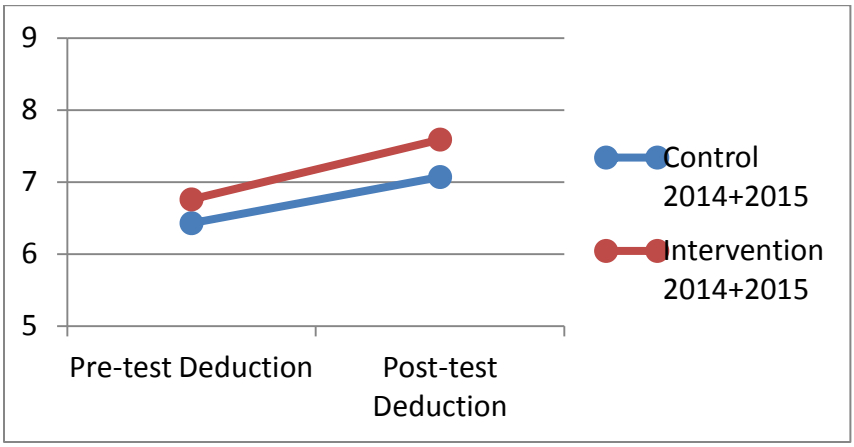


Figure 15: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2014 + 2015, Deduction

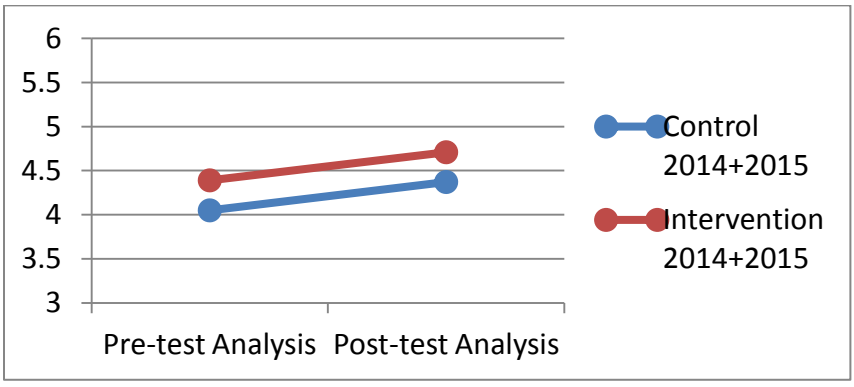


Figure 16: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2014 + 2015, Analysis

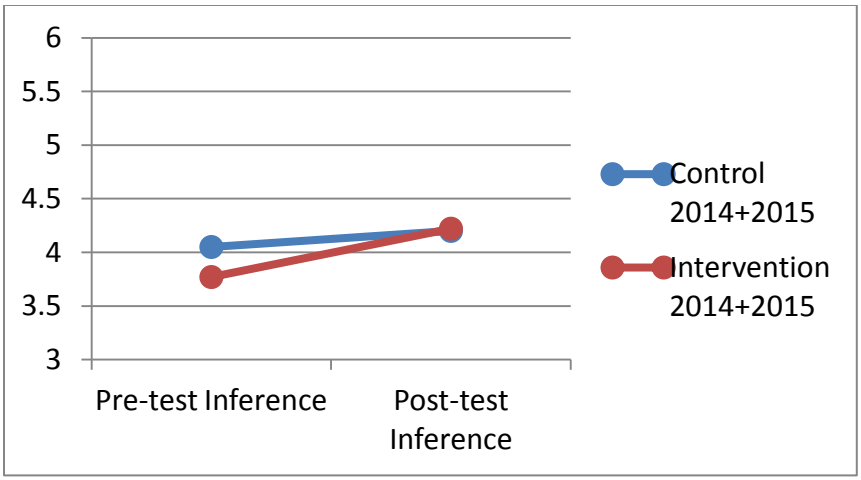


Figure 17: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2014 + 2015, Inference

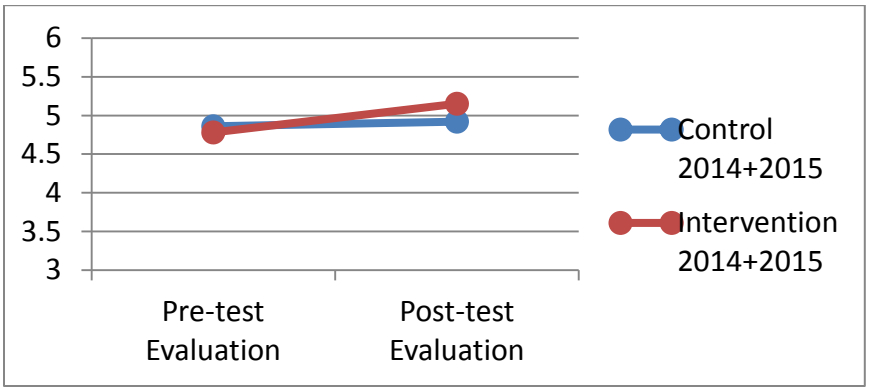


Figure 18: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2014 + 2015, Evaluation

Research Question 2

The second research question focused on students' self-perceived reasoning skills in the two groups, to examine if one type of case study and instructional method was superior to the other in facilitating reasoning. In order to determine if there was a statistically significant difference in self-reported perceived clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone, data from the Self-Assessment of

Clinical Reflection and Reasoning (SACRR) was utilized. Only participants from the 2015 data collection cycle were utilized, as this instrument was not used in the 2014 data collection cycle. Therefore, there were originally 18 students in the control group and 17 students in the intervention group. However, due to incomplete data for one student in the control group, only 17 students were included. This resulted in a sample size of 17 in each group. The Self-Assessment of Clinical Reflection and Reasoning (SACRR) is a 26-item self-report Likert-scale questionnaire that was designed by Royeen, Mu, Barrett and Luebben (2001) to evaluate the effect of instructional methods on clinical reflection and reasoning (see Appendix E). The SACRR has been used to study problem-based and experiential learning specifically in occupational therapists and occupational therapy students (Coker, 2010; Scaffa & Smith, 2004; Scaffa & Wooster, 2004).

Comparisons within groups. First, paired t-tests were used to compare the pre- and post-test scores of the SACRR of the control group (Table 13) and the intervention group (Table 14), to determine if a statistically significant change occurred. For the control group, improved post-test score means were noted in 25 of the 26 individual items, or 96.2% of the questions. This change was statistically significant for seven individual items, or 26.9% of all the items. Item 5 focused on keeping an open mind regarding interventions, item 10 addressed understanding of clinical problems, item 12 focused on intervention planning, item 15 addressed coping with change, item 16 was functioning with uncertainty, item 18 was validation of hypotheses through experience, and item 25 addressed decision making based on experience. (Item 5 $t_{(16)} = 3.77$, $p<.01$, item 10 $t_{(16)} = 2.22$, $p=.04$, item 12 $t_{(16)} = 2.75$, $p=.01$, item 15 $t_{(16)} = 2.68$, $p=.02$, item 16 $t_{(16)} = 3.39$, $p<.01$, item 18 $t_{(16)} = 3.04$, $p<.01$, and item 25 $t_{(16)} = 2.51$, $p=.02$.) The total

mean score in the control group improved from 100.59 to 110.00 (out of a possible 130 score). This was also a statistically significant improvement, for total self-assessment of clinical reasoning. (Total score $t_{(16)} = 4.61$, $p<.01$.)

For the intervention group, improved post-test scores were noted in 23 of the 26 individual items, or 88.5% of the questions. This change was statistically significant for six individual items, or 23.1% of the items. Item 7 related to examination of theory for understanding client problems and proposed solutions, item 16 was functioning with uncertainty, item 17 addressed hypothesizing about the reasons for client problems, item 24 was use of clinical protocols for treatment, item 25 addressed decision-making based on experience, and item 26 focused on use of theory to understand intervention strategies. (Item 7 $t_{(16)} = 2.70$, $p=.02$, item 16 $t_{(16)} = 3.10$, $p<.01$, item 17 $t_{(16)} = 2.17$, $p=.05$, item 24 $t_{(16)} = 3.04$, $p<.01$, item 25 $t_{(16)} = 3.10$, $p<.01$, item 26 $t_{(16)} =3.10$, $p<.01$.) The total mean score in the control group improved from 99.42 to 105.29 (out of a possible 130 score). This was also a statistically significant improvement, for total self-assessment of clinical reasoning. (Total score $t_{(16)} = 45.86$, $p<.01$.)

Two items showed a statistically significant difference between pre-test and post-test in both the control and intervention groups. These were items 16 (functioning with uncertainty) and 25 (making decisions based on experience). In addition, the change in the total score was statistically significant in both groups.

Table 13

Comparison of SACRR Pre-Test and Post-Test Scores (2015, Control Group)

	Pre-test		Post-test				
	Mean	SD	Mean	SD	Difference	t	p
1 Question myself	3.88	0.78	4.18	0.95	0.29	1.16	0.26
2 Ask questions	4.59	0.51	4.82	0.39	0.24	1.73	0.10
3 Sufficient data	3.65	0.79	4.00	0.50	0.35	1.56	0.14
4 Seek solutions	4.12	0.70	4.35	0.61	0.24	1.17	0.26
5 Open mind	4.29	0.47	4.76	0.44	0.47	3.77	**0.002***
6 Compare info	4.00	0.71	4.35	0.61	0.35	1.85	0.08
7 Theory (understand client)	3.35	0.49	3.35	0.79	0.00	0.00	1.00
8 Frame of reference (planning)	3.71	0.92	3.82	0.64	0.12	0.52	0.61
9 Use theory for treatment	3.47	0.72	3.59	0.71	0.12	0.62	0.54
10 Frame of reference (understand problem)	3.53	0.80	4.00	0.61	0.47	2.22	**0.04***
11 Examine assumptions	3.59	0.80	3.94	0.75	0.35	1.31	0.21
12 Ask "what if"	4.12	0.49	4.53	0.51	0.41	2.75	**0.01***
13 Colleagues	4.47	0.51	4.71	0.47	0.24	1.73	0.10
14 Client's family	3.88	0.78	4.29	0.59	0.41	1.51	0.15
15 Cope with change	3.29	0.99	3.94	0.56	0.65	2.68	**0.02***
16 Uncertainty	2.82	1.13	3.76	0.67	0.94	3.39	**0.004***
17 Hypothesize	3.76	0.83	4.24	0.66	0.47	2.06	0.06
18 Own experience	3.47	0.80	4.00	0.71	0.53	3.04	**0.008***
19 Identify problems	4.18	0.64	4.41	0.51	0.23	1.29	0.22
20 Anticipate events	4.29	0.59	4.59	0.62	0.29	1.77	0.10
21 What makes it work	4.18	0.64	4.12	0.78	- 0.06	0.19	0.85
22 Context	4.24	0.75	4.25	0.49	0.12	0.52	0.61
23 Did intervention work	4.18	0.64	4.53	0.62	0.35	1.56	0.14
24 Protocols	4.00	0.79	4.35	0.61	0.35	2.07	0.06
25 Decision based on experience	3.94	0.83	4.65	0.61	0.71	2.51	**0.02***
26 Theory (understand intervention)	3.71	0.59	3.82	0.73	0.12	0.52	0.61
TOTAL	100.59	6.89	110.00	6.49	9.41	4.61	**<0.01***

**p<.05*

Table 14

Comparison of SACRR Pre-Test and Post-Test Scores (2015, Intervention Group)

	Pre-test		Post-test				
	Mean	SD	Mean	SD	Difference	t	p
1 Question myself	3.71	0.85	3.88	1.05	0.18	0.72	0.48
2 Ask questions	4.24	0.56	4.35	0.49	0.12	0.70	0.50
3 Sufficient data	3.82	0.95	3.76	0.56	- 0.06	0.37	0.72
4 Seek solutions	3.76	0.83	3.88	0.70	0.12	0.62	0.54
5 Open mind	4.18	0.39	4.35	0.49	0.18	1.14	0.27
6 Compare info	3.94	0.56	4.12	0.33	0.18	1.38	0.19
7 Theory (understand client)	3.35	0.86	3.82	0.53	0.47	2.70	**0.02***
8 Frame of reference (planning)	3.82	0.73	3.53	0.72	- 0.29	1.05	0.31
9 Use theory for treatment	3.59	0.87	3.71	0.77	0.12	0.62	0.54
10 Frame of reference (understand problem)	3.47	0.94	3.82	0.53	0.35	1.38	0.19
11 Examine assumptions	3.47	0.72	3.82	0.53	0.35	1.85	0.08
12 Ask "what if"	4.18	0.53	4.24	0.56	0.06	0.37	0.72
13 Colleagues	4.29	0.47	4.47	0.51	0.18	1.85	0.08
14 Client's family	3.76	0.75	3.94	0.83	0.18	0.72	0.48
15 Cope with change	3.65	0.86	4.06	0.56	0.41	1.69	0.11
16 Uncertainty	3.18	0.81	3.82	0.64	0.65	3.10	**0.01***
17 Hypothesize	3.47	0.94	4.00	0.50	0.53	2.17	**0.05***
18 Own experience	3.71	0.77	3.88	0.86	0.18	0.68	0.51
19 Identify problems	4.24	0.56	4.29	0.47	0.06	0.57	0.58
20 Anticipate events	4.00	0.73	4.19	0.40	0.19	1.00	0.33
21 What makes it work	4.18	0.53	4.12	0.60	- 0.06	0.44	0.67
22 Context	4.18	0.53	4.24	0.56	0.06	0.37	0.72
23 Did intervention work	3.94	0.56	4.24	0.56	0.29	1.77	0.10
24 Protocols	3.71	0.59	4.24	0.56	0.53	3.04	**0.01***
25 Decision based on experience	3.82	0.95	4.47	0.51	0.65	3.10	**0.01***
26 Theory (understand intervention)	3.41	1.00	4.06	0.83	0.65	3.10	**0.01***
TOTAL	99.41	7.31	105.29	6.42	5.88	5.86	**<0.01***

**p<.05*

Comparisons between groups. ANCOVA was then conducted, to determine if differences existed between the control and intervention group post-test scores, with

adjustments for pre-existing differences in age, GPA, and prior experience. Levene's Test of Equality of Error Variances was calculated for each item and the total score of the SACRR, in order to determine if score variances were similar between the control and intervention groups. Of the pre-test and post-test data for the overall score, variance was equivalent. For the individual items, 47 of the 52 items, or 90.38% of test items, demonstrated homogeneity of variance. Five of the 52 items demonstrated a statistically significant difference in variance (items 6, 13, 16, 17, 26). Data was transformed for the items in which there were differences in variance, using the Winsor technique, in an attempt to establish homogeneity of variance. This technique influenced scores for three of the five items, but did not change the scores for the remaining 2 SACRR items. When Levene's Test of Equality of Error Variances was again calculated for the three altered items, the variance remained statistically significant for all items. In other words, this technique did not correct the problem with homogeneity of variance for any of the single SACRR items (see Appendix P for details). Internal consistency was acceptable, as demonstrated by Cronbach's alpha of 0.75 for the SACRR pre-test and 0.78 for the SACRR post-test. This was slightly lower than the reported 0.87 for the pre-test and 0.92 reported for the post-test by the SACRR developers (Royeen, et. al., 2001). However, this was still within acceptable ranges for reliability.

SACRR means, adjusted for age, GPA, and prior experience, are listed in Table 15 for total score and individual item scores. The factors of GPA and age did not have a statistically significant effect on student perceptions of their reasoning skills. However, experience did have an influence on one item (Item 8) of the SACRR ($F = 7.78$. $p=.01$),

which asked participants to identify their use of frames of reference when planning intervention strategies.

There were no statistically significant differences noted in SACRR individual item scores between the control and intervention groups when adjusted post-test means were compared (See Table 16). The total score, although not a statistically significant result, can be considered relevant as it was approaching the p=.05 significance level ($F_{(1,32)} = 3.97$, $p = .06$).

Table 15

SACRR Estimated Marginal Means, 2015

	Control		Intervention		
	Mean	SE	Mean	SE	Effect size
1 Question myself					
Pre-Test	3.91	.21	3.68	.21	
Post-Test	4.18	.26	3.88	.26	0.29
2 Ask questions					
Pre-Test	4.54	.14	4.29	.14	
Post-Test	4.72	.11	4.46	.11	0.59
3 Sufficient data					
Pre-Test	3.68	.24	3.79	.24	
Post-Test	3.91	.14	3.85	.14	0.11
4 Seek solutions					
Pre-Test	4.16	.21	3.73	.21	
Post-Test	4.36	.17	3.88	.17	0.71
5 Open mind					
Pre-Test	4.24	.11	4.23	.11	
Post-Test	4.69	.12	4.43	.12	0.54
6 Compare info					
Pre-Test	3.93	.17	4.01	.17	
Post-Test	4.36	.14	4.11	.14	0.45
7 Theory (understand client)					
Pre-Test	3.38	.16	3.33	.16	
Post-Test	3.31	.17	3.86	.17	0.46
8 Frame of reference (planning)					
Pre-Test	3.72	.17	3.81	.17	
Post-Test	3.93	.18	3.43	.18	0.69
9 Use theory for treatment					
Pre-Test	3.48	.16	3.58	.16	

Post-Test	3.62	.19	3.67	.19	0.07
10 Frame of reference (understand problem)	3.61	.21	3.39	.21	
Pre-Test	3.94	.14	3.88	.14	0.11
Post-Test					
11 Examine assumptions					
Pre-Test	3.47	.20	3.59	.20	
Post-Test	3.94	.18	3.83	.18	0.15
12 Ask “what if”					
Pre-Test	4.16	.14	4.13	.14	
Post-Test	4.61	.15	4.16	.15	0.75
13 Colleagues					
Pre-Test	4.38	.13	4.38	.13	
Post-Test	4.63	.13	4.54	.13	0.17
14 Client’s family					
Pre-Test	3.68	.20	3.96	.20	
Post-Test	4.27	.20	3.97	.20	0.38
15 Cope with change					
Pre-Test	3.21	.25	3.73	.25	
Post-Test	3.89	.15	4.11	.15	0.37
16 Uncertainty					
Pre-Test	2.26	.26	3.38	.26	
Post-Test	3.69	.17	3.90	.17	0.31
17 Hypothesize					
Pre-Test	3.65	.23	3.59	.23	
Post-Test	4.20	.16	4.03	.16	0.27
18 Own experience					
Pre-Test	3.49	.22	3.69	.22	
Post-Test	3.99	.22	3.90	.22	0.10
19 Identify problems					
Pre-Test	4.11	.16	4.31	.16	
Post-Test	4.40	.14	4.31	.14	0.16
20 Anticipate events					
Pre-Test	4.18	.16	4.11	.16	
Post-Test	4.48	.14	4.28	.14	0.36
21 What makes it work					
Pre-Test	4.09	.15	4.27	.15	
Post-Test	4.19	.19	4.04	.19	0.20
22 Context					
Pre-Test	4.14	.17	4.28	.17	
Post-Test	4.40	.15	4.19	.15	0.35
23 Did intervention work					
Pre-Test	4.13	.16	3.99	.16	
Post-Test	4.49	.16	4.28	.16	0.33
	4.01	.19	3.70	.19	

24 Protocols	4.33	.16	4.26	.16	0.11
Pre-Test					
Post-Test					
25 Decision based on experience					
Pre-Test	3.93	.24	3.83	.24	
Post-Test	4.58	.15	4.54	.15	0.07
26 Theory (understand intervention)	3.62	.21	3.50	.21	
Pre-Test	3.77	.23	4.05	.23	0.30
Post-Test					
Overall Score					
Pre-Test	99.19	1.71	100.81	1.71	
Post-Test	109.49	1.77	105.80	1.77	0.52

Table 16

SACRR ANCOVA, 2015

	F-value	Significance (p)
1 Question myself	0.04	0.85
2 Ask questions	0.01	0.95
3 Sufficient data	0.25	0.62
4 Seek solutions	0.02	0.89
5 Open mind	1.10	0.30
6 Compare info	1.46	0.24
7 Theory (understand client)	3.62	0.07
8 Frame of reference (planning)	2.49	0.13
9 Use theory for treatment	0.03	0.86
10 Frame of reference (understand problem)	0.18	0.67
11 Examine assumptions	0.34	0.57
12 Ask “what if”	2.54	0.12
13 Colleagues	0.22	0.64
14 Client’s family	1.73	0.20
15 Cope with change	0.55	0.47
16 Uncertainty	1.69	0.21
17 Hypothesize	0.08	0.78
18 Own experience	0.55	0.47
19 Identify problems	1.29	0.27
20 Anticipate events	0.21	0.65
21 What makes it work	0.74	0.40
22 Context	1.15	0.29
23 Did intervention work	0.30	0.86
24 Protocols	0.58	0.45
25 Decision based on experience	0.02	0.90
26 Theory (understand intervention)	1.22	0.28
Overall Score	3.97	0.06

Trends in SACRR data. Trends were noted among participants, even though they were not statistically significant when ANCOVA was used to partial out pre-existing differences between the groups. Overall scores for both groups improved from pre-test to post-test, indicating students' perceptions of improved reasoning skills. Examination of individual item scores demonstrated that students in the control group identified improved reasoning in 25 of the 26 items; students in the intervention group improved in 22 of 26 items.

Relationship to research question. Data from the Self-Assessment of Clinical Reflection and Reasoning (SACRR) was used to determine if a statistically significant difference existed in self-reported, perceived clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone. Statistically significant changes between pre-and post-test total scores of the SACRR and in several item scores, demonstrated that all students perceived some improvement in their reasoning skills, regardless of which learning activity was completed. Age and GPA did not influence reasoning, but prior experience with physical rehabilitation affected one item of the SACRR. When comparing the two groups, and partialling out the effects of GPA, age and prior experience in physical rehabilitation settings, the difference between the control and intervention groups was approaching statistical significance ($p=.06$). In fact, the control group had a higher post-test score than the intervention group. Therefore, although all students identified some perceived improvements to their clinical reasoning skills, the type of instructional activity did not make a statistically significant difference. The

students who participated in the text case study perceived changes in their clinical reasoning skills that were higher, although not statistically significant, than the students in the video case study and clinical reasoning activity. Figure 19 illustrates the differences between the groups, when examining the changes from pre-test to post-test, as calculated with ANCOVA.

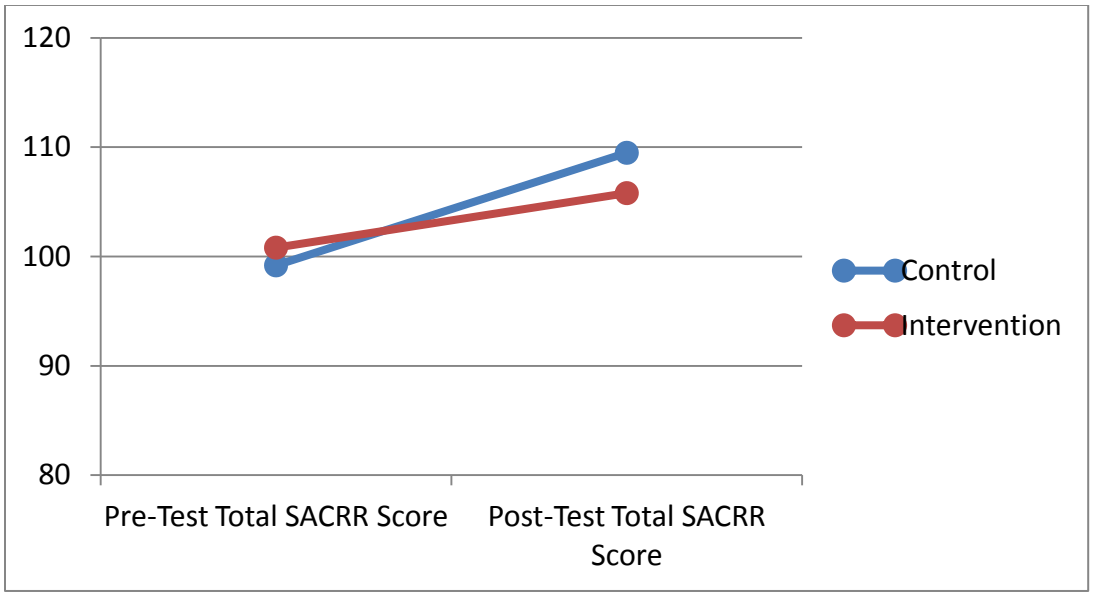


Figure 19: SACRR Pre-Test and Post-Test Comparison for Both Groups, Overall Score

Convergent validity of HSRT and SACRR. The overall scores of the HSRT and the total scores of the SACRR were examined to determine if there was convergent validity between these two instruments. The Pearson Correlation was used to determine the strength and direction of the relationship between these two measures (see Table 17). Only the overall scores were used from the HSRT, as this indicated the most meaningful measure of reasoning (Abrami, 2008). Only the total scores were used from the SACRR, as these were used in measures of validity in prior studies (Coker, 2010; Royeen, Mu, Barrett & Luebben, 2001). There was a moderate correlation between the HSRT overall

pre-test score and the SACRR total pre-test score ($r_{(34)}$=.43, p=.01). This demonstrated convergent validity in the pre-tests. However, this was not repeated in the post-test correlation ($r_{(35)}$= .24, p=.16).

Table 17

Convergent Validity Testing of Instruments using Pearson Correlation

	SACRR Total Pre-test (r)	Significance (p)	SACRR total Post test (r)	Significance (p)
HSRT Overall Pre-test	.433	**0.010***	0.329	0.053
HSRT Overall Post-test	.082	0.645	0.241	0.164

**p<.05*

Research Question 3

The third research question utilized a phenomenological approach to promote understanding of student satisfaction, perceptions of the learning experience, and their perceptions of clinical reasoning developed through the case-based learning activities. Four interviews were conducted with students who participated in each of the learning assignments, either the intervention group utilizing a comprehensive online video case study with a clinical reasoning learning activity, or the control group who utilized text and brief video cases alone.

The four participants from the control group were all female, with a mean age of 20.75 years old and a mean GPA of 3.80. Their range of the overall score of the HSRT pre-test was 10-29, which exactly matched the entire control group. The mean overall score of these four participants was 21.00, and the total control group mean was 22.22. The median HSRT overall pre-test score for the total control group was 22.50. These interviewees represented the lowest pre-test score (10), a score near the median (21), a

score above the median (24), and the highest group score (29). The range of the HSRT overall post-test score was 7-29 for the control group, 7-22 for these four interviewees. The mean overall post-test score for these participants was 16.25, compared to 22.78 for the entire control group. The control group median score on the HSRT overall post-test was 24.0. The interviewees represented the lowest score (7), with the remaining three scores below the median (15, 21, 22). It is noteworthy that all of these participants demonstrated decreased overall scores on the post-test when compared to their pre-test scores. Their pre-test mean of 21 is categorized as strong reasoning performance by Insight Assessments (2014), their post-test mean of 16.25, is categorized as a moderate reasoning skill performance. In summary, these four participants reflected low, medium and high performance on the overall pre-test, but low to medium performance on the post-test.

The four participants from the intervention group were also all female, with a mean age of 24.50 years old and a mean GPA of 3.36. Their range of the overall score of the HSRT pre-test was 13-19, while the entire intervention group range was 13-27. The mean overall pre-test score of these four participants was 18.00, and the total intervention group mean was 20.24. The median HSRT overall pre-test score for the total intervention group was 21.00. These interviewees represented the lowest pre-test score (13), and the remaining three scores below the median (15, 15, 19). The range of the HSRT overall post-test score was 16-29 for the intervention group, 16-21 for these four interviewees. The mean overall post-test score for these participants was 18.25, compared to 22.29 for the entire intervention group. The group median score on the HSRT overall post-test was 22.0. The interviewees represented the lowest score (16), with the remaining three scores

below the median (18, 18, 21). For the intervention group, three of the four participants demonstrated increased overall scores on the post-test than they did on the pre-test. Their pre-test mean of 18.00 and post-test mean of 18.25 are categorized as moderate reasoning performance by Insight Assessments (2014). In summary, these four participants reflected low and low to medium performance on both the HSRT overall pre-test and post-test. (See Appendix Q for summary of interview participant's description.)

Description of data analysis.

Consistent with the sequential nature of this mixed methods approach, all interviews were conducted after the students had completed the quantitative portions of the study, and after course grades had been posted. In each interview, the researcher explicitly asked participants to be honest in expressing and describing their responses to the questions, as well as in the discussions that resulted from these questions, since the researcher was also the course instructor. The interviews followed a semi-structured format, with guiding questions that were reflective of the research question (see Appendix H) but that allowed for elaboration or further discussion depending on the participant responses. Each interview lasted for approximately 25-45 minutes, and each participant was informed at the beginning of the interview that the conversation was being recorded with a digital voice recorder. These interviews all took place over three days. At the conclusion of the interviews, the audio files were delivered electronically to a transcribing service, and the transcribed interviews were later returned to the researcher.

The Epoche process was completed by the researcher prior to conducting these interviews, to acknowledge and bracket the pre-conceived notions about the learning activities, student participants, and potential outcomes of the interviews. Specifically, the

researcher had to acknowledge the pre-conceived notions that the video cases were superior to the text cases, regarding the development of clinical reasoning. This belief was based on both personal opinion, as well as a preliminary review of the results of the Health Science Reasoning Test. The researcher also acknowledged a pre-existing belief that the videos and the associated learning activity offered a richer learning experience for students, and that they would prefer these to traditional or text-based cases. This belief, too, was based on both a personal opinion and a preliminary review of the Self-Assessment of Clinical Reflection and Reasoning. The complementary nature of this sequential mixed methods design allowed for review of the quantitative data to inform the follow-up questions and discussions in the interviews, to gather more data to facilitate understanding of the student learning experience and student clinical reasoning development.

The phenomenological reduction phase of data analysis was initiated after the transcribed interviews had been returned to the researcher. Interviews were read, and statements that were viewed to give some insight into the student experiences and research question were grouped into categories or clusters, called horizonalization by Moustakas (1994). These included clusters related to instruction, learning preferences, comparison of assignments to other course components, (i.e., lecture or lab), advantages and disadvantages of text or video cases, value of observation or visual cues, facilitation of learning, student satisfaction, use of reasoning or reflection, relationship to ethics, and application of assignments to other courses taken during the semester. One unexpected cluster was the comparison of video to text cases and case-based reasoning. This emerged as students who had participated in the text-based assignments for the research

study had viewed brief video clips or discussed videos during class sessions in other courses taken concurrently, for example Adult Neurological Conditions. During this phenomenological reduction phase, both descriptive codes and a few direct quotations were collected into a document.

Two colleagues were consulted at this stage of analysis, in order to discuss the clusters of meaning and ensure validity. Both of these colleagues are occupational therapy faculty members at the institution in which the study was conducted. One colleague was a clinical faculty member who recently completed a doctoral program, culminating with a dissertation which utilized qualitative methods. This colleague was able to relate her own learning process of coding and analysis which had been reviewed by her doctoral committee. The second colleague was a tenure-track faculty member who has consistently directed graduate level research at the institution in which the study was conducted. She has also conducted qualitative research for several years with articles currently being considered for publication. Both of these colleagues were asked to contribute to validity checking for this study based on their experience with qualitative research, their understanding of the occupational therapy constructs that were addressed in this research study, and with their experience using instructional methods in an occupational therapy curriculum. Discussions with these colleagues contributed to the second round of analysis.

During this imaginative variation stage of analysis, the researcher first reviewed the clusters of meaning, as they had been discussed and refined with colleagues. One category was eliminated, as it was mentioned by only one interviewee and was not described for full understanding of meaning, namely relationship of assignments to

ethics. Additional quotations were collected and grouped with the original clusters, so that the textural descriptions could be further considered and refined into structural descriptions. The clusters or horizons were refined and re-grouped into descriptions with additional meaning. For example, student satisfaction was clarified to consider what students stated contributed to satisfaction, such as relevance to clinical practice. Students also described high satisfaction with the theoretical construct of case-based reasoning, based on their descriptions of how they processed information about the cases, and how they made decisions to complete the assignment.

The more experienced colleague was also consulted at this point in data analysis, to review the researcher's document with the refined descriptions and quotations. She was in general agreement with the refined textual descriptions, but discussed how some of the quotations may be used to understand multiple groupings or themes.

In the final data analysis stage of synthesis, the researcher began by returning to the methodology and research questions as they were structured in the research proposal. The key categories of inquiry were re-visited, namely student satisfaction, student perceptions of learning experience, and student perceptions of clinical reasoning. The groupings and quotations that were refined in the imaginative variation phase were considered as they fit into these three lines of inquiry or questioning. Textural descriptions were integrated into themes that demonstrated an expression of the essence of the student experience. Specific quotations were selected to demonstrate the phenomenon of the student experience related to the learning activities studied and student clinical reasoning skills.

Once again, the occupational therapy colleague reviewed these themes and the initial writing by the researcher describing these themes. Discussion was utilized during this stage of data analysis to facilitate relationship of these themes and findings to the quantitative findings, and to discuss integration of the two types of analysis into meaningful conclusions and future directions. Figure 20 provides an overview of the qualitative data analysis process, which is based on the phenomenological framework detailed by Moustakas (1994).

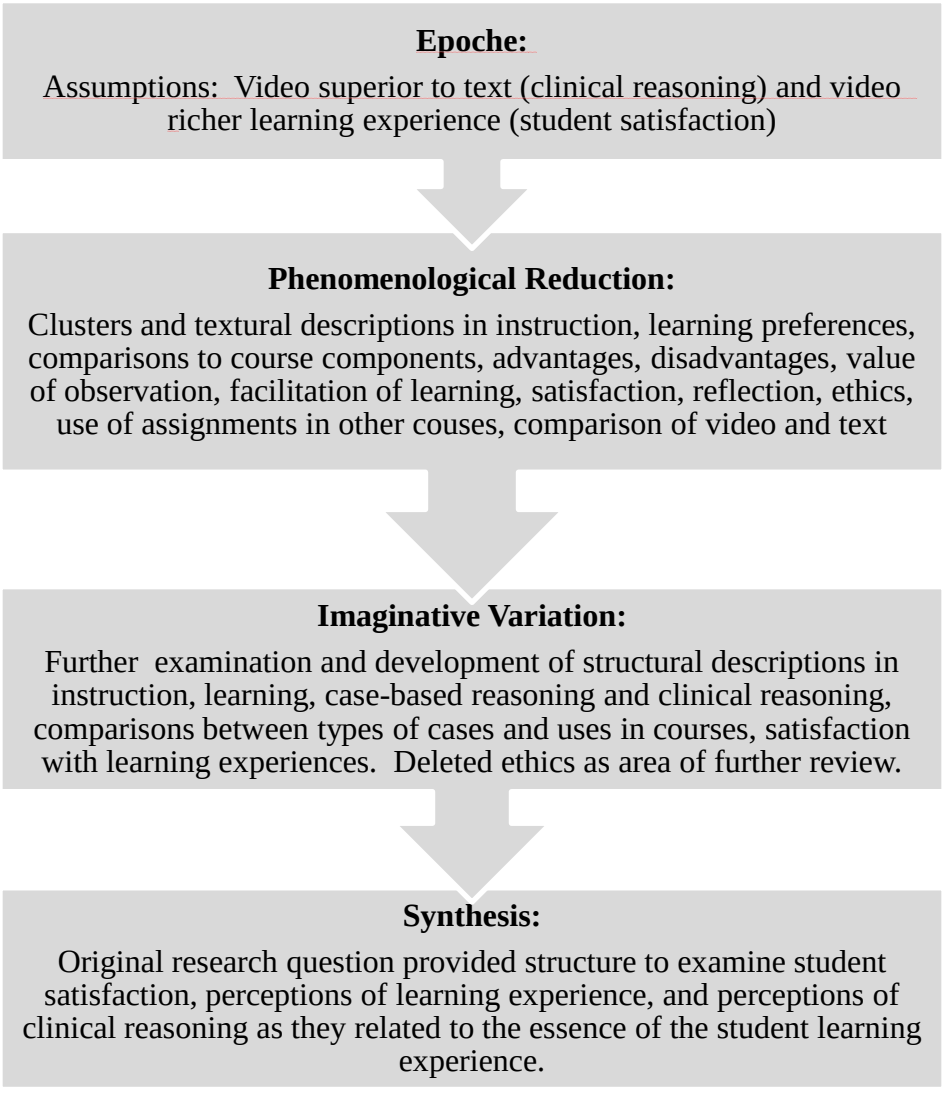


Figure 20: Summary of Qualitative Analysis Process

Key themes of qualitative analysis.

Several key themes were eventually identified in each of the targeted lines of inquiry identified in research question 3; student satisfaction, student perceptions of the learning experience, and student perceptions of clinical reasoning (See Table 18). Student satisfaction was consistent for both types of assignments, as all interviewees stated they were satisfied with the learning activities. More specifically, they reported that the cases were relevant to fieldwork and clinical practice, and they described how they were able to use case-based reasoning as a means to facilitate learning. Investigation of student perceptions of the learning experience allowed for identification of key advantages and disadvantages of each type of case, and learning preferences or features of the learning activities that students reported to be positive, such as the ability to work with a partner or group, the ability to repeat the assignment with new cases, and the value of integrating instructor feedback. Finally, students consistently reported that both types of cases facilitated clinical reasoning skills. However, the cognitive process that the learners described showed that students who viewed the video cases and completed the clinical reasoning activity were more able to explicitly identify and explain specific aspects of clinical reasoning than those who completed the text case assignment.

Student satisfaction.

Satisfaction has been described in case-based learning as a positive experience or making the "learning experience more enjoyable" by Curran, Sharpe, Forristall and Flynn (2008, p. 432). Similarly, Thistlewaite, et. al., (2012) describe satisfaction as positive student emotion, engagement in the learning activities, and positive learning experiences.

Table 18

Primary Themes Identified from Interviews

Categories / Guiding Questions	Key Themes
Student Satisfaction	1. Relevance to fieldwork and clinical practice 2. Case-based reasoning used to facilitate learning
Student Perceptions of Learning Experience	1. Advantages of text or video cases 2. Disadvantages of text or video cases 3. Learning preferences common to both learning activities a. Working with partner or group favorable b. Ability to repeat assignment with new case c. Integration of instructor feedback
Student Perceptions of Clinical Reasoning	1. Both types of cases facilitated clinical reasoning 2. Differing abilities to explain clinical reasoning a. Text cases more global view of reasoning b. Video cases more explicit descriptions of reasoning

These descriptions were similar to student descriptions for both learning activities in the current study.

When asked to describe their satisfaction, including what they liked or disliked about the learning activities, all interviewees reported satisfaction with the assignments. Student comments were not specific, but reflected an overall appreciation for the cases. Statements such as “I really did like the text ones,” “I definitely feel like I benefitted from the case studies,” and “I definitely enjoyed the case studies,” were expressed by students in the control group. The particular format for the cases, whether video or text cases, did not have an impact on satisfaction, even though each method had different characteristics, advantages or disadvantages. In the intervention group, students reported “I like watching the videos, you know,” and “I just love the videos.” All of the students

interviewed, regardless of the type of learning activity, reported satisfaction with the assignment.

When asked to describe their satisfaction further, Terri stated the following about the text cases: "On a scale of 1 to 10, 10 being most satisfied, I would say 10. Because it kind of like forces you to use your clinical reasoning." Dana, who was also in the text group, stated "I think it was a good way to do it [learn clinical reasoning]." From the video case group, Laura reported "I thought it was a good assignment." Probing questions were used to identify what was satisfying about the assignments in both groups, and the two primary themes were relevance to fieldwork and clinical practice, and a description of how case-based reasoning was used to facilitate learning and reasoning in the assignments.

Relevance to clinical practice. Relevance to clinical practice, both in fieldwork and in future work as a professional occupational therapist, was cited by all students, regardless of group, as a key benefit of the assignments. "I actually really liked them [case studies]. I felt like it gave me a good idea of what to expect, you know, when we start practicing in the future," was reported by Kelly, a student in the text group. Relevance to clinical practice served to increase student interest and motivation or investment in completing the assignments. Emma, another student in the text group stated, "So, I feel like I had more of an interest maybe in the case studies, because I felt like it was something that really applied to my future." From the video group, Jessie remarked, "It makes it more real life when you see somebody in that situation. And it makes you kind of, like, almost feel more you want…to put more effort into it, almost." Both types of cases were structured to facilitate student investigation of contextual detail

and situations specific to individual clients. This type of application to clients and detail regarding context is not typically presented during classroom lectures, in which generalities are taught. Although an instructor can state in a lecture that context needs to be considered, these cases allow for demonstration of the importance of application and situational reasoning as it applies to recipients of occupational therapy services. Jessie described this as "I like watching the videos, you know. Because you can just see what the OT is doing too. So you kind of get like an idea of -- like some ideas of how he would approach that situation."

Use of case-based reasoning. Case-based reasoning as a means to facilitate learning was also an important benefit identified by students in both sections. Although students did not explicitly state that they had used case-based reasoning, all described situations in which they had utilized this theoretical construct. This included principles of case-based reasoning such as authenticity, high levels of engagement in the activities, and structured in realistic problems (Bagdasarov, et. al., 2012; Choi & Lee, 2009; Jonassen, 1996; Kim, et. al., 2006; Thistlewaite, et. al., 2012). For example, Kelly, from the text case group reported,

> I feel like it, you know, in the classroom you learn about all these conditions and things. And then being able to actually see a client or at least a fake client on paper [facilitates learning]. And be able to, you know, think about brain storm like what we could do to help them, and like get feedback on it. So that was definitely helpful.

Engagement in the learning activities and realism of the problems was cited by both groups; however authenticity was cited more in the video group. For example, Laura

stated, “I think you might learn more from the videos. Just because it’s more like practicing will be.” Emma stated, “[It’s] more realistic probably to have the video cases. Because you have to really observe and pay really close attention.”

Students reported recalling patient cases from fieldwork to complete the learning activities associated with the assigned cases, another key cognitive strategy gained through case-based reasoning. They also utilized case-based reasoning to recall cases used for the assignments to answer questions on course exams or during other classroom and lab activities and assignments. This utilizes the process described by Jonassen and Hernandez (2002), in which learners are able to give meaning and context to experiences, index those experiences for future recall, and then perform more effective problem-solving based on their understanding of those cases. Kelly, for example, stated, “I actually suggested that we do that in a few of the other classes, like the neuro class and things like that. Because I definitely benefit from those types of [case-based] approaches when learning.” In some interviews, students reported utilizing the online video library or other online resources to search for video cases to facilitate their more comprehensive understanding of a condition. From the text group, Dana stated:

> I don’t know what I would do for a burn at all. So I went to You Tube and looked up like, I don’t know, I watched a really great video on some OT that worked in an out-patient burn clinic.

Student perceptions of the learning experience.

Advantages and disadvantages of the text-based assignments and use of video cases were identified by students, either common to both types of cases or specific to either text or video cases. In addition, they discussed key features of the assignments that

focused on student learning preferences. This type of information was important to investigate, in order to ensure that learning activities and instructional methods are engaging and appropriate throughout an occupational therapy curriculum.

A***dvantage of repetition common to both groups.*** Only one advantage was reported in both types of assignments, namely the repetition available in these learning activities that is not possible in fieldwork or clinical practice experiences. Both the text and the video allowed for students to review the case as often as necessary to complete the learning assignment, to look for different elements in the case, or to refine their observations and analysis of the situation. Three students utilizing the video cases reported they had watched the videos on more than one occasion, but all four students using the text cases reported this as an advantage. Kelly reported:

> I think at first you, when you like read the case study, and you're like, oh I know like exactly what to do. But then you kind of have to like re-read it a few times and like really think about which one is -- or which intervention is the best for the client. So that's another reason I like them, because I was able to, you know, keep reading them over and over again until I like found the perfect fit for whatever the patient needed.

Similarly, Rebecca reported regarding the video case, "I went back and looked at them for your exam, for competencies, for neuro exam…. So, I like going back. And oh yeah, it really helps."

Advantages to text-based cases. Although repetition was a common advantage cited by students, some advantages were identified that were specific to each type of case presentation. All of the students who utilized the text cases, for example, reported a

positive feature regarding identification of the client's assets, problems, or particular areas of concern that would be addressed by an occupational therapist. Students didn't have to observe a problem; instead the text cases typically stated the client's strengths or problems explicitly. Kelly described this as follows:

> I think I'm just definitely the type of person that needs to have like all the background information. So having everything written out for me, that I could like keep referring back to, was really, really helpful. Because like that's how I learn best.

Written cases provided a more in-depth background, called an occupational profile in the discipline of occupational therapy, than the video cases. This was viewed favorably by all students in the text-based group, giving learners a richer understanding of the client, including his or her particular goals that could be used in planning interventions. Two students in the video group and three students in the text group considered the text-based case assignments as easier than the video to complete, based on the explicit statements regarding client needs. Terri stated, "The written case is better. Because it kind of like -- it gives you what to focus on, versus if you're watching a video, and you really don't know what you're supposed to be like looking at." Dana described this as "I felt like they summed it up good for you. Like they give you his background. They give you what he's doing in therapy. I feel like it's less that you have to analyze."

Advantage to video-based cases. The most frequently stated advantage to the video was a higher degree of realism or authenticity than other forms of cases. Students liked the ability to observe the client, as well as the occupational therapist's interactions with that client. For example, Jessie stated:

> Because you see the person. And then also, like it makes it more like a real life experience versus just reading something that, you know, it's kind of hard to like help someone come up with interventions when you don't really get a sight of like who the person is and things like that.

Jessie stated, "I like watching the videos, you know. Because you can just see what the OT is doing too. So you kind of get like an idea of -- like some ideas of how he would approach that situation." Students who identified themselves as visual learners also preferred any form of video cases, with or without the associated learning activities provided, to facilitate their learning. Brief video cases viewed and discussed in other classes were viewed as valuable for authenticity. Beth described this as follows:

> I'm very like visual and hands on. In a lecture, like sometimes I just get like distracted and by myself on a tangent. But the video like helps me focus in because it's stimulation to like view what I'm doing.

Readiness for fieldwork experiences and future clinical practice was another advantage, although cited less often than authenticity. Jessie described this as "Because it kind of like gets your anxiety out of the way. Because you're getting more like experience, like feeling like you're there." She also described this as "So, it's like that kind of like field work experience almost, because you're – like you're watching in on a session. You're the outside person." "I feel like the videos are more like clinical [or fieldwork], like, you know, getting that experience," reported Beth. Rebecca stated, "It's just like you're going to a field work over and over again."

Disadvantage of text-based cases. The only consistently reported disadvantage of the text cases showed the contrast to video authenticity; three of the four students did

not feel they had as realistic a view of the client and/or therapist in the text cases. Terri reported, "So often times like there's a difference between when you're reading something and then like when you're actually seeing it being applied." Dana stated "Because, you know, when you're seeing a patient, you're going to be seeing what they're doing." Finally, Dana explained "I feel like the text cases are a little less realistic maybe."

Disadvantage of video-based cases. The key disadvantage of the videos was the reliance on viewer interpretation, which resulted in some self-doubt for learners, who often felt that they may not be interpreting the videos correctly or accurately. For example, Emma reported of the video case, "You don't know as much background. You can't reference it as much. Again, it's more up to your own interpretation." Rebecca stated "It was definitely like hard in the beginning to be able to pick out like, you know, after a two minute clip, what's wrong. But it definitely makes you think."

The video case and associated assignment was typically viewed as more difficult and time intensive by students than a text-based case would be. Laura described, "I think you might learn more from the videos. Just because it's more like practicing will be. But I think the videos are harder." Beth stated "I thought that the videos …took more effort than the paper. Because paper like doesn't take that long to read.… to like watch the videos was kind of time consuming because I was taking notes and trying to watch." In fact, she suggested making changes to equalize the perceived differences between the video and text assignments. "I just think it's kind of fair [to add an additional component to the text-based assignment], because the videos take a lot more time than just reading a piece of paper."

Finally, two students were concerned that they were only viewing one small excerpt of a client's true story, and were not given as thorough a background or an occupational profile as students who utilized a text-based case, or who were given information directly from the instructor. Jessie described:

> I feel like I'm missing information [when watching videos], because I don't know that much, and I'm taking it from my perspective. Whereas, when you're teaching me, I feel like I'm getting all of the information I need to know.

Rebecca reported, "Some of the videos were short. So it's like you probably don't know what happened previously….That was the challenging part. You don't have the whole picture."

Learning preferences. Some aspects of the instructional methods were identified by students as favorable learning preferences, regardless of whether the cases were presented in written or visual format. Working with a partner and discussing ideas facilitated a broader comprehension of the case. Beth, from the video group explained:

> So, when I did it the first time with my partner, it really helped me to like have it click… we were like sharing ideas. So then I was able to reason and see like different things that I wouldn't pick up on my own.

The ability to repeat the same type of assignment with a new case was also valued by students in both groups. Reviewing and integrating feedback from the first case was considered useful to facilitate improved grades, learning, and clinical readiness. "So it makes you think twice [feedback from first assignment]. And it really helps… that was really good to have the feedback and then go back and redo it," explained Laura. Similarly, Rebecca stated, "And for you giving us feedback on our first one, make us

think, oh, maybe this is exactly what she's looking for. This is what it is. So it was very satisfying." Finally, Emma reported, "After like I got my grade and looked at it, I realized there were parts that I was missing."

Perceptions of clinical reasoning.

A difference emerged in how the text or video assignments facilitated the clinical reasoning process in students. Of the four students who participated in the text-based assignment, every learner described a more global view of clinical reasoning and how it was utilized in the case. All learners with this type of case relied more on instructor feedback than their own analysis for the development and use of clinical reasoning. Terri described that global approach as follows:

> Because you're given the scenario, and you have to think as a therapist. If I were an OT, how would I treat this person? What type of assessments would I do based upon their condition? The interventions and things like that. So, it kind of gives you the opportunity to think like an OT.

Also from the text group, Emma explained her clinical reasoning process as "Like it definitely had every element of what a real case would. So that helped me, I think, think through -- use my clinical reasoning -- because I had to consider everything." Emma further described her reliance on feedback as follows:

> So, there was a big jump, I felt like, to what we were given now, and having to use our clinical reasoning through every single question and really interpreting things. So even with the case studies, like I think that still applies [increased expectations from prior assignments/years]. After like I got my grade and looked

> at it, I realized there were parts that I was missing. Like I wasn't getting the comprehensive view of the case.

However, all four students who participated in the video learning assignment were able to more explicitly describe their cognitive process and they were able to specify the types of reasoning that are used by occupational therapists described in the literature. Rebecca described how it facilitated her ability to reason as:

> The video helps, because at first when you look at the definition of what is like conditional or like, you know, scientific reasoning, you might not understand that. But when you look at the video and try to find out where was it applied…it would really make you understand and it will stick forever.

Beth stated, "I could even sit down and explain to somebody, this is how you use this. This is how you can use scientific reasoning. Because it helped find a couple of examples in those videos that was proven." Laura explained, "And so I kind of went through and focused on one at a time. And I was like, all right, I'm going to look for this type of reasoning and see what she does through that." Finally, Jessie described her reasoning process for the assignment as follows:

> Because at first, I'm like what is clinical reasoning really? Even the word itself had scared me… Like you can't even explain it. But, when you look at the videos it really makes sense…it defines what clinical reasoning is all about.

Summary of findings from interviews.

Qualitative analysis of student satisfaction, perceptions of learning experience, and perceptions of clinical reasoning regarding the use of case-based learning activities, identified several similarities and differences between a video case study with a clinical

reasoning learning activity and text and isolated video cases. Student satisfaction with the learning activities was consistent between both groups, with positive identification of relevance to clinical practice and effective use of case-based reasoning. Student perceptions were favorable for the ability to repeatedly read or view the cases, work with partners, and to integrate instructor feedback into subsequent assignments. Advantages of the text cases included an explicit statement of client problems and needs, and a thorough background or occupational profile. Advantages of video cases included realism or authenticity of the cases, and the value of observation in understanding the case. The disadvantage of the case was limited authenticity. Disadvantages of the video included stronger reliance on learner interpretation of the case, higher perception of difficulty and time demands of the assignment, and viewing only one small excerpt of a client case. Finally, students in both groups felt their clinical reasoning skills had improved. However, the learners who utilized the text cases relied more on instructor feedback and viewed reasoning to be a global or holistic understanding of the case, whereas learners who viewed the video cases were able to explicitly define and explain types of clinical reasoning utilized by the occupational therapist.

Integration of Quantitative Data and Qualitative Data

The complementary mixed methods research design allowed for consideration of the multiple data sources in this study to provide a more thorough understanding of clinical reasoning in occupational therapy education, and how student reasoning may be influenced by various instructional methods of case-based reasoning. Specifically, the themes identified from the student interviews were used to explain and enhance the results from the quantitative analysis of student clinical reasoning using the Health

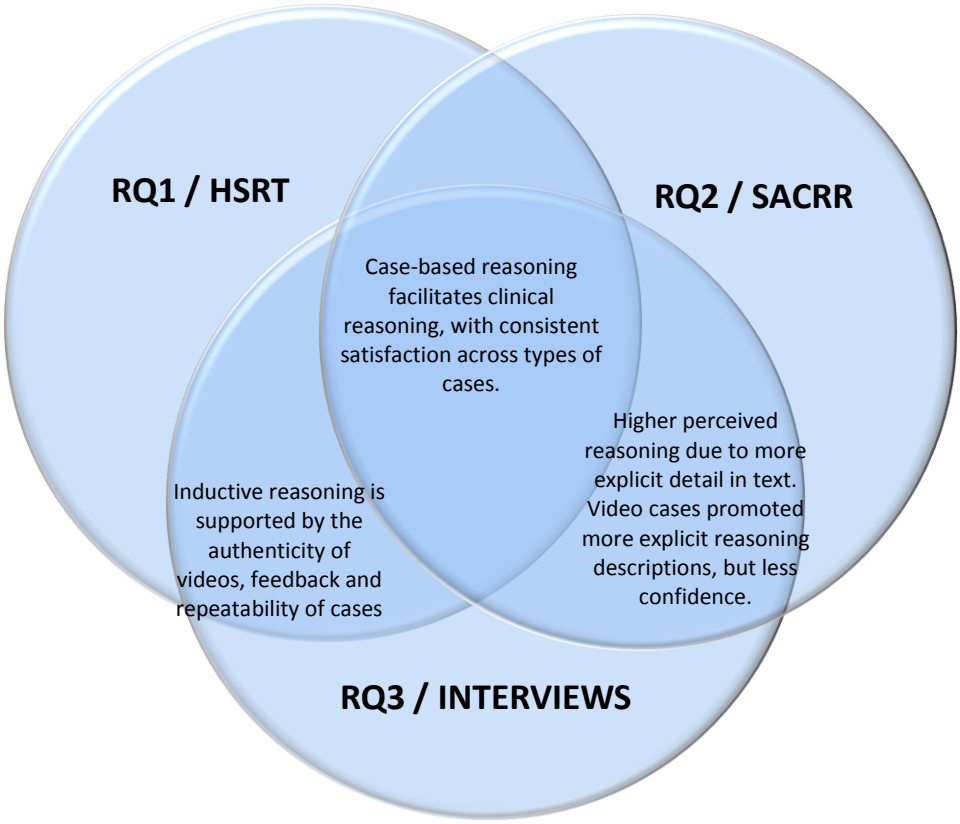


Figure 21: Qualitative support for quantitative findings

Science Reasoning Test and the Student Assessment of Clinical Reflection and Reasoning. Figure 21 begins to describe the areas of support provided by the qualitative line of analysis.

Consistent with the complementary mixed methods design, the qualitative findings from the interviews were used to more fully understand and describe the quantitative measures of reasoning gained from the Health Science Reasoning Test and the Self-Assessment of Clinical Reflection and Reasoning. When considering the HSRT as an objective measure of reasoning, students who participated in the video cases with the associated clinical reasoning learning activity demonstrated more skilled inductive reasoning. Qualitative findings supported this as students explained that the authenticity

or realism of the videos promoted their understanding of the cases. In addition, they felt they were relevant to their future clinical practice as occupational therapists. These video scenarios promoted a process of making observations, testing hypotheses and drawing conclusions, which are characteristics of inductive reasoning.

However, qualitative findings supported student perceptions of the video cases and learning activities to be more difficult than the text based cases. Again, the videos demanded that the learner engage in the process of inductive reasoning by drawing conclusions from the observed scenarios. Text based cases were viewed to be less difficult that the video case activities, as expressed by students in the interviews, since more information was provided to the students as a part of the case. In a sense, some of the reasoning had already been completed for the learner in the text descriptions of those cases.

The process of inductive reasoning, while clearly facilitated in the video case and associated learning activities, was viewed to be difficult by students in the qualitative findings. This may have been a contributing factor to the text-based group scoring higher than the video group on the quantitative self-assessment measure (SACRR). Although both groups did report that they felt their reasoning abilities had improved as a result of the case-based reasoning activities in both the interviews and the SACRR, the text group was more confident in their abilities at the conclusion of the semester as evidenced by the higher SACRR scores. This may have been because their inductive skills were not challenged as effectively as those in the video group.

Qualitative findings supported learner satisfaction, as students in both the text-based group and the video-based group reported a positive experience from working with

a partner, repeating the assignments during the semester, and having the opportunity to integrate feedback from the instructor in these repeated assignments. These qualitative findings may have contributed to the quantitative findings of improved perceptions of reasoning in both groups when comparing pre to post-test SACRR scores, and possibly to the improved induction scores of the video group in the HSRT. All of these factors related to including additional information on repeated case-based learning opportunities allowed for inclusion of additional discussions with peers, guidance from an expert, and integration of learning throughout the semester.

Finally, the measures of the SACRR that demonstrated improvement for each individual group were reflected in the student descriptions of reasoning during the interviews. In the text based group, students demonstrated increased scores on those measures that relied on concrete fact. This type of information was provided in the text. When interviewed, students were able to describe their reasoning process only in global terms. Their analysis of the reasoning process was limited. For the students in the video group, they scored higher on the SACRR in items that demonstrated more abstract and complex skills. When describing clinical reasoning, they were able to describe and explain the types of reasoning in more detail and with more advanced skills. Therefore, the video cases and the associated clinical reasoning activity facilitated a deeper understanding of clinical reasoning than the text-based cases.

Implications for Learning Activities

There are clearly benefits to each type of learning activity, based on the research findings. Text-based cases, which provide more concrete information to the learner in the format of the case, were viewed to be a less difficult means to improving clinical

reasoning by these occupational therapy students. They reported a favorable learning experience, relevance to fieldwork and future clinical practice, and improved levels of perceived reasoning. The video cases with the associated learning activity, however, demanded more interpretation from the learners. This resulted in improved inductive reasoning and a more skilled ability to define and describe their reasoning process. Although these case-based learning activities were viewed to be challenging, students still reported satisfaction with the learning experience, specifically authenticity of the cases and relevance to fieldwork and future clinical practice.

Chapter V: Discussion

Clinical reasoning, the cognitive process of a skilled occupational therapist, is a complex and necessary component of evaluating clients and implementing interventions that facilitate each client's achievement of relevant and meaningful participation in daily occupations. Rogers (1983) described clinical reasoning as a blend of artistry, science, and ethics which relies on a combination of inductive reasoning, deductive reasoning, ethical decision-making, knowledge, experience, and interaction skills. Clinical reasoning encompasses a set of skills that must be integrated into college curricula for the preparation of occupational therapists, but it is not easily taught. Occupational therapy educators and researchers have utilized the principles of case-based reasoning in an attempt to facilitate clinical reasoning in students (Bazyk & Jeziorowski, 1989; Cook & Triola, 2009; Liu, Schneider & Miyazaki, 1997; Lysaght & Bent, 2005; Neistadt & Smith, 1997; Tomlin, 2005; Van Leit, 1995). Other occupational therapy researchers have attempted to link experiential learning with clinical reasoning (Coker, 2010; Royeen, Mu, Barrett & Luebben, 2001; Scaffa & Smith 2004). However, there was a continued need to explore how specific instructional techniques, constructed on the tenants of case-based reasoning, can be utilized during didactic education to facilitate the development of clinical reasoning in occupational therapy students. It was also valuable to further explore student perceptions of reasoning and student perceptions and engagement in the learning process, utilizing these case-based constructs, in order to continue to improve teaching and learning in occupational therapy curricula.

This research study was designed to explore these issues. First, an objective measure of clinical reasoning, the Health Science Reasoning Test, was used to measure

and compare clinical reasoning skills of students before and after participation in two specific case-based learning activities. Secondly, a self-assessment by students of their clinical reasoning skills was used to compare their perceived development of these skills as a result of the case-based learning activities. Finally, students were interviewed to better understand their satisfaction and perceptions of the learning activities and particularly how they felt the activities may have facilitated the development of clinical reasoning.

A control group of occupational therapy students participated in case-based learning activities utilizing text-based case assignments, and with only limited exposure to brief video clips in the classroom. An intervention group of occupational therapy students viewed comprehensive video case studies presented over an online platform, that were combined with an associated learning activity designed to specifically promote clinical reasoning. These video cases and learning activities were constructed according to the principles of case-based learning and effective structure of cases as reported in the literature (Bagdasarov, et. al., 2012; Choi & Lee, 2009; Jonassen, 1996; Jonassen & Hernandez, 2002; Kim, et. al., 2006; Kolodner, 1997; Kolodner & Guzdial, 2000; Thistlewaite, et. al., 2012). This learning activity was validated by experts in occupational therapy education.

Data obtained from the Health Science Reasoning Test was compared from two academic semesters (2014 and 2015) to promote examination of a larger sample size, and to allow for examination of trends over time. In 2015, additional data was collected regarding student perceptions of clinical reasoning, using the Self-Assessment of Clinical Reflection and Reasoning. Student interviews were also conducted in 2015 and analyzed

to investigate student satisfaction and perceptions of the learning experience, and development of clinical reasoning.

The results of each of the three lines of inquiry are discussed next, followed by conclusions substantiated by the synthesis of all results.

Integration of Reasoning and Student Experience

According to Rogers (1983), an occupational therapist uses inductive reasoning to apply information gained from client interactions, which may include the observed skills and abilities and interventions, to better understand a client's motivation, environment, and goals. The videos and associated learning activities utilized in this research provided the opportunities for learners to observe and analyze the client and his interactions with his occupational therapists, and to develop an understanding of factors that may influence the therapeutic process in a more effective way than the text-based cases. Coker (2010) identified improvement in inductive reasoning in graduate students in an occupational therapy program as a result of experiential learning, specifically where the students provided intervention for children with cerebral palsy in a camp setting. The video cases in the research study did not involve direct client contact or the same type of experiential learning as the camp setting studied by Coker (2010). However, from the perspective of an occupational therapy educator, the video case study does allow for an authentic learning environment in which to utilize case-based reasoning and it removes the risk of harm to clients when services are provided by students still learning the skills required of an occupational therapist. And the inductive reasoning, as one component of clinical reasoning, is consistent between the two studies.

The first research question sought to determine if a statistically significant difference existed in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text cases or brief video clips alone. The Health Science Reasoning Test (HSRT) was used to examine induction, deduction, analysis, inference, and evaluative skills. These skills are foundational to competent clinical practice as an occupational therapist, and have been identified as such in the occupational therapy literature (Boyt Schell & Schell, 2008; Crepeau, Cohn, & Boyt Schell, 2009; Fleming, 1991; Fleming & Mattingly, 1993; Mattingly, 1991; Rogers, 1983). However, overall and percentile scores, which combined all five of these types of reasoning skills, were supported by Abrami (2008) as the most significant and meaningful measures of critical thinking. The subscale measures allowed for further interpretation and understanding of the overall score.

When comparisons were made within groups, the students who utilized the text-based cases demonstrated only one statistically significant difference between pre- and post-test scores (deduction in 2014 cycle). However, the students who utilized the comprehensive video case and associated learning activity demonstrated statistically significant improvements in overall score, percentile, and deduction in all three rounds of analysis (2014, 2015, and combined). These students also demonstrated statistically significant improvements in induction and evaluation in 2014 and the combined rounds of analysis. In the combined round of data analysis within groups, improvements in the overall score, percentile, induction, deduction and evaluation were statistically

significant; analysis and inference were relevant as they were approaching significance for the group that utilized the video case and associated learning activity.

When comparisons were made between the control and intervention groups, GPA was noted to have a statistically significant effect on some HSRT scores in 2014 and in the combined 2014 + 2015 analysis. When the effects of age and GPA were factored out, the students who participated in the video case study and clinical reasoning activity demonstrated statistically significant differences in adjusted post-test scores in induction, when compared to those students who participated in the text-based learning activities in both the 2014 and combined data collection analyses. This was the only outcome for which a statistically significant difference was identified between the control and intervention groups. These results indicated stronger inductive reasoning as a result of the video cases and the associated learning activity, which is a necessary component of effective clinical reasoning.

Authenticity is a quality of case-based learning that is espoused by experts throughout the research on this type of learning (Bagdasarov, et. al., 2012; Choi & Lee, 2009; Jonassen, 1996; Jonassen & Hernandez, 2002; Kim, et. al., 2006; Kolodner, 1997; Kolodner & Guzdial, 2000; Thistlewaite, et. al., 2012). Qualitative analysis of student interviews conducted in this research supported the importance of authenticity in the development of inductive reasoning. Students explicitly identified the realism of the video cases as a strength of the learning activity in the development of clinical reasoning. Inductive reasoning relies on the use of knowledge, information, or observations in order to draw conclusions. In this case, the realism or authenticity of the videos contributed to

the inductive reasoning skills of students who completed the video case study and associated learning activity.

In addition, students in both groups reported learning preferences for the case-based reasoning in working with partners, integrating feedback from the instructor, and having the opportunity to repeat the case-based assignments. All of these factors may also be contributing to the improved inductive reasoning. This promoted inclusion of additional information to draw conclusions. Although this may have been expressed in higher objective reasoning scores on the HSRT for the students in the video group, it may also have contributed to higher perceptions of reasoning skills for the students in the text based group, as expressed through higher scores on the SACRR.

Integration of Student Self-Reported Reasoning and Student Experience

Scaffa and Wooster (2004) found statistically significant changes in undergraduate occupational therapy student self-assessed reasoning, following a five week course of problem-based learning utilizing clinical cases, as well as following participation in fieldwork experiences. There was no comparison group in this study, however.

The second research question of this study sought to determine if a statistically significant difference existed in self-reported, perceived clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and associated learning activity, when compared to students who were presented with text or brief video clips alone. The Self-Assessment of Clinical Reflection and Reasoning (SACRR) measured students' perceptions of their abilities before and after participation in the cases. Statistically significant improvements were noted in each

of the groups for several items, when comparing pre-test to post-test total scores. For the group utilizing the text cases, students reported improved skills primarily in concrete skills related to understanding client needs and planning interventions to address these needs, as well as coping with change and making clinical decisions. The intervention group reported improvements in skills that are more abstract, including items regarding hypothesizing about reasons for client problems, using theory to understand interventions, and also in clinical decision-making. In each group, the change in total scores for self-assessment of reasoning improved by a statistically significant amount from pre-test to post-test.

This result was mirrored in the qualitative findings as well. Students in the control group, who completed the text-based case activities, described clinical reasoning in general terms. They were able to describe how they used reasoning to "think like an OT" and that it was used to choose assessments and develop interventions in a general sense. However, the students in the intervention group, who utilized the video cases and associated learning activity, were better able to describe and explain the types of reasoning they utilized to understand the case and make decisions. They described their use of explicit types of reasoning in specific components of the case. The students in the video group had developed a deeper understanding of reasoning and were better able to relate it to complex concepts related to theory and therapist judgments and actions.

Although both groups demonstrated improvements in self-perceived clinical reasoning from pre-test to post-test on the SACRR, the intervention group demonstrated a smaller degree of change than the control group. The intervention group started with a slightly higher pre-test score, but the control group ended with a higher post-test score.

When comparing the groups, and considering confounding factors of age, GPA and prior experience, the differences between post-test scores of perceived clinical reasoning between the two groups was not statistically significant, but was considered in interpretation of findings as it was relevant or nearing statistical significance ($p=.06$). Therefore, the students who completed the text-based cases had an elevated perception of their own clinical reasoning skills when compared to the students who completed the video-based cases and associated learning activity.

Qualitative analysis did not identify differences between the two groups in their satisfaction or engagement in the learning activities, as all interviewees were satisfied with the activities and felt that the case-based reasoning facilitated clinical reasoning.

Consistent with the findings of Scaffa and Wooster (2004), perceived reasoning of students changed, following specific learning activities. In fact, this study found that this change in self-perceived reasoning may be slightly better through use of the text-based cases rather than video-based cases, even though both methods of case-based learning influenced student perceptions of clinical reasoning in a positive way. One of the advantages to the text based cases according to qualitative analysis, was that students appreciated the increased background or occupational profile provided. Students from the video groups reported that they were challenged to interpret more from the cases. These may have been contributing factors in the higher perceptions that the students in the text group demonstrated on the SACRR. Finally, students in both the text and video groups also expressed their satisfaction with the learning activities, and described how use of the cases facilitated their abilities in clinical reasoning. It appears that the

instructional method is less important than the construct of case-based learning in the development of self-perceived clinical reasoning.

Integration of Student Experience with Reasoning Measures

Prior research in higher education across disciplines cites case-based reasoning (to be particularly relevant to clinical practice and motivation for engagement in learning activities. (Kim, Pederson, & Baldwin, 2012; Thistlethwaite, et. al., 2012). To further explore this concept, the third research question explored undergraduate occupational therapy student satisfaction, perceptions of learning experience and perceptions of clinical reasoning with the use of case-based learning activities, utilizing either a comprehensive online video case study with a clinical reasoning learning activity or text and video cases alone. Students who participated in each learning activity were interviewed, and qualitative analysis identified several themes.

Findings were again consistent with prior research. Common to both student groups in this research were reports of consistent student satisfaction with the learning activities. Students identified both video and text case-based learning methods as being highly relevant to future clinical practice as occupational therapists. In both the text and video cases as well, students utilized learning strategies congruent with case-based reasoning, including utilization of experts in the field for learning, and transferring these experiences into knowledge for storage and retrieval of cases in flexible ways for new situations (Kolodner & Guzdial, 2000).

Students in both the text and video based groups expressed positive learning preferences for working with partners, the ability to repeatedly view the cases, and integrating instructor feedback for subsequent assignments. These also reflect the

construct of critical reflection in case-based reasoning, as described by Kolodner (1997), and in occupational therapy literature as a necessary condition of clinical reasoning (Boyt Schell & Schell, 2008; Crepeau, Cohn, & Boyt Schell, 2009; Fleming, 1991; Mattingly, 1991; Royeen, Mu, Barrett & Luebben, 2001).

The students who completed the text-based case learning activity described the explicit summaries of client strengths, needs and backgrounds in the cases, in other words the occupational profile, as a distinct advantage of the text cases. However, the text cases had the disadvantage of limited authenticity. Advantages of the video cases included authenticity and the value of direct observation of the expert occupational therapist and client. Disadvantages of the video cases and associated learning activity included increased time and effort to complete, less complete understanding of client background, and a higher perceived level of difficulty of the assignment. Lysaght and Bent (2005) also reported advantages of text cases to be convenience and control of information included in the cases, advantages of video cases to be authenticity and rich context. Mounsey and Reid (2012) reported decreased learning efficiency in the use of video cases for medical students, as these cases took students more time to review than other forms of learning activities.

Students who viewed the video cases reported difficulty due to the higher reliance on learner interpretation, as compared to text cases, where problems are typically described more explicitly. This may have been a contributing factor to the lower self-perceived clinical reasoning skills that these students reported on the SACRR post-test. However, according to Kolodner (1997), this analysis of the case by the learner is a contributing factor to critical reflection that is useful for encoding and retrieving cases.

It is up to the learner to determine what is relevant and how problems may be solved by interpreting the observations. This authentic context and interpretation by the learner is necessary for development of clinical reasoning. In fact, this type of interpretation of observations in implicit in inductive reasoning, and a necessary skill for the occupational therapist who must develop appropriate interventions for their clients. This was also demonstrated by the higher scores on the Health Science Reasoning Test in inductive reasoning by the students who completed the comprehensive video case and associated learning activity.

All of the students interviewed in the current study, regardless of whether they completed the text or video learning activity, reported perceived improvement in clinical reasoning, and stated that the cases had facilitated this change. However, the ability to define, describe and explain clinical reasoning was more advanced in the students who viewed the video cases with the associated clinical reasoning activity when compared to the responses from the students who viewed the text cases. For those using the text cases, for example, they described thinking "like a therapist" or "considering everything" about a case. Their understanding of clinical reasoning was better than before the assignments were completed. However, this remained a difficult construct for them to explain or describe. This has been a historical challenge in occupational therapy education, and one that justified the need for continued study (Boyt Schell & Schell, 2008; Ciaravino, 2006; Lederer, 2007; Mattingly, 1991; Rogers, 1983; Vogel, et., al., 2009). Students who utilized the video case clearly demonstrated an understanding of reasoning that was more detailed and explicit. These students were able to describe the types of reasoning that are found in the current occupational therapy literature (Boyt Schell & Schell, 2008;

Crepeau, Cohn, & Boyt Schell, 2009) and they were able to detail the cognitive process that led them to draw conclusions from the cases.

This was a clear demonstration of inductive reasoning, and reflected a cognitive process that could presumably make them more successful in fieldwork experiences and eventually in clinical practice.

Conclusions and Discussion

In order to more fully understand the learning activities and their impact on clinical reasoning for students preparing for a career in occupational therapy, it is important to examine all the pieces of this study in a complementary way. Data from the Health Science Reasoning Test, and associated statistical analysis, support the use of the video cases and associated learning activity as a means to facilitate improved inductive reasoning. Data from the Self-Assessment of Clinical Reflection and Reasoning, although not statistically significant, ($p=.06$), support the idea that students who utilized the text-based cases had more confidence in their reasoning ability than those who utilized the video-based cases. Qualitative analysis of student perceptions of their reasoning ability also supports the use of the video case as a means to improve inductive reasoning, since these students were better able to define and describe their clinical reasoning process and gather various types of information to draw conclusions regarding occupational therapy services and interventions for the clients observed.

It can be concluded, therefore, that the comprehensive online video case study and the associated clinical reasoning activity facilitated inductive reasoning and a more explicit cognitive process in which students were able to describe clinical reasoning. The authenticity and realism of the video cases challenged the learners to make observations,

analyze and then refine these observations, and draw conclusions that could lead to decision-making about occupational therapy interventions and services. This process of analysis and decision-making required more inductive reasoning of the learner than reading a text-based case, in which some conclusions were already drawn for the reader. Because the video cases required more inductive reasoning by the students, they described less confidence regarding their clinical reasoning skills than their peers who used the text cases.

This improvement in inductive reasoning occurs by asking the learner to consider what is known about medical conditions, situational or contextual influence, and constructs of occupational therapy, and apply all of these premises in a logical way to an individual's specific case in order to make assumptions that guide and inform clinical practice. Although some information is given, the learner must analyze a situation based on what is known, and make judgments to develop interventions that facilitate achievement of a client's goal, within the scope of practice of occupational therapy. This process may be uncomfortable and viewed as more difficult by students, but this type of inductive reasoning is deemed necessary within professional practice in OT. What may feel uncomfortable or difficult to students is, in fact, what instructors may view as crucial and necessary skill development to prepare for occupational therapy practice. Within the practice of occupational therapy, practitioners must develop the ability to generalize what they have learned in the didactic setting into practice, and apply knowledge and information obtained from a client to develop interventions. This research study proves that case-based reasoning, and the use of comprehensive video case studies combined

with an explicit learning activity, do in fact promote the inductive reasoning process required to develop interventions.

Implications for Occupational Therapy Education and Future Directions

This research study supports the use of instructional methods and learning activities with a foundation in case-based reasoning to engage students in the learning process in an occupational therapy curriculum, and to promote the clinical reasoning skill required for practice. It provides some guidelines for student engagement, including instructor feedback, the use of group work to discuss the reasoning process, repeated assignments to facilitate this change in the learners, and even the possibility of making improvements to both types of cases to facilitate reasoning. In addition, this study promotes the use of a comprehensive video library and an associated learning activity that is specific to clinical reasoning, to improve inductive reasoning in occupational therapy students.

Future directions for occupational therapy program studied.

For this researcher, the study informs current use of instructional methods in the courses taught in this occupational therapy program. Factors viewed as favorable from the qualitative analysis are being utilized, including continued use of case-based learning activities, promoting student group work to further develop reasoning, repeatability of assignments with new cases, and expectation of integration of instructor feedback. In addition, a combination of both text and video cases is being utilized in order to reap the benefits of both improved inductive reasoning and an improved perception by the learner of their critical reasoning ability. The cases are being updated and improved; for example, a hypothetical occupational profile that was provided by the text-based cases is

being developed for inclusion with the video cases, thereby addressing the problem expressed by students about a limitation of the video case. Lastly, the comprehensive video case studies with the associated learning activity are now discussed more explicitly during classroom preparation related to inductive reasoning, in order to facilitate this specific type of clinical reasoning for the learners.

There are several recommendations that can be made based on the results of this study within the occupational therapy curriculum in which the research was based, and outside the particular course in which this study was situated. The format for this assignment, with its basis in case-based reasoning and use of appropriate cases, can be used in other content areas, such as pediatric or mental health occupational therapy practice. When the repeatability features cross courses, it could allow for less didactic time devoted to instructing students how to complete the assignments, and promote more time actually viewing and processing the cases. Inclusion of video cases and the clinical reasoning learning activity to other courses may further promote inductive reasoning and potentially facilitate development of other forms of reasoning as well in occupational therapy students.

Finally, additional interviews could be used as a continued means to enrich understanding of the clinical reasoning process and to continually improve the assignments related to the development of clinical reasoning. If students participate in both text and video case-based learning activities, these interviews may lend more insight into comparative study of the assignments, and utilization of the strengths of each type of learning activity.

Future directions for occupational therapy higher education.

The results of this study may influence occupational therapy education in a more far-reaching way. As instructional technologies continue to advance, video libraries or means of participating in case-based activities may increase. Those clinicians and educators who are creating and maintaining the online videos could benefit from understanding the perspectives of classroom educators and students, to improve the videos. Adding the occupational profile that is currently available in the text-based cases to the video cases is one such example, and could be developed more accurately by the individuals who are taping the occupational therapy sessions for the video libraries. The online video library used in this research is now being used in 300 colleges and universities in various health care disciplines. Instructor materials are in continued development, and the clinical reasoning learning activity utilized with the videos in this research study have been requested for inclusion in this resource for occupational therapy educators across the country (J. Davis, personal communication, April 6, 2016).

Providing more comprehensive cases may be another impact on occupational therapy higher education. There are emerging opportunities in tele-health, video-conferencing in clinical settings, and other means of connecting students to realistic and authentic occupational therapy practice scenarios that could be considered as a format for case-based instruction. This theoretical construct and the learning activities designed for this research study could be used to develop additional learning activities associated with video libraries and other uses of technology in connecting students and patients. The continued ability to study clinical reasoning and educational means to support and

advance this complex set of skills is valuable within the discipline of occupational therapy.

Future directions for research.

Due to the limitations of sample size and limited time between pre-test and post-test of this research study, it would be useful to continue to use the instruments utilized in this study, namely the Health Science Reasoning Test and the Self-Assessment of Clinical Reflection and Reasoning throughout the occupational therapy curriculum. Repeating the research as it was done in 2014 and 2015 would increase the sample size and allow for continued data analysis. In addition, continued qualitative data collection and analysis would be important for a richer understanding of the impact of changes made to these case-based learning activities in current and future semesters. Some areas of questioning, such as student satisfaction, may be reduced as this is well supported in the literature and since differences were not identified between the text and video groups. Other areas of the interview, for example how students perceive and describe clinical reasoning, could be expanded in order to gain additional insight into the reasoning process as experienced by students who are engaged in the learning process. Continuing the mixed methods approach would be particularly useful. As more quantitative data is gathered, there may be additional conclusions reached. Interviews could continue to be refined for additional elaboration of findings.

In addition, it may be meaningful to use the instruments from this study at different times in the occupational therapy program. Measuring clinical reasoning skills annually, for example, may assist in understanding how clinical reasoning develops over time, and when considered with the existing literature, may promote positive curricular

change within the program being studied. Collecting data following fieldwork experiences may also be useful, and allow students to discuss how the learning activities contributed to their clinical reasoning abilities as novice practitioners.

Utilization of the video cases and associated learning activity could also be expanded. Integration of these activities on the planned faculty resource section of the ICE Learning Center site would allow for additional users, and the potential to collect more data across different educational programs and universities. Collaboration with other researchers in other locations and occupational therapy educational programs, could promote richer research regarding clinical reasoning with a foundation in case-based reasoning. By duplicating this study across multiple programs, limitations of sample size and instructor bias may be reduced, and additional data could enrich data analysis and strengthen conclusions.

Appendices

Appendix A: IRB Approval (Original)

TOWSON
UNIVERSITY

EXEMPTION NUMBER: 14-X017

To: Lynn Murphy
From: Institutional Review Board for the Protection of Human Subjects, Justin Buckingham, Member VS
Date: Tuesday, September 24, 2013
RE: Application for Approval of Research Involving the Use of Human Participants

Office of University Research Services

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Thank you for submitting an application for approval of the research *The use of an online video library in the development of case-based clinical reasoning skills in occupational therapy education*

to the Institutional Review Board for the Protection of Human Participants (IRB) at Towson University.

Your research is exempt from general Human Participants requirements according to 45 CFR 46.101(b)(1). No further review of this project is required from year to year provided it does not deviate from the submitted research design.

If you substantially change your research project or your survey instrument, please notify the Board immediately.

We wish you every success in your research project.

CC: Liyan Song (Occupational
File

Appendix B: IRB Approval (Amended)

TOWSON UNIVERSITY

May 3, 2015

To: Lynne Murphy
Department of Occupational Therapy and Occupational Science
RE: Modifications to TU IRB project 14-X017

Ms. Murphy,

Thank you for informing the Towson IRB of your modifications to project 14-X017 "The use of an online video library in the development of case-based clinical reasoning skills in occupational therapy education". The Institutional Review Board for the Protection of Human Participants has reviewed and approved your modification for this project. Since this is exempt research, this approval does not expire.

If any other modifications are made to this project, or if any new risks are discovered, please inform the Board immediately.

Should you have any questions, please do not hesitate to contact me at IRB@towson.edu.

Sincerely,

V. Denise Spears, MPA
Compliance Administrator, On Behalf of Towson University Institutional Review Board for the Protection of Human Participants

CC:
File

Office of Sponsored Programs
& Research

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Appendix C: Informed Consent Form

Towson University
8000 York Road
Towson, MD 21252-0001

INFORMED CONSENT FORM- Participant

Title: Use of an Online Video Library in the Development of Case-Based Clinical Reasoning Skills in Occupational Therapy Education

Principal Investigator: Lynne Murphy, MS, OTR/L

PURPOSE OF RESEARCH STUDY:

This study is designed to examine how instructional methods related to the use of an occupational therapy video library may influence the clinical reasoning skills and content knowledge of occupational therapy students.

PROCEDURES:

Students aged 18 or older who are enrolled in OCTH 317 (Adult Musculoskeletal Occupational Therapy) are invited to participate in this study during the academic semester in which these classes are taken.

If you agree to join this research study, you will complete the Health Science Reasoning Test (HSRT) online and the Self-Assessment of Clinical Reflection and Reasoning (SACRR) survey. These surveys will take approximately 1 hour. These tests will be repeated later in the semester, following participation in learning activities and assignments that are a part of these courses. Although you should participate in all learning activities that are introduced by your instructor as they appear on the syllabus in order to complete the course successfully, you may decline from the research tests (HSRT and survey) at any time. Your performance on the HSRT and associated survey will in no way influence your grade for the course.

CONFIDENTIALITY:

All information will remain confidential. You may create a unique identifier when taking the HSRT to remain anonymous. However, the same unique identifier should be used for both the pre-test and post-test, to allow for comparison of scores. No individual identifiers will be used for reporting of the data,

RISKS/DISCOMFORTS:

There are no anticipated risks or discomforts associated with participation in this study.

BENEFITS:

It is hoped that this study will provide objective data that can be used to improve the instructional methods and activities used to develop clinical reasoning within the occupational therapy curriculum at Towson University. There is no cost or compensation to participants.

ALTERNATIVES TO PARTICIPATION:

Participation in this study is voluntary. If you choose not to participate, your decision will in no way affect expectations for course completion or any grade within the course. If you wish to withdraw from the study or have any concerns or questions, you may contact Lynne Murphy at 410-704-2320 at any time.

WHAT YOUR SIGNATURE MEANS:

Your signature below means that you understand the information given to you about the study and in this consent form. If you sign the form it means that you agree to join the study.

This project has been explained to me, in language I can understand. I have been encouraged to ask questions, both now and in the future about this research study.

Participant's signature Date

Signature of Investigator Date

Witness to Consent Procedures Date

Appendix D: Health Science Reasoning Test (HSRT) Sample Questions

These sample questions are copied directly from Insight Assessments and copyrighted by The California Academic Press. They are the only samples provided by Insight Assessments, and are intended to provide information about the types of questions used to assess reasoning. Access to questions specifically included on the HSRT are available only by paid preview of the instrument.

(http:// http://www.insightassessment.com/Resources/node_1487)

For Sample Items 1, 2 and 3 please consider this information: A scientific study compared two matched groups of college women. The women in both groups were presented with information about the benefits of a healthy diet and regular exercise. The women in one group were paired up with one another and encouraged to work as two-person teams to help each other stick with the recommended healthy regimen of smart eating and regular vigorous exercise. The women in the other group were encouraged to use the same recommended regimen, but they were also advised to work at it individually, rather than with a partner or teammate. After 50 days the physical health and the well-being of all the women in both groups were evaluated. On average the women in the first group (with teammates) showed a 26 point improvement in measures of cardiopulmonary capacity, body strength, body fat reduction, and sense of well-being. On average the women in the other group (encouraged to work as individuals) showed a 17 point improvement on those same measures. Using statistical analyses the researchers determined that the probability that a difference of this size had occurred by chance was less than one in 1000.

Sample Item # 1
If true, these research findings would tend to support which of the following assertions?
A = A college woman cannot achieve optimal health functioning without a teammate.
B = Universities should require all students living in campus residence halls to participate in a health regime of smart eating and regular vigorous exercise
C = A healthy diet will cause one to have better mental health and physical strength.
D = This research study was funded by a corporation that makes exercise apparel.
E = A regimen of smart eating and regular exercise is related to better health.

Sample Item # 2.
If the information given in the case above were true, which of the following hypotheses would not need to be ruled out in order to confidently claim that for the majority of young adults a regimen of smart eating and regular vigorous exercise will result in significant improvements in one's overall health.
A = This study was about women, the findings cannot be generalized to include men.
B = Since the study began to solicit willing participants before the Research Ethics Review Committee of the college gave the research project its formal approval to gather data, the findings are invalid.
C = Some women in the study over-reported their compliance with the eating and exercise regimen, which led the researchers to underestimate the full impact of the

regimen.
D = Since many of those studied described themselves as overweight or out of shape when the study began, a similar regimen will not benefit people who are healthier to start with.
E = The performance tests used to evaluate the health and well-being of females may not be appropriate for evaluating the health and well-being of males.

Sample Item # 3.
Consider the claim, "Working with a teammate or partners on a health regimen is better than working individually." Which of the following additional pieces of information would not weaken that claim?
A = Most of the women in the group that was encouraged to work individually actually worked with friends and partners who were not part of the study.
B = Most of the pairings and teams created in the first group (with teammates) fell apart after a few days and the women in that group actually worked individually.
C = There was something about the women in the first group (with teammates) that the researchers overlooked, thus invalidating the intended matching of the two groups.
D = Men are more likely to work alone, so any recommendation that men find a teammate or partner to support them in sticking with the regimen will be ignored.
E = The study was undertaken when there were no exams or major projects due, thus the results about working with a teammate do not apply to more stressful times of the year.

Sample Item # 4.
Three graduate school friends, Anna, Barbara, and Carol, graduated successfully. Being in the same program, the three often worked as a team on group assignments. Anna earned the special recognition of "pass with distinction" when she graduated. Carol and Barbara, although receiving their degrees, did not earn this special honor. A fourth student in the same graduate program, Deirdre, often said that the graduate program was poorly designed and not difficult at all. Deirdre did not graduate, instead she was advised by the faculty to withdraw from the program because her work was below acceptable standards. Given this information only, it follows that
A = Carol and Barbara deserved to receive "pass with distinction" like Anna.
B = Barbara's work in the program was superior to Carol's.
C = Barbara was jealous of the academic success her friend, Anna, enjoyed.
D = Deirdre's work in the program was below the quality of Carol's work.
E = Anna, being successful, will decide to enroll in another advanced graduate program

Appendix E: Self-Assessment of Clinical Reflection and Reasoning (SACRR)

Response Key:
SD = Strong Disagree. D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD 1	D 2	U 3	A 4	SA 5
1	I question how, what, and why I do things in practice.	☐	☐	☐	☐	☐
2	I ask myself and others questions as a way of learning.	☐	☐	☐	☐	☐
3	I don't make judgments until I have sufficient data.	☐	☐	☐	☐	☐
4	Prior to acting, I seek various solutions.	☐	☐	☐	☐	☐
5	Regarding the outcome of proposed interventions, I try to keep an open mind.	☐	☐	☐	☐	☐
6	I think in terms of comparing and contrasting information about a client's problems and proposed solutions to them.	☐	☐	☐	☐	☐
7	I look to theory for understanding a client's problems and proposed solutions to them.	☐	☐	☐	☐	☐
8	I look to frames of reference for planning my intervention strategy.	☐	☐	☐	☐	☐
9	I use theory to understand treatment techniques.	☐	☐	☐	☐	☐
10	I try to understand clinical problems by using a variety of frames of reference.	☐	☐	☐	☐	☐
11	When there is conflicting information about a clinical problem, I identify assumptions underlying the differing views.	☐	☐	☐	☐	☐
12	When planning intervention strategies, I ask "What if" for a variety of options.	☐	☐	☐	☐	☐
13	I ask for colleagues' ideas and viewpoints.	☐	☐	☐	☐	☐
14	I ask for the viewpoints of clients' family members.	☐	☐	☐	☐	☐
15	I cope well with change.	☐	☐	☐	☐	☐
16	I can function with uncertainty.	☐	☐	☐	☐	☐
17	I regularly hypothesize about the reasons for my clients' problems.	☐	☐	☐	☐	☐
18	I must validate hypotheses through my own experience.	☐	☐	☐	☐	☐
19	I clearly identify the clinical problems before planning intervention.	☐	☐	☐	☐	☐
20	I anticipate the sequence of events likely to result from planned intervention.	☐	☐	☐	☐	☐
21	Regarding a proposed intervention strategy, I think, "What makes it work?"	☐	☐	☐	☐	☐
22	Regarding a proposed intervention, I ask, "In what context would it work?"	☐	☐	☐	☐	☐
23	Regarding a particular intervention with a particular client, I determine whether it worked.	☐	☐	☐	☐	☐
24	I use clinical protocols for most of my treatment.	☐	☐	☐	☐	☐
25	I make decisions about practice based on my experience.	☐	☐	☐	☐	☐
26	I use theory to understand intervention strategies.	☐	☐	☐	☐	☐

Appendix F: Text-Based Assignment Used for Control Group

Case Study 2: Selected Conditions

Read the following chapters in Halloran and Lowenstein's *Case Studies through the Healthcare Continuum.*

Choose one of the following cases and answer the associated questions.

Chapter 15: Oscar, Pneumonia, Chronic Obstructive Pulmonary Disease

1. How will you recommend that Oscar's environment be adapted for his COPD? (5 points)

2. While working on dressing skills, Oscar is bending over to put on his pants. He is struggling, and his face becomes red. What may be happening and what should you do? How could you educate Oscar and prevent this from happening? (10 points)

3. Given Oscar's memory problem, how would you ensure carryover of your teaching of new information? (5 points)

4. Oscar will need to go home with oxygen. What is necessary to educate Oscar and Stacey about? Do you include her teenaged sons in the education as well? (5 points)

Chapter 13: Mary, Total Hip Replacement, Osteoarthritis

1. What portion of the ADL routine do you anticipate will be most difficult for her to accomplish? How might you adapt this portion of the ADL routine to maximize independence? (5 points)

2. What environmental adaptations might be needed for her transition safely back home? (10 points)

3. How might the staff (including you as the OT) react to Mary's personality? Give both positive and negative reactions. (5 points)

4. You are in the OT kitchen with Mary practicing making tea. You notice that Mary is not putting any weight on her LLE. "I don't want to take any chances," she says. How do you deal with this? (5 points)

Chapter 12: Lyle, Right Total Knee Replacement

1. What are some safety issues that might arise for Lyle? What could you do to reduce the safety risk? (5 points)

2. At what level will Lyle be able to return to work? How long do you anticipate it will take him to accomplish this (explain)? (5 points)

3. You enter Lyle's room and find him trying to get to the bathroom by himself without the knee immobilizer on. What might you say to him? What would you do? (5 points)

4. What would you do if Lyle decided 2 days before the planned discharge date that he was leaving to go home? Write out a home program for Lyle. (10 points)

Appendix G: Video-Based Assignment Used for Intervention Group

Instructions for Clinical Reasoning Case Study Analysis

1. Review the Clinical Reasoning Review attached, which describes the types of clinical reasoning that have been discussed in class.

2. Watch the following video clip / case from www.icelearningcenter.com. Follow the order as listed.

   a. Patient 002 (Tom, 44 year old male, R CVA, subsequent neurosurgery)
   Total time 39:29

   ICU Treatment Begins, Part 1: Preparing the Room (3:41)
   ICU Treatment Begins, Part 2: Lower Extremity Assessment (5:27)
   ICU Co-Treatment, Part 3 (1:39)
   ICU Co-Treatment, Part 4 (4:51)
   ICU Co-Treatment, Part 5 (5:13)
   ICU Co-Treatment, Part 6 (4:46)
   ICU Co-Treatment, Part 8 (1:53)
   ICU Co-Treatment, Part 9 (4:17)
   ICU Co-Treatment, Part 10 (7:39)

   b. Patient 001 (Ben, 25 year old male, mitral valve replacement, subsequent CVA)
   Total time: 28:49

   Acute Care Part 2: Monitoring Blood Pressure in Supine (1:51)
   Acute Care Part 4: Dizziness while Standing (2:40)
   Medical Management: Sternal Precautions (0:38)
   Upper Extremity Assessment: Acute Care (5:55)
   Mobility: Ambulation in Acute Care (2:25)
   Self-Care Part 1: Oral Hygiene at the Sink in Acute Care (2:16)
   Self-Care Part 3: Brushing Hair at the Sink in Acute Care (2:06)
   Self-Care: Dressing in Acute Care, Part 1 (4:43)
   Self-Care: Dressing in Acute Care, Part 2 (4:22)
   Mobility: Transfer from chair to bed in Acute Care (1:53)

3. Complete the Clinical Reasoning Template for the Case Study Analysis for each case. You may need to infer some parts of the Occupational Profile, but what you add there should be considered as you complete the template.

Clinical Reasoning Review
for Case Study Analysis

Scientific Reasoning
- Determination of OT services based on knowledge of diagnosis or condition
- Best practices based on review of evidence
- Consideration of theories, models, and frames of reference that guide practice
- Systematic approach to choosing assessments and interpreting results, analyzing occupational performance, and designing OT interventions

Procedural Reasoning
- Following procedures to get things done
- What happens next in the therapy process
- Identify problems and develop interventions / solutions
- Decision-making based on deficits in client factors

Pragmatic Reasoning
- Consider demands, resources and constraints of the OT setting
- Consider skills and abilities of the therapist
- Constraints that extend beyond the client-therapist relationship

Narrative Reasoning
- Understand client's story through story-telling or story-making approach
- Determine the themes that influence client's performance and perception of disability
- Used (with interactive and conditional reasoning) to project possible futures for the client
- Relies on understanding client's cultural and social contexts

Interactive Reasoning
- Based on interactions between client and therapist
- Used to understand the client and engage him/her in the therapy process
- Exploration of client's occupational profile and their view of the disability
- Discuss and understand client's goals and needs

Conditional Reasoning
- Consider the conditions or contexts in which the client performs occupations
- Determine how conditions might affect the potential outcome(s)
- Integrate client's current status with hoped-for future
- Promotes re-appraisal and adjustment of interventions to refine goals

Ethical Reasoning
- Decisions guided by OT Code of Ethics
- Assists therapists to determine if ethical dilemmas influence OT services
- Make decisions according to ethical principles

Clinical Reasoning Template for Case Study Analysis

Occupational Profile
Model / Frame of Reference #1
Model / Frame of Reference #2
Evidence to Support and/or Guide OT Process **(2 articles with references in APA format)**
What information is relevant for each type of clinical reasoning? **How does this guide OT evaluation and/or intervention?**
Scientific
Procedural
Pragmatic
Narrative
Interactive
Conditional
Ethical

Application and Synthesis

Critique the assessments / interventions viewed in the video case study. What was useful and well-performed? What could be added or improved?

How could this case be used to build your own cognitive library? (What cognitive "keywords" would you use to store it?)

Appendix H: Interview following Case-Based Learning Activity

These open-ended questions will be modified slightly, according to the specific learning activities utilized for the control or experimental group (i.e. videos for class discussion and text-based case assignments for the control group, comprehensive online video case study and clinical reasoning learning activity for experimental group).

Student Satisfaction

1. How would you describe your satisfaction with the learning activity?
2. What did you like or dislike about the use of the clinical cases and/or videos?
3. What challenges did you face when using the case studies?

Perceptions of learning experiences

1. Did the cases and learning activities facilitate your learning and prepare you for your clinical practice as an occupational therapist? Why or why not?
2. How did the case-based learning activity compare to your lab and lecture experiences? How did the activity contribute to learning?

Perceptions of clinical reasoning

1. Can you describe how the learning activities contributed to your clinical reasoning skills?
2. How did you make decisions about your evaluations and interventions for the clients in the case studies?

Appendix I: Summary of Expert Validation of Learning Activity for Intervention Group

The purpose of this scoring sheet is to ensure that the content of the video clips chosen and the learning activity (template) address the learning objectives and purpose of the study (content validity).

Please score the following objectives / purposes according to the following scale:

1 = learning objective not met
2 = learning objective marginally addressed
3 = learning objective adequately addressed

Objective / Purpose: **VIDEO**	Expert 1 (MR)	Expert 2 (KE)	Expert 3 (SL)	Expert 4 (JC)	Expert 5 (AL)	Mean of validity scores
Assess client safety and readiness for participation in occupational therapy services.	3	3	2	3	3	2.8
Identify the types of clinical reasoning in occupational therapy practice in physical rehabilitation and describe how they are applied to a specific case.	3	2	3	3	3	2.8
Identify appropriate evidence to support the provision of occupational therapy services when applied to a specific case	3	3	1	2	3	2.4
Demonstrate the ability to interpret evaluation findings and patient performance in relation to relevant theoretical approaches, models of practice and frames of reference	3	3	1	2	3	2.4
Identify skills of the occupational therapist that either facilitate or impede client occupational performance.	3	3	3	3	3	3
Identify relevant features of a case to promote recall and development of a cognitive library of cases.	3	3	3	3	3	3

Comments:

MR: These two cases are very similar in setting (ICU, acute care). In both, the information provided by the patient is limited. That will make it difficult for students to think about narrative and interactive reasoning. (My note: We discussed adding the out-patient case I have also chosen, but not added here for validity testing. Those video clips show much more interaction with the patient and more information provided the patient that is relevant to those types of reasoning).

Objective / Purpose: **LEARNING ACTIVITY / TEMPLATE**	Expert 1 (MR)	Expert 2 (KE)	Expert 3 (SL)	Expert 4 (JC)	Expert 5 (AL)	Mean of validity scores
Assess client safety and readiness for participation in occupational therapy services.	3	2	1	2	3	2.2
Identify the types of clinical reasoning in occupational therapy practice in physical rehabilitation and describe how they are applied to a specific case.	3	3	3	3	3	3
Identify appropriate evidence to support the provision of occupational therapy services when applied to a specific case	3	3	3	3	3	3
Demonstrate the ability to interpret evaluation findings and patient performance in relation to relevant theoretical approaches, models of practice and frames of reference	3	3	2	3	3	2.8
Identify skills of the occupational therapist that either facilitate or impede client occupational performance.	3	3	2	3	3	2.8
Identify relevant features of a case to promote recall and development of a cognitive library of cases.	3	3	3	3	3	3

Comments:

MR: Add intervention planning assignment. Even if you are able to improve clinical reasoning, what is the outcome from the perspective of improving the actions students take to improve interventions to patients?

SL: Provided some edits to wording of instructions, with changes to structure and clarity, but no changes related to content.

SL: Suggested providing additional explanation to students regarding the model / frame of reference section (i.e., should they outline main constructs of model? Give examples from case? Use of model to determine additional actions to take?)

KE: Some of the objectives are better accomplished by EITHER the video clips or the written template, but together they work to meet the objectives.

KE: For the template, I think some students might fill the space with benign info just to fill it in. You may consider making it more specific, like having them relate the treatment / assessment to the articles they had to find.

Appendix J: 2014 Data

The first cycle of data collection occurred in the spring of 2014, and 13 students in each section of the Adult Musculoskeletal Occupational Therapy course participated in this research (see Table J1). The mean age of the 2014 control group was 20.92 years (standard deviation 0.86), and the mean age of the 2014 intervention group was 22.31 years (standard deviation 3.38). There was one outlier for age in the 2014 control group, a female aged 23, and one outlier in the 2014 intervention group, a male aged 32. All other participants in 2014 were female. The mean GPA of the 2014 control group was 3.62 (standard deviation 0.24), and the mean GPA of the 2014 intervention group was also 3.62 (standard deviation 0.21). There were no outliers for GPA in either group. Of the 26 participants in 2014, 25 were Caucasian and 1 was African-American.

Table J1

Description of Participants, 2014

	Number	Gender	Age		GPA	
			Mean	SD	Mean	SD
Control	13	13 Female	20.92	0.86	3.62	0.24
Intervention	13	12 Female	22.31	3.38	3.62	0.21

Comparisons within groups.

In the 2014 data collection cycle, 13 students in the control group and 13 students in the intervention group agreed to participate in the study. First, comparisons were made for each of those groups to determine if a statistically significant change occurred from pre-test to post-test in scores of the Health Science Reasoning Test (HSRT), as listed in Tables J2 and J3. For the control group, improvements in post-test scores were noted in overall score, percentile, deduction, and inference; there was no change in analysis; and

decreased scores were noted in induction and evaluation. The only statistically significant change was in deduction ($t_{(12)}$ = 2.28, p=.04). For the intervention group, improvements were noted in all areas. Statistically significant changes were noted in overall score ($t_{(12)}$ = 2.67, p=.02), percentile ($t_{(12)}$ = 2.42, p=.03), induction ($t_{(12)}$ = 3.61, p=.01), deduction ($t_{(12)}$ = 2.42, p=.03) and evaluation ($t_{(12)}$ = 2.64, p=.02). The changes were not statistically significant in analysis and inference. Graphic representations are presented in Figures J1 through J4.

Table J2

Comparison of HSRT Pre-Test and Post-Test Scores (2014, Control Group)

	Pre-test		Post-test				
	Mean	SD	Mean	SD	Difference	t	p
Overall	21.69	3.04	23.00	3.53	1.31	1.73	0.11
Percentile	71.08	18.74	76.77	19.44	5.69	1.26	0.23
Induction	8.15	1.28	7.62	2.06	-0.53	1.13	0.28
Deduction	6.31	1.89	7.31	1.49	1.00	2.28	**0.04***
Analysis	4.46	0.88	4.46	0.97	0.00	0.00	1.00
Inference	3.92	1.12	4.23	0.83	0.31	0.84	0.42
Evaluation	5.08	1.19	5.00	1.53	-0.08	0.25	0.81

**p<.05*

Table J3

Comparison of HSRT Pre-Test and Post-Test Scores (2014, Intervention Group)

	Pre-test		Post-test				
	Mean	SD	Mean	SD	Difference	t	p
Overall	21.77	3.92	24.54	3.55	2.77	2.67	**0.02***
Percentile	71.46	22.51	83.77	18.01	12.31	2.42	**0.03***
Induction	7.38	1.12	8.38	1.04	1.00	3.61	**0.01***
Deduction	7.15	1.91	7.85	2.08	.70	2.42	**0.03***
Analysis	4.62	1.26	4.69	1.18	.07	0.43	0.67
Inference	4.08	1.19	4.23	1.36	0.15	0.46	0.66
Evaluation	4.77	1.17	5.46	0.66	0.69	2.64	**0.02***

**p<.05*

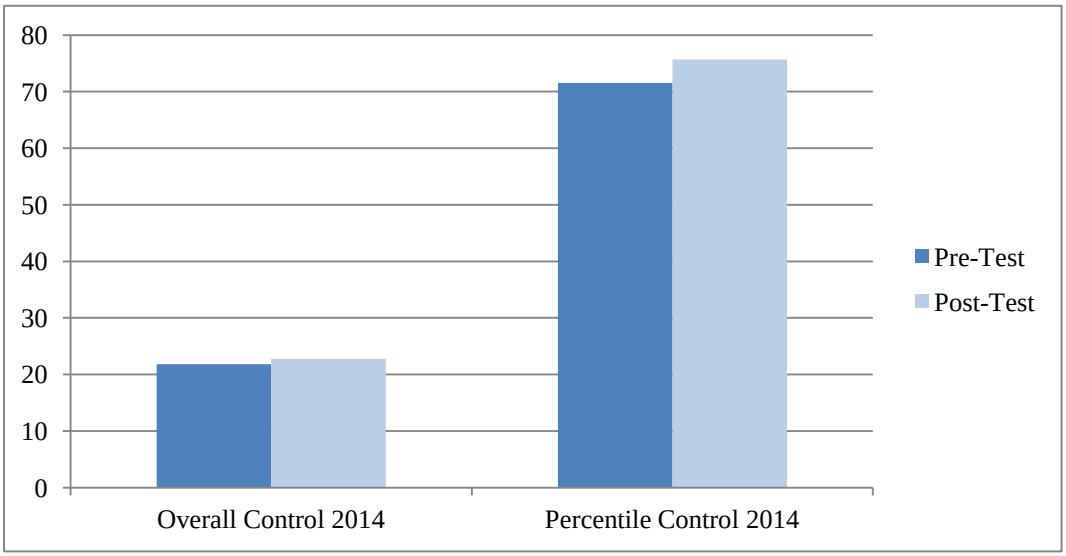


Figure J1: HSRT Pre-Test to Post-Test Comparison for Control Group 2014, Overall and Percentile

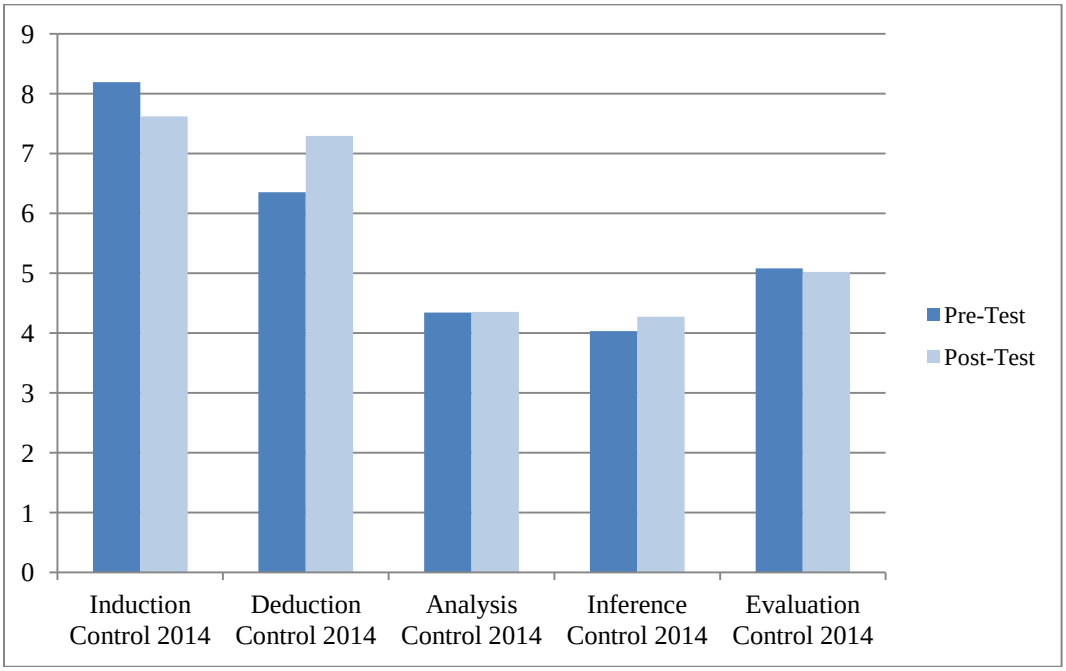


Figure J2: HSRT Pre-Test and Post-Test Comparison for Control Group 2014, Sub-Tests

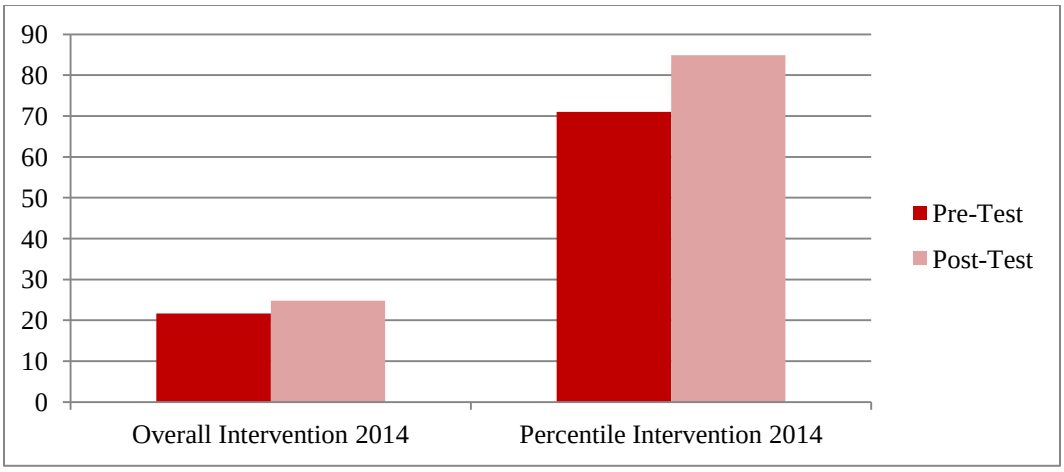


Figure J3: HSRT Pre-Test to Post-Test Comparison for Intervention Group 2014, Overall and Percentile

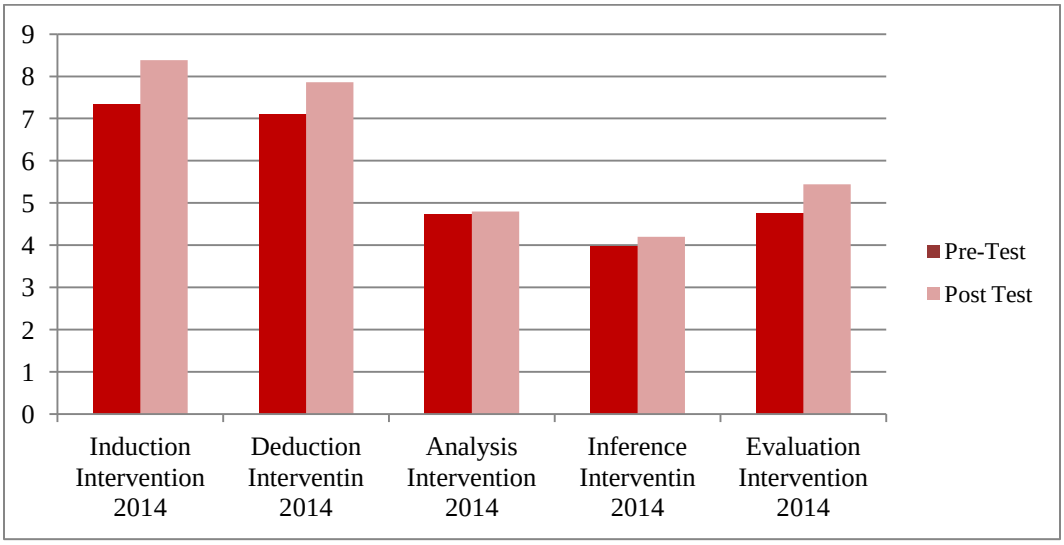


Figure J4: HSRT Pre-Test and Post-Test Comparison for Intervention Group 2014, Sub-Tests

Comparisons between groups

ANCOVA was then conducted to determine if differences existed between the control and intervention groups, when adjusting for pre-existing differences between the groups. Levene's Test of Equality of Error Variances was calculated for each test and sub-test of the HSRT, in order to determine if post-test score variances were similar

between the control and intervention groups. The HSRT post-test for inference was the only sub-test with a statistically significant difference in variances between the groups ($F_{(1,24)} = 5.72$, p= 0.03). There was no statistically significant difference in variances in any of the other measures, demonstrating homogeneity of variance in 13 of the 14 measures of the HSRT. Data was transformed for the inference scores, using the Winsor technique, to establish homogeneity of variance (see Appendix K for details).

Analysis of co-variance was used to identify how age and GPA may have influenced the HSRT scores within all subjects. Age did not have a statistically significant effect on any measure of the HSRT. GPA did have a statistically significant effect on HSRT sub-test scores within subjects in the areas of induction ($F_{(1,24)} = 6.86$, p = .02), inference ($F_{(1,24)} = 4.34$, p = .05) and evaluation ($F_{(1,24)} = 7.61$, p = .01). HSRT means, adjusted for age and GPA, are listed in Table J4, for overall, percentile and all sub-test categories.

There was a statistically significant difference in induction between the control and intervention groups ($F_{(1,24)} = 9.28$, p = .01) when adjusted post-test means were compared. Although the control group had a higher pre-test score in induction, the intervention group had a higher post-test induction score. The post-test mean of 7.62 for the control group scored in the moderate range, while the post-test mean of 8.38 for the intervention group scored in the strong range. There were no other statistically significant differences in the post-test scores of the two groups (see Table J5). Graphic representations are presented in Figures J5 through J8.

Table J4

Health Science Reasoning Test (HSRT) Estimated Marginal Means, 2014

	Control		Intervention		
	Mean	SE	Mean	SE	Effect size
Overall Score					
Pre-Test	21.80	0.97	21.66	0.97	
Post-Test	22.75	1.11	24.79	1.11	1.84
Percentile					
Pre-Test	71.56	5.74	70.98	5.74	
Post-Test	75.68	5.39	84.86	5.39	1.89
Induction					
Pre-Test	8.18	0.33	7.35	0.33	
Post-Test	7.62	0.48	8.38	0.48	1.58
Deduction					
Pre-Test	6.35	0.53	7.11	0.53	
Post-Test	7.29	0.52	7.86	0.52	1.10
Analysis					
Pre-Test	4.34	0.28	4.74	0.28	
Post-Test	4.35	0.28	4.80	0.28	1.61
Inference					
Pre-Test	4.03	0.32	3.97	0.32	
Post-Test	4.27	0.32	4.20	0.32	0.22
Evaluation					
Pre-Test	5.08	0.33	4.77	0.33	
Post-Test	5.02	0.35	5.44	0.35	1.20

Table J5

Health Science Reasoning Test (HSRT) ANCOVA, 2014

	F-value	Significance (p)
Overall Score	3.12	0.09
Percentile	2.14	0.16
Induction	9.28	**0.01***
Deduction	0.12	0.74
Analysis	0.01	0.92
Inference	0.00	0.98
Evaluation	3.67	0.07

**p<.05*

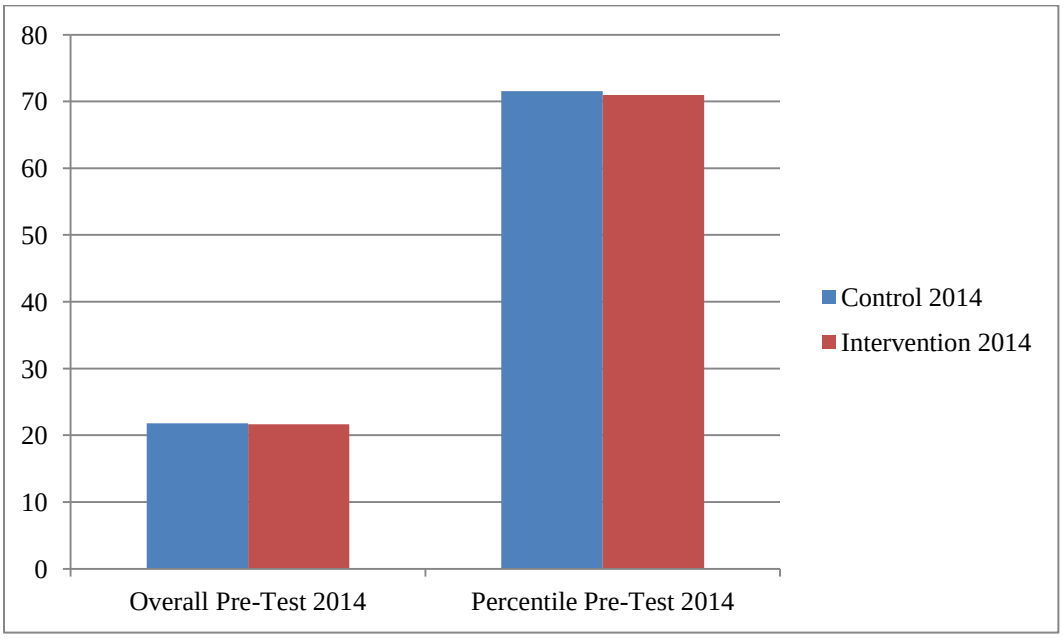


Figure J5: HSRT Pre-Test Comparison 2014, Overall and Percentile

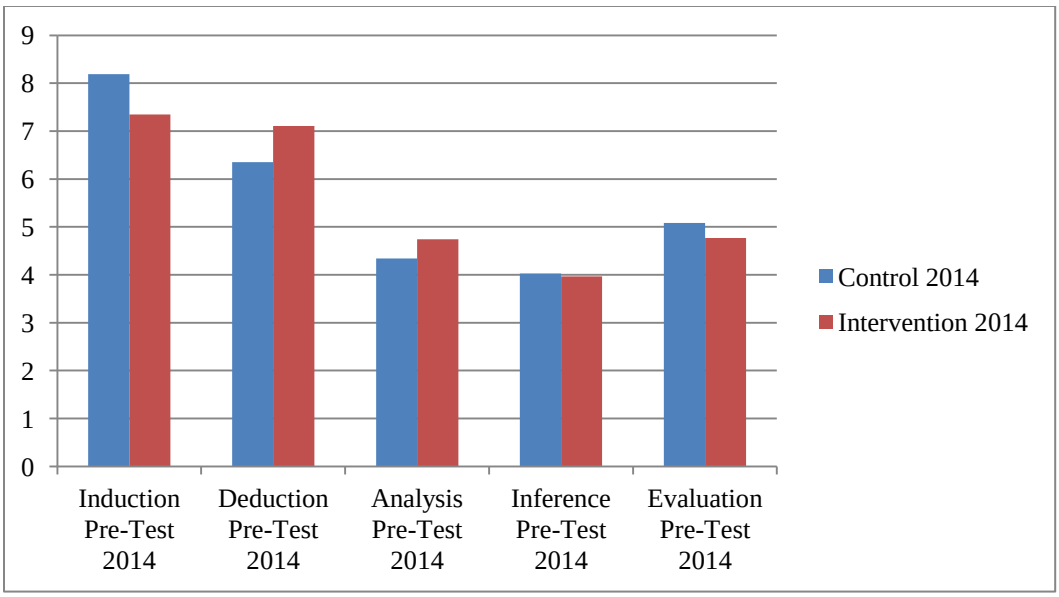


Figure J6: HSRT Pre-Test Comparison 2014, Sub-Tests

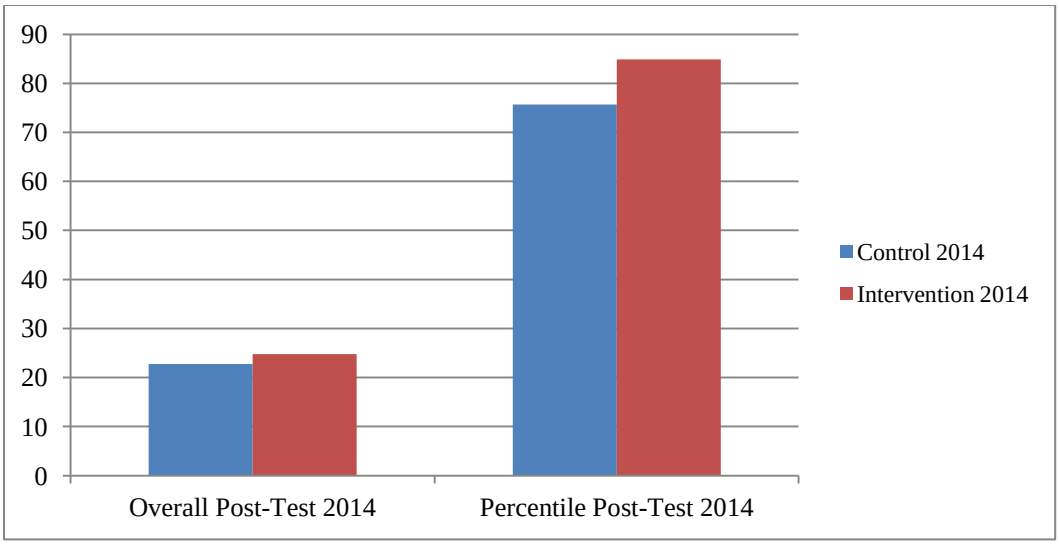


Figure J7: HSRT Post-Test Comparison 2014, Overall and Percentile

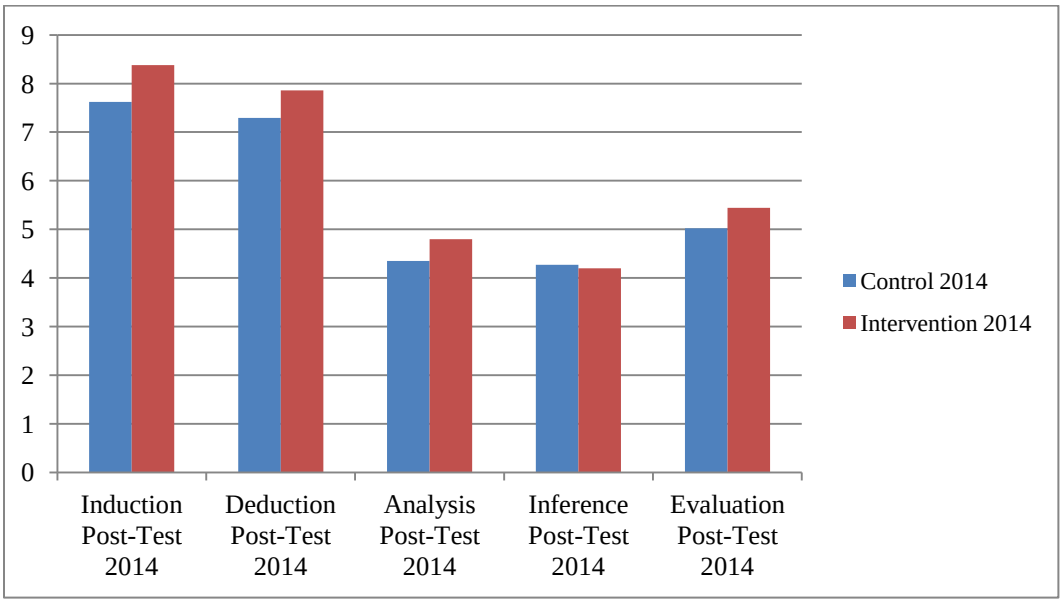


Figure J8: HSRT Post-Test Comparison 2014, Sub-Tests

Trends in data.

There were some trends of note, in the comparisons between the groups, however, even if not statistically significant (see Figures J9 through J15). Examination of the estimated marginal means demonstrated that there were improvements in the

control group of overall scores, percentile scores, and 3 of the 5 sub-tests (deduction, analysis, inference). The 2 remaining sub-tests did not improve (induction, evaluation). In the intervention group, the overall score, percentile score, and all 5 sub-tests demonstrated improved scores of the post-tests, when compared to the pre-tests.

Relationship to research question

Data from the Health Science Reasoning test was used to determine if a statistically significant difference existed in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone. In 2014, a statistically significant change was identified only in deduction, when comparing pre-test to post-test means for the control group. A statistically significant change was identified in overall scores, percentile scores, induction, deduction, and evaluation for the intervention group. When comparing the two groups, and partialling out the effects of GPA and age, there was a statistically significant difference in induction between the control and intervention groups. Specifically, the control group scored higher than the intervention group in the pre-test; however the intervention group scored higher than the control group in the post-test. The control group post-test scores were in the moderate range for induction, while the intervention group post-test scores were in the strong range, as defined by the HSRT scoring manual (Insight Assessments, 2014). Therefore, the students who participated in the video case study and clinical reasoning learning activity demonstrated significantly higher scores in induction, when compared to those students who participated in text or

brief video clip activities. However, there were no statistically significant differences in overall score, percentile scores, or other types of reasoning.

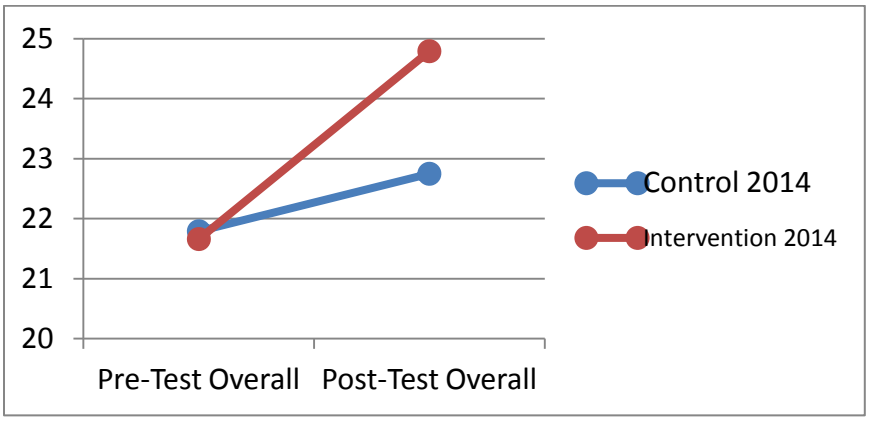


Figure J9: HSRT Pre-Test and Post-Test Comparisons for Both Groups 2014, Overall

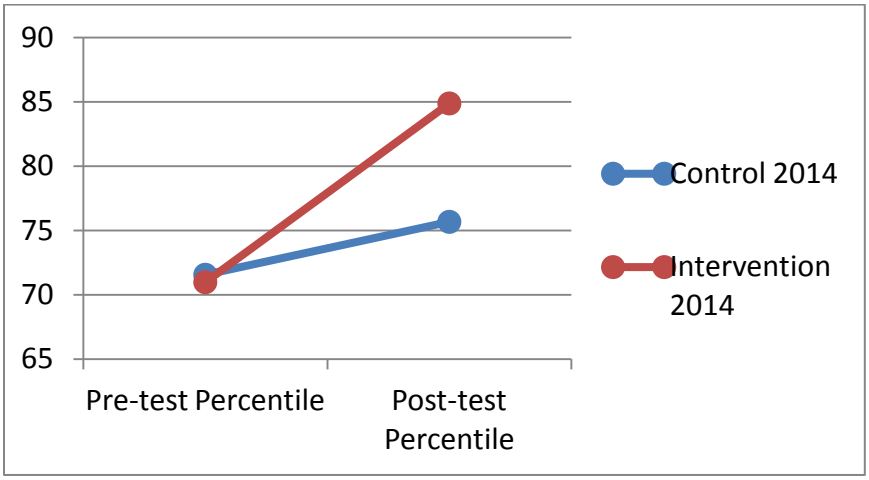


Figure J10: HSRT Pre-Test and Post-Test Comparisons for Both Groups 2014, Percentile

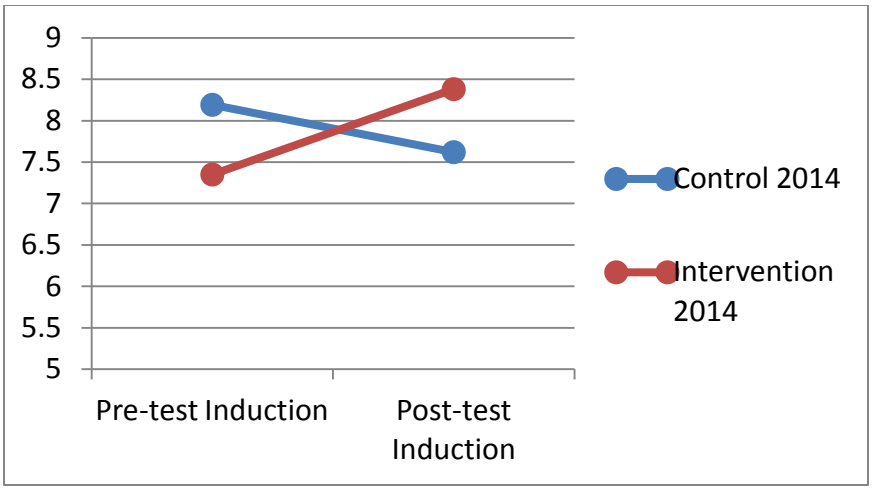


Figure J11: HSRT Pre-Test and Post-Test Comparisons for Both Groups 2014, Induction

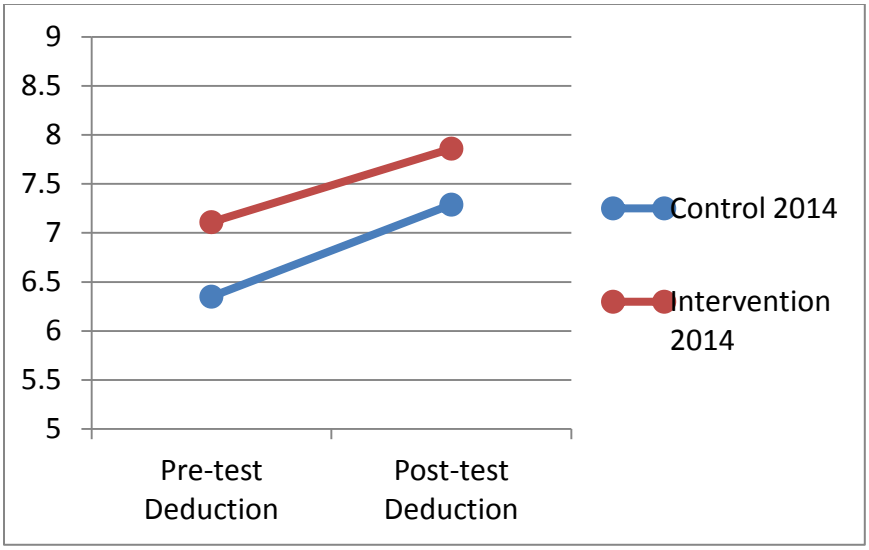


Figure J12: HSRT Pre-Test and Post-Test Comparisons for Both Groups 2014, Deduction

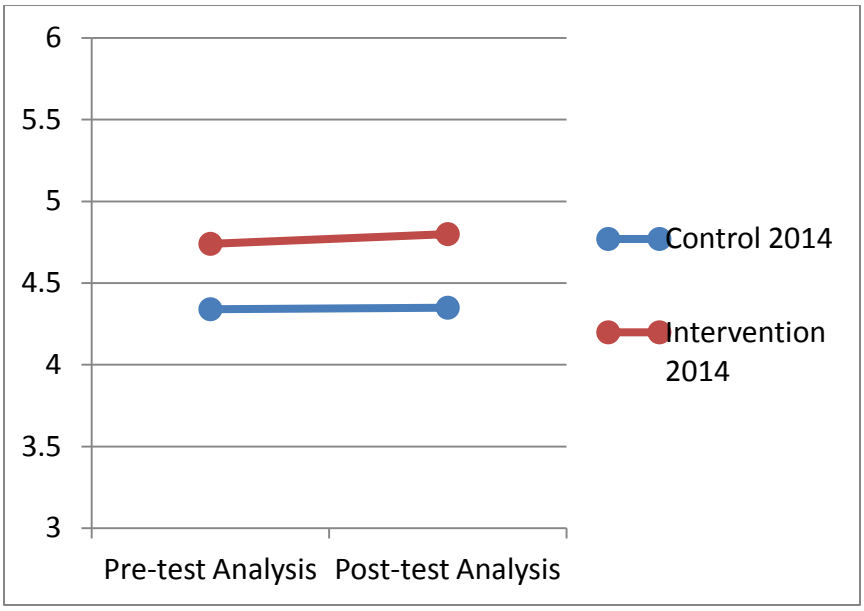


Figure J13: HSRT Pre-Test and Post-Test Comparisons for Both Groups 2014, Analysis

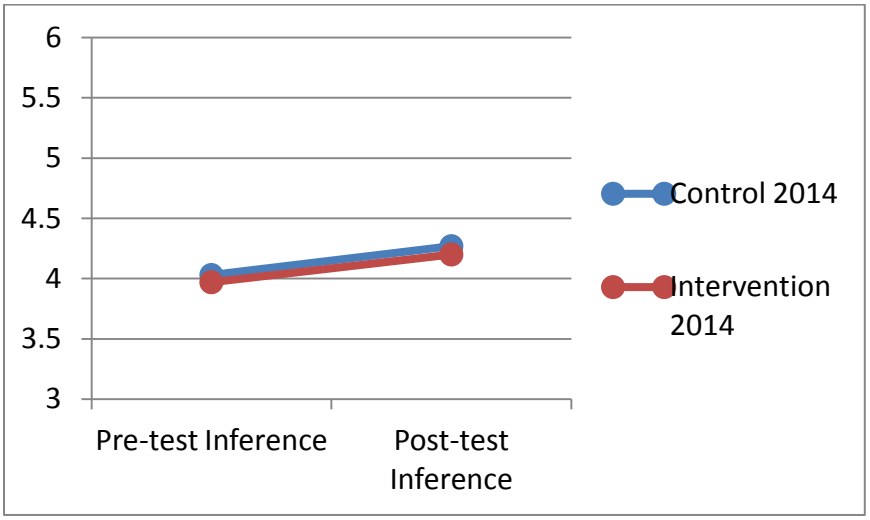


Figure J14: HSRT Pre-Test and Post-Test Comparisons for Both Groups 2014, Inference

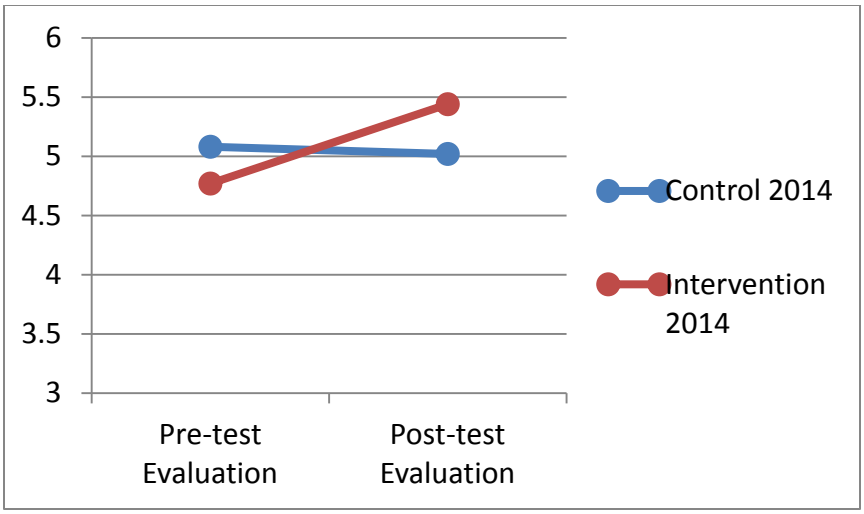


Figure J15: HSRT Pre-Test and Post-Test Comparisons for Both Groups 2014, Evaluation

Appendix K: Adjustment for Homogeneity of Variance, 2014

Regarding Research Question 1, data from the Health Science Reasoning test was used to examine if differences existed between the control and intervention groups, specifically to determine if a statistically significant difference existed in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone. Data analysis was conducted using ANCOVA, since GPA was determined to have an effect on the HSRT scores. Levene's Test of Equality of Error Variances was calculated for each test and sub-test of the HSRT, in order to determine if variances existed between the control and intervention groups. During the 2014 data collection cycle, the HSRT post-test for inference was the only measure with a statistically significant difference in variances between the groups ($F = 5.72$, $p = 0.03$). In order to adjust for this variance, data was transformed using the Winsor technique. Extreme values (below 5^{th} percentile and above 95^{th} percentile) were then changed to match the existing values at 5^{th} and 95^{th} percentiles. This eliminated the variance between the groups for the post-test ($F = 3.17$, $p = 0.09$). Tables K1 and K2 detail this adjustment.

ANCOVA was then conducted with the adjusted values for the inference post-test scores. In the original data analysis, GPA was the only co-variate that had a statistically significant effect on the inference scores ($F = 4.34$, $p = .05$). With the adjusted scores, GPA no longer had this effect on the inference scores of the groups ($F = 3.61$, $p = 0.07$). Consistent with the initial round of data analysis, there was no statistically significant difference in the inference post-test scores between the control and intervention groups.

Table K1

Adjusted Homogeneity of Variance for Inference, HSRT, 2014

	F-value	Significance (p)
Inference Score before adjustment		
Pre-Test	0.17	0.68
Post-Test	5.72	**0.03***
Inference Score after adjustment		
Pre-Test	0.17	0.68
Post-Test	3.17	0.09

**p<.05*

Table K2

Adjusted Health Science Reasoning Test (HSRT) ANCOVA, 2014

	F-value	Significance (p)
Inference before adjustment	0.54	0.47
Inference after adjustment	0.02	0.90

Appendix L: 2015 Data

The second cycle of data collection occurred in the spring of 2015, with participation of 18 students in the control group and 17 students in the intervention group (see Table L1). The mean age of the 2015 control group was 20.61 years (standard deviation 0.70), and the mean age of the 2015 intervention group was 22.59 years (standard deviation 3.48). There were 2 outliers for age in the 2015 intervention group, females aged 29 and 33. One participant in the intervention group was male, all other participants in both groups were female. The mean GPA of the 2015 control group was 3.71 (standard deviation 0.15), and the mean GPA of the 2015 intervention group was 3.56 (standard deviation 0.25). Once again, there were no outliers for GPA in either group. Of the 35 participants in the 2015 data collection cycle, 30 were Caucasian, four were African-American and one was Asian-American. In 2015, participants were asked to indicate their prior experience in physical rehabilitation settings. In the control group, nine students (50%) indicated no prior experience, eight students (44.4%) indicated minimal prior experience, and one student (5.6%) indicated moderate prior experience. In the intervention group, six students (35.3%) indicated no prior experience, 10 students (58.8%) indicated minimal experience, and one student (5.9%) indicated moderate prior experience.

Table L1

Description of Participants, 2015

	Number	Gender	Age		GPA	
			Mean	SD	Mean	SD
Control	18	18 Female	20.61	0.70	3.71	0.15
Intervention	17	16 Female	22.59	3.48	3.56	0.25

Comparisons within groups

In the 2015 data collection cycle, 18 students in the control group and 17 students in the intervention group agreed to participate in the study. First, comparisons were made for each of those groups to determine if a statistically significant change occurred from pre-test to post-test in scores of the Health Science Reasoning Test (HSRT), as listed in Tables L2 and L3. For the control group, improved post-test scores were noted in overall score, percentile, deduction, analysis, inference, and evaluation; a decreased score was noted in induction only. None of these changes were statistically significant, however. For the intervention group, improvements were noted in all areas. Statistically significant changes were noted in overall score ($t_{(16)} = 3.06$, p=.01), percentile ($t_{(16)} = 2.87$, p=.01), deduction ($t_{(16)} = 2.35$, p=.03) and inference ($t_{(12)} = 2.39$, p=.03). The changes were not statistically significant in induction, analysis or evaluation. Graphic representations are presented in Figures L1 through L4.

Table L2

Comparison of HSRT Pre-Test and Post-Test Scores (2015, Control Group)

	Pre-test		Post-test				
	Mean	SD	Mean	SD	Difference	t	p
Overall	22.22	4.41	22.78	5.25	0.56	0.61	0.53
Percentile	73.44	22.45	76.23	26.00	2.84	0.64	0.67
Induction	7.83	1,54	7.72	1.87	-0.11	0.44	0.60
Deduction	7.00	2.03	7.22	2.39	0.22	0.53	0.11
Analysis	4.11	1.23	4.61	1.38	0.50	1.70	0.88
Inference	4.17	1.34	4.22	1.26	0.05	0.16	0.63
Evaluation	4.83	1.20	4.94	1.21	0.11	0.49	0.53

Table L3

Comparison of HSRT Pre-Test and Post-Test Scores (2015, Intervention Group)

	Pre-test		Post-test				
	Mean	SD	Mean	SD	Difference	t	p
Overall	20.24	3.87	22.29	3.27	2.05	3.06	**0.01***
Percentile	61.53	23.45	73.41	17.84	11.88	2.87	**0.01***
Induction	7.47	1.18	7.65	1.17	0.18	0.57	0.58
Deduction	5.94	2.16	7.06	1.43	1.12	2.35	**0.03***
Analysis	3.82	1.38	4.41	1.18	0.59	2.06	0.06
Inference	3.53	1.12	4.18	1.19	0.65	2.39	**0.03***
Evaluation	3.53	1.12	4.82	1.13	1.29	0.64	0.53

*$p<.05$

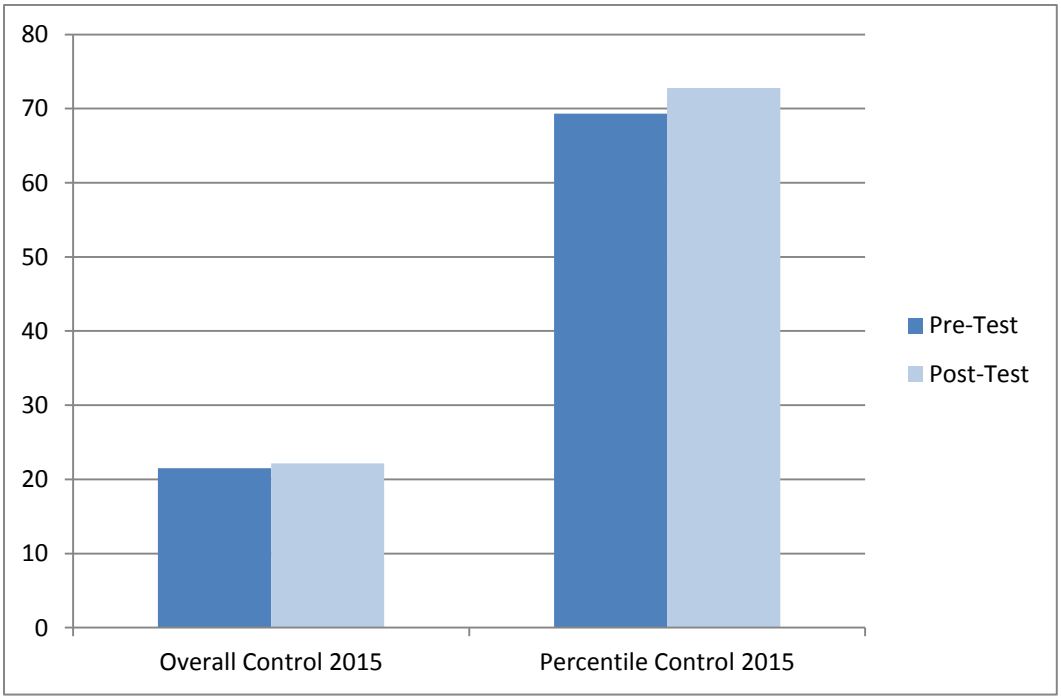


Figure L1: HSRT Pre-Test to Post-Test Comparison for Control Group 2015, Overall and Percentile

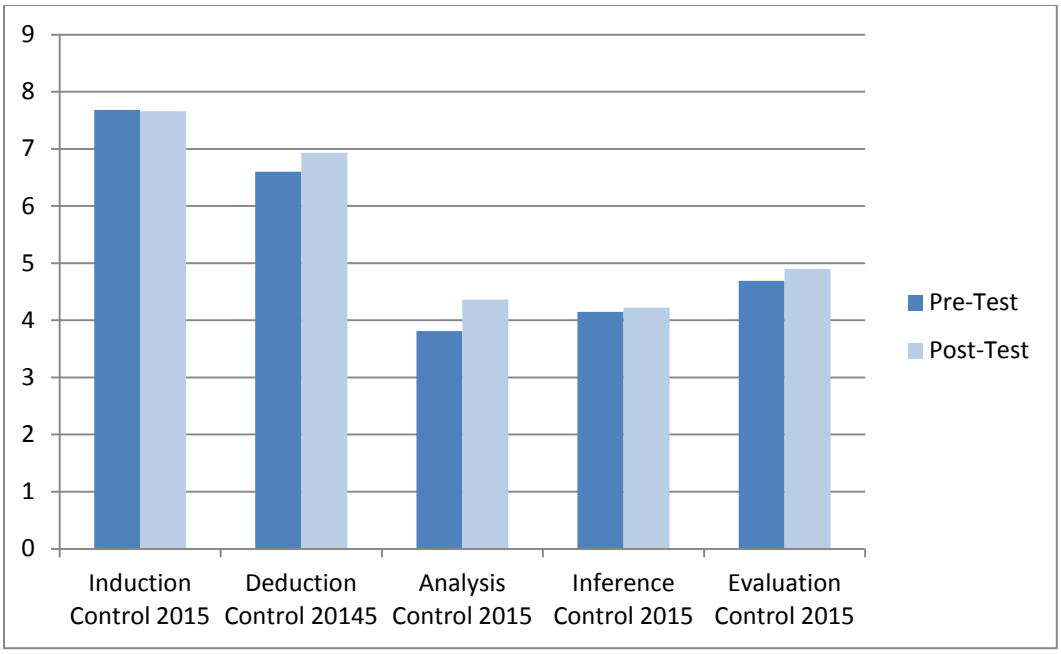


Figure L2: HSRT Pre-Test to Post-Test Comparison for Control Group 2015, Sub-Tests

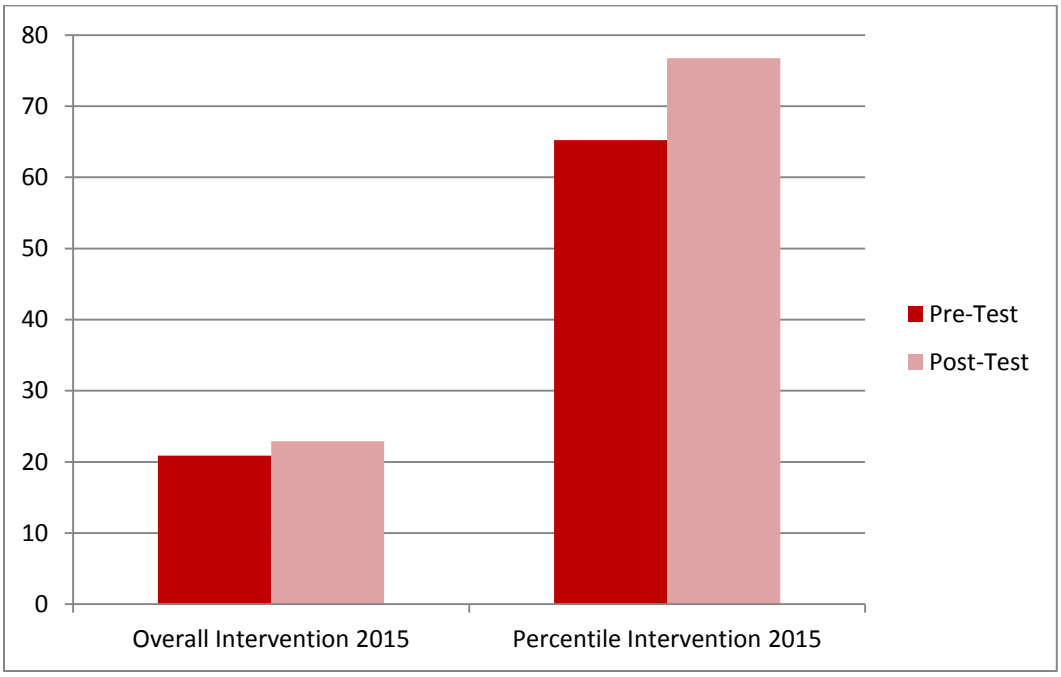


Figure L3: HSRT Pre-Test to Post-Test Comparison for Intervention Group 2015, Overall and Percentile

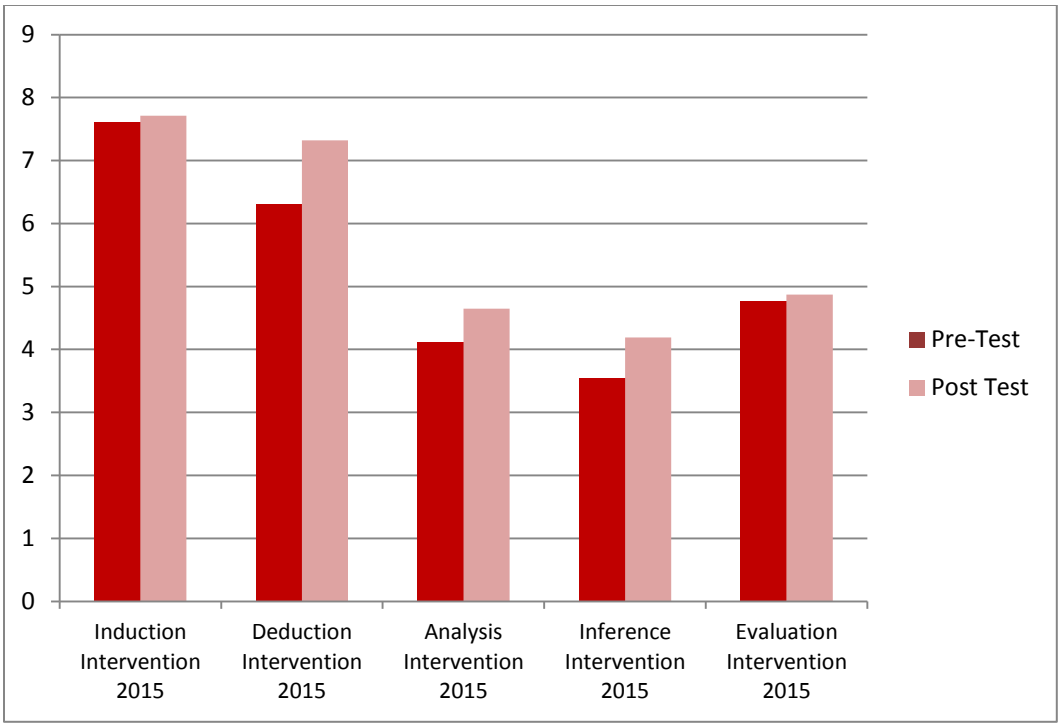


Figure L4: HSRT Pre-Test to Post-Test Comparison for Intervention Group 2015, Sub-Tests

Comparisons between groups

ANCOVA was then conducted to adjust for pre-existing differences between the groups. Levene's Test of Equality of Error Variances was calculated for each test and sub-test of the HSRT, in order to determine if post-test score variances were similar between the control and intervention groups. The HSRT post-test for overall score was the only measure with a statistically significant difference in variances between the groups ($F_{(1,33)} = 3.99$, $p = 0.05$). There was no statistically significant difference in variances in any of the other measures, demonstrating homogeneity of variance in 13 of the 14 measures of the HSRT. Data was transformed for the overall scores, using the Winsor technique, to establish homogeneity of variance (see Appendix M for details).

HSRT means, adjusted for age, GPA and prior experience, are listed in Table L4, for overall, percentile and all sub-test categories. Analysis of co-variance was used to identify how age, GPA, and prior experience may have influenced the HSRT scores within all subjects. None of these factors were noted to have a statistically significant effect on the groups. Graphic representations are presented in Figures J5 through J8.

There were no statistically significant differences identified between the control and intervention groups when adjusted post-test means were compared (see Table L5).

Table L4

Health Science Reasoning Test (HSRT) Estimated Marginal Means, 2015

	Control Group		Intervention Group		
	Mean	SE	Mean	SE	Effect size
Overall Score					
Pre-Test	21.51	0.92	20.88	0.94	
Post-Test	22.15	0.98	22.90	1.00	0.77
Percentile					
Pre-Test	69.33	5.19	65.23	5.30	
Post-Test	72.78	5.01	76.76	5.12	0.79
Induction					
Pre-Test	7.68	0.32	7.60	0.32	
Post-Test	7.66	0.40	7.71	0.41	0.13
Deduction					
Pre-Test	6.60	0.47	6.30	0.48	
Post-Test	6.93	0.46	7.32	0.47	0.85
Analysis					
Pre-Test	3.81	0.27	4.11	0.28	
Post-Test	4.36	0.28	4.65	0.29	1.04
Inference					
Pre-Test	4.15	0.30	3.54	0.31	
Post-Test	4.22	0.30	4.19	0.30	0.10
Evaluation					
Pre-Test	4.69	0.28	4.77	0.28	
Post-Test	4.90	0.30	4.87	0.30	0.10

Table L5

Health Science Reasoning Test (HSRT) ANCOVA, 2015

	F-value	Significance (p)
Overall Score	0.54	0.47
Percentile	0.86	0.36
Induction	0.73	0.39
Deduction	0.43	0.52
Analysis	0.02	0.89
Inference	1.43	0.24
Evaluation	0.21	0.65

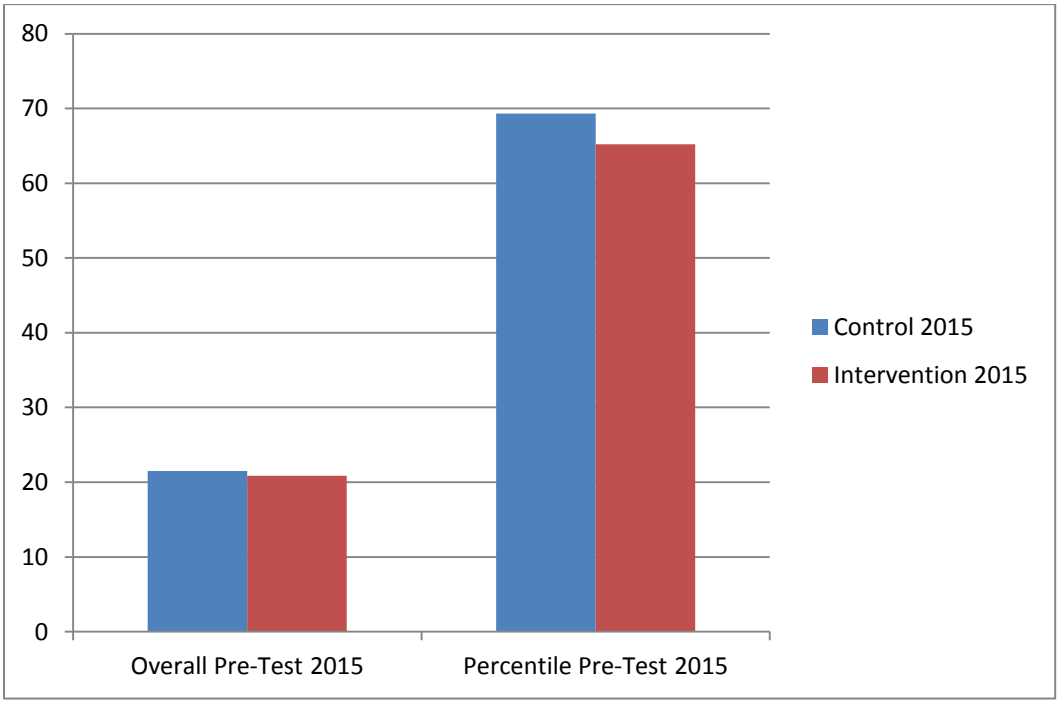


Figure L5: HSRT Pre-Test Comparison 2015, Overall and Percentile

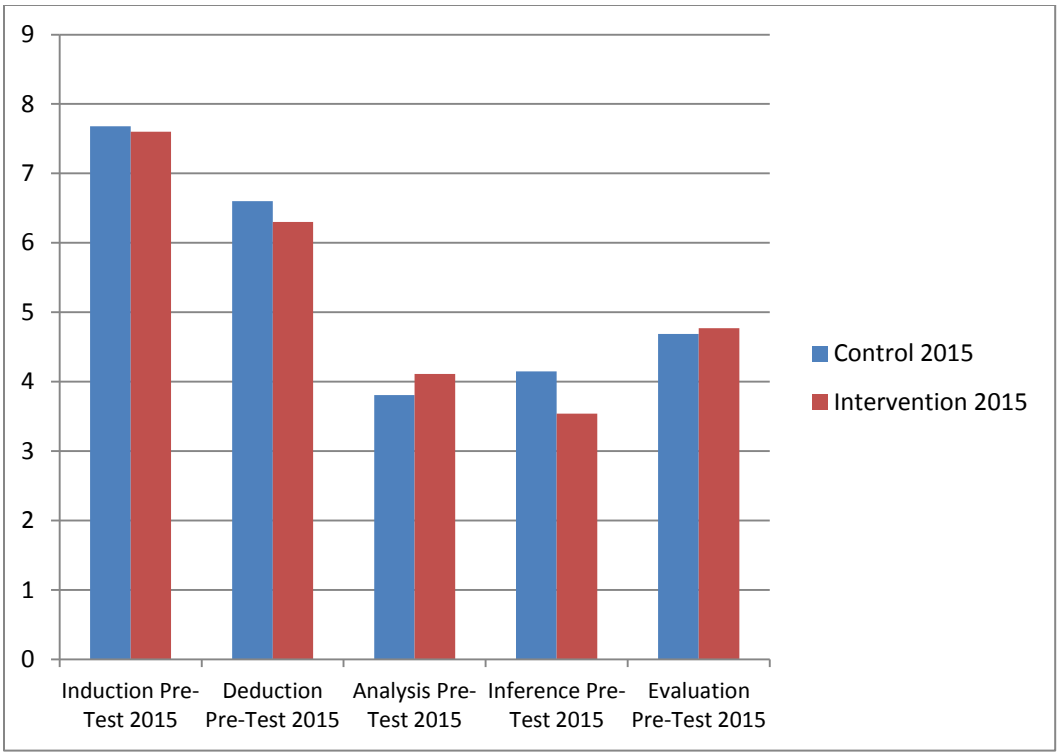


Figure L6: HSRT Pre-Test Comparison 2015, Sub-Tests

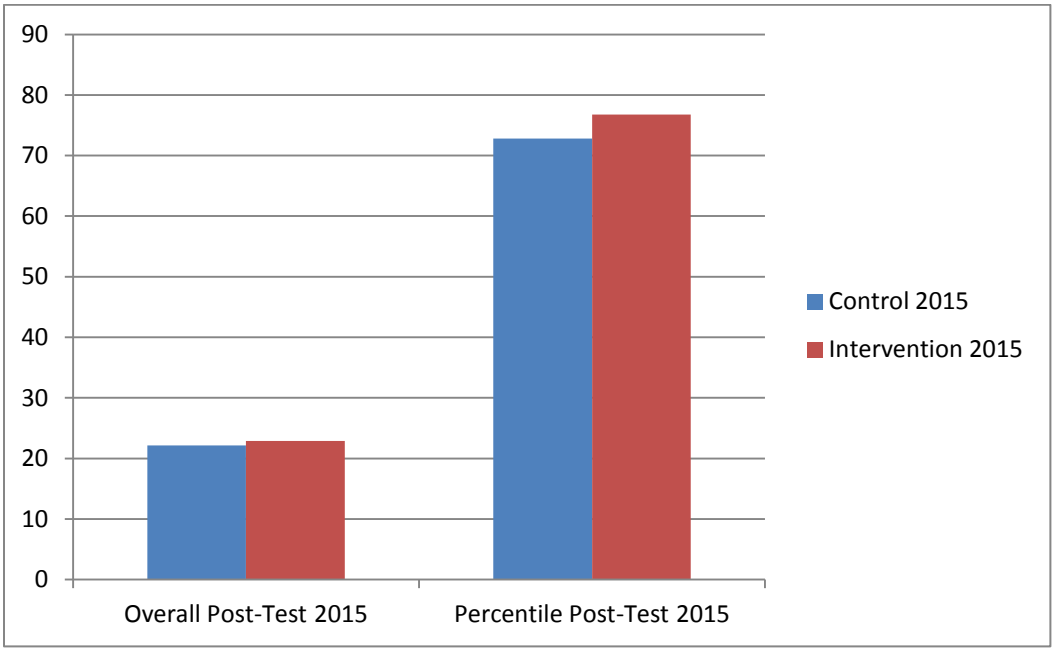


Figure L7: HSRT Post-Test Comparison 2015, Overall and Percentile

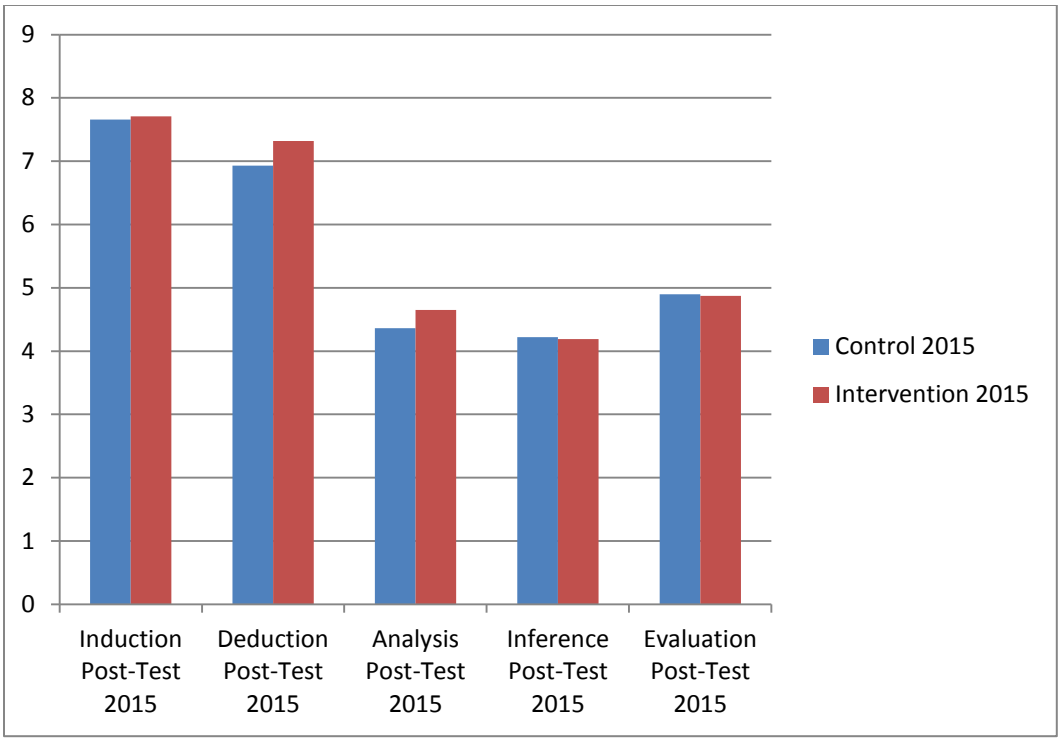


Figure L8: HSRT Post-Test Comparison 2015, Sub-Tests

Trends in 2015 data

There were some trends of note, however, even if not statistically significant (see Figures L9 through L15). Examination of the estimated marginal means demonstrated that there were improvements in the control group of overall scores, percentile scores, and 4 of the 5 sub-tests (deduction, analysis, inference, evaluation). The remaining sub-tests did not improve (induction). In the intervention group, the overall score, percentile score, and all 5 sub-tests demonstrated improved scores of the post-test, when compared to the pre-tests. The overall post-test scores were in the strong range for both groups, as categorized in the HSRT manual (Insight Assessments, 2014). The post-test scores for all the categories of reasoning were in the moderate ranges for both groups.

Relationship to research question

Data from the Health Science Reasoning test was used to determine if a statistically significant difference existed in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone. In 2015, no statistically significant changes were identified when comparing pre-test to post-test means for the control group. A statistically significant change was identified in overall scores, percentile scores, deduction, and inference for the intervention group. When comparing the two groups, and partialling out the effects of GPA, age, and prior experience in physical rehabilitation, there were no statistically significant differences in any of the reasoning scores between the control and intervention groups. Therefore, the students who participated in the video case study and clinical reasoning learning activity did not demonstrate any significant advantages when compared to those students who participated in text or brief video clip activities.

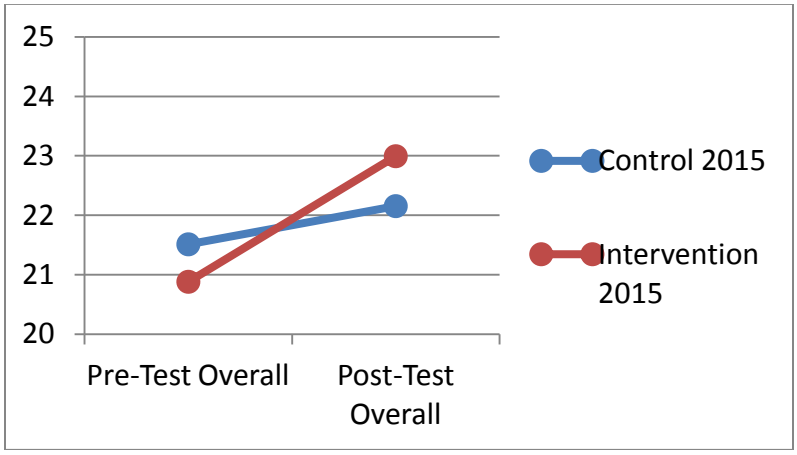


Figure L9: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2015, Overall

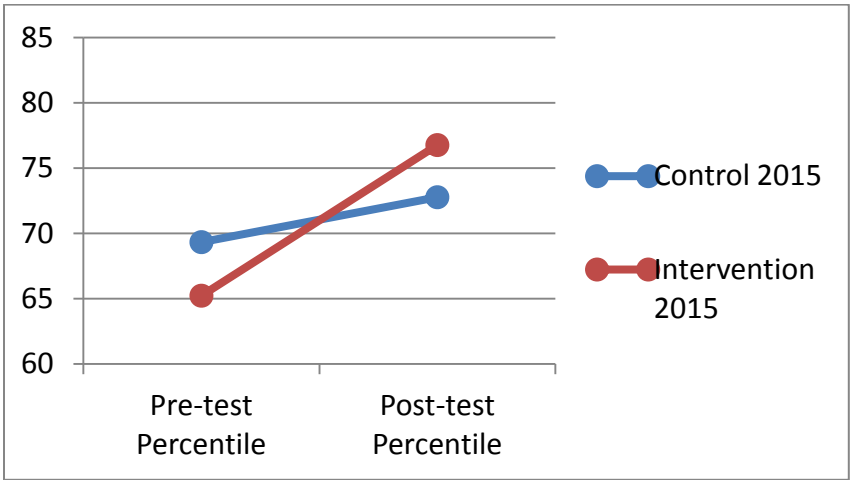


Figure L10: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2015, Percentile

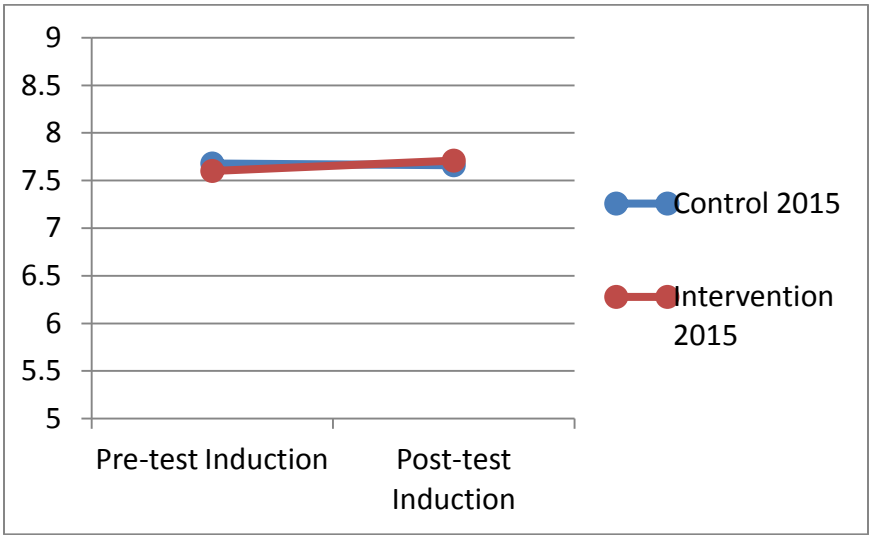


Figure L11: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2015, Induction

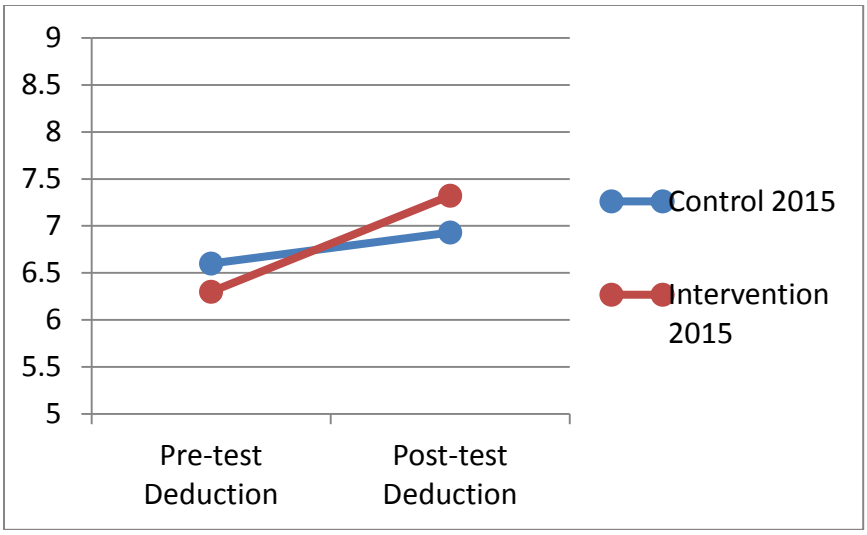


Figure L12: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2015, Deduction

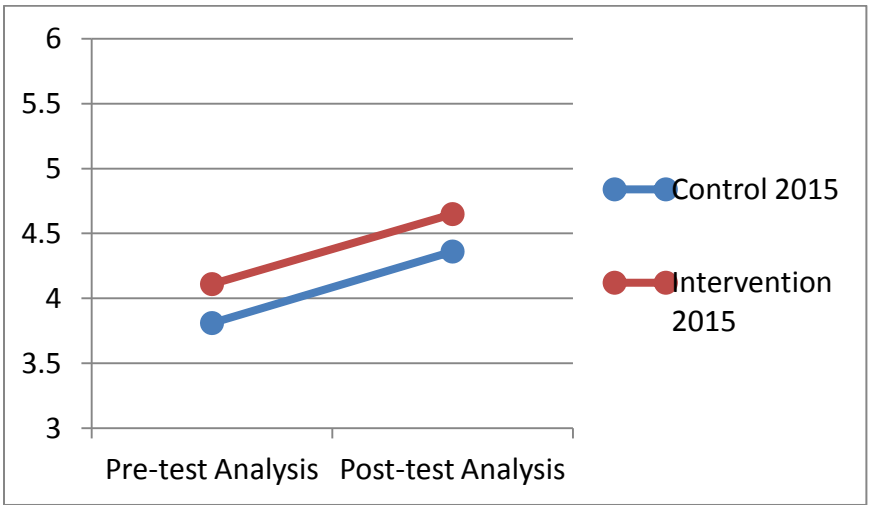


Figure L13: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2015, Analysis

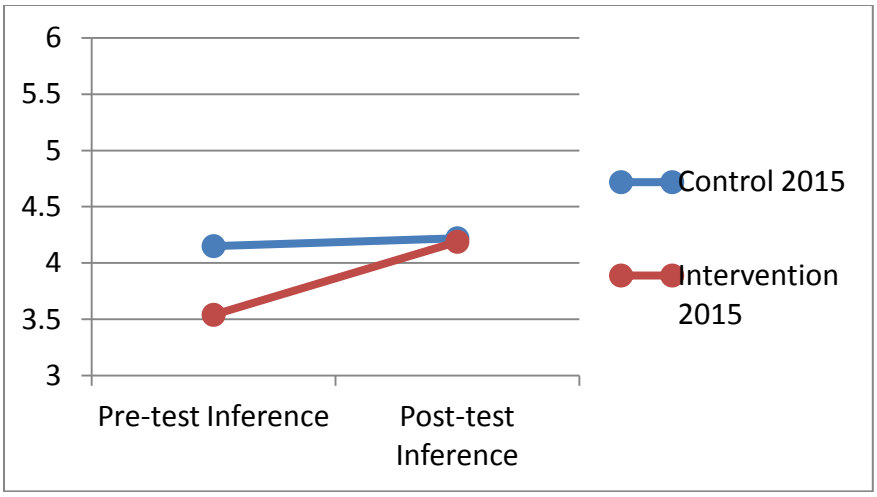


Figure L14: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2015, Inference

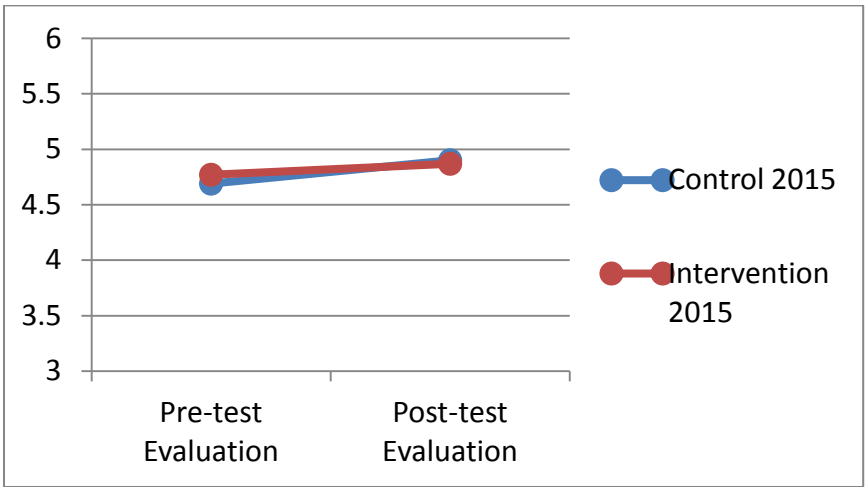


Figure L15: HSRT Pre-Test to Post-Test Comparisons for Both Groups 2015, Evaluation

Appendix M: Adjustment for Homogeneity of Variance, 2015

Regarding Research Question 1, data from the Health Science Reasoning test was used to examine if differences existed between the control and intervention groups, specifically to determine if a statistically significant difference existed in clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone. Data analysis was conducted using ANCOVA. Levene's Test of Equality of Error Variances was calculated for each test and sub-test of the HSRT, in order to determine if variances existed between the control and intervention groups. During the 2015 data collection cycle, The HSRT post-test for overall score was the only measure with a statistically significant difference in variances between the groups ($F = 3.99$, $p = 0.05$). In order to adjust for this variance, data was transformed using the Winsor technique. Extreme values (below 5^{th} percentile and above 95^{th} percentile) were then changed to match the values existing values at 5^{th} and 95^{th} percentiles. This eliminated the variance in overall score between the groups for the post-test ($F = 3.19$, $p = 0.08$). Table M1 details this adjustment.

ANCOVA was then conducted with the adjusted values for the overall post-test scores. Consistent with the original data analysis, there were no statistically significant effects of co-variants on the groups. Also consistent with the original data analysis, no statistically significant differences were noted in the post-test scores between the control and intervention groups (See Table M2).

Table M1

Adjusted Homogeneity of Variance for Overall Score, HSRT, 2015

	F-value	Significance (p)
Overall Score before adjustment		
Pre-Test	0.17	0.68
Post-Test	3.99	**0.05***
Overall Score after adjustment		
Pre-Test	0.17	0.68
Post-Test	3.19	0.08

**p<.05*

Table M2

Adjusted Health Science Reasoning Test (HSRT) ANCOVA, 2015

	F-value	Significance (p)
Overall Score before adjustment	0.54	0.47
Overall Score After adjustment	0.04	0.84

Appendix N: Additional Graphic Representation for 2014 + 2015 Combined Data

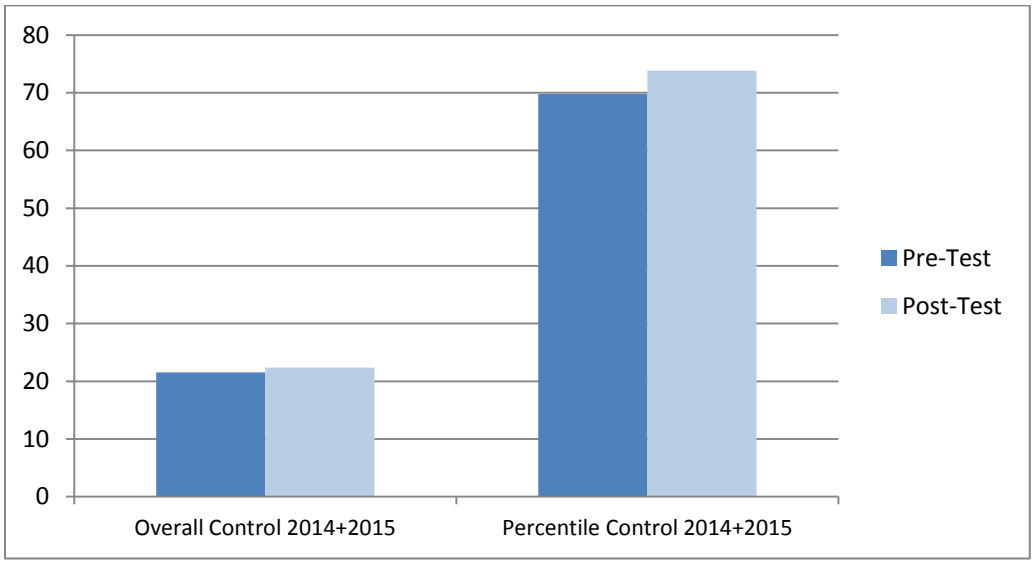


Figure N1: HSRT Pre-Test to Post-Test Comparison for Control Group 2014 + 2015, Overall and Percentile

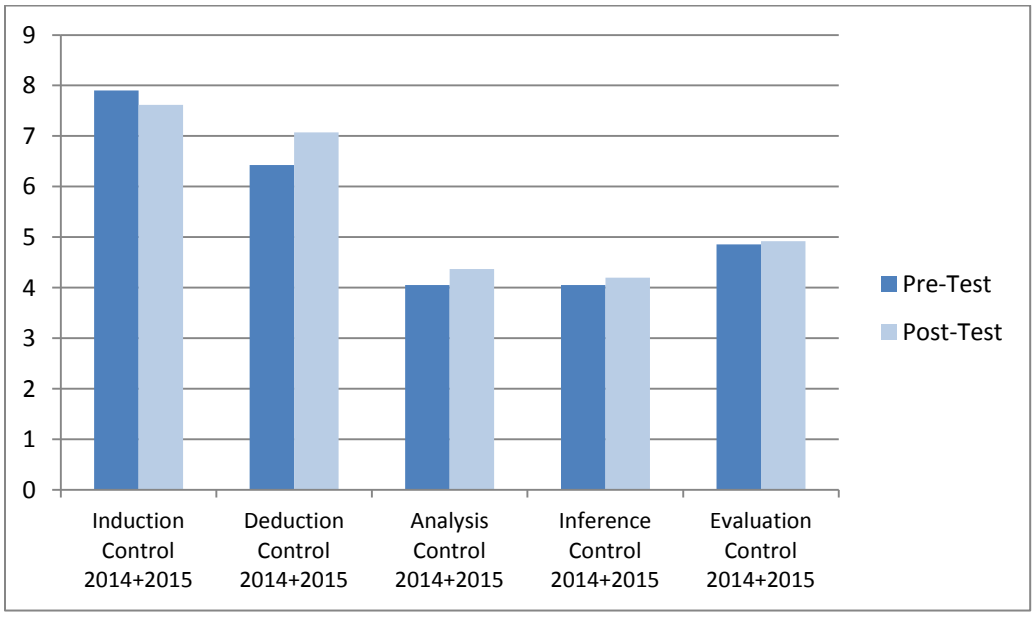


Figure N2: HSRT Pre-Test to Post-Test Comparison for Control Group 2014 + 2015, Sub-Tests

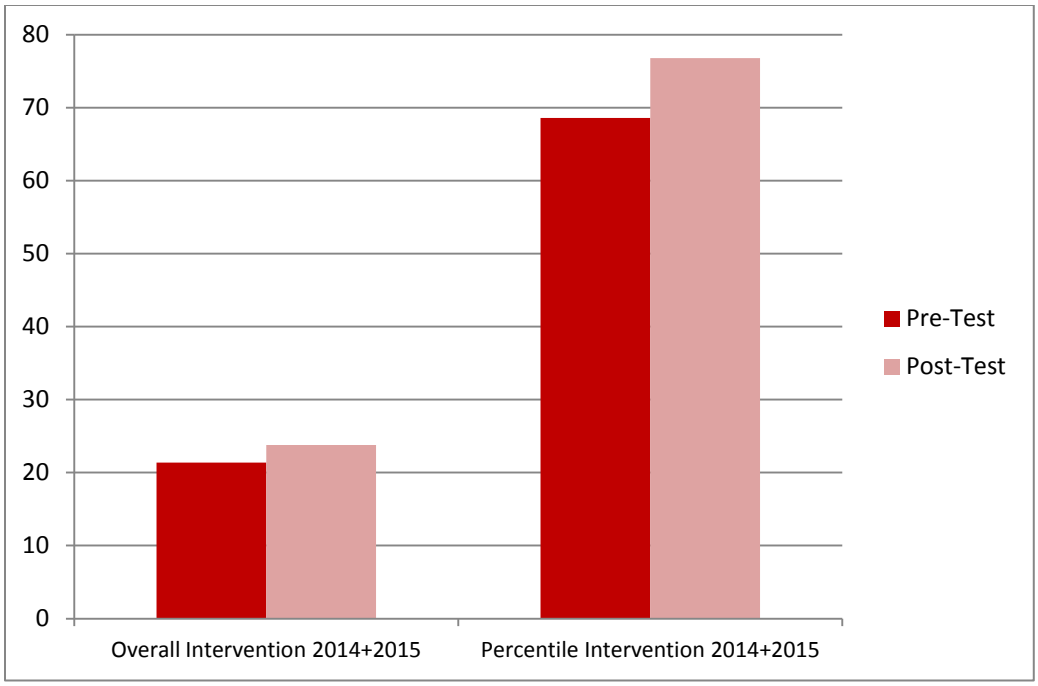


Figure N3: HSRT Pre-Test to Post-Test Comparison for Intervention Group 2014 + 2015, Overall and Percentile

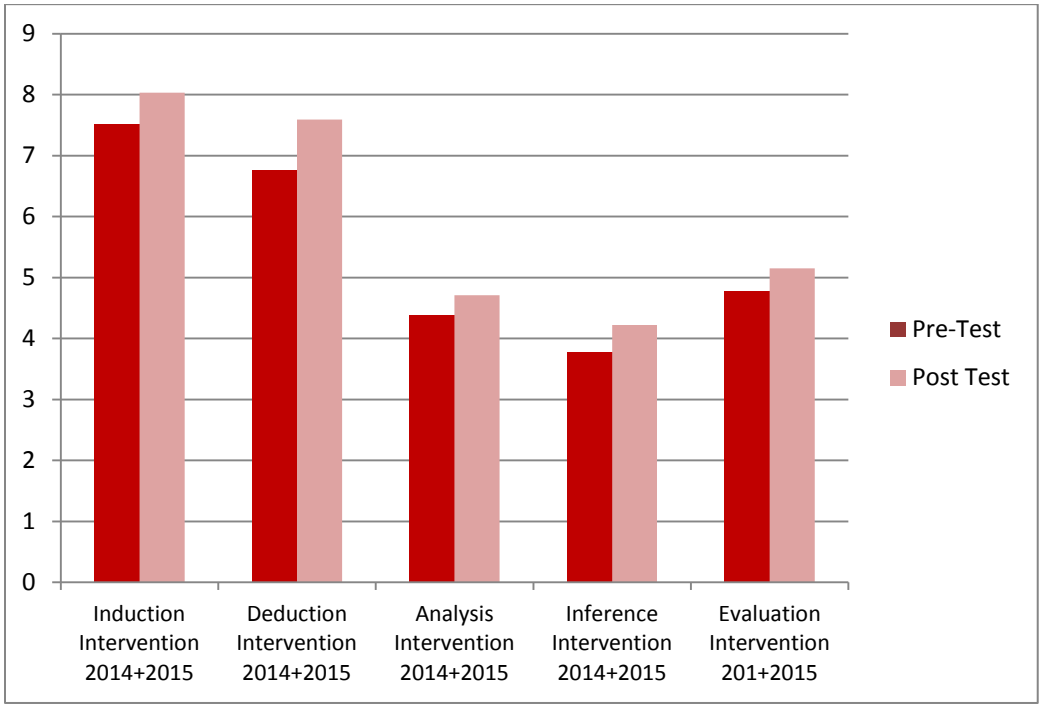


Figure N4: HSRT Pre-Test to Post-Test Comparison for Intervention Group 2014 + 2015, Sub-Tests

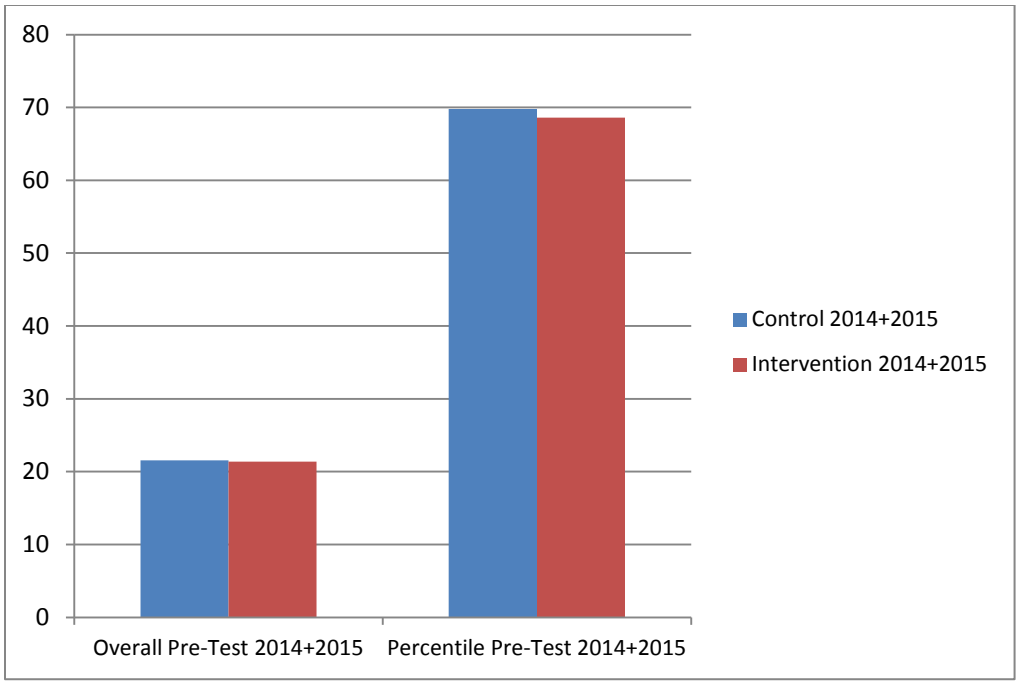


Figure N5: HSRT Pre-Test Comparison 2014 + 2015, Overall and Percentile

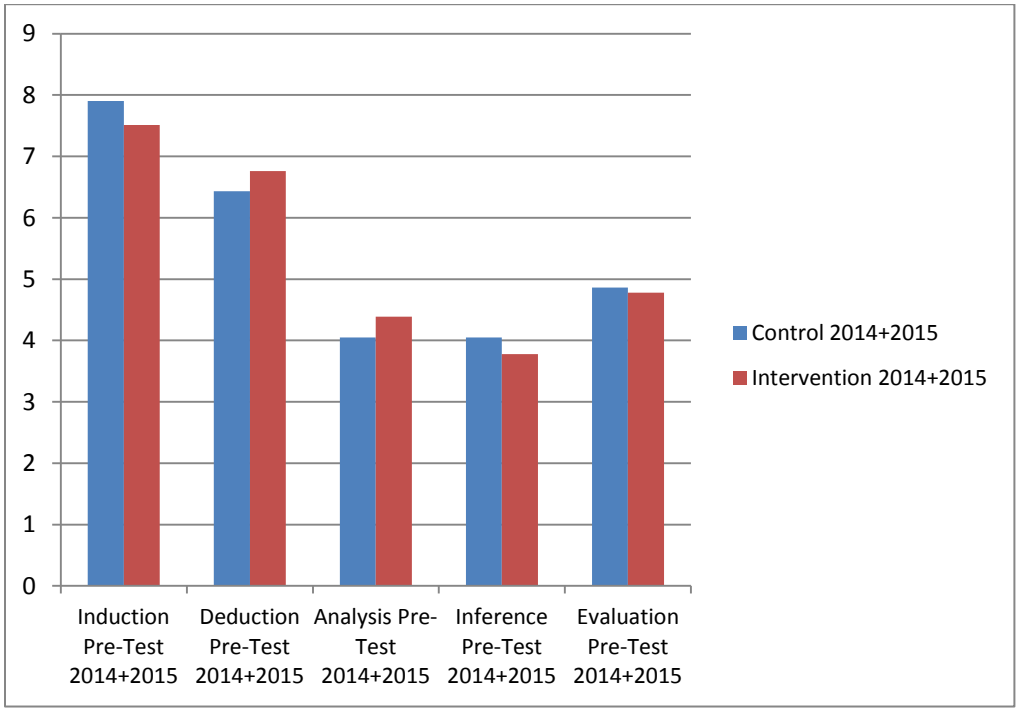


Figure N6: HSRT Pre-Test Comparison 2014 + 2015, Sub-Tests

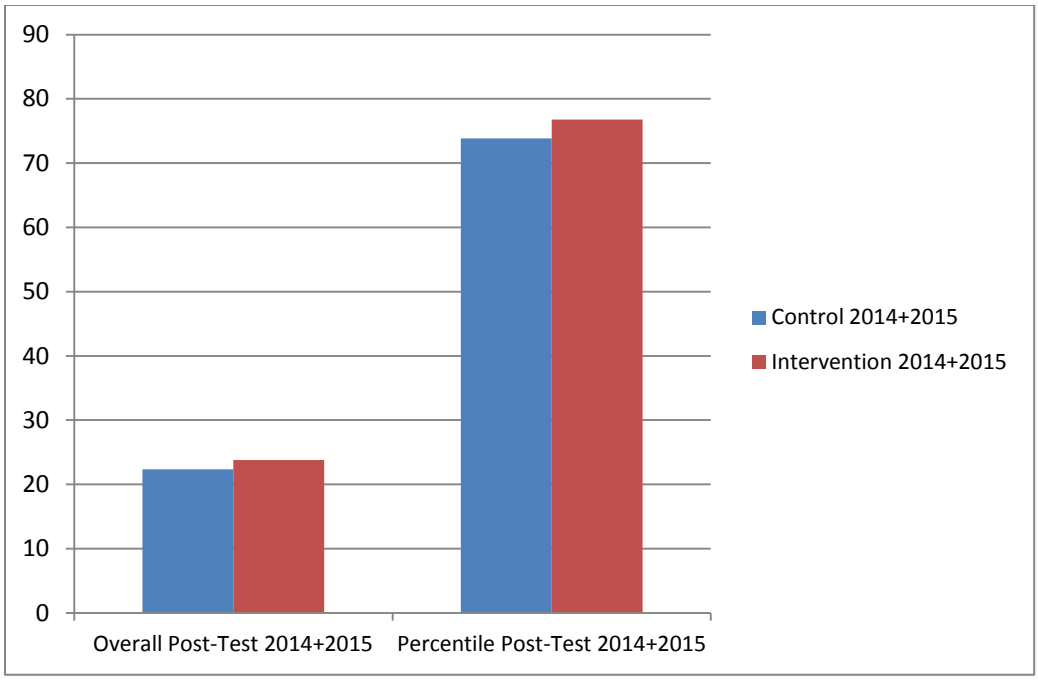


Figure N7: HSRT Post-Test Comparison 2014 + 2015, Overall and Percentile

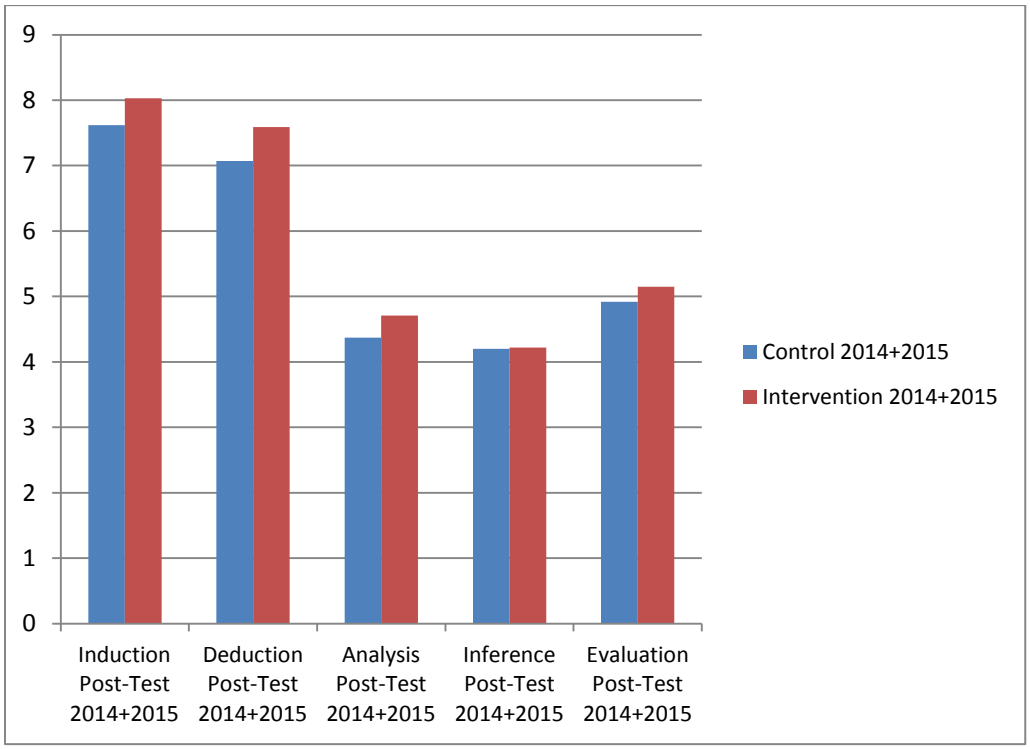


Figure N8: HSRT Post-Test Comparison 2014 + 2015, Sub-Tests

Appendix O: SACRR Graphic Representation

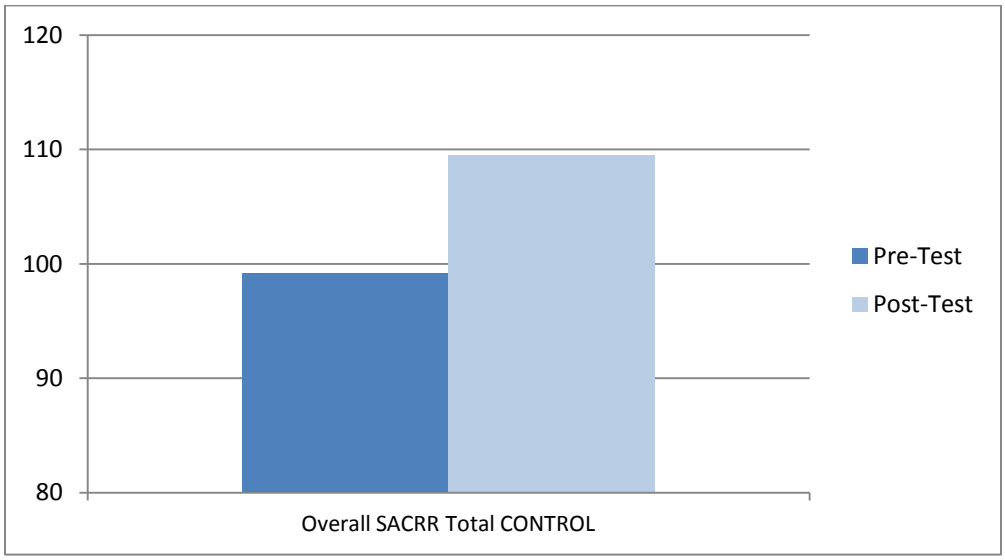
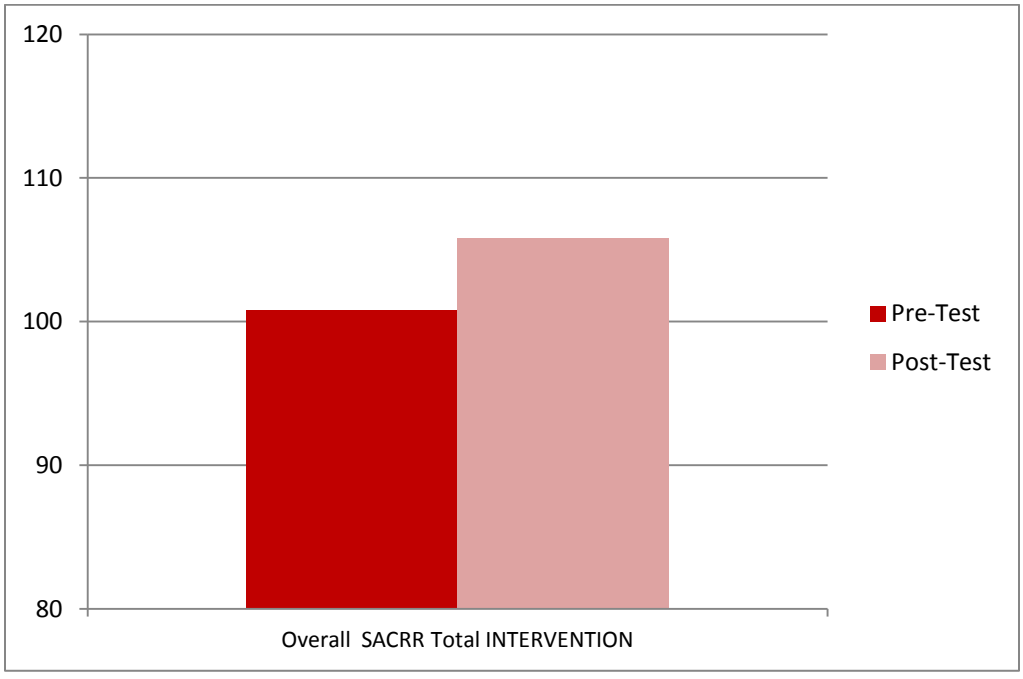


Figure O1: SACRR Pre-Test and Post-Test Comparison for Control Group, Overall Score



FigureO2: SACRR Pre-Test and Post-Test Comparisons for Intervention Group, Overall Score

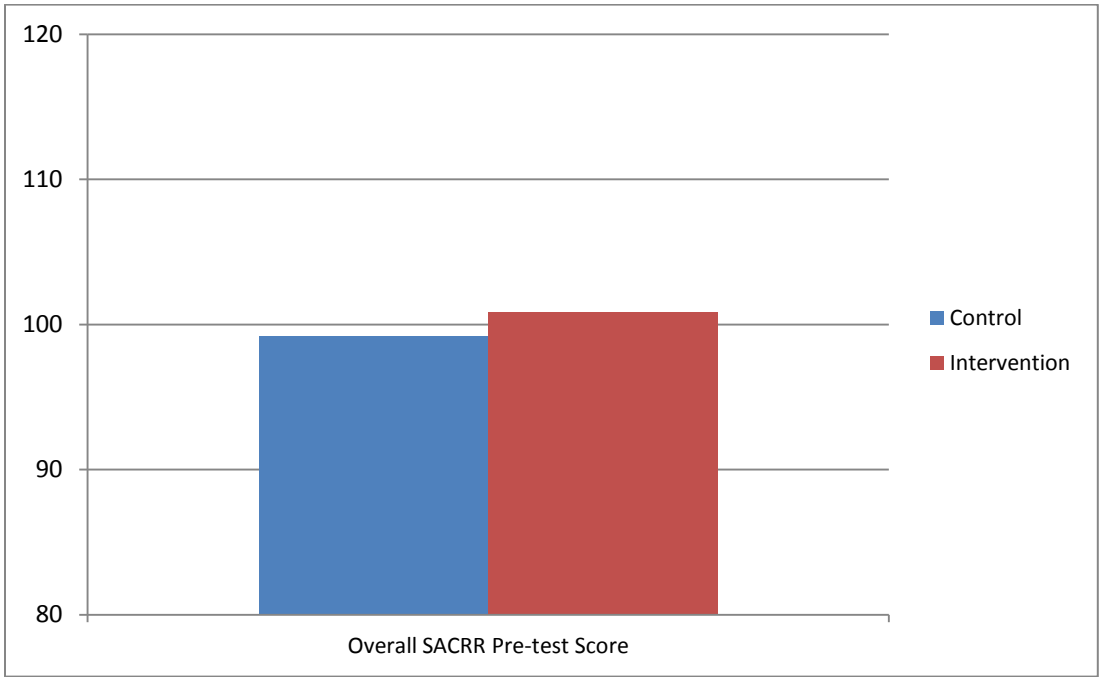


Figure O3: SACRR Pre-Test Comparison, Overall Score

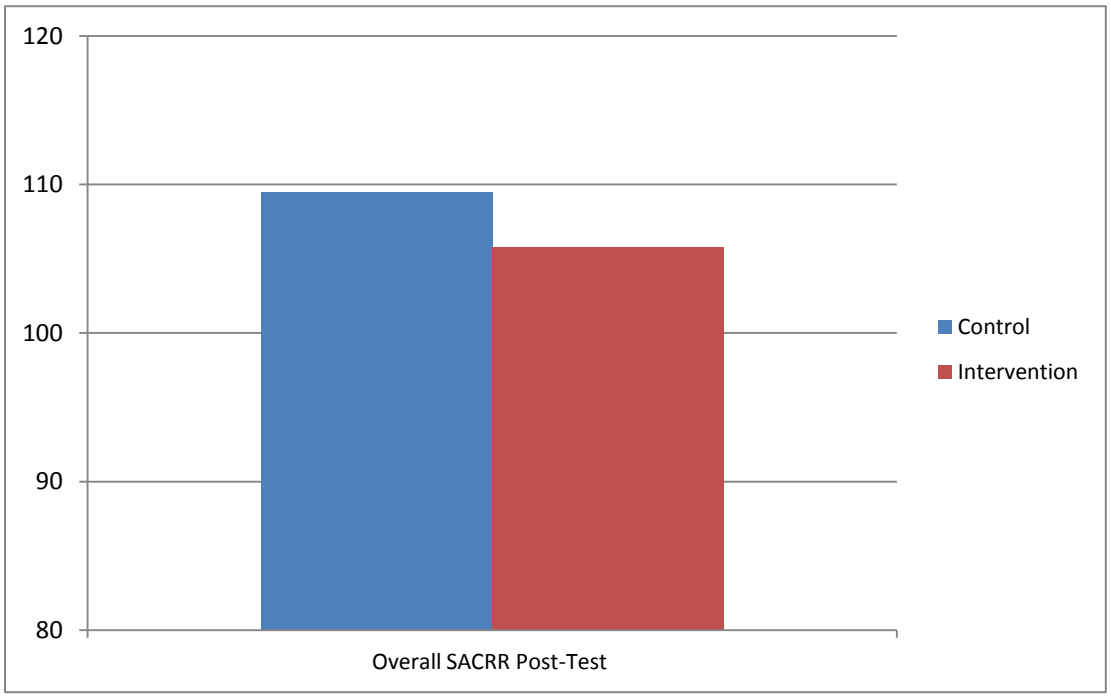


Figure O4: SACRR Post-Test Comparison, Overall Score

Appendix P: Adjustment for Homogeneity of Variance, SACRR

Regarding Research Question 2, data from the Self-Assessment of Clinical Reflection and Reasoning was used to examine if differences existed between the control and intervention groups, specifically to determine if a statistically significant difference existed in perceived clinical reasoning skills of undergraduate occupational therapy students following the use of a comprehensive online video case study and clinical reasoning learning activity, when compared to students who are presented with text or brief video clips alone. Data analysis was conducted using ANCOVA to adjust for pre-existing differences between the groups. Levene's Test of Equality of Error Variances was calculated for each item and for the overall score of the SACRR, in order to determine if variances existed between the control and intervention groups. The SACRR was conducted only during the 2015 data collection cycle, with 18 students in the control group and 17 students in the intervention group. There were 5 sub-tests of the SACRR in which homogeneity of variance was not established, out of the 26 pre-test items and 26 post-test items. In an attempt to adjust for this variance, data was transformed using the Winsor technique. Extreme values (below 5^{th} percentile and above 95^{th} percentile) were then changed to match the existing values at 5^{th} and 95^{th} percentiles. This changed the scores for Item 6 post-test, Item 16 pre-test, and Item 26 pre-test. This did not change the scores for Item 13 pre-test or Item 17 post-test. Variance was again calculated for these three sub-test scores, but homogeneity of variance was not established (see Table P1).

ANCOVA was again conducted with the new values for the 3 Items in which the adjustments were made (see Table P2). Consistent with the original data analysis, no

statistically significant differences were noted in the post-test scores between the control and intervention groups for these items.

Table P1

Adjusted Homogeneity of Variance for SACRR, 2015

	F-value	Significance(p)
Item 6 Post-test Score		
Before Adjustment	12.85	<0.01*
After Adjustment	18.22	<0.01*
Item 16 Pre-test Score		
Before Adjustment	6.30	0.02*
After Adjustment	4.18	0.05*
Item 26 Pre-test Score		
Before Adjustment	6.50	0.02*
After Adjustment	9.19	0.01*

**p<.05*

Table P2

Adjusted Self-Assessment of Clinical Reflection and Reasoning Scores, ANCOVA, 2015

	F-value	Significance
Item 6 Score		
Before Adjustment	1.46	0.24
After Adjustment	1.67	0.21
Item 16 Score		
Before Adjustment	1.69	0.21
After Adjustment	1.67	0.21
Item 26 Score		
Before Adjustment	1.22	0.28
After Adjustment	2.07	0.16

Appendix Q: Description of Interview Participants

	Individual Pre-test Score (HSRT Overall)	Group **Pre-test** Perfor-mance (HSRT Overall)	Interview **Pre-test** Perfor-mance (HSRT Overall)	Individual Post-test Score (HSRT Overall)	Pre to Post Change	Group **Post-test** Perfor-mance (HSRT Overall)	Interview **Post-test** Perfor-mance (HSRT Overall)
CONTROL							
"Terri" Age 22 GPA 3.57	10	Range 10-29 Mean 22.22 Median 22.50	Range 10-29 Mean 21.00	7	-3	Range 7-29 Mean 22.78 Median 24.00	Range 7-22 Mean 16.25
"Emma" Age 21 GPA 3.84	29			21	-8		
"Dana" Age 20 GPA 3.90	24			22	-2		
"Kelly" Age 20 GPA 3.88	21			15	-6		
INTERVEN-TION							
"Laura" Age 22 GPA 3.12	19	Range 13-27 Mean 20.24 Median 21.00	Range 13-19 Mean 15.50	18	-1	Range 16-29 Mean 22.29 Median 22.00	Range 16-21 Mean 18.25
"Jessie" Age 21 GPA 3.61	15			21	+6		
"Rebecca" Age 33 GPA 3.56	13			16	+3		
"Beth" Age 22 GPA 3.14	15			18	+3		

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The Use of Videotapes to Facilitate Clinical Reasoning in Occupational Therapy Education, American Occupational Therapy Annual Conference, April 3, 2014.

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To Poll or not to Poll: The Use of Student Response Systems in Occupational Therapy Education, NOVA Southeastern Occupational Therapy Faculty, May 13, 2013.

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Cultural Considerations during Fieldwork Education, with Jerry Bentley and Barbara Demchick, Maryland Occupational Therapy Association Annual Conference, November 19. 2011.

Powering Up Future Practitioners: Occupational Therapy Professional Education Program Evaluation, with Sonia Lawson and Jerry Bentley, Maryland Occupational Therapy Association Annual Conference, November 5, 2010.

Ensuring a Bright Tomorrow: Get Involved in Occupational Therapy Professional Education Program Evaluation, with Maggie Reitz and Sonia Lawson, Maryland Occupational Therapy Association Annual Conference, November 6, 2009.

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