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Experiential learning and its impact on critical thinking

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EXPERIENTIAL LEARNING AND ITS IMPACT ON CRITICAL THINKING

by

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This Independent Study, submitted by Vanessa Dvergsten and Alissa Haugen in partial fulfillment of the requirement for the Degree of Master of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

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Signature of Faculty Advisor

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PERMISSION

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ABSTRACT

Background: In occupational therapy education, it is unclear what educational methods best facilitate the development of critical thinking. Therefore, this pilot study explored whether Level I fieldwork coupled with reflective learning opportunities impacts the development of critical thinking skills.

Methods: The researchers employed a pre and post-test design which measured both self-perception of critical thinking and actual performance of critical thinking. Specifically, the Health Science Reasoning Test (HSRT) and a reflective writing assignment graded with a rubric were utilized to measure actual performance. The Self-Assessment of Critical Reflection and Reasoning (SACRR) was used to measure self-perceived performance of critical thinking.

Results: In this study, participants demonstrated improvements in critical thinking following a Level I fieldwork. Specific improvements were found in the areas of evaluation and induction skills, which are subscales of the HRST. There was also an increase in participants' self-perceived confidence in utilizing critical thinking skills. The use of reflective writing assignment was found to increase the participants' ability to use evaluation, inference, and deduction skills.

Conclusion: Experiential learning experiences coupled with a reflective writing assignment is an effective means of developing critical thinking skills. Future research should utilize a bigger sample size to confirm the findings and increase the generalizability of the results.

CHAPTER I

INTRODUCTION

Critical thinking is an essential skill to use as an occupational therapist (Coker, 2010; Scaffa & Smith, 2004). The ability to think critically is something that is expected to be instilled in occupational therapy students as a result of their education and fieldwork experiences (Lederer, 2007). According to Lederer (2007), occupational therapists need to be able to utilize critical thinking skills throughout their day-to-day job, which requires systematic analysis of complex information. In occupational therapy literature, critical thinking skills are referred to or used in conjunction with professional reasoning (Boyt Schell, 2009). Due to the requirement of critical thinking skills in one's career as an occupational therapist, it is essential that the development and enhancement of these skills be addressed in occupational therapy education curriculums.

Previous researchers have studied a variety of ways in which critical thinking is addressed and incorporated into occupational therapy curriculums. One way is Level I and Level II fieldworks, which are completed by students throughout their schooling (Coker, 2010; Haynes, 2007; 2011; Loretto, 2011). There is only one study that has measured the influence of Level I fieldwork on the development of critical thinking. Therefore, there is a limited understanding regarding the influence of Level I experiential learning experiences on critical thinking (Scaffa & Smith, 2004). Occupational therapy programs, along with other allied health graduate programs are allowing students to

participate in experiential learning experiences similar to Level I and Level II fieldworks. Therefore, it is important to see what students are taking away from these experiences, including the level of critical thinking that is developed in students.

Reflective learning has been noted by many to be an important and influential aspect of experiential learning (Loretto, 2011; Merriam et al., 2007). According to Jarvis (2001), when experiential learning and reflection are used together they are considered the highest method of learning. A desired outcome of engaging in reflection is that the individual will "gain deeper insights that lead to action" (Merriam et al., 2007, p. 173). Merriam et al. (2007) and Plack and Santasier (2004) discovered that interviews, critical reflection, portfolio development, and journaling are common methods to incorporate reflective learning into the classroom in order to ensure the optimal level of learning and knowledge from the opportunity. Due to the positive findings with integrating reflection as an aspect of experiential learning opportunities, reflective learning was included as an aspect of the research study.

It is evident that experiential learning experiences have a positive impact on students, both in the field of occupational therapy and in other allied health professions (Coker, 2010; Haynes, 2007; Loretto, 2011). However, research on this topic is very limited as to what aspects of the experiential learning process assist in creating the impact of critical thinking skills. There is also limited understanding of what strategies and concepts to include in the experiential learning experience. Coker (2010) suggested that more studies be conducted in order to further determine what elements are beneficial to students' learning that enhance the critical thinking skills in both qualitative and quantitative allied health.

Purpose of Study

The purpose of this study was to explore whether Level I fieldwork coupled with reflective learning opportunities impacts the student's development of critical thinking skills. A pre and post-test design using the Self-Assessment of Reflection and Reasoning (SACRR) and Health Sciences Reasoning Test (HSRT) was used before and after participating in an experiential learning experience.

Research Questions

Throughout the study the authors sought to answer the following questions: Does experiential learning (Level I fieldwork) improve students overall critical thinking? Does experiential learning (Level 1 fieldwork) improve students' analysis, inference, evaluation, induction, and deduction skills? Do students demonstrate improved critical thinking skills in reflective writing that is part of the Level I fieldwork assignment? Do students demonstrate self-perceived improvement in critical thinking skills? Are there statistically significant patterns of improvement pre and post-test to report, in each individual question? Is there a relationship between self-perceived reasoning and scores on the HSRT? The researchers anticipate that after having level I fieldwork students engage in reflective writing, their perceptions and actual critical thinking skills will show improvements due to engaging in an experiential learning experience. The researchers also anticipate being able to make recommendations regarding learning activities that promote critical thinking on level I fieldwork experiences.

Population

Purposive sampling was utilized to obtain the participants of this study as the researchers used their resources and knowledge to select a group of individuals that were

eligible and willing to participate in the experiential learning opportunity, which in this study is a level I fieldwork experience. The population of interest was year one occupational therapy students who enrolled in the course OT 429: Occupational Therapy with School Age Children and Young Adults that is offered at the University of North Dakota's Occupational Therapy Program, which requires completing a level I fieldwork experience. Seven first year occupational therapy students who met the inclusion criteria agreed to partake in this study.

Theory

The experiential learning theory was selected because it takes into consideration Level I and II fieldworks, which are learning experiences that occur outside of the classroom that are intended to increase a student's knowledge in the field of occupational therapy. This theory helped guide our research process by taking into consideration both objective and subjective factors of the learning experience such as the setting, learning preferences, and learning experience provided (Kolb & Kolb, 2012). The reason the authors coupled the learning experience with reflective writing was because the experiential learning theory believes that an experience is enriched by reflection that allows thinking at a deeper and richer level (Kolb & Kolb, 2012). The experiential learning theory places "experience at the center of the learning process," which coincides well with the design and purpose of this study.

Definitions

The following definitions are important to understanding aspects related to the study and to ensure the consistent understanding of this study.

Critical thinking skills: “the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action” (Sullivan, 2012, p. 323).

Clinical reasoning: “the reflective thought process that therapists undergo to integrate client evaluation information and to develop and implement intervention” (Royeen, Mu, Barrett, & Luebben, 2001, p.108).

Experiential learning experience: is a process in which individuals can develop skills, knowledge, and value from a direct experience outside of a traditional academic setting (Haynes, 2007; Loretto, 2011). Experiential learning experiences can also include other non-traditional academic experiences other than fieldworks, including undergraduate research, studying abroad, work experiences, internships, and service learning projects (Haynes, 2007; Loretto, 2011).

Reflective learning: can be thought of as a process in which we “plan, monitor, and reflect upon our experiences” (Jarvis, 2001, p.52).

Level I fieldwork: A two-week long hands-on learning experience under the supervision and direction of a licensed occupational therapist.

Summary

Chapter I was composed of an introduction to this study, an introduction to the literature used to support the study, an overview of the research questions, information on the participants involved in this study, use of learning style to guide the study, and definitions of terms. The purpose of this study was to explore whether Level I fieldwork coupled with reflective learning opportunities impacts the student's development of critical thinking skills by completing the SACRR and HSRT before and after participating in an experiential learning experience. Chapter II includes a detailed literature review related to the use critical thinking, critical thinking outcome measures, and interventions used to enhance critical thinking. Chapter III includes a description of the research methods that were used in this study, including: a) locale of the study, b) population, c) specific instruments used, d) data collection, and e) the data analysis process. Chapter IV includes a summary of the results including the pre and post-test data results from the HSRT, SACRR, and the reflective writing assignment. Chapter V consists of a summary of the researchers' findings, conclusions, recommendations, and limitations.

CHAPTER II

REVIEW OF LITERATURE

Critical thinking can be defined as "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by: observation, experience, reflection, reasoning, or communication, as a guide to belief and action" (Sullivan, 2012, p. 323). In a broad spectrum, critical thinking involves reasoning, applying learned materials, and enhancing one's knowledge and understanding of a topic or situation at hand. The utilization of critical thinking skills improves one's learning experience including the ability to comprehend and generalize what the individual has learned to multiple situations. Critical thinking is a required subset or skill that all healthcare professionals, including occupational therapists, are expected to have in order to make "sound clinical decisions" (Brudvig, Dirkes, Dutta, & Rane, 2013, p. 12).

The purpose of this literature review is to examine what critical thinking is, how experiential learning influences the development of critical thinking, and its application within occupational therapy and health sciences education. This topic was chosen due to the limited research on how reflective and experential learning impact critical thinking in occupational therapy education. The researchers anticipate that after Level I fieldwork students engage in reflective journaling, their perceptions and actual clinical reasoning skills will show improvements due to engaging in an experiential learning experience.

The researchers also anticipate being able to make recommendations regarding learning activities that promote critical thinking on Level I fieldwork experiences.

Critical Thinking

Research shows that critical thinking is an essential skill to use as an occupational therapist (Coker, 2010; Scaffa & Smith, 2004). The ability to think critically is something that is expected to be instilled in occupational therapy students as a result of their or education and fieldwork experiences (Lederer, 2007). According to Lederer (2007), occupational therapists need to be able to utilize critical thinking skills throughout their day to day job, which requires systematic analysis of complex information. In occupational therapy literature, critical thinking skills are referred to or used in conjunction with professional reasoning (Boyt Schell, 2009). According to Boyt Schell (2009), "although experience is necessary, experience alone is not sufficient to ensure advancement in critical reasoning skills" (p. 324).

In order to ensure an improvement in critical thinking skills, reflecting on the experience is essential (Boyt Schell, 2009). Some researchers believe that in order to be a competent and culturally appropriate occupational therapist, one must use critical thinking skills (Velde, Wittman, & Vos, 2006). From an occupational therapy standpoint, an "ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-mined, flexible, fair-minded in evaluation, honest in facing person biases, prudent in making judgment, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results" (Velde et al., 2006, p. 50). More occupational therapy curriculums are looking to stray away from memorization of treatment

approaches and rather emphasize the use of critical thinking and problem solving skills to make decisions in practice more individualized and client-centered (Velde et al., 2006).

Due to the requirement of critical thinking skills in one's career as an occupational therapist, it is essential that the development and enhancement of these skills be addressed in occupational therapy education curriculum. Occupational therapy students are expected to use critical thinking skills and are given the opportunity to do so on experiential learning experiences offered, such as fieldworks.

Often individuals think that critical thinking and clinical reasoning essentially mean the same thing, when the reality is that critical thinking skills can lead to clinical reasoning (Brudvig et al., 2013). In comparison to clinical reasoning, critical thinking can be thought of as a more broad term that not only applies in a clinical setting, but also outside of it. Clinical reasoning is, "the reflective thought process that therapists undergo to integrate client evaluation information and to develop and implement intervention" (Royeen, Mu, Barrett, & Luebben, 2001, p.108), which leads many to believe that critical thinking skills help individuals further develop clinical reasoning skills, specific to one's area of practice which, in this case is occupational therapy.

Experiential Learning

Experiential learning is a process in which individuals can develop skills, knowledge, and value from a direct experience outside of a traditional academic setting (Haynes, 2007; Loretto, 2011). The researchers chose to focus on experiential learning while looking at critical thinking, but there are many educational settings and experiences that can impact and influence critical thinking. The experiential learning theory was selected because it takes into consideration Level I and II fieldworks, which are learning

experiences that occur outside of the classroom that are intended to increase a student's knowledge in the field of occupational therapy. Experiential learning experiences can also include other non-traditional academic experiences other than fieldworks, including undergraduate research, studying abroad, work experiences, internships, and service learning projects (Haynes, 2007; Loretto, 2011). However, all experiential learning experiences are usually highly supervised and assessed in order to ensure an increase in knowledge and skill in a different environment, to promote career development, and to build on the classroom curriculum (Haynes, 2011). A major component of experiential learning experiences consists of the "experiential" piece of it. These various experiences consist of reflection, analysis of learning, engaging intellectually and socially, taking initiative, learning from mistakes, making decisions, and taking ideas away from successes (Coker, 2010; Haynes, 2007;2011; Loretto, 2011; Merriam, Caffarella, & Baumgartner, 2007; Scaffa & Smith, 2004). A study conducted by Coker (2010) concluded that experiential learning opportunities have the potential to improve the participant's critical thinking and clinical reasoning skills. The findings of this particular study support the use of a hands-on learning in occupational therapy curriculums to help students develop critical thinking skills, to promote success in a dynamic healthcare environment.

Reflective Learning

Reflective learning has been noted by many to be an important and influential aspect of experiential learning (Loretto, 2011; Merriam et al., 2007). Reflective learning can be thought of as a process in which we "plan, monitor, and reflect upon our experiences" (Jarvis, 2001, p.52). According to Jarvis (2001), when experiential learning

and reflection are used together they are considered the highest methods of learning. Reflecting on experiential learning experiences is beneficial for multiple reasons. Reflection not only allows the learner to take the time to reflect on various standpoints or views of the experience, but in turn it also ensures that the learner keeps an open mind to the numerous perspectives that exist in every situation (Merriam et al., 2007). In addition, including reflective learning as an aspect of each experiential learning experience, allows the individual to process his or her beliefs or thoughts (Merriam et al., 2007). A desired outcome of engaging in reflection is that the individual will "gain deeper insights that lead to action" (Merriam et al., 2007, p. 173). There are various modes in which reflection can take place as an aspect of experiential learning. Merriam et al. (2007) shares that interviews, critical reflection, portfolio development, and journaling are common methods to incorporate reflective learning can be incorporated into experiential learning experiences in order to ensure the optimal level of learning and knowledge from the opportunity.

Studies have been completed by healthcare professionals showing the positive effects of incorporating reflective learning into occupational therapy curriculums (Plack & Santasier, 2004; McNulty, Crowe, & VanLeit, 2004). Results of the study conducted by Plack and Santasier (2004) demonstrate how reflective learning can be integrated into education to instill the duty of being a reflective practitioner as evidenced by the participants' professional behaviors, critical thinking skills, and ease of integration throughout the study. McNulty et al. (2004) discovered that, "professional reflection in the context of problem-based learning can not only improve students' professional reasoning, but also build on critical thinking and clinical reasoning skills" (p. 74) by

discovering how to apply information gained in a meaningful context and increase learning in order to apply the knowledge in various contexts. Due to the positive findings with integrating reflection as an aspect of experiential learning opportunities, the researchers chose to include reflective learning as an aspect of the research study.

Critical Thinking and Occupational Therapy

Previous researchers have studied a variety of ways in which critical thinking is addressed and incorporated into occupational therapy curriculums. One way is Level I and Level II fieldworks, which are completed by students throughout their schooling (Coker, 2010; Haynes 2007; 2011; Loretto, 2011). In addition, various opportunities offered in the classroom setting such as the use of guided reciprocal peer questioning (GRPQ) and other educational strategies as well as online courses and strategies have been used as general ways of addressing critical thinking in occupational therapy curriculum (Lederer, 2007; Murphy, 2004; Plack & Santasier, 2004; Schaber & Shandling, 2012; Velde et al., 2006).

Occupational therapy students are expected to use critical thinking skills and they are given the opportunity to do so on experiential learning experiences offered, such as fieldworks. There is only one study that has measured the influence of Level I fieldwork on the development of critical thinking. Therefore, there is a limited understanding regarding the influence of Level I experiential learning experiences on critical thinking (Scaffa & Smith, 2004). Occupational therapy programs, along with other allied health graduate programs are allowing students to participate in experiential learning experiences similar to Level I and Level II fieldworks. Therefore, it is important to see what students are taking away from these experiences, including the level and amount of

critical thinking that is required of the students. There are very few studies that look into critical thinking within the realm of occupational therapy programs and other allied health programs; however, there are a few studies that informed our research (Murphy, 2004; Plack & Santasier, 2004; Schaber & Shanedling, 2012).

Critical Thinking Interventions

Studies conducted on critical thinking in conjunction with occupational therapy Level I and Level II fieldworks describe different interventions that have been implemented to support critical thinking. Some researchers, such as Coker (2010), Haynes (2007; 2011), and Loretto (2011) used experiential learning experiences as the intervention to build on an individual's critical thinking skills. Coker (2010) evaluated the clinical reasoning and critical thinking skills of occupational therapy students before and after the students participated in a one-week hands on experiential learning program with children with cerebral palsy. Whereas, Haynes (2011) explored the experiences and perceptions of students and fieldwork educators while they were on Level I fieldworks, as an experiential learning experience. In both studies, researchers were looking to see how the experiential learning experiences increased, maintained, or decreased the students' critical thinking skills by assessing the students before and after the experiential learning experience.

Loretto (2011) and Haynes (2007) were advocates for using an experiential learning experience like fieldwork, to show the improvement in students' critical thinking skills after being exposed and having hands-on experience in the clinical field. As Level I and II fieldworks can be considered an experiential learning experience, a similar study to the ones mentioned above was conducted by Scaffa and Smith (2004). This study looked

at the effects of Level II fieldwork experiences on the students' critical thinking skills. In this particular study, the participants had to complete two Level II fieldworks, each being 12 weeks in length, to see if students gained critical thinking skills over the course of this type of learning experience (Scaffa & Smith, 2004). Many of the other interventions used in research were implemented in conjunction with fieldworks, such as the use of reflection, problem-based learning (PBL), GRPQ, and the curriculum being taught while preparing for fieldwork and during the learning experiences (Scaffa & Smith, 2004).

Along with experiential learning experiences, reflective writing is another intervention that was discovered in literature as an intervention for advancements in critical thinking skills (Loretto, 2011; McNulty et al., 2004; Plack & Santasier, 2004). As previously mentioned, this intervention was commonly used with students who were on Level I or Level II fieldworks to initiate deeper reasoning skills in order to increase critical thinking skills. Murphy (2004) used reflective writing as an intervention to see to what extent there was a difference in clinical reasoning as measured by the ability to assess and analyze patient data and the domain-specific knowledge of assessments between nursing students who received explicit instruction in the treatment methods and students who did not receive instruction in the treatment methods. The students in both groups were required to complete reflective writing assignments that were later assessed to measure the change in critical thinking skills. The amount and type of education provided to students was another common intervention used in literature regarding students and critical thinking. While some students received explicit instructions to an intervention, others were given basic instructions and left to problem solve an appropriate

intervention to see which group of students applied more of the components of critical thinking in determining a proper intervention (Murphy, 2004).

A study headed by Plack and Santasier (2004) also used reflection in the classroom to note the development of critical thinking skills, integration, and professional behaviors in physical therapy students. Plack and Santasier (2004) used context reflection, process reflection, premise reflection, reflection-in-action, reflection-on-action, and reflection-for-action in the classroom setting to see the effects reflection has on critical thinking skills. Lederer (2007) used a similar intervention that was based on instructors teaching strategies and the amount of education a person receives. Lederer (2007) believed that one of the most useful things instructors can do is to explicitly model the various dispositions of critical thinking to students over time, both in and out of the classroom in order for the students to develop the skills, which the students documented and processed through reflective writing (Lederer, 2007).

A few studies have been conducted to measure the changes in students and health professionals' critical thinking skills after participating in a course or engaging in hands-on learning. As Lederer (2007) focused on incorporating critical thinking skills in the classroom, he looked at whether the amount of experience or time in the occupational therapy program made a difference in the level of critical thinking skills a student applies. Schaber and Shanedling (2012) conducted a study that measured changes in participants' critical thinking abilities over the course of a semester, to measure their perceptions in regards to their own development of critical thinking while participating in an online course. Another study focusing on critical thinking skills in the classroom environment looked at the effectiveness of facilitating GRPQ, a specific intervention, on increasing the

occupational therapy students' ability to think critically (Velde et al., 2006). Some of the students participated in the GRPQ group, whereas the others did not. Researchers were looking to see if the use of GRPQ would require students to utilize reasoning skills, reflect on skills and knowledge, and think more critically.

Scaffa and Wooster (2004) had occupational therapy students take part in a five week, 30 hour PBL course prior to Level II fieldwork experiences to see if there would be a difference in the student's perception and ability to use critical thinking skills based on the pre and post scores. Scaffa and Wooster (2004) also used PBL evaluative activities as an intervention to increase students' ability to reflect on their professional development by using evaluative activities that are components of PBL. PBL was a commonly used intervention that was typically used when students were participating in a clinical experience, such as an experiential learning experience or fieldwork. This intervention typically requires the students to engage in curriculum aimed at critical thinking skills; such as reasoning, analyzing, evaluating, and synthesizing information gathered, along with working out scenarios with peers to assist in developing questions to improve critical thinking skills (Davys & Pope, 2006; McNulty et al., 2004; Scaffa & Wooster, 2004).

All of the interventions utilized in the research to aid this study were implemented in the academic field of an allied health program or with experiential learning experiences. The interventions used throughout the various research assisted this current topic under study by providing detailed information of how each intervention was carried out, what tools were used to measure the effectiveness of the intervention, and the outcome of the implementation of the intervention on critical thinking skills.

Critical Thinking Outcome Measures

The California Critical Thinking Skills Test® (CCTST) (Insight Assessment Inc., 2014) is an outcome measure that has been used in previous research when looking at critical thinking skills in occupational therapy and other medical health professions. Studies completed by Velde et al. (2006) and Coker (2010) used the CCTST to gather information on the subjects' critical thinking skills by measuring the participants' analysis, evaluation, inference, deductive reasoning, and inductive reasoning abilities. Previous research has recommended the use of Health Science Reasoning Test® (HSRT) (Insight Assessment Inc., 2014) versus the CCTST as it looks more at analyzing critical thinking skills in the medical field as the questions are based off of professional and clinical practice and is more sensitive to change than outcome measures such as the CCTST (Brudvig et al., 2013).

The HSRT is used to measure and detect use of clinical reasoning or critical thinking skills (Insight Assessment Inc., 2014). The HSRT breaks down the components of critical thinking into five sub-skills: a) analysis, b) inference, c) evaluation, d) induction, and e) deduction (Insight Assessment Inc., 2014). A score is reported for each subscale as well as an overall score. The first skill taken into consideration in the HSRT is analysis. Analytical reasoning skills allow individuals to notice assumptions, reasons, claims, and help determine how these elements interact. The second skill taken into consideration is inference skills. Inference skills allow individuals to form conclusions from reasons and evidence that has been gathered. Evaluative reasoning skills is another subscale skill that the HSRT analyzes. This skill permits people to assess creditability of sources and claims that are made. In addition, it helps recognize the strengths and

weaknesses of an argument. Induction is the fourth skill included in the HSRT and is a skill used to make informed conclusions or choices about information that is typically familiar or familiar experiences to the individuals. The final skill, deduction is another aspect of decision making that is used to help come to a general conclusion about information related to the topic of discussion (Insight Assessment Inc., 2014). Although this assessment has not been used in previous research, it has been recommended to be used in future research instead of other options, such as the CCTST (Bredvig et al., 2013).

The HSRT has been found to have good content, construct, and criterion validity (Insight Assessment Inc., 2014). With regards to content validity, the HSRT was developed upon the APA Delphi study (Insight Assessment Inc., 2014). This instrument's content validity was also reinforced by the professionals who were experts in human reasoning skills (Insight Assessment Inc., 2014). Content validity is the ability for the instrument to cover the areas it is projected to test as well as the tools ability that the "sensible method of test construction are employed" (Insight Assessment Inc., 2014, p.59). Construct validity is ensuring that the tool remains true to the domain that it is projected to test. In terms of construct validity, high correlations were found for the following standardized tests: GRE Total Score: Pearson $r = .719$, $p < .001$; GRE Analytic $r = .708$, $p < .001$; GRE Verbal $r = .716$, $p < .001$; GRE Quantitative, $r = .582$, $p < .001$" (Insight Assessment Inc., 2014, p. 63). The HSRT has been found to have strong internal consistency in regards to reliability with a minimum alpha level of .80 (Insight Assessment Inc., 2014). This specific tool has been found to have ongoing validity. "The

data from ongoing validation studies produces internal consistency estimates (Kuder Richardson -20) ranging from .68-.80" (Insight Assessment Inc., 2014, p.63).

The California Critical Thinking Dispositions Inventory (CCTDI) is an assessment tool that has been used in previous studies looking at individual's ability to think critically (Bredvig et al., 2013). Previous research completed by Lederer (2007) used this particular tool to assess the participants' beliefs in regards to critical thinking in seven areas including truth seeking, open mindedness, analyticity, systematically, critical thinking self-confidence, inquisitiveness, and maturity of judgment (Insight Assessment Inc., 2014). The CCTDI is a companion assessment to the HSRT.

Another outcome measure that is commonly used to measure critical thinking in students enrolled in medical programs is the Self-Assessment of Clinical Reflection and Reasoning (SACRR) (Royeen et al., 2001). The SACRR is a 26-item assessment, with each item focusing on a different aspect of clinical reasoning and reflection (Royeen et al., 2001). According to Portney and Watkins (1993), the SACRR has high internal consistency as well as test re-test reliability and its test stability has been found to be moderate.

Additional instruments that have been used to measure critical thinking in occupational therapy students, as well as in other allied health sciences, include Student Evaluation of Level I Fieldwork (SELF) (Johnson et al., 2006), the Assessment and Analysis Instrument (AAI) (Murphy,2004), Student Self-Assessment of Problem Based Learning (PBL) Participation (McNulty et al., 2004), Student PBL Professional Objectives and Growth (McNulty et al., 2004), Faculty Facilitator Evaluation (McNulty et al., 2004), and the PBL Focus Group Interview (McNulty et al., 2004). All of these

instruments were created by the authors of the studies specifically for use in their study; therefore, they lack validity or reliability as they were built based off study parameters and have not been used outside of the study they were created for.

The SELF was designed by Johnson et al. (2006) and the five participating schools to look at application of knowledge, supervision, and clinical skills using a five-point likert scale to score all areas under inspection except clinical skills in which students documented by listing the skills they had the opportunity to use. The AAI was created by Murphy (2004) in order to rate the participant's written patient assessment, which was a study-specific requirement. The Student Self-Assessment of Problem Based Learning Participation, Student PBL Professional Objectives and Growth, Faculty Facilitator Evaluation, and the PBL Focus Group Interview were all created by McNulty et al. (2004) to best assess the PBL reflection process and its affect on the participants ability to develop reflection, professional, and clinical skills.

Critical Thinking Outcomes

From the literature reviewed all of the interventions including participating in fieldworks, using reflection, engaging in PBL, using GRPQ, and the curriculum being taught while preparing for and during fieldwork were found to have a positive impact on critical thinking skills (Coker, 2010; Davys & Pope, 2006; Lederer, 2007; McNulty et al., 2004; Murphy, 2004; Plack & Santasier, 2004; Scaffa & Smith, 2004; Scaffa & Wooster, 2004; Schaber & Shanedling, 2012; Velde et al, 2006). The study completed by Coker (2010) concluded that experiential learning opportunities have the potential to improve the participants' critical thinking and clinical reasoning skills by receiving statistically significant data from both of the assessments used to measure the data. Coker (2010) and

Johnson et al. (2006) found evidence to support the use of a hands-on learning in occupational therapy curriculums to help students develop critical thinking skills so they will succeed in a dynamic healthcare environment. By learning in a non-traditional academic setting it is evident that the hands-on experience assisted the knowledge the students had gained in the classroom, to increase their overall perception of the role of occupational therapy by being able to make decisions, learn from mistakes, take away from successes, and initiate tasks in the clinical setting (Coker, 2010; Johnson et al., 2006). Scaffa and Smith (2004) also discovered similar improvements in students' critical thinking skills. After completing the two Level II fieldworks and taking the posttest it was revealed that all 48 subjects' total scores on the SACRR improved (Scaffa & Smith, 2004). This study concluded that 24 weeks of full-time fieldwork experience in the senior year of occupational therapy school can significantly facilitate the development of students' clinical reasoning skills (Scaffa & Smith, 2004).

Other interventions also proved to have similar effects on critical thinking skills, including schooling and curriculum that coincides with fieldworks. Lederer (2007) found that students with more experience and/or a degree prior to starting the occupational therapy program showed more improvement and higher levels of critical thinking skills. Along with having greater amounts of schooling and education, certain curriculums can assist in building critical thinking skills. Of the many studies reviewed on critical thinking in allied health professions, all of them supported the use of classroom education to facilitate critical thinking skills. Classroom education incorporated certain components of critical thinking by having students engage in reflective writing and discussion with classmates in order to enhance students and professionals critical thinking skills, and to

better their professional services (Lederer, 2007; Murphy, 2004; Plack & Santasier, 2004; Schaber & Shanedling, 2012). Learning these critical thinking skills in the classroom is beneficial, but Johnson et al. (2006) discovered that being able to apply these learned skills in a clinical setting actually increases the skill set and critical thinking level even more than discussing and reading about the components in the classroom. These studies assist this research project by informing the researchers that certain interventions, such as the ones mentioned above, should be incorporated into the current research and classroom settings to increase the likelihood of improved critical thinking skills in occupational therapy students.

Using reflection, PBL, GRPQ, and application of clinical knowledge in the academic setting has been found to increase critical thinking skills (Coker, 2010; Davys & Pope, 2006; Haynes, 2011; Johnson et al., 2006; Murphy, 2004; Scaffa & Wooster, 2004; Schaber & Shanedling, 2012; Velde et al., 2006). Coker's (2010) results indicated that the use of reflection and evaluating the effectiveness of a care plan can enhance clinical reasoning and critical thinking skills. Like the previous researchers, Murphy (2004) also had positive findings with the use of reflection in order to improve critical thinking skills by implementing an intervention. Nursing students that were instructed on focused reflections displayed higher scores on clinical reasoning and critical thinking than the students that did not use reflections and articulation. Students that used reflections to document findings also described significant learning events more fully than those with low clinical reasoning. For example, individuals with high reasoning described the patient, the situation, their active response to the situation, and their feelings about their learning (Murphy, 2004). Murphy's (2004), along with Schaber and

Shanedling's (2012) results, assist our research by concluding that reflection, articulation, and courses promoting critical thinking components can significantly enhance the practice dimension of clinical reasoning. Plack and Santasier (2004) supported the above articles by finding that reflection can be facilitated in the classroom for the development of critical thinking skills, integration, and professional behaviors by conducting a study on physical therapy students. Context reflection, process reflection, premise reflection, reflection-in-action, reflection-on-action, and reflection-for-action in the classroom setting improved critical thinking skills (Plack & Santasier, 2004). Along with individual reflection, group reflection processes have been found to be beneficial with increasing critical thinking skills in allied health students and professionals.

Velde et al. (2006) found that the experimental group that participated in GRPQ tended to ask more questions related to or about critical thinking than the control group, which suggests the use of GRPQ method may improve students' skills for asking questions that include application, analysis, synthesis, and/or evaluation. A similar group and peer learning process, PBL also displayed positive results. According to Davys and Pope (2006), an occupational therapy program's curriculum incorporated the PBL approach and found positive qualities including students being able to demonstrate learning at a deeper and more holistic level. Additional qualities found in students included the speed of students' ability to become familiar with a range of research, as well as presentation skills required for feedback sessions. These skills will be benefit and enhance students' clinical reasoning skills and improve their clinical practice (Davys & Pope, 2006). The studies conducted by Davys and Pope (2006) and Velde et al. (2006) will assist in the administration of the author's study as they supported that it is possible

that students may ask more high-ordered questions and use critical thinking skills as a result of a constructivist classroom. It is hoped that this skill developed will lead to students developing new knowledge when in the situated learning contexts of fieldwork and entry-level practice.

After completing a fieldwork and coursework, students' critical thinking skills not only improved with each intervention used in the various studies reviewed, but there was also a positive correlation with the students' self-perception of their own critical thinking skills according to Schaber and Shanedling (2012). The researchers measured changes in the participants critical thinking abilities over the semester of education and fieldwork and found that in regards to students perceptions, students thought they improved their skills over the semester as they developed critical thinking skills that will be applicable in their future practice as occupational therapists by participating in a course that covered theoretical development, schematic and glossary, self-assessment, occupational assessment, video case application, study critique, and scholarly disclosure (Schaber & Shanedling, 2012). From all of the studies reviewed it is evident that schooling, experiential learning experiences, higher level curriculum, and application of academic knowledge, such as fieldworks, assists in improving student's critical thinking skills. The various research articles reviewed assist this current study by discussing interventions that promote critical thinking skills to implement in this particular study, as well as promising tools to utilize in order to collect and measure the data gathered.

Conclusion

From the literature reviewed, it was evident that experiential learning experiences have a positive impact on students, both in the field of occupational therapy and in other

allied health professions. However, research on this topic is very limited as to what aspects of the experiential learning process assist in creating the impact of critical thinking skills. There is also limited understanding of what strategies and concepts to include in the experiential learning experience. The researchers specifically wanted to further explore this topic with occupational therapy students, to see the effect of a Level I fieldwork experience can have on the students' critical thinking and clinical reasoning skills. The information from the few studies related to this research topic made the researchers aware of what concepts to use to improve critical thinking, how reflective writing can play a role in the development of critical thinking, and the different types of experiential learning experiences that can have such an effect on individuals' critical thinking skills. All of the information received from previous studies related to critical thinking will be taken into consideration when conducting this research to assess whether Level I fieldwork coupled with reflective learning opportunities impact the development of critical thinking like it has in previous studies.

CHAPTER III

METHODOLOGY

A pilot study using a pre and post-test design was used to explore the use of critical thinking skills in experiential learning opportunities, more specifically in Level I fieldwork experiences. Pilot studies are also used in instances where determination of further research is needed on the subject (Stein, Rice, & Cutler, 2013). In addition, a pilot study design usually is comprised of a small sample size as well as allowing the participants to engage in the experience without having all the variables controlled, which are both present in this study (Stein et al, 2013). The purpose of utilizing a pre and post-test design is to measure the change in the variables being studied over time. Since the researchers are looking at the use of critical thinking skills in experiential learning, it was imperative that the pre and post-test design be used as a part of this study to measure the change before and after the participant's Level I fieldwork experience. Approval was received from the University of North Dakota's Institutional Review Board and informed consent was obtained from all students who participated in this study.

Sources of Data

Locale of the Study

The research study took place before and after a Level I fieldwork experience during the summer of 2014. The administration of the Health Sciences Reasoning Test (HSRT) (Insight Assessment Inc., 2014) (See Appendix A) and Self-Assessment of Clinical Reflection and Reasoning (SACRR) (Royeen et al., 2001) (See Appendix B)

were administered at the University of North Dakota's Occupational Therapy Department. The HSRT and SACRR were administered through the internet on the Blackboard Course Management System. The assignment given (Appendix C) to the participants was completed on the first day of their Level I fieldwork and on the last day of their Level I fieldwork. The assignment was submitted through Blackboard Course Management System, with the participants names removed from the assignment. The HSRT was chosen to be administered online instead of in hard copy because of the need to send the information to the Insight Assessment Company® for the HSRT and ease of data analysis for the SACRR. The University of North Dakota's Occupational Therapy Department was chosen to administer the assessments both prior to and after the participants' engagement in experiential learning. This area was chosen due to the ease of access for the researchers as well as the participants as they are all students of the University of North Dakota's Masters in Occupational Therapy Program. To ease the administration process for all of the participants, the researchers chose to give the HSRT and the SACRR in the University of North Dakota's Occupational Therapy Department to ensure the comprehension of the directions and purpose of the assessment. Level I fieldwork during the summer of 2014 was chosen as the pilot study because the number of students enrolled was small, and the experience that was provided to each student was similar.

Population/Sampling

Purposive sampling was utilized to obtain the participants of this study as the researchers used their resources and knowledge to select a group of individuals that were eligible and willing to participate in the experiential learning opportunity, which in this

study is a Level I fieldwork experience (Berg & Lune, 2012). The population of interest was year one occupational therapy students who were enrolled in the course OT 438: Practicum with Child and Adolescent that was offered through the University of North Dakota's Occupational Therapy Program. In order to participate in this study the individuals had to meet the following inclusion criteria: a) first year student in the University of North Dakota's Occupational Therapy Program, b) enrolled in OT 438: Practicum with Child and Adolescent, c) chose to participate in the two-week Level I fieldwork experience, and d) met the pre-requisites for participating in a Level I fieldwork. Seven first year occupational therapy students who met the inclusion criteria agreed to partake in this study. All seven participants were Caucasian females, ranging from 21-28 years old.

Instrumentation and Data Collection

A combination of three instruments were used to collect data in this study including the HSRT, SACRR, and an assignment created by the researchers.

Health Sciences Reasoning Test

The HSRT is an assessment used to measure clinical reasoning and decision-making skills (Insight Assessment Inc., 2014). The HSRT looks at five skills including analysis, inference, evaluation, induction, and deduction (Insight Assessment Inc., 2014). A score is reported for each subscale as well as an overall score.

The first subscale skill taken into consideration in the HSRT is analysis (Insight Assessment Inc., 2014). Analytical reasoning skills allow individuals to notice assumptions, reasons, claims, and help determine how these elements interact. The second skill taken into consideration is inference skills. Inference skills allow individuals

to form conclusions from reasons and evidence that has been gathered. Evaluative reasoning skills are another subset skill that the HSRT analyzes. This skill permits people to assess creditability of sources and claims that are made. In addition, evaluative reasoning helps recognize the strengths and weaknesses of an argument. Induction is the fourth skill included in the HSRT and is a skill used to make informed conclusions or choices about information that are typically familiar information or experiences to the individuals. The final skill, deduction is another aspect of decision making that is used to help come to a general conclusion about information related to the topic of discussion (Insight Assessment Inc., 2014).

The HSRT is based off of the California Critical Thinking Skills Test® (CCTST). In regards to validity, the HSRT has been found to have good content, construct, and criterion validity (Insight Assessment Inc., 2014). Content validity is the ability for the instrument to cover the areas it is projected to test as well as to ensure that the tool is a "sensible method of test construction" (Insight Assessment Inc., p.59, 2014). In regards to the HSRT, the American Philosophical Association (APA) Delphi Study clearly defined the specific areas of critical thinking (Insight Assessment, 2014). Construct validity is ensuring that the tool remains true to the domain that it is projected to test. In terms of construct validity, high correlations were found for the following standardized tests (GRE Total Score: Pearson *r*- .719, $p < .001$; GRE Analytic $r = .708$, $p < .001$; GRE Verbal $r = .716$, $p < .001$; GRE Quantitative, $r = .582$, $p < .001$" (Insight Assessment Inc., p. 63, 2014). The HSRT has been found to have strong internal consistency in regards to reliability with a minimum alpha level of .80 (Insight Assessment Inc., 2014). This specific tool has been found to have ongoing validity. "The data from ongoing validation

studied produces internal consistency estimates (Kuder Richardson -20) ranging from .68-.80" (Insight Assessment Inc., p.63, 2014).

The HSRT is designed for use by health science practitioners as well as graduate and undergraduate trainees in health sciences educational programs, which makes this tool even more applicable to this study rather than using a more broad assessment such as the CCTST. Specific aspects of the HSRT are derived from the CCTST, but are more geared towards health sciences specifically. Like all forms of the CCTST, the HSRT provides subscale scores in regards to different specific critical thinking skills to help instructors know what weaknesses to address related to critical thinking and reasoning errors.

The researchers administered the HSRT to all seven participants electronically and at the same time before and after their Level I fieldwork experience to ensure consistency throughout the administration process. In addition, the data collected from the participants was sent to Insight Assessment Company® after the pre-test was completed as well as after the post-test was completed. The pre-test interpreted data was not analyzed by the researchers until the post-test data had been sent and interpreted by the Insight Assessment Company®. Once the interpreted data from both the pre and post-test was sent back, the researchers analyzed the data using a Wilcoxon Signed-Rank Test via SPSS software, from all seven participants at once to ensure consistency when analyzing the results.

Self-Assessment of Clinical Reasoning and Reflection

The SACRR is a tool used to measure the effects of educational strategies in regards to clinical reasoning based on the participant's self-reflection (Royeen et al.,

2001). The SACRR is a 26-item assessment, with each item focusing on a different aspect of clinical reasoning and reflection. This assessment tool uses a five-point Likert scale with a "1" indicating "strongly disagree" and "5" indicating "strongly agree". This assessment tool was used as a pre and post-test to gather a comprehensive score. In addition, the researchers analyzed the scores the participants received on each item of the SACRR separately and compared the pre and post-test scores for each item to each other.

All seven participants completed the SACRR pre and post-test in the University of North Dakota's Occupational Therapy Department prior to completing the HSRT. The SACRR was administered electronically through the Blackboard Course Management System. There are no known administration requirements needed to administer the SACRR; however, the individual giving the assessment should understand the evaluation tool and what it entails. In addition, the individual should hand out the assessment and read the directions to the participants. The researchers did not analyze the data gathered from the pre-test until the post-test had been completed to compare each individual's scores of the SACRR to one another.

The reflective writing assignment consisted of six questions. Participants were asked to complete the questions provided in regards to their fieldwork experience. This reflective assignment was given after the completion of their first day and submitted to the Blackboard Course Management System. It was completed again through the Blackboard Course Management System on the last day of the participant's fieldwork experience. The rubric used to grade this assignment was based off the HSRT subscales including analysis, inference, evaluation, induction, and deduction (See Appendix D). The researchers chose keywords and phrases to include in the rubric to look for within

each participant's reflective writing assignment. Keywords and phrases were chosen for each subscale that closely relate to the meaning of the particular subscale. The rubric was based on a Likert scoring system using the number 0, 1, 2, and 3 based on the number of elements present in the individual's assignment. This reflective writing tool is a new instrument; therefore, there is no established validity and reliability.

Data Analysis

Health Sciences Reasoning Test

The HSRT was used to measure the participants' clinical reasoning and problem-solving skills. The data was analyzed using the Wilcoxon Signed-Rank Test using version 21 of the SPSS Software® and the results were reported in a chart showing the comparison or differences between the pre and post-test scores for each participant. Due to the varying amount of time the participants spent on completing the HSRT pre and post, these results should be interpreted with caution. The average time it took the participants to complete the pre-test was 40.43 minutes. The average time it took the participants to complete the post-test was 27.43 minutes, indicating a decrease in the amount of time spent completing the HSRT post-test.

Self-Assessment of Clinical Reflection and Reasoning

The SACRR was used to measure the participants' self-perception of clinical reasoning reflection skills. Once the participants had completed the SACRR before and after their experiential learning opportunity, the researchers used the Wilcoxon Signed-Rank test to compare the participants' pre and post-test responses to look for an increase in their self-perceived ability of clinical reasoning and reflection skill and reported information in a table format.

Reflective Writing Assignment

The Wilcoxon Signed-Rank Test was used to compare the participants' pre and post-test scores after grading the assignments The results of this analysis were reported in a narrative format emphasizing the main findings and take away points. After the participants handed in their assignments, the researchers scored the assignments separately and then came together to finalize the scores. When discrepancies between raters occurred, a score was issued that was directly between the two original given scores. For example if rater one issued a 3.0 and rater two issued a 2.0, the participant was given the score of 2.5. Using this strategy increased the inter-rater reliability of the overall study. Inter-rater reliability was calculated for each area of the grading rubric. There was a noted discrepancy when rating inference and evaluation both in the pre and post-test, and in induction in the post-test. The raters inter-rater reliability for analysis and deduction pre and post-test, and induction pre-test was perfectly correlated. The inter-rater reliability for the pre-test between the two raters was 98.34% overall. The inter-rater reliability for the post-test between the two raters was 79.98% overall.

Table V: Inter-Rater Reliability on Reflective Assignment

Subscales	Pre-test Pearson's R	Post-test Pearson's R
Analysis	.100	.100
Inference	.951	.417
Evaluation	.966	.645
Induction	.100	.936
Deduction	.100	.100

CHAPTER IV

RESULTS

Research Question 1: *Does experiential learning (Level I fieldwork) improve students overall critical thinking?* The mean score for the overall HSRT pre-test was found to be 22.71 (SD = 3.564). The mean score for the overall HSRT post-test was found to be 22.86 (SD = 2.035). This indicated that there was a slight increase in overall critical thinking following participation in an experiential learning experience. A Wilcoxon test examined the results of whether there was an improvement in students' overall critical thinking on the HSRT after participating in an experiential learning experience. No significant difference was found in the results (Z = -.170, p > .433).

Research Question 2: *Does experiential learning (Level 1 fieldwork) improve students' analysis, inference, evaluation, induction, and deduction skills?* A Wilcoxon test examined the results of whether there was an improvement in students' ability to utilize analysis, inference, and evaluation, induction, and deduction skills after completing an experiential learning experience. Following the completion of the experiential learning experience, there was not an increase in the mean of the subscales analysis and deduction on the HSRT (Table 1). There was a slight increase in the use of the subscales evaluation and induction after participating in an experiential learning experience. The use of the subscale inference showed no change.

Table 1: HSRT Subscale Analysis

	Pre-Mean	Pre-SD	Post-Mean	Post-SD	*Z*	*p*
Analysis	4.00	.186	3.71	1.496	-.412	.340
Inference	4.57	.787	4.57	1.134	.000	.500
Evaluation	5.29	1.496	5.57	.535	.378	.352
Induction	7.57	1.718	8.29	.488	1.134	.129
Deduction	7.29	1.704	7.14	1.435	-.378	.352

Research Question 3: *Do students demonstrate improved critical thinking skills in reflective writing that is part of the Level I fieldwork assignment?* The critical thinking skills evaluated in the reflective writing assignment were based off of the HSRT subscales analysis, inference, evaluation, induction, and deduction. Following the completion of the experiential learning experience, there was not a significant increase in the use of analysis in the reflective writing assignment (Table 2). There was a slight increase in the use of the following subscales in the participants' written reflections: inference, evaluation, and deduction. The use inductive reasoning in the participants' written reflections remained the same prior to and upon completion of an experiential learning experience. Though inference approached significance ($p = .070$), there was not a significant difference found in any of the areas graded based on the HSRT subscales following participation in an experiential learning experience.

Table 2: Reflective Writing Subscale Analysis

	Pre-Mean	Pre-SD	Post-Mean	Post-SD	*Z*	*p*
Analysis	2.714	.4880	2.429	.7868	-.816	.207
Inference	1.786	.9940	2.429	.4499	1.473	.070
Evaluation	2.071	1.4268	2.786	.3934	.109	.802
Induction	1.429	1.2724	1.429	1.3048	.000	.500
Deduction	1.429	.7868	1.571	.7868	1.000	.159

Research Question 4: *Do students demonstrate self-perceived improvement in critical thinking skills?* The mean score for the overall pre-test of the SACRR was found

to be 96.29 (SD = 8.902). The mean score for the overall post-test of the SACRR was found to be 105.00 (SD = 12.570). This indicated that there was a slight increase in self-perception following participation in an experiential learning experience. A Wilcoxon test examined the results of whether there was an improvement in students' self-perception of their ability to think critically after participating in an experiential learning experience. No significant difference was found in the results though the increase did approach significance ($Z = 1.690$, $p = .054$). Therefore, the participants' total scores for pre-test and post-test did not demonstrate statistical significance after participating in an experiential learning experience.

Research Question 5: *Are there statistically significant patterns of improvement pre and post-test to report, in each individual question?* Of the 26 items on the SACRR, five items in addition to the overall total score were found to be statistically significant (Table 3). Item nine of the SACRR which states, "I use theory to understand treatment techniques", was found to have a statistically significant decrease in the participants' self-perceived scores from pre to post-test. Items 4, 13, 14, and 17 were also found to have a statistically significant increase in self-perceived scores from pre to post-test. These four items all related to seeking out viewpoints, hypothesizing, or seeking various solutions to solve upcoming and current client problems.

On the SACRR 18 of the 26 items were found to have a slight but not significant increase in self-perceived ability following the experiential learning experience. Three items did not increase following the participation in an experiential learning experience. These three items were related to selection of frame of reference, theory, and clinical protocols to use in treatment. Five items remained the same following the participation

in the experiential learning experience. Three of these five items related to dealing with clinical problems, whether these clinical problems occurred when selecting the most appropriate frame of reference, identifying differing views, and identifying the problems prior to intervention.

Table 3: Self-Assessment of Clinical Reasoning and Reflection (SACRR) Pretest and Post-test Comparisons

	SACRR Item	Pre-Mean	Pre-SD	Post-Mean	Post-SD	*z*	*p*
1	I question how, what, and why I do things in practice.	4.00	.577	4.00	1.000	.000	.500
2	I ask myself and others questions as a way of learning.	4.57	.535	4.86	.378	1.414	.785
3	I don't make judgments until I have sufficient data.	4.00	1.000	4.29	.756	.707	.240
4	Prior to acting, I seek various solutions.	4.00	.000	4.43	.535	1.732	.042*
5	Regarding the outcome of proposed interventions, I try to keep an open mind.	4.14	.690	4.43	.787	1.000	.159
6	I think in terms of comparing and contrasting information about a client's problems and propose solutions to them.	4.00	.577	4.14	.690	.577	.282
7	I look to theory for understanding a client's problems and proposed solutions to them.	3.14	1.069	3.43	.976	.816	.207
8	I look to frames of reference for planning my intervention strategy.	3.71	.951	3.29	.951	-1.134	.129
9	I use theory to understand treatment techniques.	3.43	.976	3.00	1.000	-1.732	.042*
10	I try to understand clinical problems by using a variety of frames of reference.	3.71	.488	3.71	.756	.000	.500
11	When there is conflicting information about a clinical problem, I identify assumptions underlying the differing views.	3.71	.488	3.71	.756	.000	.500
12	When planning intervention strategies, I ask "What if" for a variety of options.	3.86	.690	4.29	.488	1.134	.129
13	I ask for colleagues' ideas and viewpoints.	4.43	.535	4.86	.378	1.732	.042*
14	I ask for the viewpoints of clients' family members.	3.71	.756	4.43	.535	1.890	.029*
15	I cope well with change.	3.29	.756	3.57	1.272	.557	.289
16	I can function with uncertainty.	3.29	.756	3.43	.976	.577	.282
17	I regularly hypothesize about the reasons for my client's problems.	4.00	.577	4.57	.535	2.00	.023*
18	I must validate clinical hypotheses through my own experience.	3.71	.951	4.29	.756	1.134	.129
19	I clearly identify the clinical problems prior to planning intervention.	4.14	.378	4.14	.690	.000	.500
20	I anticipate the sequence of events likely to result from planned interventions.	4.00	.577	4.14	.690	.577	.282
21	Regarding a proposed intervention strategy, I think, "What makes it work?"	4.00	.000	4.14	.690	.577	.282
22	Regarding a particular intervention, I ask, "In what context would it work?"	3.71	.756	4.14	.690	1.134	.129
23	Regarding a particular intervention with a particular client, I determine whether it worked.	4.29	.488	4.43	.787	.577	.282
24	I use clinical protocols for most of my treatment.	3.57	.787	3.71	.951	.272	.393
25	I make decisions about practice based on my experience.	4.29	.488	4.14	.690	-.577	.282
26	I use theory to understand intervention strategies.	3.43	.787	3.43	.976	.000	.500
	TOTAL	96.29	8.902	105.00	12.570	1.609	.054*

* An asterisk denotes statistically significant change

Research Question 6: *Is there a relationship between self-perceived reasoning and scores on the HSRT?* A Spearman *rho* correlation coefficient was calculated for the relationship between the participants' overall pre-test total on the SACRR and HSRT. A weak negative correlation was found (*rho* (5) = -.214; *p* =.322). The participants' overall pre-test total on the SACRR and HSRT was not statistically significant. A Spearman *rho* correlation coefficient was calculated for the relationship between the participants' overall post-test total on the SACRR and HSRT. A moderate positive correlation was found (*rho* (5) = .436; *p* = .164). Although a moderate positive correlation was found, it was not statistically significant. A more detailed test was completed to distinguish the relationship between each individual question from the SACRR and the overall score of the pre and post-test of the HSRT. There were four individual items that were statistically significant, being item numbers 2, 3, 16, and 23 (Table 4). However items 2 and 16 were noted to have a negative correlation, whereas items 3 and 23 had a positive correlation.

Table 4: Relationship Between Self-Perceived Reasoning and Scores on HSRT

	SACRR Item	HSRT Pre-Test *r* (*p*)	HSRT Post-Test *r* (*p*)
1	I question how, what, and why I do things in practice.	.134 (.388)	-.121 (.398)
2	I ask myself and others questions as a way of learning.	-.722* (.034)	-.206 (.329)
3	I don't make judgments until I have sufficient data.	.896** (.003)	.331 (.234)
4	Prior to acting, I seek various solutions.	.156 (.354)	-.218 (.319)
5	Regarding the outcome of proposed interventions, I try to keep an open mind.	.000 (.500)	.211 (.235)
6	I think in terms of comparing and contrasting information about a client's problems and propose solutions to them.	.401 (.186)	-.251 (.293)
7	I look to theory for understanding a client's problems and proposed solutions to them.	-.019 (.484)	-.699* (.040)
8	I look to frames of reference for planning my intervention strategy.	-.493(.131)	-.342 (.227)
9	I use theory to understand treatment techniques.	-.206 (.329)	-.653 (.056)
10	I try to understand clinical problems by using a variety of frames of reference.	-.474 (.141)	.136 (.385)
11	When there is conflicting information about a clinical problem, I identify assumptions underlying the differing views.	.158 (.367)	.253 (.292)
12	When planning intervention strategies, I ask "What if" for a variety of options.	.438 (.163)	-.399 (.188)
13	I ask for colleagues' ideas and viewpoints.	-.144 (.379)	-.412 (.179)
14	I ask for the viewpoints of clients' family members.	.386 (.196)	-.364 (.211)
15	I cope well with change.	.231 (.309)	-.759* (.024)
16	I can function with uncertainty.	-.694* (.042)	-.387 (.195)
17	I regularly hypothesize about the reasons for my client's problems.	-.535 (.108)	.364 (.211)
18	I must validate clinical hypotheses through my own experience.	.118 (.400)	-.584 (.084)
19	I clearly identify the clinical problems prior to planning intervention.	.408 (.182)	-.251 (.293)
20	I anticipate the sequence of events likely to result from planned interventions.	.267 (.281)	.111 (.407)
21	Regarding a proposed intervention strategy, I think, "What makes it work?"	.375 (.189)	.352 (.220)
22	Regarding a particular intervention, I ask, "In what context would it work?"	.612 (.072)	.111 (.470)
23	Regarding a particular intervention with a particular client, I determine whether it worked.	.791* (.017)	.211 (.325)
24	I use clinical protocols for most of my treatment.	.538 (.107)	-.302 (.256)
25	I make decisions about practice based on my experience.	.158 (.367)	-.141 (.382)
26	I use theory to understand intervention strategies.	.000 (.500)	-.415 (.177)

* Correlation is significant at .05 level (one- tailed)
** Correlation is significant at .01 level (one-tailed)

CHAPTER V

DISCUSSION

This study addressed the impact of experiential learning experiences coupled with reflective writing on critical thinking skills. Participants in this study demonstrated an increase in overall critical thinking scores; however, the improvement was not statistically significant. These findings are consistent with previous studies which also found improvements in critical thinking as a result of experiential learning opportunities or interventions on critical thinking skills (Coker, 2010; Davys & Pope, 2006; Lederer, 2007; McNulty, Crowe & VanLeit, 2004; Murphy, 2004; Plack & Santasier, 2004; Scaffa & Smith, 2004; Scaffa & Wooster, 2004; Schaber & Shanedling, 2012; Velde, Wittman & Vos, 2006).

Coker (2010) concluded baswed on the scores of the Self-Assessment Clinical Reflection and Reasoning (SACRR) (Royeen et al., 2001) and California Critical Thinking Skills Test® (CCTST) (Insight Assessment Inc., 2014) that experiential learning experiences do improve critical thinking and clinical reasoning. Scaffa and Smith (2004) concluded that participation in a Level II fieldwork experience in the senior year of occupational therapy school significantly facilitated the development of students' clinical reasoning skills. Loretto (2011) and Haynes (2007) also advocated for the use of experiential learning experience such as fieldwork to show the improvement in students' critical thinking skills after being exposed and having hands-on experience in the clinical field. Although many of the studies focused on different specific interventions as

experiential learning experiences, the results concluded that learning experiences have a positive and statistically significant impact on students' critical thinking skills which is consistent with the findings in this study.

In this specific study, participants demonstrated an increase in the Health Science Reasoning Test® (HSRT) (Insight Assessment Inc., 2014) subscales of evaluation and induction following the experiential learning experience. There was a decrease in the subscales of analysis and deduction. In regards to the subscale inference there was no change prior to or upon completion of the experiential learning experience. By participating in an experiential learning experience, it was found that the participants' evaluative and inductive reasoning skills improved, while their analysis and deductive skills did not improve. This may be due to the lack of opportunity to use these skills, the exposure to certain experiences, or the student's inability to use these particular types of critical thinking skills.

While no previous study utilized the HSRT, the CCTST has been used in previous research which is a broader form of the HSRT using the same subscales to analyze data. The HSRT was used in this study due to its emphasis on healthcare. Coker (2010) found that the CCTST subscales of evaluation, inductive reasoning, and deductive reasoning improved and were statistically significant when comparing pre and post-test scores. Coker (2010) found that there was no significant change in the subscale scores for inference and analysis, however they did increase. A study by Velde et al., (2006) used the CCTST as an outcome measure, however subscale scores were not reported; and therefore, the researchers could not compare the results to this current study.

In this study, it was found that after participating in an experiential learning experience and completing a reflective writing assignment, the participants' inference, evaluation, and deduction skills increased. The subscale inference was noted to be approaching statistical significance, which is noteworthy since this is a pilot study. The participants' inductions skills stayed the same following the reflective writing assignment and participation in a Level I fieldwork. Coker (2010) and Murphy (2004) found that the use of reflection and participating in an experiential learning experience whether it be a Level I fieldwork or evaluating a care plan, can enhance clinical reasoning and critical thinking skills. Students that used reflections to document findings also described significant learning events more fully than those with low clinical reasoning (Murphy, 2004). The findings of this specific study, Plack and Santasier's (2004), and Schaber and Shanedling's (2012) demonstrate how the incorporation of reflection can improve critical thinking skills when utilized in the classroom setting to facilitate further learning. McNulty et al. (2004) also had similar findings discovering that using reflection in problem based learning improves critical thinking skills. Therefore, this study further reinforces the value of using reflective writing assignments coupled with experiential learning experiences to increase critical thinking skills.

Overall, this study found that there was a slight increase that was approaching significance, in students' self-perceived ability in using critical thinking skills on the SACRR. Based on the results, the participants felt their ability to use critical thinking skills improved after participating in an experiential learning experience, which in this case was a Level I fieldwork. These findings are consistent with previous research studies where students self-perceived critical thinking skills improved after participating

in an experiential learning experience. These improvements occurred whether the experiential learning experience was a Level I fieldwork or after participating in an on-line course over the semester (Coker, 2010; Schaber & Shanedling, 2012). The findings of this study closely match the results of the past literature which concluded that students felt more confident in their ability to use critical thinking skills following an experiential learning experiences, which helped facilitate the participants learning and thinking processes (Coker, 2010; Schaber & Shanedling, 2012).

Coker (2010) analyzed the SACRR for patterns in participants' responses by looking at the statistical significance of each item. This study followed the same process by analyzing each individual item of the SACRR and finding the significance. Similar to Coker (2010), items on the SACRR were analyzed to identify patterns within this study. Coker (2010) found that the use of theory and frames of reference to plan and understand treatment strategies was statistically significant. Whereas in this specific study there was a statistically significant decrease on this particular item. Overall, in both Coker's (2010) study and this current study, the students' scores improved following the intervention and was statistically significant. Coker (2010) found three other themes in the study: a) asking questions of self in regards to intervention strategies, b) use of clinical protocols, c) decision making and judgment based on examining data and one's own experience.

In this study, five items were found to have a statistically significant increase pre and post-test, with four items being a positive increase and one item not increasing. The common pattern between the four items that increased related to hypothesizing, viewpoints, and seeking various solutions to solve upcoming and current client problems. The findings of item 17 being statistically significant is interesting because it dealt with

hypothesizing about client's problems. This was found to be interesting because the participants were probed to hypothesize about their client's diagnosis in the reflective writing assignment, which may have increased their likelihood to hypothesize. This further supports the effectiveness in using the reflective writing assignment to improve critical thinking skills including the ability to hypothesize. Writing the reflective questions to matching the critical thinking skills was beneficial. It is also important to note that three items of the SACRR decreased following the participation in the experiential learning experience. All three items related to selecting a proper frame of reference, theory, and clinical protocol to use in treatment. This shows that students were not confident in their ability to utilize theory and frame of reference on fieldwork and/or did not have the opportunity to utilize them during their experiential learning experience. Overall, these patterns support the findings that participation in an experiential learning experience improve critical thinking skills, especially in regards to hypothesizing, viewpoints, and problem-solving.

The students' self-perceptions gathered using the SACRR and objective data from the HSRT were compared to assess whether a correlation was present between the participants' perception and their actual level of critical thinking. No correlation was found between the pre-test of the SACRR and HSRT, which indicates that the participants' perception of their own skill level was not related to their actual skill level. In regards to the post-test of the SACRR and HSRT, a moderate positive correlation was found. In this study, students who rate self-perception higher also scored higher on the actual objective measure. These results may have occurred due to the participants being

asked to apply critical thinking in the reflective writing assignment, so they were better able to understand their skills.

Conclusion

The results of this study provide encouraging support for the use of experiential learning experiences in developing critical thinking skills in occupational therapy students. This study supports the use reflective writing assignments in conjunction with participating in an experiential learning experiences to improve students' abilities to think critically. In addition, a result of this study not anticipated was the importance of incorporating an objective outcome measure such as the HSRT with a subjective measure, like the SACRR. This is concluded because the pre-test results on the HSRT and SACRR indicated that self-perception is not always an accurate depiction of ones skillset.

It is recommended that reflective writing assignments should be used to facilitate critical thinking, as both the results of this study and previous research support the use of writing assignments as they positively impact critical thinking skills. As these reflective writing assignments would be implemented to increase critical thinking skills, the researchers believe that it would be important to develop the writing assignments based on the critical thinking subscales such as evaluation, induction, deduction, inference, and analysis. Since these are specific components of critical thinking, by integrating these components into the reflective writing assignment it will assist in developing the critical thinking skills, as supported by this study.

The researcher felt that comparing Level I fieldworks with Level II fieldworks would be beneficial to see if there are different gains made in shorter versus longer

fieldwork experiences. By allowing the participants to be engaged in a longer experiential learning experience, the chance of improving and developing critical thinking skills is higher due to the amount of clinical exposure they will receive.

Implications for Future Research

Future research should include a larger sample size to increase the chance of statistical significance and to better generalize the findings. Future research may compare Level I fieldwork with Level II fieldwork to see if there are different gains made in shorter versus longer fieldwork experiences. Future studies should consist of a variety of Level I placement site experiences that are not the same for all participants, as all participants were at the same fieldwork site for this study. Future research could also focus on what aspects of the experiential learning experience facilitated or inhibited critical thinking, specifically each subscale of the HSRT subscales including analysis, inference, evaluation, induction, and deduction.

Limitations

It is important to note that this was the participant's first experiential learning experience with an actual population, which may affect the overall confidence in their overall skillsets related to self-perception. In addition, the small sample size limits the generalizability of the findings as well as the lack of significant results. When interpreting the results of the study, validity of the results of the SACRR and HSRT is in question because of the discrepancy in test taking times pre and posttest.

APPENDICES

Appendix A
HSRT Sample

Health Science Reasoning Test (HSRT)

The Health Sciences Reasoning Test (HSRT) is an assessment used to measure clinical reasoning and decision-making skills (Insight Assessment Inc., 2014). The HSRT looks at five skills including analysis, inference, evaluation, induction, and deduction (Insight Assessment Inc., 2014). The assessment is a standardized and norm-referenced tool developed specifically for students in the health sciences in order to understand critical thinking in this population. A score is reported for each subscale as well as an overall score. Because of the copyright rules with this assessment, it could not be attached, but can be viewed by request. The researchers do have a one-time electronic link if the reviewers want to review the tool. We do have to pay for each electronic viewing. Per our conversation with Michelle at IRB we were instructed to provide sample items. A couple of sample questions include:

"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."

In addition another example question includes, " 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."

We have also attached a screen shot of what the student will see when they enter the assessment page.

Appendix B
SACRR Evaluation Tool & Permission Letter

Identification Number

Self-Assessment of Clinical Reflection and Reasoning:

Please rate your response to each question from 1 to 5, Strongly AGREE, AGREE, NEUTRAL, DISAGREE, to Strongly DISAGREE:

	SA	A	N	D	SD
1. I question how, what, and why I do things in practice	5	4	3	2	1
2. I ask myself and others questions as a way of learning	5	4	3	2	1
3. I don't make judgments until I have sufficient data	5	4	3	2	1
4. Prior to acting, I seek various solutions	5	4	3	2	1
5. Regarding the outcome of proposed interventions, I try to keep an open mind	5	4	3	2	1
6. I think in terms of comparing and contrasting information about a client's problems And proposed solutions to them.	5	4	3	2	1
7. I look to theory for understanding a client's problems and proposed solutions to them.	5	4	3	2	1
8. I look to frames of reference for planning my intervention strategy	5	4	3	2	1
9. I use theory to understand treatment techniques.	5	4	3	2	1
10. I try to understand clinical problems by using a variety of frames of reference.	5	4	3	2	1
11. When there is conflicting information about a clinical problem, I identify Assumptions underlying the differing views	5	4	3	2	1
12. When planning intervention strategies, I ask "What if" for a variety of options	5	4	3	2	1
13. I ask for colleagues' ideas and viewpoints	5	4	3	2	1
14. I ask for the viewpoints of clients' family members	5	4	3	2	1

1

Identification Number

Please rate your response to each question from 1 to 5, Strongly AGREE, AGREE, NEUTRAL, DISAGREE, to Strongly DISAGREE:

	SA	A	N	D	SD
15. I cope well with change	5	4	3	2	1
16. I can function with uncertainty	5	4	3	2	1
17. I regularly hypothesize about the reasons for my client's problems	5	4	3	2	1
18. I must validate clinical hypotheses through my own experience	5	4	3	2	1
19. I clearly identify the clinical problems prior to planning intervention	5	4	3	2	1
20. I anticipate the sequence of events likely to result from planned interventions	5	4	3	2	1
21. Regarding a proposed intervention strategy, I think, "What makes it work?"	5	4	3	2	1
22. Regarding a particular intervention, I ask, "In what context would it work?"	5	4	3	2	1
23. Regarding a particular intervention with a particular client, I determine whether it worked	5	4	3	2	1
24. I use clinical protocols for most of my treatment	5	4	3	2	1
25. I make decisions about practice based on my experience	5	4	3	2	1
26. I use theory to understand intervention strategies	5	4	3	2	1

Composite Score: _____

Charlotte Royeen <royeencb@slu.edu>
Thu 3/27/2014 2:46 PM
Inbox

Mark as unread

Dear Dr. Nielsen,

It is most embarrassing for a researcher to disclose that I have lost my copy....I had one in pdf to give to people and my computer died and it is gone. I get lots of requests for this tool, so if you do locate it, please let me know!

Charlotte Royeen

On Thu, Mar 27, 2014 at 12:58 PM, Haugen, Alissa <alissa.haugen@my.und.edu> wrote:

> Dear Dr. Royeen,
>
> We are conducting an educational research study at the University North Dakota in the Occupational Therapy Program with our Advisor Dr. Sarah Nielsen. We are conducting research on experiential learning and its impact on critical thinking skills. Specifically, we will be studying students completing level I fieldwork. In our literature review process, we came across the tool you developed and have tested, the SACRR. We are highly interested in using this tool as a part of our study and were wondering if you would grant permission, what is the best way to gain access on additional information about it, as well as a copy of it. We do not have access to the 2001 edition of the *Innovations in Occupational Therapy Education* by Crist which is the provided reference in other research studies. If you have any suggestions on how to obtain a copy of the 2001 copy, we would appreciate it very much.
>
> The full citation for the article we say your tool referenced can be found below:
>
> Coker, P. (2010). Effects of an experimental learning program on the clinical reasoning and critical thinking skills of occupational therapy students. *Journal of Allied Health, 39*, 280-286.
>
> Thank you for your time and we look forward to hearing from you at your earliest convenience,
>
> Vanessa Dvergsten, OTS & Alissa Haugen, OTS
>
> Advisor, Dr. Sarah Nielsen

Appendix C
Reflective Writing Assignment

Critical Thinking Reflective Writing Assignment
Level I Fieldwork

Based on your assigned client, use the following key questions to guide your learning reflection:

1. Describe your client and how you make sense of them in the intervention environment.

2. What have you learned in your educational experiences that you can apply to understanding your client?

3. What additional questions do you have about your client and how might you answer them? (Cite learning materials you would use to answer these questions).

4. Based on your understanding of the client, what are the needs of the client?

5. Propose one way in which you would meet your client's needs and provide evidence to support your choice. Explain the process you used to come to this conclusion.

6. Considering sources you drew evidence from, what was most valid and useful? What was least valid and useful?

Appendix D
Reflective Writing Assignment Grading Rubric

Critical Thinking Research Rubric for Reflective Writing Assignment

Skills	**Samples of Evidence**	**Total Points*assign one point per element that is present**
Analysis	1. Student identifies factors and/or details about the client's ability to interact in an activity. 2. Student determines how factors and/or details about the client interact with one another 3. Student provides insight into meaning of client's behavior and verbalizations. Keywords: identify, examines interactions	0 1 2 3
Inference	1. Student shows evidence of formulating questions/ hypothesis 2. Student references learning material to identify consequences 3. Student reflects on potential outcomes of their inference Keywords: draws conclusions, identifies consequences of facts/conditions	0 1 2 3
Evaluation	1. Student assesses credibility of the sources and claims they have made 2. Student can explain processes used to support conclusions reached 3. Student justifies the choice of intervention or response to situation	0 1 2 3

	Keywords: assess credibility of sources and claims made, provides evidence for claims made	
Induction (Decision making)	1. Does the student identify general principles/inferences about what they think is occurring? 2. Does the student make specific observations to support any general principles/inferences identified? 3. Does discuss the probability or likelihood that their inductive argument is true? Keywords: inference, what is possibly true? Generalizing or extrapolating from initial information	0 1 2 3
Deduction (Decision making)	1. Does the student identify a general statement or premise as a basis for a conclusive argument? 2. Does the student clearly identify the terms/process/rules used to logically support the deductive argument? 3. Does the student consistently apply general rules to logically narrow the range of possible conclusions until only one possibility is left? Keywords: True belief, logic, clear cut; conclusion reached reductively by applying general rules that hold over the entirety	0 1 2 3

This rubric will be used by the researchers to analyze the work completed by the students participating in the research study. Attached is the reflective writing student assignment which will occur the first day of the fieldwork and again on the last day of the fieldwork.

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