

The Efficacy of a Skill-Building Workshop for Reflective Critical Thinking with Graduate Students: Effect-Size Differences Based on Race

*This manuscript has been peer-reviewed, accepted, and endorsed by the North American
Community.*



North American Community
Journal of Interdisciplinary Education

Natalie Michaels, PT, Ed.D.
Belmont University, Nashville, TN., USA

Abstract

The purpose of this study was to develop and evaluate the effectiveness of a workshop created to help doctoral physical therapist students build reflective critical thinking strategies. The workshop participants included 48 doctoral physical therapist students who were placed in two separate groups: the workshop group and the control group. Both groups were given the Health Sciences Reasoning Test (HSRT) before and after the workshop. No significant differences were found *between* group comparisons. *Within* group comparisons, however, higher *pre-test* HSRT scores for Caucasian students were noted, but African American students achieved higher post-test scores. Factors potentially effecting results included novelty of learning situation, prior exposure to tested concepts/strategies, and need for authentic practice opportunities. Further research is recommended.

Keywords: reflective critical thinking, higher-order thinking, physical therapy students, workshop, equity

The Efficacy of a Skill-Building Workshop for Reflective Critical Thinking with Graduate
Students: Effect-Size Differences Based on Race

Background

It goes without question that there is not an equitable representation of African Americans in the pool of healthcare professionals in the United States. According to the 2010 United States Census, 7.8% of Healthcare Practitioner Professionals are African American, compared to 75.7% who are Caucasian (Census, 2010). This is disconcerting considering that in 2010, Black or African American Citizens made up 13.6% of the United States Population (U.S. Census, 2010), but in 2007, only 2% of listed American Physical Therapy Association (APTA) members were identified as African American (APTA, 2007). One potential reason for this discrepancy could be difficulty passing high stakes examinations.

High-Stakes Testing

It has been reported over the past 50 years by many different sources in the United States that ethnic minority students, as a whole, tend to average lower scores on standardized testing instruments than do Caucasian students (Berlak, 2001; Eelis et al., 1951; Johnson, Boyden, and Pittz, 2001; Marco, 1988; Obiakor, 1992). This has also been found to be the case with the National Physical Therapist Examination (NPTE) (Utzman, Riddle, and Jewell, 2007). A study that included data on 3,365 students conducted by Utzman, Riddle, and Jewell (2007), found that one factor that could help to predict success on the NPTE was the student's race or ethnicity. In another study by Utzman, Riddle and Jewell (2007a) focusing on data from 3,582 physical therapist students, ethnicity (other than white, non-hispanic) was found to be significant as a predictor of academic difficulty. The ability to apply reflective critical thinking strategies was considered very important when taking these tests.

The NPTE consists of questions that require students to recall knowledge, interpret that knowledge and use clinical application to choose a correct response from choices presented (NPTE, 2008). If different groups learn to synthesize information differently, then the development of a workshop that meets the needs of many different learning styles becomes more of a challenge.

Reflective Critical Thinking and Physical Therapy

A physical therapist must utilize high-level critical thinking strategies to pass the National Physical Therapy Examination (NPTE), and to be successful in a clinical setting. High-level critical thinking skills are extremely valuable for any health care practitioner treating a multitude of diverse patients in today's health care settings (Velde, Wittman, and Vos, 2006; Kowalczyk and Leggett, 2005; Pitney, 2002; Martin, 2002). A practicing physical therapist often utilizes reflective critical thinking strategies to make clinical decisions in an effort to guide patients toward the most appropriate therapeutic intervention techniques and/or referral (Edwards, Jones, Carr, Braunack-Mayer, and Jensen, 2004; Plack and Santasier, 2004; Vendrely, 2005). Critical thinking is most often defined as an integration of the elements depicted in Bloom's Taxonomy (Aviles, 2000; Huitt, 1998). Other definitions of the term include the ability to use reflection or *metacognition* (thinking about one's own thought processes) (Dean and Kuhn, 2003), *collaboration* (Vygotsky, 1978), and *hands-on skills* or *learning by doing* (Dewey, 1916). The skills required for high-level critical thinking have been found to be extremely important for physical therapist clinical decision-making, and professionalism (Vendrely, 2005; Jette, Grover, and Keck, 2003).

There is little how-to information in the literature regarding the development of critical thinking strategies for healthcare students. Suggestions for improvement in the classroom

curriculum include the implementation of more opportunities for problem-based learning (Foord-May, 2006), use of interactive web-based sites (Gottsfeld, 2000), use of case-method formats (Wade, 1999), increased use of classroom technology (Halpern, 1999), and additional opportunities for use of patient-simulation mannequins (Seybert et al., 2005). Due to limited empirical evidence related to the effectiveness of such strategies, choosing suitable approaches for teaching critical thinking poses a quandary.

In a doctoral physical therapist program, faculty need a means to (a) connect with students on a higher level; (b) challenge them to think through various scenarios; and (c) utilize reflection while focusing on the relevancy of information being taught. This consists of a confusing labyrinth of thought on the part of the professor. Connecting with each student on this higher level of reflective thought can be a challenge. When a student fails to meet the high standards set, it sometimes stems from problems processing, applying, and synthesizing the information needed in order to diagnose and treat the patient population typically encountered in a physical therapy setting. Although there have been many different definitions of critical thinking in the literature (Halpern, 1999; Aviles, 1999; Aviles, 2000), the term *Critical Thinking* in this paper refers to an individual's ability to analyze, evaluate, infer, reason deductively, and reason inductively (Facione and Facione, 2006).

Racial Disparities Related to Opportunity and Critical Thinking

Keeping information taught in a classroom fresh and authentic is typically an effective way to achieve a higher level of attention and motivation among young adult learners as they tend to perform better when tasks involve novel experiences. Participation in innovative problem solving situations requires more fluid than crystalized intelligence thereby enhancing one's ability to think abstractly and discern new relationships (Horn and Cattell, 1967).

However, what is considered “new” for some students might not be new for others.

Socioeconomic status and ethnicity have been found to coincide with educational disparities that often lead to less exposure to newer, more innovative methods of teaching (Welner and Carter, 2013). There is not only an *Achievement Gap* between the races in the United States; there is also a major *Opportunity Gap*, and these two entities seem to run hand-in-hand (Oakes, Lipton, Anderson, and Stillman (2013). African Americans as a group have been found to have less of an opportunity to be in a classroom that promotes a higher level of reflective critical thinking (Welner and Carter, 2013). This lack of exposure could lead to lower scores on high stakes tests. Nisbett et al. (2012) found that environment and socioeconomic status can also play a role in measured IQ, again stressing the magnitude of this opportunity gap. Not all students, even those in a graduate physical therapy program, have been exposed to the same quality of education prior to being admitted into the program.

The original purpose of this research was to develop a workshop to build skills in reflective critical thinking for doctoral physical therapist students, and to see if there would be a difference in the pre- and post- Health Sciences Reasoning Test (HSRT), scores when compared to a control group. This study took a turn when within-group effects for race were later scrutinized.

Methods

This study was conducted with doctoral physical therapist students at Tennessee State University (TSU).

Participants

The participants in this study were doctoral physical therapist students in their first or second year who had not yet been exposed to this, or any similar workshop at TSU. Forty-eight participants (19 male, and 29 female) met the criteria for inclusion. These students were

randomly assigned to two groups (N = 24 participants in each group). One group attended the first workshop, and the other group did not, and served as the control group (who later attended a second workshop). Both groups took the HSRT before and after the first workshop, to provide data from a group that attended the workshop (the experimental group), and from a group that did not yet attend the workshop (the control group).

The Workshop

A reflective critical thinking workshop was developed for the classes of 2011 and 2010. The development of this workshop was based upon the elements depicted in Bloom's Taxonomy (Aviles, 2000; Bloom, 1984; Huitt, 1998), incorporating strategies for metacognition (Dean and Kuhn, 2003), collaboration (Vygotsky, 1978), and hands-on learning ((Dewey, 1916) (See Appendix).

Instrumentation

All students (experimental and control) took the Health Science Reasoning Test (HSRT) before and after the first three-session workshop. The HSRT is a version of the California Critical Thinking Skills test that focuses on five criteria of critical thinking (problem solving, deductive reasoning, analysis, inference, and evaluation). This workshop incorporated information currently being covered in the PT course curriculum, focusing on studying methods for increased utilization of application and less memorization. The results were then compared to see if there was a significant difference in the test-retest score of the experimental group when compared to the control group. Within group differences were also calculated.

Results

Testing the Original Hypothesis

An analysis of variance (AVOVA) was used to compare the different group criterion means to determine if the differences occurred were greater than those which might happen by chance alone. When comparing results of the critical thinking scores on the HSRT between the experimental and control groups, there was a slight increase in the evaluative and problem solving scores for the experimental group; but these differences were not found to be statistically significant. In fact, students in the control group showed greater improvements in deductive reasoning and inference. The control group's improved scores may have been due to students' recent exposure to items on the first test, a phenomenon called test-retest attenuation (Maruish, 2004). Because no statistically significant improvements were found when the scores of the experimental group were compared to the control group, the scores on the HSRT were examined more closely with respect to demographics in an analysis of within-group effects.

Analysis of the Experimental Group Alone

When the subjects were randomly assigned to the two groups, controlled random assignment for race was not conducted. For this reason, there were more African Americans in the experimental group (N=7) than in the control group (N=1). The experimental group was, therefore, analyzed further for differences between subgroups. Paired t-testing was administered to analyze the differences between the pre-test and post-test scores for participants in one subgroup. When looking more closely at the experimental group, it was found that the African American subgroup (N=7) made significant gains in their total HSRT score ($p=.027$, with an effect size of $d = .619$). There was one Asian participant, whose results were not included in this part of the study. Although the Caucasian subgroup (N=16) also experienced gains in the total

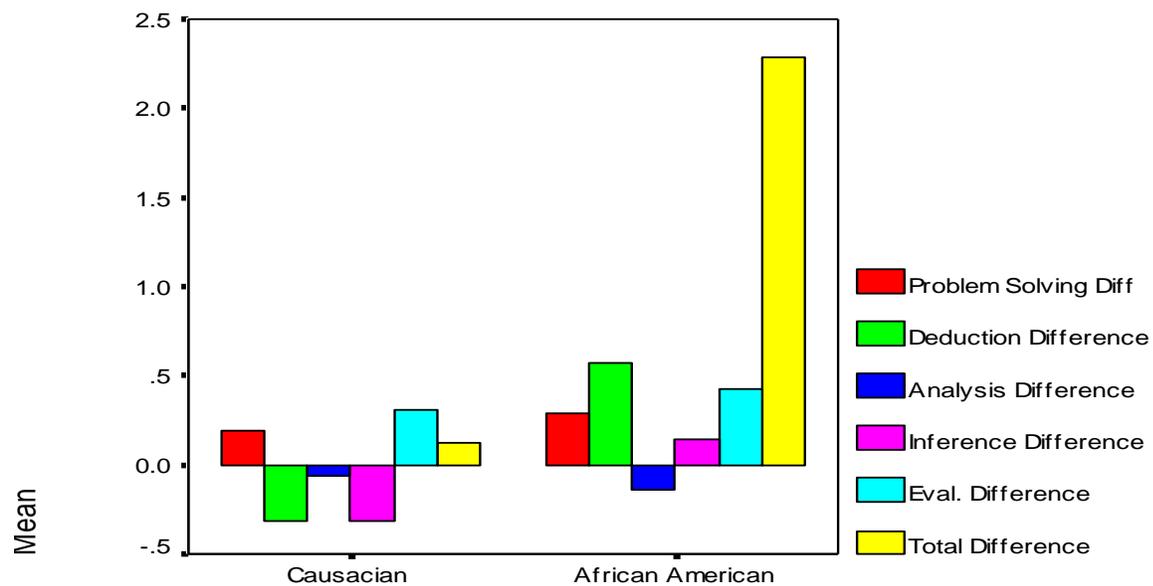
score, these were not found to be statistically significant ($p=.849$, with a smaller effect size of $d = .033$) (See Table). The most impressive pre-posttest gains in HSRT scores for the African American students following the workshop were in the areas of deductive reasoning, and evaluation

(See Figure 1).

Table – Paired-samples t-test for total pre and post HSRT scores for African American students compared to Caucasian students

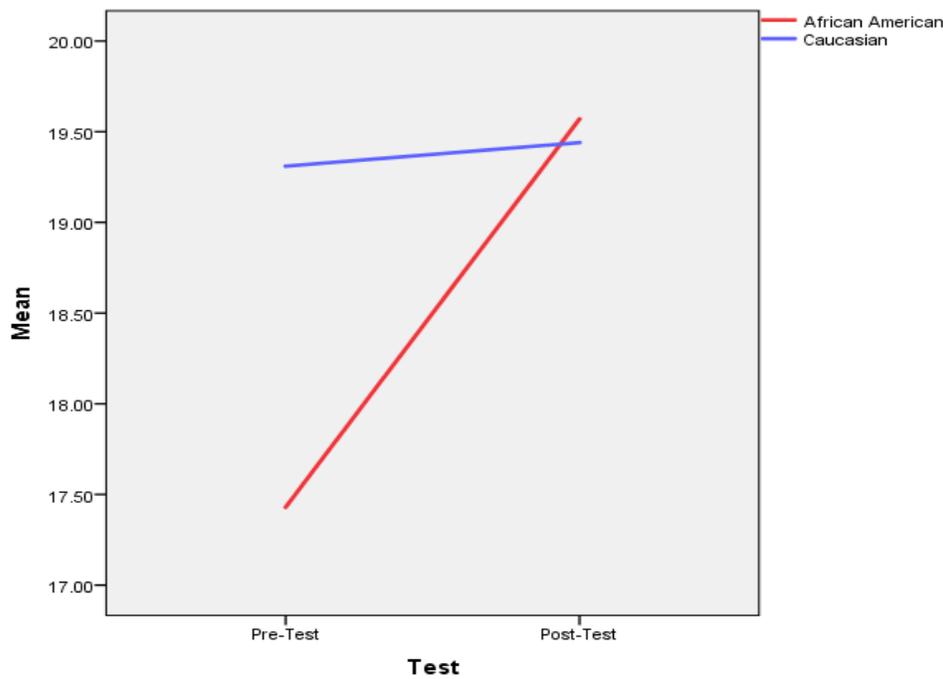
Group	Paired Differences			Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	
African American	-2.14	1.952	.738	.027
Caucasian	-.13	2.579	.645	.849

Figure 1 - Pre-test means, minus post-test means for group



When looking at the means of the total HSRT pre-posttest scores, there was a dramatic difference between the Caucasian group and the African American group (See Figure 2). Although the Caucasian group scored higher on the HSRT than the African American students during the pre-test (Caucasian = 19.31; African American = 17.43), the African American students scored slightly higher on the post-test for the HSRT than the Caucasian students (Caucasian = 19.44; African American = 19.57). The effect size for the difference between the pre-minus-post total HSRT scores for these groups was $d = .887$, and this was significant at the .05 level ($p = .045$).

Figure 2 – Depiction of group means for pre-test and post-test HSRT scores



Discussion/Conclusion

Insights

Most of the students participating in this study and workshop reported gaining new insight with respect to their own personal learning style and studying strategies. No statistically significant gains in HSRT score were found in the experimental group when compared to the control group, so the data of the experimental group alone were examined more closely. The increase in total HSRT score demonstrated by the Caucasian subgroup on the post-test was not statistically significant, but the African American subgroup showed significant gains in the total HSRT score when comparing the pre-test to the post-test. The African American subgroup also demonstrated higher scores on the final post-test than did the Caucasian subgroup.

The Caucasian students later mentioned as a group that they may have shown more benefit from the workshop if the material presented had been new. Many reported that they had been previously exposed to much of this material during their undergraduate studies. This supports the earlier work of Horn and Cattell (1967), that novelty supports learning in this age group. The African American students, on the other hand, stated that for them, the activities in the workshop were novel activities to which they had never been previously exposed. One student even used the words, "lack of prior opportunity." This connection between the African American student's reported lack of opportunity and the lower scores on the pre-test, would collaborate with the contention of Welner and Carter (2013) and Oakes, Lipton, Anderson, and Stillman (2013). Once exposed to the material, however, the African American students actually achieved higher scores than their Caucasian classmates. This supports the assertion that a lack of opportunity could be a powerful influence, and one of the variables leading to the test score discrepancy based on race

in this country. It could also help explain the lower test scores based on race on the NPTE reported by Utzman, Riddle, and Jewel (2007).

Limitations

Limitations in this study included the small sample size and the unequal number of African American to Caucasian student representation, so the results should be interpreted with caution. Although the true reason for the discrepancy between races in this study remains unclear, information could help provide an indication of teaching strategies that may prove most effective for use with various groups. This could be important in an effort to decrease the discrepancy in standardized testing scores between groups based upon ethnicity as evidenced in the literature (Berlak, 2001; Johnson, Boyden, and Pittz, 2001; Bosher, 2003; Utzman, Riddle, and Jewell, 2007).

Future Endeavors

The initial racial disparity on the HSRT in this study was eliminated after the students were exposed to the strategies used in this workshop, thus removing any misconceptions. Finding a way to reach even one student is an accomplishment, and with the help of student focus groups, and continuation of workshops like this, more novelty could be added to affect all students. However, it still begs the question, why weren't the African American students ever exposed to the same learning strategies as their Caucasian counterparts? The healthcare profession has an under-representation of people from minority groups working as healthcare professionals. This discrepancy includes the field of physical therapy (Haskins, 2006). If teaching strategies can be identified to target these less-fortunate groups, this could be a great benefit to the profession, in an effort to provide more inclusion and equity in the health care arena.

Acknowledgements

This research was conducted with assistance from the TSU Faculty Research Award (FRA) which provided support for the purchase of a practice examination for the NPTE, the Health Science Reasoning Test (HSRT), and other materials and services needed to develop, assess, and reassess an ongoing program of critical thinking instruction that could eventually be incorporated into the core curriculum. This researcher would also like to thank Dr. Rosalyn Pitt and Dr. Ronald Barredo for their guidance and support.

References

- APTA (2007). PT Demographics Race/Ethnic Origin of Members. *American Physical Therapy Association*. Retrieved from <http://www.apta.org/AM/Template.cfm?Section=Demographics&CONTENTID=41547&TEMPLATE=/CM/ContentDisplay.cfm>
- Aviles, C.B. (1999). Understanding and testing for “Critical Thinking” with Bloom’s Taxonomy of Educational Objectives. *The 1999 Counsel on Social Work Education, 45th Annual Conference*. Retrieved. <https://eric.ed.gov/?id=ED446025>
- Aviles, C. B. (2000). *Teaching and Testing for Critical Thinking with Bloom’s Taxonomy of Educational Objectives*. Buffalo State College. Buffalo: NY. Retrieved. <https://eric.ed.gov/?id=ED446023>
- Berlak, H. (2001). Race and the achievement gap. *Rethinking Schools On-Line*. Retrieved. http://www.rethinkingschools.org/archive/15_04/Race154.shtml
- Bloom, B.S.(1984). *Taxonomy of Educational Objectives, Book 1: Cognitive Domain*. New York: Longman.
- Bosher, S. (2003). Barriers to creating a more culturally diverse nursing profession: Linguistic bias in multiple-choice nursing exams. *Nursing Education Perspectives, 24*(1): 25-34.
- Census (2010). EEO-ALL03W Occupational groups by sex, race/ethnicity for worksite geography, total population. *U.S. Census*. Retrieved. <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>
- Dean, D., Kuhn, D. (2003). *Metacognition and Critical Thinking*. Teachers College, Columbia University. Retrieved. <http://files.eric.ed.gov/fulltext/ED477930.pdf>

- Dewey, J. (1916). *Democracy and Education: An Introduction to the Philosophy of Education*. New York: The Free Press.
- Edwards, I., Jones, M., Carr, J., Braunack-Mayer, A., Jensen, G.M. (2004). Clinical reasoning strategies in physical therapy. *Physical Therapy*, 84(4): 312-330.
- Eelis, K., Davis, A., Havighurst, R.J., Herrick, V.E., Tyler, R.W. (1951). *Intelligence and Cultural Differences: A Study of Learning and Problem Solving*. Chicago: University of Chicago Press.
- Facione, N.C., and Facione, P.A. (2006). *Health Sciences Reasoning Test: A Test of Critical Thinking Skills for Health Care Professionals, Manual: 2006 Edition*. Millbrae, CA: Insight Assessment, California Academic Press.
- Foord-May, L. (2006). A faculty's experience in changing instructional methods in a professional physical therapist education program. *Physical Therapy*, 86(2): 223-235.
- Gottsfeld, I.B. (2000). Using a web-based learning environment to promote development of critical thinking skills in baccalaureate undergraduate nursing students. *International Journal of Continuing Engineering Education and Life-Long Learning*, 10 (1-4): 175-181.
- Halpern, D.F. (1999). Teaching for critical thinking: Helping college students develop the skills and dispositions of a critical thinker. In C. M. Wehlburg, *New Directions for Teaching and Learning*, 80: 69-74. San-Francisco, CA: Jossey-Bass.
- Haskins , B (2006). Recruitment and Retention of students from minority groups. *Physical Therapy*, 86(1):19-29.
- Horn, J. L., Cattell, R. B. (1967). Age differences in fluid and crystallized intelligence. *Acta Psychologica*, 26: 107-129.

- HPSO (2007). Archived Cases. *Healthcare Providers Service Organization*. Retrieved.
<http://www.hpso.com/case/caseindex.php3#search> on May 5th, 2007.
- Huitt, W. (1998). Critical thinking: an overview. *Educational Psychology Interactive*. Valdosta, GA: Valdosta state University. Retrieved.
<http://chiron.valdosta.edu/whuitt/col/cogsys/critthnk.html> on May 5th, 2007.
- Jette, D.U., Grover, L., Keck, C.P. (2003). A qualitative study of clinical decision making in recommending discharge placement from the acute care setting. *Physical Therapy*, 83(3):224-236.
- Johnson, T., Boyden, J.E., Pittz, W.J. (2001). *Racial Profiling and Punishment in U.S. Public Schools: How zero tolerance policies and high stakes testing subvert academic excellence and racial equity*. Report from the U.S. Department of Education: Office of Educational Research and Improvement. Oakland, CA. Retrieved.
http://www.lausd.k12.ca.us/district_g/resources/small_lrn_com/files/profiling.pdf
- Kowalczyk, N., and Leggett, T.D. (2005). Teaching critical thinking skills through group-based learning. *Radiologic Technology*, 77: 24-31.
- Marco, G.L. (1988). Does the use of test assembly procedures proposed in legislation make any difference in test properties and in the test performance of Black and White test takers? *Applied Measurement in Education*, 1(2):109-133.
- Martin, C. (2002). The theory of critical thinking of nursing. *Nursing Education Perspectives*, 23(5): 243-247.
- Maruish, M. (2004). *The Use of Psychological Testing for Treatment Planning and Outcomes Assessment*. New York: Routledge.

- Nisbett, R.E., Aronson, J., Blair, C., Dickens, W., Flynn, J., Halpern, D.F., Turkheimer, E. (2012). Intelligence: New findings and theoretical developments. *American Psychologist*, 67(2): 130-159.
- NPTE (2008). *2008 NPTE Candidate Handbook: For the National Physical Therapy Examinations: PT, PTA*. Federation of States boards of Physical Therapy . Accessed August 9, 2008. Retrieved.
<http://www.fsbpt.org/download/CandidateHandbook20080715.pdf>
- Oakes, J., Lipton, M., Anderson, L., Stillman, J. (2013). *Teaching to Change the World*. New York: Paradigm Publishers.
- Obiakor, F.E. (1992). *Multiculturalism in Higher Education: A Myth or Reality?* Paper Presentation for the Multicultural Fair. Chattanooga, TN. February 6, 1992. Retrieved.
<https://eric.ed.gov/?id=ED343511>
- Pitney, W.A. (2002). The professional socialization of certified athletic trainers in high school settings: A grounded theory investigation. *Journal of Athletic Training*, 37(3): 286-292.
- Plack, M.M., and Santasier, A. (2004). Reflective practice: A model for facilitating critical thinking skills within an integrative case study classroom experience. *Journal of Physical Therapy Education*, 18(1): 4-12.
- Seybert, A.L., Laughlin, K.K., Benedict, N.J., Barton, C.M., and Rea, R.S. (2005). Instructional Design and Assessment: Pharmacy student response to patient-simulation mannequins to teach performance-based pharmacotherapeutics. *American Journal of Pharmaceutical Education*, 70(3), Article Number 48.
- U.S. Census (2010). The Black Population: 2010. *United States Census*. Retrieved:
<https://www.census.gov/prod/cen2010/briefs/c2010br-06.pdf>

- Utzman, R.R., Riddle, D.L., Jewell, D.V. (2007). Use of demographic and quantitative admissions data to predict performance on the national physical therapy examination. *Physical Therapy, 87*(9): 1181-1192.
- Utzman, R.R., Riddle, D.L., Jewell, D.V. (2007a). Use of demographic and quantitative admissions data to predict academic difficulty among professional physical therapist students. *Physical Therapy, 87*(9): 1164-1180.
- Velde, B.P., Wittman, P.P., and Vos, P. (2006). Development of critical thinking in occupational therapy students. *Occupational Therapy Intervention, 13*(1): 49-60.
- Vendrely, A. (2005). Critical thinking skills during a physical therapist professional education program. *Journal of Physical Therapy Education, 19*(1): 55-59.
- Vygotsky, L. (1978). *Mind in Society: The Development of Higher Psychological Processes*: Cambridge, MA: Harvard University Press.
- Wade, G.H.(1999). Using the case method to develop critical thinking skills for the care of high-risk families. *Journal of Family Nursing, 5* (1): 92-109.
- Welner, K.G., Carter, P.L. (2013). *Closing the Opportunity Gap*. New York: Oxford University Press.

APPENDIX:**The Workshop**

The workshop: The workshop developed for the pilot study that was conducted during the Summer of 2008 was created by this author, and patterned after Bloom's Taxonomy (Bloom, 1984):

The **first session** began with a short historical account of the critical thinking paradigms utilized to promote critical thinking. The students begin the reflective process by completing a short VAS (visual, auditory, kinesthetic) questionnaire to provide them with information pertaining to their individual, preferred learning styles. An overview of the levels of Bloom's Taxonomy was conducted, and students were oriented to the outline for the rest of the workshop, which is built around this taxonomy. The students were then introduced to the (basic) meaning of the words, "metacognition" and "reflection," collaboratively discussing these terms, and what they mean to the students as individuals. They were then introduced to theoretical constructs pertaining to critical thinking, including information processing, learning styles, multiple intelligences, the human genome, and the effect of healthy living on cognition. Next, the students discussed the first level of Bloom's taxonomy, Knowledge. In collaborative groups, the idea of knowledge (memorization, recall, lists, etc.) was depicted using mind maps of course content, chunking, and method of loci of recently learned material in the physical therapy courses, with curriculum alignment for each class. This year, the topic chosen by the students was human anatomy. Other ideas such as mnemonics, acronyms, and songs were introduced.

The **second session** covered the taxonomy levels of understanding, application, and analysis. The students first learned the meaning of the word, Understanding, then tried to understand a list of words by categorizing similar entities. Students were then asked to memorize the path of blood flow through the human body for the knowledge stage, after which they talked

about the flow of the blood within the body to provide a visualization of the process, and an understanding. After these activities, the students were asked to individually write down the path of blood flow through the heart. (During the workshop this past summer, most of the students found that understanding the information brought about better recall than their previous attempt at memorization.) The class then broke into collaborative groups to focus on a new topic (lung capacities) and to create a diagram that depicted understanding. This activity is followed by Application. During this segment of the session, students learned to apply, choose, demonstrate, and practice using the information related to blood flow and lung capacity. The students were asked questions, such as, “Where in the heart would a partial obstruction need to be to cause pulmonary edema?” or “If you knew that the Functional Residual Capacity (FRC) in an individual remained unchanged, but the Expiratory Reserve Volume (ERV) had increased, what must have happened to the Residual Volume (RV)?” The students were encouraged to discuss their answers in collaborative groups, to use metacognitive strategies to explain how they came to their conclusions, and to re-think their answers. The third segment of the second session covers Analysis, encouraging students to appraise, differentiate, and question. In collaborative groups, students were asked to compare and contrast two muscles of the posterior thorax for origin, insertion, action, and innervation, explaining how (in biomechanical terms) the muscles perform various movements. The groups were then asked to present their findings to the rest of the class using a poster-board created by the group, and using reflective critical thinking to explain the group’s thought processes. The students were then divided into two groups for curricular alignment. The 2010’s used their analytical skills to answer mock board exam questions, and the 2011’s made posters of origins and insertions, using analysis to explain the angle of pull, and why the muscles perform specific actions. They then had to explain the

agonists, antagonists and eccentric versus concentric contractions. As homework, students were asked to think about their preferred styles of learning, and attempt to understand their own comfort zones, but dare to move outside these comfort zones to exercise areas that may need strengthening.

The **third session** began with a re-cap of the first four levels of Bloom's Taxonomy, then precedes to the next level, Synthesis, with organization, development, design, and creativity. The class was divided into 6 groups. Each group received a different article published in the *Journal of Physical Therapy* about clinical decision making and critical thinking. They read the article in their groups, and talked together to promote an understanding of the process recommended in the article. Each person in the group, then needed to be able to teach the concept to the other groups. Then, one-by-one, each group would split, with each member migrating to one of the other groups to teach the concept from their article. The other groups were to take notes from each of their "teachers." Then the groups were then asked to synthesize their own idea from their article, and from the articles of the others to form a new strategy for clinical decision making, and for studying in the classroom. After this, the students were to present their new strategy to the class. The students then, moved on to Evaluation or the ability to choose, assess, appraise, defend, predict, value and judge. The term evaluation was defined for the students, along with the elements of critical thinking defined by Facione and Facione: analysis, evaluation, inference, deductive reasoning, and inductive reasoning (Facione and Facione, 2006). Students performed a peer review of the presentations just given by the other students, and are asked to metacognitively justify their assessments. For the next activity, actual cases of physical therapist litigation were obtained from the Healthcare Providers Service Organization (HPSO, 2007) website. Students were given all the information except the names of the people involved, and

the verdict. Students were separated into 6 groups, with members from both class cohorts (i.e. students from the class of 2010 and the class of 2011) in each group. Each group was asked to present a separate court case by acting out the parts, with the rest of the class acting as the jury. After each case was presented, the class collaboratively deliberated to decide on a verdict using their ability to argue, and defend their stance. This required the use of analysis, evaluation, inference, indicative reasoning, and deductive reasoning. After each verdict was delivered, and after a short discussion of the metacognitive strategies used to reach that collaborative verdict, the instructor informed the class the actual decision of the real-life case. The third session ended with a recap of Bloom's Taxonomy, and new ways to apply these ideas to classroom study and clinical education experiences. There was a short graduation ceremony, and students then rated the workshop experience.

The **Health Science Reasoning Test (HSRT)** was given one day before this workshop, and repeated one day after this workshop.