

**COMPARISON OF CRITICAL THINKING IN UNDERGRADUATES
AND GRADUATES IN SPECIAL EDUCATION****Victoria Zascavage***Xavier University*

and

William G. Masten**Jennifer Schroeder-Steward**

and

Christopher Nichols*Texas A&M University*

This study assessed overall critical thinking ability in graduate and undergraduate students in special education at a southwestern university. A comparison of the two groups resulted in significant differences on the Watson-Glaser Critical Thinking Appraisal Form Short (WGCTA-FS) subscales for Inference, Recognition of Assumption, Deduction, and Total Critical Thinking. Conclusions amalgamate Council for Exceptional Children Standards for a Beginning Special Educator, Bloom's Taxonomy, and the Critical Thinking Scale of the Watson-Glaser- FS. Findings reinforce the need for rigorous mentorship of the novice special educator and direct instruction for the pre service educator in critical thinking through participation in research coursework.

The definition of critical thinking traditionally includes the cognitive strategies used for decision-making, task analysis, and problem solving that result from a mixture of executive functioning skills and metacognitive ability (Elder & Paul, 1994; Cotter, 1992; Morse, 1990; Murray, 1992). The emphasis on critical thinking and rational thought as important components of the educated mind traces back 2500 years to the teaching of Socrates (Center for Critical Thinking, downloaded 5-16-06). During the late 20th century, a deficit in the critical thinking abilities of high school seniors in the United States was declared a form of *unilateral, educational disarmament* (National Commission on Excellence in Education, 1983). *Goals 2000* stated that in the 21st century, critical thinking abilities were necessary for productive employment opportunities and an essential component of a quality education (H.R.1804 Goals 2000: Educate America Act, Section 102-B). Likewise, over the years, researchers, educators, and psychologists have emphasized the importance of critical thinking as one of the highest priorities in a college education (Gadzella, Ginther & Bryant, 1997); Ennis, 1987; Halonen & Gray, 2001; John, retrieved 9/3/2004).

In the field of special education, critical thinking skills are essential. Since low critical thinking skills reduce the possibility of succeeding in areas that require considerable critical thinking (Gadzella, Ginther & Bryant, 1997), the critical thinking ability of special educators becomes an issue of considerable importance (Kamen, 2004). For example, the individualized education plan (IEP) is the vehicle for the informed decision making process guiding the educational opportunities of students with disabilities (Bateman, 1995). In order to design an appropriate IEP, special educators must be able to evaluate information gathered from observations and the assessment of research-based interventions (Bateman, 2004; Schenk, 2001; Smith & Brownell, 1995; Smith & Simpson, 1989). Smith and Simpson (1989) contend that without critical-thinking abilities, the construction of annual goals on the IEP extends beyond the scope of the special educator's competence.

White and Burke (1994) tested the critical thinking ability of 123 senior level education majors using the Watson-Glaser Critical Thinking Appraisal (WGCTA) and found that the total critical thinking scores for this group was below national norms at the time of testing. Even though they discovered no correlation between the total critical thinking ability (CTA) and scores on the Examination for Teacher Certification in Texas, they were concerned that those with weak critical thinking skills might be unable to teach or apply these skills. In contrast to the White and Burke study (1994), Chambers,

Munday and Justice (1999), using the Cornell Critical Thinking Test, determined that the critical thinking abilities of 116 undergraduate students enrolled in a teacher preparation program was a meaningful contributor to their success on the professional development section of the Texas state examination for teachers for secondary education.

Given these results, the question then becomes, is it possible to teach essential critical thinking skills? A systematic intervention module consisting of 10 two-hour sessions was used by Kong and Seng (2004) in an attempt to answer this question. They sought to increase the total critical thinking scores (CTA) of 107 pre-service teachers in Korea. The instrument used for CTA evaluation was the Watson-Glaser Critical Thinking Appraisal Form Short (WGCTA-FS). The post-test showed a significant increase in CTA for those individuals exposed to the intervention module over the control group following intervention.

Additionally, Halpern (1999) supports specifically designed direct instruction in critical thinking. Her four-part model for the instruction of critical thinking starts with instruction in the skills and disposition towards critical thought, but also incorporates structure training and metacognitive monitoring. Structure training teaches discrimination and retrieval of information, thereby enhancing reasoning and problem-solving ability. Metacognitive monitoring addresses the executive functioning skills of critical thinking (i.e., the evaluation of the appropriateness of the goal and the progress of the endeavor). Incorporated into the Council for Exceptional Children Standards for a Special Educator (1998) are the aforementioned skills of metacognition, discrimination, and critical thought (Figure 1 next page).

Is critical thinking ability a byproduct of advanced educational opportunities? Orwuegbuzie (2001) compared Master's level and Doctoral students on total critical thinking ability. Doctoral students scored significantly higher than Master's level students did in overall CTA. Another study compared undergraduate students to graduate students in the social sciences and math and found a significant effect for educational level on CTA as measured by the WGCTA (King, Wood, & Mines, 1990). The total CTA of the social science majors increased with educational levels for both male and female participants. However, for mathematics majors, the CTA decreased for female graduate students compared to female undergraduate students leading to the conclusion that higher CTA abilities are not an inherent outcome of higher education.

In special education, critical thinking and individual learning processes are, by definition, components of decision-making, task analysis, problem solving, and data interpretation, all of which support the successful implementation of research-based interventions and the IEP process (Bateman, 2004). Our study sought to determine whether the more experienced and educated special educators, the special education graduate students, would demonstrate higher levels of critical thinking on the WGCTA-FS when compared to the pre-service special education students.

Method

Participants

Participants were 195 graduate and undergraduate students in special education at a southwestern university. Overall 56% were undergraduates in their junior/senior year of study ($n = 110$) and 44% ($n = 85$) were graduate students returning to school during the evening to seek a Master's degree. Within this group of 195, female students outnumbered male students 6 to 1. The testing of participants spanned two academic semesters. All participation was voluntary and confidentiality of testing outcome was assured and maintained.

Instrumentation

The WGCTA-FS has five subtest scores:

- 1) *Inference*, where the subject determines to what extent one can discriminate the veracity of the statements from data provided;
- 2) *Recognition of Assumptions*;
- 3) *Deduction*, a skill that asks the subject to decide whether certain conclusions necessarily follow the information provided;
- 4) *Interpretation*, where the subject considers the evidence and applies the information; and
- 5) *Evaluation of Arguments* (Watson & Glaser, 1994b).

Figure1 How Critical Thinking Relates to Special Education

Reference: Watson-Glaser, 1994; Anderson & Krathwohl, 2001; The Council For Exceptional Children, 1998. (CC represents the Common Core Location and S represents the section within this core of the CEC Manual)

The Total Critical Thinking Appraisal Score sums the five subtest scores and provides an overall estimate with respect to critical thinking (Watson & Glaser, 1994b). The reliability and validity of the WGCTA-FS has been reported in previous studies and is provided in the testing manual (Gadzella, Stacks, Stephen, & Masten, 2003; Watson & Glaser, 1994b). Recently, Gadzella, Hogan, Mastens,

Watson Glaser Critical Thinking Appraisal	Bloom's Taxonomy	CEC Essential Areas of Knowledge and Skills
	Knowledge & Application Factual Dimensions Procedural Dimensions	Knowledge – CC 1,2,3,4,5,6,7,8 : historical, legal, characteristics, assessment, instructional content, planning, behavior management, communication, collaboration, and ethics
Inference	Knowledge & Analysis: patterns, identification of components and organizational parts; Factual, Conceptual & Metacognitive Dimensions	Skills :CC3,S5 Interpretation of information from formal and informal assessment; CC3,S10 Evaluate results of instruction
Recognition of Assumptions	Analysis- recognition of hidden meanings, seeing patterns; Evaluation- recognize subjectivity, discriminate; Conceptual , Metacognitive Dimensions	Skills: CC2,S1 Assessments of characteristics; CC6,S4 Identify realistic expectations for personal and social behavior in various settings
Deduction	Knowledge & Analysis- organization of parts; Factual, Procedural & Conceptual Dimensions	Skills: CC2,S1 Assessment of characteristics; CC3,S10 Evaluate results of instruction; CC4S9 Sequence , implement, and evaluate individual learning objectives
Interpretation	Synthesis- generalize from given facts, relate knowledge from several areas, predict, draw conclusions; Conceptual & Metacognitive Dimensions	Skills: CC3,S5 Interpretation of information from formal and informal assessment; CC4,S1 Interpret assessment data for instructions; CC5, S4 Incorporate evaluation, planning, and management procedures that match learner needs with the instructional environment; CC4, S3 Develop comprehensive, longitudinal, individualized programs
Evaluation of Arguments	Evaluation- assess value of theories , make choices based on reasoned argument; Conceptual & Procedural & Metacognitive Dimensions	Skills: CC2,S1 Assessment of characteristics; CCC3,S11 Evaluate supports needed for integration
Total Critical Thinking Ability = Summation of Evaluation, Deduction, Interpretation, Inference, Recognition of Assumptions	Dimensions of Cognitive Processing :Factual, Conceptual, Procedural, and Metacognitive	CEC Common Core of Knowledge and Skills Essential for All Beginning Special Educators

Stacks, Stephens, and Zascavage (2006) determined the internal consistency of the WGCTA-FS acceptable when the instrument tested the total critical thinking ability of graduate and undergraduate students (graduate $\alpha = .78$; undergraduate $\alpha = .92$).

Analysis

A one-way MANOVA investigated the difference between undergraduate and graduate students on the WGCTA-FS. Six dependent variables associated with the WGCTA were Inference, Recognition of Assumption, Deduction, Interpretation, Evaluation, and Total Critical Thinking. The independent variable was degree level status; graduate versus undergraduate students.

Results

A MANOVA indicated a statistically significant difference between graduate and undergraduate

students ($N = 195$) on the combined dependent variables: $F(6, 188) = 4.21, p = .001$, Wilks' Lambda = .882; partial eta squared = .118. When the results for the dependent variables were considered separately, using a Bonferroni adjusted alpha level of .0083, Inference, Recognition of Assumptions, Deduction, and Total Critical Thinking scores reached statistical significance

- Inference $F(1, 193) = 10.567, p = .001$, partial eta squared = .052;
- Recognition of Assumptions $F(1, 193) = 7.551, p = .007$, partial eta squared = .038;
- Deduction $F(1, 193) = 11.306, p = .001$, partial eta squared = .055; and
- Total Critical Thinking $F(1, 193) = 14.046, p = .001$, partial eta squared = .068.

An inspection of the mean scores indicated that when comparing the undergraduates to the graduate student, the undergraduate student consistently scored lower (Table 1).

Table 1
Significant Independent Variables on the WGCTA-FS for Students in Special Education Coursework (N = 195)

The level of CTA for undergraduates enrolled in special education coursework (23.63) was low when compared to the normative scales established by Watson-Glaser (1994b) in the test manual. Case in point, the test manual reported mean scores in total CTA for railroad dispatchers (25.15) and security applicants (25.00), scores that were 5% higher than our undergraduate subject pool. Moreover, our study found an 11% difference in the total critical thinking ability between graduate and undergraduate students in special education. Graduate students tested for total critical thinking averaged 26.58 as compared to the undergraduate students who average 23.63. Interpretation and Fact Retention were the only subscales of the WGCTA-FS where the mean of the undergraduates exceeded that of the graduate

Dependent Variable	Mean	Standard Deviation
Inference		
Undergraduate	3.3355	1.475
Graduate	4.118	1.802
Recognition of Assumption		
Undergraduate	4.464	2.273
Graduate	5.365	2.226
Deduction		
Undergraduate	5.245	1.916
Graduate	6.141	1.746
Total Critical Thinking		
Undergraduate (n=110)	23.627	5.011
Graduate(n=85)	26.576	5.968
For $p < .001$		

students and neither of contribute to the difference between graduate and undergraduate total critical thinking ability. Total critical thinking ability is, according to the author's of the test (Watson-Glaser, 1994b) the most reliable subscale to evaluate overall individual critical thinking ability.

Discussion and Implications

To raise the level of CTA for undergraduate special educators before they enter the work force as teachers will not happen without active intervention. Therefore, we agree with Van Horn (1999) and Smith & Brownell (1995) that a significant portion of college preparatory coursework should include a component of critical thinking.

Critical thinking ability can be taught (Halpern, 1999). For example, a systematic intervention module consisting of 10 two hour sessions was used by Kong and Seng (2004) in an attempt to increase the total critical thinking scores (CTA) of 107 pre-service teachers in Korea. The instrument for CTA evaluation was the WGCTA-FS. The post- test showed a significant increase in CTA over the control group following intervention.

Current research supports a bidirectional relationship between critical thinking and research skills (Onwueguzie, 2001). The improvement of critical thinking skills increases as the student's research skills improve. This in turn enhances students' research competency and by implication, their ability to

implement research-based intervention. The use of research-based interventions for the education of students with disabilities is a critical component of IDEA (2004) and No Child Left Behind (The Secretary's Fourth Annual Report on Teacher Quality, 2005). Best practice in lesson planning, assessment, and IEP development engages the educator in research based tasks. These same tasks (understanding, evaluation, synthesis and application of information) are the components of critical thinking ability.

In order to paint a clear picture of what is required of today's special educator and to place critical thinking into this picture we compared the subscale descriptions of the Watson-Glasser to CEC standards, and Bloom's Taxonomy of essential thinking skills (Figure1). Drawing from the similarity of wording, Figure 1 compares the Bloom's Taxonomy with the CEC standards for a beginning special educator. In the same manner, the subscale descriptions within the Watson-Glasser are compared to Bloom's Taxonomy. Specifically, the WGCTA-FS critical thinking skills of evaluation and interpretation, and Bloom's cognitive levels of synthesis and analysis use similar words to describe the same thought processes.

It is our contention that directly teaching the evaluation and interpretation of information through the lens of Bloom's taxonomy to undergraduate special educators might effectively raise their critical thinking ability. The use of instruction based on *Bloom's Taxonomy of Educational Objectives* to increase cognitive skills is not a new concept. It has been and continues to be a useful gauge against which educational professionals can measure mean thinking levels (Wilson, 1973). The nature of instruction might well focus on case study analysis of students with special needs. Using case studies as training manuals, experienced educators could mold the critical thought processes of the fledgling teacher.

Krull (2005) addressed the disparity of skills between the undergraduate and the graduate, the experienced and the novice educators, and supported formal mentoring programs. He recommends supervisory mentors from the teacher faculty at local universities work in conjunction with the local educational faculty to support and supervise the intern-level educator. Supervisory teachers would be those considered by the administration as the more able to make critical choices and set educational priorities.

There are some pitfalls to the mentoring system. In special education, for example, mentoring may not be a simple task of assigning a more experienced teacher to the novice educator. It is important to consider whether the potential mentor educator has the precise knowledge and competencies to assist the new special educator. Drawing conclusions from our research, we might expect the Masters level educator to be a more skilled critical thinker. However, conveying this skill to the new special educator might need a mentoring specialist skilled in the evaluation and implementation of critical thought as it applies to the field of special education. Specifically, mentor specialists could be university personnel, who continue to guide the novice teacher during their first few years of teaching and IEP development. Mentorship might use the skills of doctoral level graduate students engaged in field service work. Schools could draft their Master level special educators who demonstrate critical thinking ability to train incoming teachers in the art of critical thought as it applies to special education tasks.

Perhaps what keeps our schools from wholeheartedly endorsing this tenet is a combination of the lack of comprehensive studies in the preparation of mentors and supervisors and the possible financial burden of compensating the master teachers. There is, according to Krull (2005), no reliable research on the effectiveness of mentor programs. He suggests, and we concur, that research concentrate on mentor effectiveness and the role of supporting the learning of practical skills related to theory. We see a particular need for this line of research in the field of special education where mentoring might serve to protect the appropriateness of educational decisions dependent upon critical thinking ability.

In Conclusion

We have concluded that the returning graduate student when compared to the undergraduate pre-service special educator is a more capable critical thinker. In addition, we have uncovered the reality of overall low critical thinking ability in our pre-service teachers as it reflects on the field of special education. Critical thinking is not only using the skills of interpretation, evaluation and inference, skills that encompass the foundation for judgment, but application of these skills to the development of appropriate individualized educational plans and research based intervention.

Burbach, Matkin, and Fritz (2004), in their study of 80 undergraduate students enrolled in an introductory leadership program addressed concern about the depressed levels of CTA within their subject pool. The researchers speculated that the results might be attributable to lack of integrative coursework in CTA at the university, a geographic anomaly or possibly the steering of students with low CTA ability into this area of study. The latter is of great concern to the field of special education because there is no easy answer. As universities educating the future special educator, we can integrate CTA into our coursework and volunteer to act as mentors during residency and probationary periods of employment. We can examine a geographic anomaly and apply stringent standards for internship acceptance and residency. However, for the students with exceptionally low CTA who wish to become special educators the university department of special education finds itself in the crossfire between who we are and what we teach.

From the perspective of special education, incomplete and inaccurate thinking puts the disability community at risk. Without critical thought, we open ourselves to fragmented curriculum decisions, assessment bias, and inadequate individualized education planning. When teachers are not able to synthesize and evaluate the many facets needed to plan an individualized education, opportunity barriers to the education of students with disabilities occur (Zascavage & Keefe, 2004).

The lack of critical thought in special education is insidious when students who are victims of poor planning based on inadequate abilities to interpret, evaluate, discriminate, and apply information are the same students who may themselves lack these skills to challenge inept curriculum or contest segregated placement decisions. It is our contention that effective methods of raising the critical thinking ability of undergraduate special educators require directly teaching the skills of evaluation and interpretation of information through the lens of Bloom's taxonomy and applying these skills to the evaluation and implementation of research based interventions.

From the perspective of disability construct, allowing special educators into the field with poor critical thinking ability compromises the quality of the individualized education offered to students with disabilities and violates their rights to an appropriate education. The field of special education needs to lose the make do perspective that is based on supply and demand ratios. An increase in the level of critical thinking ability of the special educator has the potential to effect problem solving ability at a societal level. Williams (2005) refers to the investment of education in critical thinking as a humanitarian challenge and we concur.

References

- Anderson, L. W., & Krathwohl, D. R. (Eds). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman.
- Bateman, B. (2004). Writing individualized education programs for success. Wrights Law, retrieved 8-20-05 from <http://wrightslaw.com/info/iep.success.bateman.htm>
- Bateman, B. (1995). Writing individualized education programs (IEPS) for success. *Secondary Education and Beyond Learning Disabilities Association*. On line 4/27/06 at Wrightslaw, <http://www.wrightslaw.com/advoc/articles/iep.success.bateman.htm>
- Burbach, M., Matkin, G., and Fritz, S. (2004). Teaching critical thinking in an introductory leadership course utilizing active learning strategies. *College Student Journal* 38 (3), 482-493.
- Center for Critical Thinking, Sonoma State University. *A brief history of the idea of critical thinking*. <http://www.sonoma.edu/CThink/K12/k12library/cthistory.ncl> downloaded 5-15-06 from <http://alpha.montclair.edu/~figueroaj/history.html>
- Council for Exceptional Children (1994). *CEC policies for delivering services to exceptional children*. Reston, VA: Author.
- Chambers, S., Munday, S., & Justice, M. (1999). Predictors of success on the Texas State Certification Test for Secondary Teaching. *College Student Journal*, 33(1), 462-478.
- Cotter, B. (1992). Critical Thinking Skills in a Meteorology Curriculum MA . Dissertation University of Massachusetts at Boston. In John, S. (2004). Critical thinking: Its role in managing the future of educational curriculum. Retrieved 9/23/2004 at <http://cwgsy.net/private/sljohn/criticalthinking.htm>.
- Elder, L. & Paul, R. (1994). Critical thinking: Why we must transform our teaching. *Journal of Developmental Education*, 18, 34-35.
- Ennis, R. H. (1987). A taxonomy of critical thinking disposition and abilities. In J.B. Baron & R. J. Sternberg (Eds.) *Teaching thinking skills: theory and practice*, New York: Freeman.
- Gadzella, B., Ginther, D. & Bryant, G. (1997). Prediction of performance in an academic course by scores on measures of learning style and critical thinking. *Psychological Report*, 81, 595-602.

- Gadzella, B., Hogan, L., Masten, W., Stacks, J., Stephens, R., & Zascavage, V. (2006) Reliability and Validity of the Watson Glaser Critical Thinking Appraisal /Forms for Different Academic Groups. *Journal of Instructional Psychology* 33, 141-143.
- Gadzella, B. M., Stacks, J., Stephens, R. C., & Masten, W. G. (2005). Watson-Glaser Critical Thinking Appraisal, Form-S for education majors *Journal of Instructional Psychology*, 32(1), 9-12.
- Halpern, D. F. (1999). Teaching for critical thinking: Helping college students develop the skills and dispositions of a critical thinker. *New Directions for Teaching and Learning*, 80, 69-74.
- Halonen, J. & Gray, C. (2001). *The critical thinking companion*. New York: Worth.
- H.R.1804 Goals 2000: Educate America Act, Section 102-B. 103 Congress. Washington DC 1-25-1994. Downloaded 5-15-2006 from <http://www.ed.gov/legislation/GOALS2000/TheAct/index.html>
- Individuals with Disabilities Educational Improvement Act 2004. H.R.1350, Sect. 177. Retrieved 8-205 at <http://thomas.loc.gov/cgi-bin/query/z?c108:h.1350.enr>:
- John, S. (2004). Critical thinking: Its role in managing the future of educational curriculum. Retrieved 9/23/2004 at <http://cwgsy.net/private/sljohn/criticalthinking.htm>.
- Kamen, M. (2004). Learning to write IEPs: A personalized, reflective approach for pre-service teachers. *Intervention in School and Clinic*, 40, 76-80.
- King, P., Wood, P., & Mines, R. (1990). Critical thinking among college and graduate students. *Review of Higher Education*, 13(2), 167-186.
- Kong, S. & Seng, S. (2004). Enhancing critical thinking skills and dispositions of pre-service teachers. *The Korean Journal of Thinking and Problem Solving*, 14(2), 41-56.
- Krull, E. (2005). Mentoring as a means for supporting student and beginning teachers' practice-based learning. *TRAMES: A Journal of the Humanities & Social Sciences*, 9 (2), 443-458.
- Morse, V. (1990). Merging Instruction in Thinking and Writing MA Dissertation University of Massachusetts at Boston. In John, S. (2004). Critical thinking: Its role in managing the future of educational curriculum. Retrieved 9/23/2004 at <http://cwgsy.net/private/sljohn/criticalthinking.htm>.
- Onwuegbuzie, A. (2001). Critical thinking skills: A comparison of doctoral and master's level students. *College Student Journal*, 35(3), 477-481.
- Smith, W. & Simpson, R. L. (1989). An analysis of individualized education programs (IEPs) for students with behavior disorders. *Behavior Disorders*, 14 (2), 107-116.
- Smith, S. & Brownell, M. (1995). Individualized education program: Considering the broad context of reform. *Focus on Exceptional Children*, 28(11), 1-11
- U.S. Department of Education, Office of Postsecondary Education (2005). *The Secretary's Fourth Annual Report on teacher quality: A highly qualified teacher in every classroom*, Washington, DC: U.S. Government Printing Office.
- White, W. & Burke, C. (1994). Teacher intern behavior influenced by critical thinking and personal social determinants. *College Student Journal*, 28 (2), 141-146.
- Williams, R. (2005). Targeting critical thinking within teacher education: The potential impact on society. *The Teacher Educator*, 40(3), 163-187.
- Wilson, I. (1973). The changes in mean levels of thinking in grades 1-8 through the use of interaction analysis system based on Bloom's taxonomy. *The Journal of Educational Research*, 66 (9), 424-429.
- Van Horn, J. (1999). Critical thinking skills and teaching- research. ERIC Digest Publication. Retrieved 9/23/2004: http://www.penpages.psu.edu/penpages_reference/28507/285072713.html
- Watson, G. & Glasser, E. (1994a). Watson-Glaser Critical Thinking Appraisal Form Short. San Antonio, TX: Psychological Corporation.
- Watson, G. & Glasser, E. (1994b). Watson-Glaser Critical Thinking Appraisal Form Short, Manual. San Antonio, TX: Psychological Corporation.
- Zascavage, V. & Keefe, C. (2004). Opportunity barriers to literacy for students with SSPI. *Focus on Autism and Other Developmental Disabilities*, 19 (4), 223-234.