Critical Thinking Skills and the Intervention Specialist

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Abstract
For the Intervention Specialist in the field of Special Education, critical thinking and the ability to process information are essential to the implementation of research based interventions, the development of individualized education plan, and lesson plan development. To assess overall critical thinking ability, 91 students in special education courses responded to the Watson Glaser Critical Thinking Appraisal Form Short (WGCTA-FS) and the Inventory of Learning Processes (ILP). Total Critical Thinking of the WGCTA-FS significantly related to the Deep Processing and the Elaborative Processing Subscale of the ILP. Since current research supports a significant relationship between critical thinking and research skills (Onwueguzie, 2001) and scientific inquiry and IEP development (Smith & Brownell, 1995), this study supports incorporating explicit critical thinking activities that encourage deep processing and elaborate processing of information into coursework for special education intervention specialists.

Critical thinking skills are essential to decision making, application to practice, determination of source reliability, and the ability to compare and contrast information (Gadzella, Stacks, Stephens, & Masten (2005); Zascavage, Masten, Schroeder-Steward, & Nichols, 2007). In areas where critical thinking supports quality decision making, compromised critical thinking skills reduce the possibility of success (Gadzella, Ginther & Bryant, 1997). For example, the decisions that allow for an effective individualized education for students with disabilities depend upon the interpretation of assessment scores, carefully constructed annual goals, and the implementation of research based interventions. Without critical thinking skills, the intervention specialist would be unable to develop an appropriate individualized education plan for the student with special needs (Bateman, 2004).

Using the using the Watson-Glaser Critical Thinking Appraisal (WGCTA), White and Burke (1994) determined that education majors tested below the national norm in total critical thinking. The researchers compared total critical thinking ability to scores on the Examination for Teacher Certification in Texas and determined that education majors with weak critical thinking scores were passing the state exam. White and Burke expressed concern that pre-service education majors with weak critical thinking skills might not have the level of expertise in critical thinking to effectively evaluate the educational assessment information essential to developing appropriate educational outcomes for all student. Likewise, Chambers, Munday and Justice (1999), concluded that critical thinking ability of pre-service educators contributed to their success on the Texas state examination. Can we improve the critical thinking ability of pre-service interventions specialists? According to Halpem (1999) and Kong and Seng (2004), direct instruction in critical thinking skills increases critical thinking ability. Discrimination and retrieval of information, essential to assessment, and metacognitive skills, essential to reasoning and problem-solving ability, are skills needed to successfully master the requirements set forth in the Council for Exceptional Children Standards for a Beginning Special Educator (CEC, 2004; Zascavage, Masten, Schroeder-Steward, & Nichols, 2007).
Critical Thinking and the Individualized Education Plan

For the special education intervention specialist, critical thinking skills allow for the amalgamation of data from various sources (observations, curriculum based assessments, research based interventions, therapeutic interventions, and the personal characteristics of the student) into one individualized education plan. This plan guides the intervention strategies and special services offered to individuals with disabilities. It’s effective implementation is required by the Individuals with Disabilities Education Improvement Act (2004). The development of this plan depends upon the ability to sequence, implement, evaluate, and measure student progress. These critical thinking skills are dependent upon the ability to deeply process information in order to evaluate and organize (i.e. formulative evaluations) and elaborative processing in order to translate concepts into individualized learning objectives (Mastropieri & Scruggs, 2004). Together these two learning processes allow for critical thinking to take place. Recognition of assumptions, inference, and deduction are also essential skills for IEP development. Recognition of assumptions allows for the development of clear, measurable annual goals and objectives (Bateman, 2004) a skill which is essential to the IEP process. Deduction skills (Watson-Glaser, 1994b) determine if the conclusion necessarily follows the information presented. However, evaluation of argument might well be the cornerstone skill for IEP development (Bateman, 2004). All information that leads to placements decisions must present strong relevant arguments (Individuals with Disabilities Education Improvement Act, 2004). Critical thinking interwoven with deep processing of information is a quintessential for the development of meaningful and appropriate Individual Education Plans for students with disabilities.

Critical Thinking and Research-Based Teaching Methods

Critical thinking is also an essential component to the implementation of research based teaching methods required by No Child Left Behind (The Secretary’s Fourth Annual Report on Teacher Quality, 2005) and the Elementary and Secondary Education Act. Since “a critical skill that teacher preparation programs must address is learning to use research-based intervention and empirical evidence in making classroom decisions” (The Secretary’s Fourth Annual Report on Teacher Quality, 2005, p.11). Methodology used in the classroom must stem from scientifically based research shown to have improved student achievement. The critical thinking skills used to implement research-based interventions depend upon the ability to deeply process information in order to infer, recognize assumptions, make deductions, interpret data and evaluate results. Gadzella, Ginther, Masten, and Guthrie (1997) classified students as either deep or shallow processors of information. Students with high scores on the Deep Processing subscale of the Inventory of Learning Process Scale could be characterized as better able to make conclusions from observed and supposed facts. Being able to draw valid conclusions in order to implement research based teaching methodology is a requirement of the Elementary and Secondary Education Act. (2001) and the foundations of the Individual with Disabilities Education Improvement Act (2004).

Critical Thinking and Lesson Plan Development

Lesson plans based on research based teaching methodology must also be developmentally appropriate, correctly sequenced, and incorporate evaluation, planning, and assessment. Their development will also require deep processing and elaborate processing of information. Assessment and planning depend upon deduction, interpretation, and evaluation of arguments to assure that they meet the student’s needs with a variety of instructional environments (CEC, 2004). Lesson
plans and classroom instruction must be supported by strong research based interventions that have been reviewed and proven by experts in the field of education (U. S. Department of Education, 2003). Educational accountability warrants that critical thinking guides the teacher as they reflect upon the effects of their teaching (The Secretary’s Fourth Annual Report on Teacher Quality, 2005).

**Purpose of the Study**

Critical thinking and individual learning processes are components of decision making, task analysis, problem solving, data interpretation, development of an IEP, effective lesson planning and the successful implementation of research based intervention (Bateman, 2004). This study examined the relationship between the Critical Thinking Scales of the WGCTS-FS and the Learning Processes Scales of the ILP for 91 students enrolled in course work leading to a career as intervention specialists (Table 2). Specifically, the study sought to determine if there existed a relationship between how students processed information and their higher overall critical thinking ability.

**Method**

**Participants and Procedure**

The participants were 91 students enrolled in special education classes at a southwestern university who completed the Watson-Glaser Critical Thinking Appraisal-Form Short, WGCTA-FS, (Watson & Glaser, 1994), and the Inventory of Learning Processes, ILP (Schmeck, Ribich, & Ramanaiah, 1977). The study spanned two semesters and data was collected during class by this researcher and cooperating faculty members. Participants supplied their gender and class rank. Students signed a research release form before responding to the questionnaires. Numbered results prevented identification of students. Students earned a small credit for participation in the assessment instrument. They could also earn an equivalent credit through a non-research option. Of the participant group, 47 were undergraduates in their junior/senior year enrolled in special education coursework and 44 were masters seeking graduate students employed or interning in a special education capacity. Female participants (N=79) divided by class rank into graduate (n=36) and undergraduate (n=43). Male participants (N=12) divided by class rank into graduate students (n=8) and undergraduate (n=4).

**Instruments**

The WGCTA-FS has five scenarios from which subtests scores were derived. These are: (a) Inference where the subject determines to what extent one can discriminate the truth or falsity of the statements from data provided, (b) Recognition of Assumptions which is the ability of a subject to recognize assumptions that are clearly stated, (c) Deduction, a skill that asks the subject to decide whether certain conclusions necessarily follow the information provided, (d) Interpretation, where the subject considers the evidence provided and determines whether generalizations on data are warranted and (e) Evaluation of Arguments, requires the subject to distinguish between the strong relevant arguments from those that are weak and irrelevant in particular issues (Watson & Glaser, 1994b).

The Total Critical Thinking Appraisal Score was the summation of the five subtest scores and provides an overall estimate with respect to critical thinking (attitudes, knowledge, and skills) (Watson & Glaser, 1994). Students responded to the WGCTA-FS by reading each scenario and reporting their responses on a Scantron sheet. The original reliability and validity of the WGCTA-
FS is provided in the test manual. Test–retest correlation was .81 (p<.001). Scores for males and females were not significantly different (t=.011, df=40). Gadzella, Hogan, Masten, Stacks, Stephens, and Zascavage (2006) investigated the reliability and validity of the WGCTA-FS for psychology, educational psychology, and special education majors. The internal consistency measured by the Cronbach alpha was .92. In the original Watson Glaser 1994 manual for the WGCTA-FS, a criterion–related validity of .30 was considered to have practical application. Gadzella, Stacks, Stephens, and Masten (2005) further investigated the WGCTA-FS instrument for education majors finding an alpha for the total WGCTA-FS to be .76. The total WGCTA-FS score correlated (r=.32, p<.01) with course grades.

The Inventory of Learning Processes (ILP) (Schmeck, Ribich, & Ramanaiah, 1977) assesses how information is processed in academic settings. It consists of 62 items providing scores for four independent scales: Deep Processing, DP, (18 items) assesses the subject’s ability to critically evaluates, conceptually organizes, and compares and contrasts information; Elaborative Processing, EP, (14 items) assesses the subject’s ability to internalize new information; Fact Retention, FR, (7 items), assesses the subject’s command of factual information; Methodical Study, MS, (23 items), assesses whether the subject can use systematic study techniques Students responded to the ILP by reporting True or False.

Schmeck et. Al. (1977) computed the inter-item consistency for the four scales of the ILP and determined correlations ranging from .58 to .89. Test retest reliability ranged from .79 to .89. Gadzella (2003) investigated the reliability and current application of the ILP. For 434 Midwestern university student, the internal consistency measured with Pearson correlations for the four learning process scales ranged from .58 to .82. For the 95 students who retested, test retest reliabilities ranged from .78 to .88. These test retest data was significant and similar to 25 years prior, updating the reliability of the instrument.

**Analysis**

Pearson product-moment correlation was chosen to explore the strength of the relationship between the Critical Thinking Scales of the WGCTS-FS and the Learning Processes Scales of the ILP (Muij, 2004). Means and standard deviation for both instruments follow. Comparison of raw score to the data in the norm table of the WGCTS-FS indicates the percentile rank corresponding to the score. Raw scores from selected occupations (n=23) are provided. Occupations are categorized as Management, Sales and Marketing, Banking and Financial, Religious, and Various which includes Police Officers, Nurse Managers and Educators. Nurse Managers and Educators in the 99 percentile have a mean critical thinking score of 37-40. Nurse Managers and Educators in the bottom 50 percentile have a total critical thinking score between 25-32. The mean score for Nurse Managers and Educators (n=111) was 30.52 with a SD if 4.86

**Results**

Data for 91 students who responded to the WGCTS-FS and the ILP are summarized in Tables 2 and 3. In Table 2 the means and the standard deviations are summarized.
Table 2
Mean and Standard Deviation for Critical Thinking Appraisal Scores and Inventory of Learning Processes Scales for 91 Students Enrolled in Special Education Courses.

<table>
<thead>
<tr>
<th>Inventory of Learning Processes</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Process</td>
<td>10.68</td>
<td>5.34</td>
</tr>
<tr>
<td>Elaborative Process</td>
<td>10.42</td>
<td>2.31</td>
</tr>
<tr>
<td>Fact Retention</td>
<td>5.32</td>
<td>1.87</td>
</tr>
<tr>
<td>Methodical Study</td>
<td>10.27</td>
<td>4.55</td>
</tr>
<tr>
<td><strong>Critical Thinking Appraisal Scores</strong></td>
<td><strong>Mean</strong></td>
<td><strong>Standard Deviation</strong></td>
</tr>
<tr>
<td>Inference</td>
<td>3.76</td>
<td>1.73</td>
</tr>
<tr>
<td>Recognition of Assumption</td>
<td>4.96</td>
<td>3.37</td>
</tr>
<tr>
<td>Deductions</td>
<td>5.44</td>
<td>2.03</td>
</tr>
<tr>
<td>Interpretations</td>
<td>4.86</td>
<td>1.97</td>
</tr>
<tr>
<td>Evaluation</td>
<td>6.55</td>
<td>1.81</td>
</tr>
<tr>
<td>Total Critical Thinking</td>
<td>25.59</td>
<td>6.25</td>
</tr>
</tbody>
</table>

Table 3 presents the correlations between the WGCTS-FS and the ILP.

Table 3
Relationships between the Watson Glaser Critical Thinking Appraisal Scale Scores-Form Short and the Inventory of Learning Process Scale Scores for 91 Students Enrolled in Special Education Coursework

<table>
<thead>
<tr>
<th>Critical Thinking Scales</th>
<th>Inventory</th>
<th>of Learning</th>
<th>Processes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inference</td>
<td>DP</td>
<td>.30**</td>
<td>.22*</td>
<td>.20</td>
</tr>
<tr>
<td>Recognition of Assumptions</td>
<td>.24*</td>
<td>.18</td>
<td>.06</td>
<td>.01</td>
</tr>
<tr>
<td>Deductions</td>
<td>.17</td>
<td>.33**</td>
<td>-.08</td>
<td>-.21*</td>
</tr>
<tr>
<td>Interpretation</td>
<td>.19</td>
<td>.06</td>
<td>.12</td>
<td>-.12</td>
</tr>
<tr>
<td>Evaluation</td>
<td>.35**</td>
<td>.20</td>
<td>.01</td>
<td>-.16</td>
</tr>
<tr>
<td>Total Critical Thinking</td>
<td>.40**</td>
<td>.32**</td>
<td>.09</td>
<td>-.10</td>
</tr>
</tbody>
</table>

*\(p<.05,\) **\(p<.01\)

DP=Deep Processing
ELP= Elaborative Processing
FR= Fact Retention
MS=Methodological
To summarize the key points, Deep Processing which measures the extent to which one critically evaluates, conceptually organizes, and compares and contrasts information under consideration had the strongest correlation ($r=\cdot.40$, $p<.01$) to the total critical thinking scores. The components of critical thinking correlated with Deep Processing are Inference, Recognition of Assumption, and Evaluation. Elaborative Processing which assesses the extent one translates new information into his/her own terminology also showed a significant correlation with total critical thinking scores ($r=.32, p<.01$). The components of Elaborative Processing correlated with critical thinking were Inference and Deduction. The mean critical thinking scores of students enrolled in special education coursework were 25.59 with a SD of 6.25.

**Discussion**

The relationship between the Critical Thinking Scales and the Inventory of Learning Processes Scales indicates a relationship exists between scores on the WGCTA-FS and the scales of the ILP. Most notably, the subscales of (a) Inference ($r=.30, p<.01$), (b) Recognition of Assumptions ($r=.24, p<.05$), (c) and Evaluation ($r=.35, p<.01$) of the WGCTA-FS correlate significantly with the (ILP) subscale Deep Processing. While the ILP subscale Elaborative Processing also significantly correlated with Inference ($r=.23, p<.05$), it alone correlated with Deduction ($r=.22, p<.05$). Overall, Total Critical Thinking Ability had the strongest association with the Inventory of Learning Process subscale Deep Processing ($r=.40, p<.01$) (Table 2). Total Critical Thinking Ability was not significantly correlated with either Fact Retention ($r=.056$) or Methodological Study ($r=-.103$).

The significant association between deep processing of information and overall critical thinking ability is consistent with past research (Gadzella & Masten, 1998) comparing scores on the Watson-Glaser Critical Thinking Appraisal and the Inventory of Learning Processes for students majoring in Psychology and Special Education compared to those majoring in Sociology. Our study also suggests that for the special education intervention specialist both deep processing of information and elaborative processing of information are essential components of critical thinking.

The overall critical thinking ability of our participant group fell in the bottom 50 percentile of total critical thinking score norms (25-32). The mean critical thinking scores of students enrolled in special education coursework was 25.59. SD 6.25. This score compared to the norm mean of 30, SD 4.86 for Nurse Managers and Educators.

**Implications of the Study**

Based on our study we feel that the best way to increase critical thinking abilities is to directly teach deep processing and elaborative processing to pre-service intervention specialist. This instruction should emphasize deep processing and elaboration of information focusing on skills of inference, deduction, and evaluation of information. One possibility is to infuse explicit critical thinking activities, activities that encourage teach the critical sub skills of deep processing and elaborate processing of information into coursework for special education intervention specialists. This infusion coincides with the Council for Exceptional Students Essential Areas of Knowledge and Skills (2004)((Table 4).

**Inference**

Inference is a learning process significantly correlated to both deep processing of information and elaborate processing. Watson and Glaser (1994) define inference as the analysis of given data. These skills coincide with the CEC standards of interpretation of assessment data and evaluation of instructional results. Inference, knowledge and analysis skills, and CEC standards are components
of the construction of individualized education plans for students with special needs. Evaluation of assessment data is a standard topic of instruction for special education. In order to increase the activities that involve inference, we suggest that detailed cases of children with special needs be used starting in the undergraduate years. Using cases of children with special needs to evaluate the testing results, intervention strategies implemented, and patterns of behavior (Kearney, 2003) practices field skills as well as inference.

**Deduction and Evaluation of Assumptions**

Deduction allows for the evaluation of assumptions. Intervention specialist must be able to evaluate and implement research based intervention strategies. That is supported by scientifically rigorous evidence. A basic knowledge of research and research evaluation is essential to the ability to evaluate research assumptions (U. S. Department of Education, 2003). Furthermore, current research supports a significant relationship between critical thinking and research skills (Onwueguzie, 2001). Adding a research component to throughout the coursework of intervention specialist would provide practice in deduction and evaluation of assumptions as well as identification of effective research based educational practices. It is our contention that special education intervention specialists can be taught to systematically evaluate observations, assessment, and curriculum mastery using predetermined benchmarks, questions, and check lists. Preservice intervention specialist can use cases of students with special needs to learn the techniques of deep processing of information. The examination of the results of assessment, observation, and curriculum mastery can be employed to teach data driven decision making which is an essential critical thinking skill based on the deep processing of information.

The critical thinking skill ability of the intervention specialist influences the provision of an appropriate education for students with special needs. The implementation of research based interventions and subsequent evaluation of effectiveness guide the individualized education concept. Best practice suggests incorporating coursework requirements for special educators that are research- based; tasks that require deep and elaborative processing of information.
<table>
<thead>
<tr>
<th>WGCTS-FS</th>
<th>ILP</th>
<th>CEC Essential Areas of Knowledge and Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inference</strong></td>
<td>Deep Processing - conceptual; Elaborative Processing - translation into own terminology</td>
<td>Interpretation of information from formal and informal assessment; Evaluate results of instruction</td>
</tr>
<tr>
<td><strong>Recognition of Assumptions</strong></td>
<td>Deep Processing - comparing and contrasting</td>
<td>Assessments of characteristics; Identify realistic expectations for personal and social behavior in various settings</td>
</tr>
<tr>
<td><strong>Deduction</strong></td>
<td>Elaborative Processing - translation of knowledge</td>
<td>Assessment of characteristics; Evaluate results of instruction of individual learning objectives</td>
</tr>
<tr>
<td><strong>Evaluation of Arguments</strong></td>
<td>Deep Processing - critical evaluation</td>
<td>Assessment of characteristics; Evaluate supports needed for integration</td>
</tr>
</tbody>
</table>

References


