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Critical Thinking in a College of Business Administration

Phyllis R. Anderson and Joanne R. Reid

Critical thinking is an essential component of education, and it is an important life skill that everyone should acquire (Case, 2005; Giancarlo, Blohm, & Urdan, 2004). Critical thinking has been defined as,

... the use of those cognitive skills or strategies that increase the probability of a desirable outcome (Halpern, 1998: 450).

Reid defined it as,

The conjunction of knowledge, skills,

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and strategies that promotes improved problem solving, rational decision making and enhanced creativity (2009a: 1).

The evidence showing this essential knowledge and skill set is not being taught or acquired is ample (Helsdingen, Bosch, Gog, & Merriënboer, 2010; Marin & Halpern, 2011; Orr, Driscoll, Taymans, Alonso, David, & Fabrizio, 2011a; 2011b; Stupnisky, Renaud, Daniels, Haynes, & Perry, 2008; Willingham, 2007). Devore (2008) reported that 87 percent of business school graduates had received no training in critical thinking skills. In a recent survey, business managers and corporate-suite executives were overwhelmingly unimpressed with the skills acquired by business school graduates (Woods-Bagot, 2012). Leading their list of unacquired skills was problem-solving and critical thinking, along with the inability to work with others.

The authors addressed these problems in a quasi-experimental pedagogical investigation involving 55 graduating seniors from a Midwestern college of business administration. Subsequently, this treatment has been in use in the college for three years. Many students have graduated and are now working in businesses, applying their education. The authors wanted to understand the effectiveness of the critical thinking treatment, especially the transfer of knowledge, skills, and strategies into the business, academic, and personal lives of the graduates. This article briefly discusses the original study and reports the results of a survey used to learn about the transfer of the critical thinking treatment into the lives of the graduates.

The Critical Thinking Pedagogical Treatment

In 2009, the authors introduced a critical

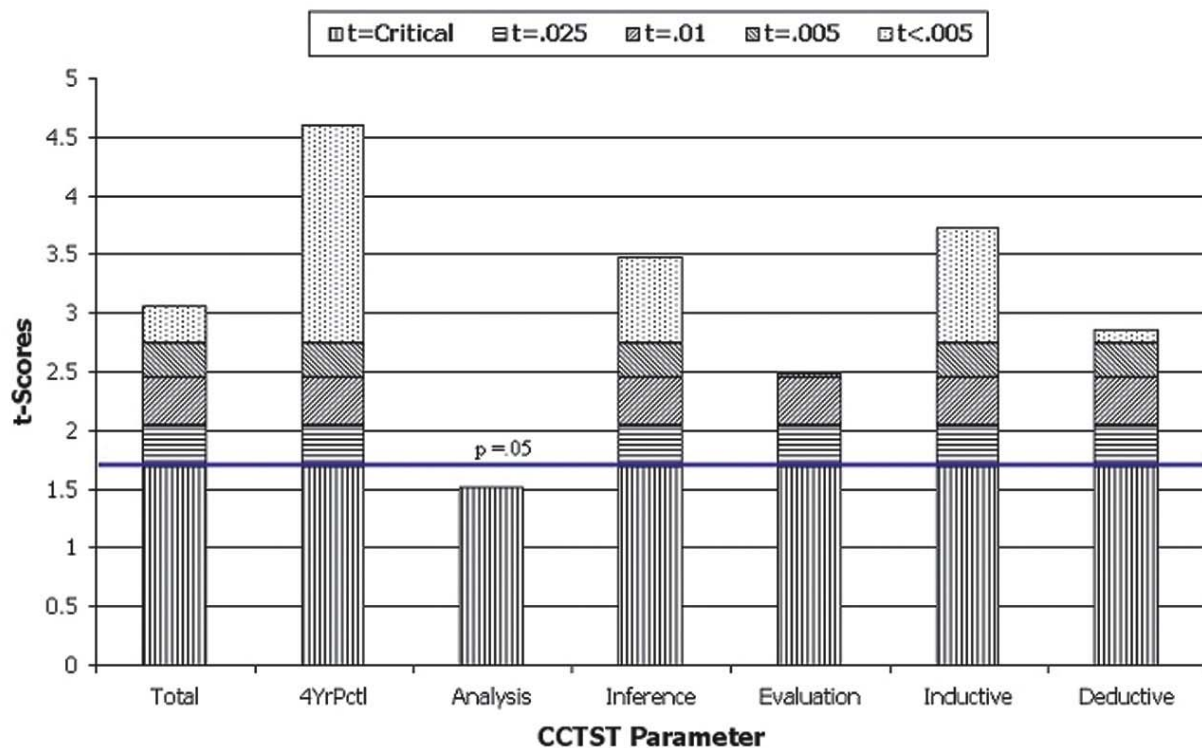
thinking pedagogical treatment to seniors taking their final capstone course in a college of business administration at a Midwestern university. Two classes of seniors became the experimental group; one was the control group. The pedagogy was based upon Diane Halpern's book, *Critical Thinking Across the Curriculum* (Halpern, 1997). One of the authors developed this pedagogical treatment based upon the cognitive-behavioral instructional system design of Foshay, Silber, and Stelnicki (2003). The

treatment used the California Critical Thinking Skills Test (CCTST) as the assessment instrument (Facione, 1990). The researchers implemented this treatment within the capstone classes being taught. They incorporated critical thinking skills into the case studies the students were evaluating as a normal part of the course, to emphasize the use of these skills in real business environments. The results of this study are shown in Figure 1.

Student critical thinking scores increased signifi-

cantly in six of the seven parameters of the California Critical Thinking Skills Test. The results of this research have been published extensively (Anderson & Reid, 2010; 2011; Reid, 2009b; Reid & Anderson, 2012a, 2012b). The question remains, however, as to whether the knowledge, skills, and strategies taught in the course were transferred into the personal, academic, and professional lives of the graduates.

Figure 1
Alpha Levels of t-Scores of California Critical Thinking Skills Test Parameters



Method

The researchers developed a 16-question survey to provide both quantitative and qualitative information concerning the pedagogical treatment. Two questions were used for screening purposes. Eleven questions were quantitative, based upon a 7-point Likert scale. On this scale, 1 was the worst possible score, 7 the best possible score, and 4 was defined as neutral. This relationship is shown in Table 1.

The researchers mailed copies of the survey along with a stamped return envelope to the graduates previously identified. In addition, copies of the survey were e-mailed to the graduates. The researchers attempted to contact some graduates by telephone. In some instances, graduates received both the mailed and the e-mailed surveys, as well as a telephone call. Graduates who had moved, or whose e-mail addresses were no longer valid, were quickly identified, and their names removed from the lists. Later, the researchers sent additional e-mails to those graduates who had not responded, followed by a third round of e-mails to complete that phase of the information gathering. A second round of mailed

packets was also sent to attempt to maximize the number of returns. Ultimately, 29 of the 71 graduates with valid contact information did respond, which is a 41 percent return rate.

The researchers tabulated the quantitative results from the surveys in a spreadsheet and performed statistical analyses to obtain the median and standard deviation. They then calculated Cohen's *d* to determine the effect size. Since the mean of the survey question was defined by the Likert scale, they performed a Z-test on the responses to determine quantitatively the transfer and use of critical thinking knowledge, skills, and strategies by graduates into their personal, educational, and professional lives.

Null Hypothesis

The researchers designed the survey to be neutral. That is, a neutral response was available in every quantitative question. Any numerical answer higher than four was a positive response; those lower were negative. They expected that the aggregate responses would be neutral, with positive and negative results being roughly equal.

Therefore, the researchers hypothesized that the mean value of the responses for each of the quantitative questions would be approximately the same as the mean value of the Likert scale employed.

Results and Discussion

Attitude Questions

Questions 3 and 5. The researchers paired Questions 3 and 5, with Question 3 being before the treatment was taken, and Question 5 after graduation. Before taking the treatment, the students were moderately optimistic about taking a course in critical thinking, with a mean score of 4.88 with a standard deviation of 1.45. This result was statistically significant ($Z = 3.28, p = .0005$). The effectiveness of the pedagogical treatment was measured by computing Cohen's *d*, which was found to be .63, a medium effect size.

Once the participants had graduated and were actively engaged in their professions, their opinions of the course in general were very positive with a mean score of 5.40 and a standard deviation of 1.61. This result was statistically

Table 1
Seven-Point Lickert Scale

1	2	3	4	5	6	7
Worst	Worse	Bad	Neutral	Good	Better	Best

significant ($Z = 4.57, p < .00003$). The effectiveness of the pedagogical treatment was measured by computing Cohen's d , which was found to be .88, a large effect size.

A difference in the means of the responses to the pre-course Question 3 and the post-course Question 5 exists. When this difference were subjected to further statistical analysis, researchers found it was significant ($Z = 1.71, p = .045$). They interpreted the results as revealing that, upon retrospection, the graduates' opinions of the critical thinking treatment had improved significantly in comparison with their opinions of the treatment as undergraduates.

Questions 4 and 6.

Similarly, they compared Questions 4 and 6, with Question 4 being before they undertook the treatment, and Question 6 being their present attitude. Before taking the treatment, the students were mildly optimistic regarding their personal need for instruction in critical thinking, with a mean score of 4.68 with a standard deviation of 1.72. This result was statistically significant ($Z = 2.08, p = .019$). The effectiveness of the pedagogical treatment, as measured by computing Cohen's d , was .40, a medium effect size.

As working professionals, their opinions of their need to have taken

this course in critical thinking were markedly improved, with a mean score of 5.63 and a standard deviation of 1.52. This result was statistically significant ($Z = 5.56, p < .00003$). The effectiveness of the pedagogical treatment, as measured by Cohen's d , was 1.07, an extremely large effect size.

Furthermore, the means of Questions 4 and 6 are significantly different ($Z = 3.28, p = .005$). Therefore, the researchers concluded with confidence, that upon reflection, the graduates were significantly more cognizant of their need to learn to think critically than they were as untrained undergraduates confident of their own capabilities while not looking forward to the prospects of additional work in a class.

Education Question

In Question 7, the researchers sought to determine the effect of the critical thinking treatment on students who took courses of study after the one that included the treatment. Nine of the graduates had taken no additional courses, and they were excluded from this analysis. Those graduates who had taken other courses reported that they had used the knowledge, skills, and strategies they had learned in later courses. The mean of their responses was 5.32, with a standard deviation of 1.52.

This result is significant, ($Z = 3.78, p = .00007$). The Cohen's d is .87, which is a large effect size.

These are extremely positive results. Such an extremely significant score would strongly suggest that students who undertook the critical thinking treatment used the knowledge, skills, and strategies in other courses. The researchers deduced that the critical thinking treatment was extremely beneficial; otherwise, the students would not have used it in other classes. That is, we can confirm with an extremely high level of confidence that transfer took place from the critical thinking treatment into other classes.

Profession or Career Question

In Question 8, the researchers considered the transfer of critical thinking knowledge, skills, and strategies from the classroom and into the professional lives of the business school graduates. The mean score for the responses was 5.26 with a standard deviation of 1.56, which is a very positive response. The Cohen's d of .81 supported the conclusion that the large effect was the result of the treatment. They deduced from this evidence that the critical thinking treatment was extremely beneficial; otherwise, the students would not be using it in

their work. The researchers concluded with an extremely high degree of confidence that the graduates transferred the critical thinking knowledge, skills, and strategies from the pedagogical treatment into their professions or careers.

Personal Questions

In Questions 9 through 13, they considered the effects of the critical thinking treatment on the graduates themselves. Questions 9 through 11 explored the interactions between graduates and others. Questions 12 and 13 investigated the graduates' self-awareness of the changes they perceived in Questions 9 through 11.

In Question 9, the survey asked if the graduates had used critical thinking skills and techniques in their daily lives. The mean score of 5.78 was the highest in the entire survey. The Z-score of 8.24 was the highest, the p-value was the lowest among all the questions, and the standard deviation was the lowest of all the questions. The Cohen's d of 1.67 was huge, supporting the conclusion that the extraordinarily large effect was the result of the treatment. The graduates were emphatic in concluding that they had transferred the knowledge, skills, and strategies into their daily lives. The researchers concluded with

the highest degree of confidence that the graduates transferred the critical thinking knowledge, skills, and strategies from the pedagogical treatment into their personal lives.

The next four questions explored several different aspects of the participants' lives in which they used critical thinking. Of these, the most positive response was in Question 11, asking in which aspects of their lives they used critical thinking. When asked about the effects of critical thinking on their perceptions of the world around them, graduates overwhelmingly agreed that the critical thinking treatment had positively affected them. The mean score of 4.96 was among the highest in the survey, and the standard deviation among the lowest, ($p < .0003$). The Cohen's d of .95 was extremely large, supporting the conclusion that the large effect was the result of the treatment. These are extremely positive results. The researchers concluded with extremely high confidence that the critical thinking knowledge, skills, and strategies had a strongly positive affect on the graduates' overall perceptions of their world.

Similarly, Question 10 asked about the effects the critical thinking treatment had on their interactions with others. Graduates enthusiastically responded that the critical thinking

treatment had positively affected them. The mean score of 5.26 was positive, and the Cohen's d of .80 supported the conclusion that the large effect was the result of the treatment. The researchers concluded with a high degree of confidence that the critical thinking knowledge, skills, and strategies very positively affected the graduates' inter-personal relationships.

Yet, when graduates were asked to seek within themselves to determine how they had changed because of the critical thinking treatment, we find different results. In Question 13, graduates responded that the critical thinking treatment had changed them in some ways but seemed reluctant about it. The mean score was 4.85, a moderate result; the Cohen's d was .46, indicating that the effect was of a medium strength. Question 12 was slightly more assertive of personal change. When asked if the critical thinking treatment had affected the graduates' perceptions of themselves, the mean scores were 4.93, also a moderate result, with a Cohen's d of .54, indicating a medium strength effect.

When the researchers considered the results of Questions 9 through 11, they concluded that the graduates had very positively asserted that they had transferred critical thinking into their daily

lives, their interactions with others, and their perception of the world. Yet, in Questions 12 and 13, the graduates demurred from concluding that the critical thinking treatment had changed them as individuals.

The researchers analyzed the means of these five questions to determine if they were statistically different. They found that the mean of Question 9 was significantly different from Question 12 ($Z = 4.29$, $p < .00003$) and significantly different from Question 13 ($Z = 3.95$, $p = .00005$). Similarly, Question 11 was significantly different from Question 12 ($Z = 2.11$, $p = .017$), and also from Question 13 ($Z = 1.86$, $p = .034$).

The researchers were puzzled by this difference. What was the reason for the cognitive dissonance the graduates are reporting? Since the graduates perceive significant differences in their daily lives, their perceptions of the world, and their interactions with

others, to what do they attribute these differences? To hold that they, as individuals, have not changed is illogical. One conclusion might be that the changes that the graduates have experienced occurred so slowly and gradually that they did not realize that they had changed or that their perceptions had changed. It is possible that they perceive the changes they experience with others in different environments, but have not reflected on the source of the changes they have undergone or realized the full extent of those changes. Equally, the researchers might conclude that this is some kind of modesty, false modesty, or reticence to admit to being pleased by the changes they have experienced. They might even be ashamed, viewing their changes as a necessary price to be paid for changes in other aspects of their lives. Regardless, this is an interesting phenomenon, which deserves to be studied.

Aggregate

The researchers aggregated the responses for all the questions to consider the transfer of critical thinking knowledge, skills, and strategies from the classroom and into the personal, academic, and professional lives of the business school graduates. The mean score for the aggregated responses was 5.16 with a standard deviation of 1.60 (statistically significant, $Z = 12.09$, $p < .00001$). The Cohen's d of .73 supports the conclusion that the large effect was the result of the treatment. The researchers concluded with great confidence that the aggregated total of all the responses demonstrated the critical thinking knowledge, skills, and strategies were transferred from the pedagogical treatment into every aspect of the graduates' lives. The results from this survey are shown in Table 2.

Table 2
Results of Summative Survey

	Mean	S.D.	Z-Score	Cohen's d
Q3	4.88	1.45	Z=3.03 Significant, p=.001	.61 Medium
Q4	4.68	1.72	Z=1.97 Significant, p=.024	.39 Medium
Q5	5.40	1.61	Z= 4.34 Significant, p=.00003	.87 Large
Q6	5.64	1.52	Z=5.38 Significant, p<.00003	1.08 Huge
Q7	4.88	1.39	Z=3.16 Significant, p=.0008	.63 Medium
Q8	5.23	1.56	Z=3.97 Significant, p=.00003	.79 Large
Q9	5.80	1.08	Z=8.33 Significant, p<<.00001	1.67 Huge
Q10	5.12	1.59	Z=3.90 Significant, p=.00005	.78 Large
Q11	5.48	1.56	Z=4.75 Significant, p<.00003	.95 Large
Q12	4.80	1.87	Z=2.14 Significant, p=.02	.43 Medium
Q13	4.88	1.71	Z=2.56 Significant, p=.005	.51 Medium
Overall	5.16	1.60	Z=12.09 Significant, p<<.00001	.73 Large

Conclusion

The authors conclude from this study that the pedagogical treatment was extremely successful in transferring the knowledge, skills, and strategies of critical thinking from the

classroom into a variety of environments. Graduates report statistically significant transfers from the classroom and into their personal lives, their jobs, and their education. Since the goal of education is

transfer, then the authors concluded that the critical thinking pedagogical treatment is an outstanding success. They reject the null hypotheses for all the questions as well as the aggregate of the responses.

Future Studies

The authors have concluded that graduates who had received the pedagogical treatment in critical thinking had transferred the knowledge, skills, and strategies from the classroom environment into their personal, academic, and professional lives. Since the goal of education is transfer of knowledge from the classroom into the person's real life, then the authors may also conclude that they have succeeded; however, several aspects of this study have not yet been considered.

The results of this survey are congruent with student satisfaction models. Considered through that lens, this survey's answers can be evaluated as evidence of student satisfaction by graduates. Unlike post-semester "smile sheets" filled out by students at the end of each class, these results are from graduates, who are experiencing and reflecting upon the results of their education. Since this is a quantitative survey, real evidence can be generated concerning the effect of the critical thinking pedagogical model on graduates' satisfaction with their education, its applicability to their careers, and its application in their daily lives.

Further, the survey had a strong qualitative component. Not only was

there a qualitative component in Questions 3 through 13, but Questions 14 through 16 asked for graduates' opinions about the best and worst aspects of the critical thinking treatment and also about modifications to the treatment. These responses can provide a broader and more emotional context to the critical thinking treatment, its uses, outcomes, and applications within the curriculum.

The authors recognize the limitations of this treatment. This report covers four years of students, who have graduated, and who now use their education, business, and life experiences to guide them. Yet, this is a small number of people, all from one college of one Midwestern university. This treatment may not be applicable to any other college, population, or curriculum. In this regard, the authors encourage their colleagues in other institutions to continue this research.

These long-term studies are compelling evidence of a successful pedagogical treatment in critical thinking, however. The results of These studies must be considered by curriculum committees at colleges and universities. Critical thinking can be taught, can be learned, and can be transferred from the classroom into other domains. Critical thinking

changes the way graduates perceive the world, perform their jobs, and interact with others. The reasons critical thinking is not taught in colleges and universities are unidentified; however, the continued intransigence of institutions of higher education towards teaching it and applying it throughout the curriculum is as incomprehensible as it is inexplicable.

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