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Generic Critical Thinking Infusion and Course Content Learning in Introductory Psychology[*]

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Abstract

One group of introductory psychology students received a moderate infusion of generic critical thinking material. The other group did not. Otherwise both groups had the same course content, and took the same pretests and posttests of their critical thinking ability and their knowledge of psychology. The experimental group improved its critical thinking test scores significantly more than the control group. There was no significant difference in psychology learning as reflected by test scores. The results provide limited support for the hypothesis that a moderate investment of class time in generic critical thinking material can lead to significant improvement in reasoning skills without necessarily causing a significant cost in terms of course content learning—an altogether felicitous set of outcomes.

Keywords: critical thinking, infusion, Cornell Z Test, course learning, introductory psychology

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Questions for Research

What is "generic" critical thinking? How does it relate to other notions of critical thinking? Can it be improved through deliberate formal instruction? If so, how should any such potential progress be assessed? Also, how much of what type of intervention is necessary and sufficient to bring about a notable degree of enhancement in generic critical thinking ability? Does it perhaps require the investment of an entire semester long special critical thinking course, or maybe an even longer term of treatment? Or, on the other hand, is it possible to achieve measurable positive change with a more limited infusion approach, i.e., by adding a critical thinking component to another course? In addition, what specific kinds of classroom materials and pedagogical strategies are most likely to be effective? Furthermore, when generic critical thinking is infused into a host course in a given subject, can a significant increase in critical thinking skill be attained without such a benefit being offset by an equal and undesirable (i.e., significant) cost in terms of course subject matter learning? These and other related issues are, seriatim, the focus of this paper. More precisely, it reports the results of a controlled study ($N = 51$) involving two introductory psychology classes, one with a moderate amount of generic critical thinking enrichment, one without.

Generic Critical Thinking

Often, if not always, in psychological research, there is a clear and commonly accepted understanding of a given construct, such as “depression” (see the DSM-IV-TR, 296.00 (APA, 2000)), and hence there is no need or excuse for a protracted discussion of the meaning of the trait under investigation, especially within the limits of a brief research report such as this one. The construct of “critical thinking,” however, is an exception to the rule.

A survey of the literature indicates that the term “critical thinking” is employed in a variety of ways. Some writers, such as McPeck (1981), use it exclusively in reference to those discipline specific analytical and problem solving skills necessary for a fairly advanced level of work in a particular field, such as history or literary criticism. In fact McPeck completely denies the legitimacy of any other meaning of critical thinking. There is, however, a much more commonly accepted sense of the term, and that is the intent here. “Critical thinking,” as used in this paper, refers to a set of basic and generic reasoning skills. These skills include the ability to identify and/or distinguish between:

1. inferences and non-inferences
2. assumptions (covert as well as overt) and conclusions
3. consistent and inconsistent statement sets
4. deductive and inductive reasoning
5. valid and invalid arguments
6. credible versus seriously questionable claims and sources
7. meaningful versus vague, ambiguous, and/or meaningless language
8. relevant versus irrelevant evidence
9. scientific versus pseudo-scientific procedures

These nine distinct but inter-related abilities collectively constitute, of course, only an elementary sense of the term. A global and more comprehensive concept would no doubt require the enumeration of many other additional attributes. Nevertheless, the nine abilities that have been listed here do indeed form essential foundational elements for any reasonable, if perhaps loftier, notion of what critical thinking is. Advanced discipline specific reflective thought processes ordinarily presuppose these more fundamental and generic (interdisciplinary) reasoning skills, McPeck and others to the contrary notwithstanding. Furthermore, such abilities are behaviorally observable, measurable (at least indirectly so), and readily lend themselves to objective and standardized testing, as in the CAAP (ACT, 1990), Cornell (Ennis, Millman, & Tomko, 1985; 2004), and Watson-Glaser (Watson & Glaser, 1980) tests. Moreover, these nine basic critical thinking skills are the very ones ordinarily taught in beginning logic and critical thinking courses, and to a lesser extent in other philosophy and psychology courses (at least those like the author's). Finally, they are also reflective of the content of many textbooks, such as those of Copi and Cohen (2000), Ennis (1996), Halpern (2003), and Jason (2001).

Generic critical thinking refers to reasoning principles that are applicable to different types of content across a variety of disciplines. Consider, for clarification, the following two arguments:

Argument 1:

All dogs are mammals.

All mammals are animals.

Thus, all dogs are animals.

Argument 2:

All cases of clinical depression are examples of mood disorders.

All mood disorders are instances of mental disorders.

Thus, all cases of clinical depression are instances of mental disorders.

Although Argument 1 and Argument 2 differ in content (the former involves biological subject matter, the latter contains psychological material), both arguments illustrate the same general principle of valid deductive inference, namely:

All A is in B.

All B is in C.

Thus, all A is in C.

Having ability or skill in generic critical thinking means being able to correctly assess whether an inference, regardless of content, is acceptable or not, and being able to explain why the reasoning is good or faulty. By way of contrast, then, a discipline-specific critical thinking skill would be exemplified by the demonstrable ability to recognize and apply appropriate criteria for textual analysis, interpretation, and evaluation in the field of literary criticism. A typical book review in the *Atlantic Monthly* would serve to illustrate this idea. Discipline-specific critical thinking principles are not ordinarily relevant to, nor transferable beyond a particular field of inquiry.

Previous Empirical Research on Critical Thinking

Although there exists an abundant theoretical and pedagogical literature on critical thinking in higher education (e.g., Kurfiss, 1988), there remains nevertheless a relative scarcity of published empirical work on the subject (see McMillan, 1987 and Solon, 2001; 2003). Even the February 1995 special issue of *Teaching of Psychology* contains less than a handful of articles that involve quantitative research on critical

thinking. Also, while there is some empirical evidence from several different studies that an entire four-year undergraduate experience contributes to modest gains in overall critical thinking skills (King & Kitchener, 1994; Lawson, 1999; Pascarella & Terenzini, 1991; 2005), there is so far little scientific basis for the notion that a single college course—other than a critical thinking type of course—makes any positive measurable difference (Annis & Annis, 1979; Leshowitz, 1989; Nisbett, 1993; Ross & Semb, 1981; Seibert & Hedges, 1999; van Gelder, 2000). And, even in the cases of critical thinking courses, the evidence is mixed to say the least (see van Gelder, 2000).

Several recent studies, however, suggest that even more limited moderate amounts of critical thinking instruction can also lead to improved scores on one commercial instrument, namely the Cornell Z test. Allegretti and Frederick (1995) report having found that a group of college seniors ($N = 24$) who were enrolled in a capstone interdisciplinary (psychology and philosophy) ethics seminar made statistically significant pre to post gains on the Cornell Critical Thinking Test, Level Z. Allegretti and Frederick imply that their systematic employment of the Toulmin model of reasoning analysis (Toulmin, Rieke, & Janik, 1984) may have been at least partially responsible for the impressive results obtained in their study. Such a conclusion may very well be correct. However, their study did not include a control group.

Encouraged by the findings of Allegretti and Frederick, but mindful of the need for additional controls, Solon (2001) proceeded to conduct further research on this topic. In his study, he found that a moderate (partial) treatment group of introductory psychology students ($n = 26$) improved their Cornell Z scores significantly more than a comparable untreated group of humanities students (also $n = 26$). The level of statistical

significance reached was beyond .001, the effect size was greater than 1.0, and the observed power was .94 (for $\alpha = .05$). Despite having obtained impressive quantitative results that are consistent with the hypothesis that a moderate amount of critical thinking instruction can be effective, the small total number of participants ($N = 52$) and the fact that participants were self-selected in the Solon study pointed to the need for further research on this important topic.

In an even more recent investigation, Solon (2003) conducted a three-group study ($N = 75$) in order to compare coursework effects on critical thinking development. In that research project, he found that a full-treatment group of critical thinking students ($n = 25$) significantly outscored both a partial-treatment group of introductory psychology students ($n = 24$) and a no-treatment group of rhetoric students ($n = 26$) on the *Cornell Critical Thinking Test, Level Z.*

Yet another most recent research project by Allegretti (2005) has likewise yielded results consistent with those of Solon (2001; 2003) and her own earlier work with Frederick (1995). In a series of two controlled studies on critical thinking infusion in an interdisciplinary great books type of course for freshmen at a small liberal arts university in the southeast ($N = 321$ and $N = 188$), Allegretti found that the experimental groups improved their Cornell Z critical thinking scores significantly more than the respective control groups in both studies.

While it may not yet be beyond reasonable doubt that critical thinking instruction *per se* causes enhanced reasoning ability, there is already a growing body of evidence that some approaches can be very effective—even in much less than a full semester length special course intervention. What remains, among other things, to be determined

is whether or not a substantial investment of class time—10 hours—may lead to a significant cost in terms of course content learning. The present study addresses this issue directly and perhaps for the first time with a replicable, objective measure in a beginning psychology class.

Method

Participants

A sample of community college students (N = 51), who were enrolled in two separate sections of introductory psychology taught by the same instructor during the same semester, took part in the study in exchange for a nominal amount of extra-credit. The experimental group (n = 25) consisted of 13 women and 12 men (average age: 23.2). The control group (n = 26) was composed of 14 women and 12 men (average age: 23.4). Despite the absence of random assignment or planned matching of participants, the groups nevertheless turned out to be quite similar in a number of respects (traits commonly held to be relevant for eventual study validity considerations). First, they had similar educational backgrounds. All were freshmen or sophomores, and the majority of both groups were in their second-semester of college work. Second, and more importantly, their critical thinking pretest scores were also similar (experimental pre score M = 25.68, SD = 5.27; control pre score M = 26.04, SD = 4.77). Third, they exhibited similar ACT composite averages (experimental M =20.9, control M = 21.2). Fourth, they had very similar GPA means (experimental M =2.63, control M =2.68). Fifth, there were no quantitatively notable group differences in average age, group gender composition, individual programs of study, or concurrent course enrollment patterns. Only 3 in each group said they were psychology majors. The most frequently declared

major in both groups was business (9 and 10 respectively). Majorities in each group reported that they were taking the course primarily to satisfy a social science general education degree requirement and not as a pure elective. Also, both sections were mid-day classes. The experimental group met M-W-F at 11:30 a.m. The control group class was held at 1:30 p.m. M-W-F. So, it was not as if there was a contrast of "early birds" 8:30 a.m. versus "night owls" 6:00 p.m. classes. Given both the variety and extent of similarities between them, it seemed evident that the two groups were indeed comparable, though not technically equivalent to one another.

Materials

The experimental group received a moderate infusion of generic critical thinking material—approximately 10 hours of class time activity and an additional 20 hours of homework exercises. The control group did not experience the special critical thinking material, although they did get the minimal disciplinary critical thinking content that was contained in the textbook (Myers, 2004) and incidental psychology critical thinking items, such as those in the assigned *Study Guide* exercises (Straub, 2004). During the time that the experimental group was experiencing its critical thinking enrichment, the control group spent those same 10 class hours going over *Study Guide* exercises, including practice test questions, with the instructor's assistance. The experimental group was thus required to cover some of the course content (approximately 25 percent of the text material) without such help. Otherwise both groups were treated identically.

The special critical thinking enrichment occurred in the following way. There were 10 homework reading and writing assignments spread roughly equally throughout the semester. Each assignment had both reading and writing components (for a total of

about 20 hours during the school term). The reading assignments were taken from Chapters 4-7 of Halpern (2003). The writing assignments included all the questions and exercises in those four chapters of the ancillary workbook (Halpern & Riggio, 2003) together with articles 1, 2, 3, 7, 9, 10, 12, and 16 in Part II, pages 161-274, of Meltzoff (1998) and handouts from the instructor (Solon, 1972; 1973; 1989; Solon & Wertz, 1969). The instructor did not attempt to teach the entire range of topics normally included in a complete critical thinking course in this psychology course setting. He did, however, introduce the experimental group students to a number of rules of inference and logical fallacies, such as *modus tollens* (contraposition) and *post hoc ergo propter hoc* ("after this therefore because of this"), and Mill's Methods of Induction. The Method of Difference, one of Mill's 5 Methods, is roughly equivalent to the 2-group, null hypothesis significance test experiment of the present day. The only modification of Mill in current practice is the application of statistical techniques, such as the *t* test. Very little class time involved lecturing. The 10 hours of critical thinking classroom activity were devoted to a review of the Halpern, Meltzoff, and related exercises. The instructor used a Socratic questioning technique to stimulate critical thinking about the generic principles of reasoning that were involved in the various exercises. To help give the reader a clearer idea of the nature of the homework and class sessions on critical thinking, here are two examples:

Critical Thinking Exercise Example 1

From Halpern, Chapter 4:

Voter: "Why should anyone vote for a philanderer like you?"

Candidate: "True, I have not been perfect in my private life. But some past great

Presidents have also not been perfect in their private lives."

Directions: Both the Voter and the Candidate seem to be making arguments that are enthymemes. Complete each of their arguments with additional statements that appear to be implied. What type of argument is each of them? Are they valid? Sound? Use circle diagrams or some alternative approach in your assessment. Do you agree with Professor Halpern's interpretation and analysis of the candidate's argument (page 170)? If so, explain. If not, why not? Include an analysis of any alternative interpretation.

Example 2

From Halpern, Chapter 7:

Linda is 31, outspoken and bright. While in college she majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.

Which of the following is more probable?

A. Linda is a bank teller.

B. Linda is a bank teller and is active in the feminist movement.

Directions: This item comes originally from the work of Nobel laureates Tversky and Kahneman (1983). Do you agree with their assessment of this example? Is this really the only reasonable way to look at the problem? Please comment. What is the underlying assumption and implication of the Tversky-Kahneman thesis?

All of the Meltzoff and Solon items are too long to reproduce here in their entirety. Additional examples can be found in the Appendix to this report. Also, as part of every exam throughout the course, all students, including the controls, wrote six graded argumentative essays on psychological issues of their choice, such as, "Is psychoanalysis

a science?" Each essay was 250-500 words in length. Collectively these essays accounted for one-third of the course grade. As the semester progressed, the average experimental group essay mark rose to almost a half grade point above that of the control group (B- vs. C+) which is not surprising, given the degree of critical thinking required to do well on the essay assignments. There was an essay portion of the final exam as well, but no comparison was conducted because of the obvious unfair advantage of the experimental group. Only multiple-choice course content items were compared.

The study used the previously mentioned Cornell Z (Ennis et al., 2004) as its dependent measure of critical thinking. This is the same test that was employed earlier by Allegretti and Frederick (1995), Solon (2001; 2003), and Allegretti (2005). Level Z is a 52-item multiple-choice test, specifically designed for college students and other adults. It is relatively inexpensive (in comparison with its counterparts), easy to administer and score, and the recommended 50-minute time limit makes it convenient for both the instructor-researcher and the student (since the typical class period is 50 minutes). It is similar in structure and content to the older, more well known Watson-Glaser Critical Thinking Appraisal, Forms A and B (Watson & Glaser, 1980) as well as the more recently developed CAAP Critical Thinking Test, Forms 88A and 88B (ACT, 1990). The Cornell Z covers a wide variety of test items involving deduction, induction, critical observation, credibility (of claims and sources), assumption identification (including hidden or missing premises), and meaning implication recognition. The newly published version of the manual (2004) provides norm, reliability, and validity data comparable with (if not superior to) that which can be found in the currently available manuals for the other commercial instruments mentioned here. The new edition of the manual on the

Cornell tests also covers virtually all results from studies conducted through 2003, including doctoral dissertations such as those of Hanson (1986) and Luckett (1991), as well as the published work of Allegretti and Frederick (1995), Frisby (1992), and Solon (2001; 2003). The addition of the findings of these more recent studies further augments the case for the construct validity of the Cornell Z. Discussions of "norm," "reliability," and "validity" in the new manual are also of particular value.

Procedures

Both groups took the same Cornell Z Critical Thinking Test pre and post. (The reader should note that the control group got some critical thinking material from the Myers text and *Study Guide*).

Also, both groups took the same pair of pre and post measures of psychology learning. The pretest was a 20-item True-False test of course subject matter information in various subfields of psychology. The posttest was a 50-item multiple-choice final over the entire semester material. Items were a random sample of questions from the *Test Bank* (Brink, 2004) that accompanied the text.

Results

Critical thinking pretest means (*M*) and standard deviations (*SD*) are displayed in Table 1:

Table 1: Critical Thinking Pretest Results

	M	*SD*
Experimental Group	25.68	5.27
Control Group	26.04	4.77

For a generation, the received wisdom has been that parametric statistical procedures, such as the *t* test, are "robust" with regard to violations of the normality of distribution and homogeneity of variance assumptions (Glass & Hopkins, 1984). Recent work by H. Keselman, Huberty, Lix, Olejnik, Cribbe, Donohue, Kowalchuk, Lowman, Petosky, J. Keselman, and Levin (1998) has, however, raised serious doubts about the alleged robustness doctrine. Therefore, in this case, Shapiro-Wilk *W* and *F* tests were conducted in order to verify compliance with the key assumptions and thus minimize the chance of Type I Error (Gravetter & Wallnau, 1988). Those underlying assumptions having been confirmed with the present data sets, a *t* test revealed $t\ (49) = -0.26$, $p = .80$ = not significant.

Critical thinking posttest mean and standard deviation data are presented in Table 2:

Table 2. Critical Thinking Posttest Results

	M	*SD*
Experimental Group	30.28	4.34
Control Group	26.54	5.56

Once again Shapiro-Wilk *W* and *F* tests were conducted to ascertain that the post samples met the normality and homogeneity assumptions of the *t* test. Such conditions having been met, a *t* test applied to the critical thinking post data produced $t\ (49) = 2.67$, $p = 0.01$ = significant, Effect Size = Cohen's $d = .66$ (95% CI: lower .08, upper 1.24) = medium, according to Cohen (1988).

Psychology learning pretest (prior knowledge) results of the study are contained in Table 3:

Table 3. Psychology Learning Pretest Data

	M	*SD*
Experimental Group	10.28	2.30
Control Group	10.35	2.02

A *t* test applied to these data revealed *t* (49) = .11, *p* = .91 = not significant.

Psychology learning posttest (multiple-choice final exam) results can be found in Table 4:

Table 4. Psychology Learning Posttest Results

	M	*SD*
Experimental Group	76.40	8.72
Control Group	76.23	8.33

A *t* test on the post data produced: *t* (49) = .91, *p* = .37 = not significant.

An analysis of pre to post critical thinking mean score changes with paired *t* tests, which is perhaps a preferable way to approach the given data, reveals:

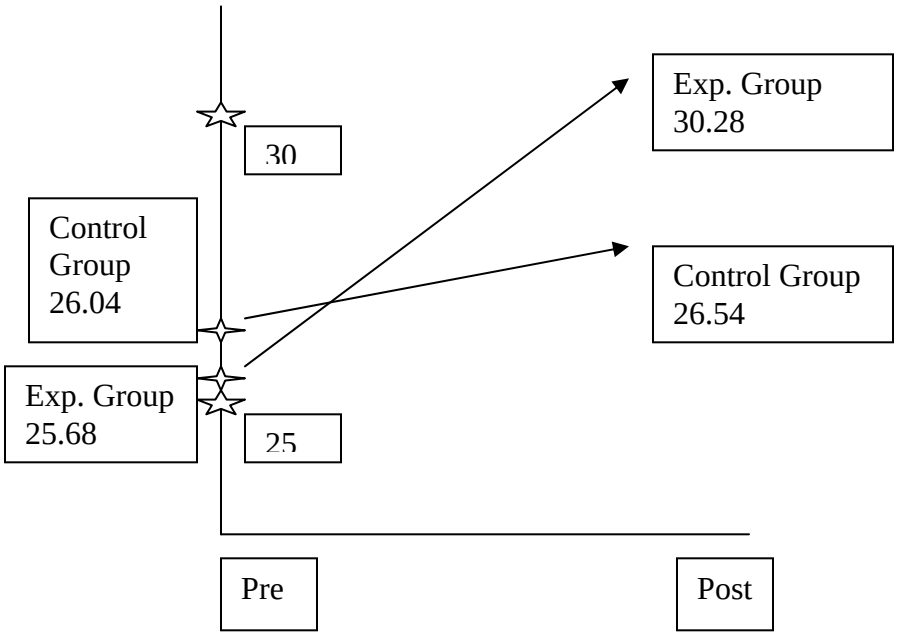
Experimental group = *t* (24) = -6.89, *p* = 0.000004 = significant, Effect Size (Cohen's *d*) = .87 (95% CI: lower 0.28, upper 1.47) = large.

Control group = *t* (25) = -0.70, *p* = 0.49 = not significant, Effect Size (Cohen's *d*) = 0.10 (95% CI: lower - 0.46, upper 0.66) = very small.

The effect size and confidence interval computations are in accord with recommendations made by Cohen (1988), Kline (2004), Robinson and Levin (1997), Thompson (2002), and Wilkinson and the APA Task Force on Statistical Significance (1999).

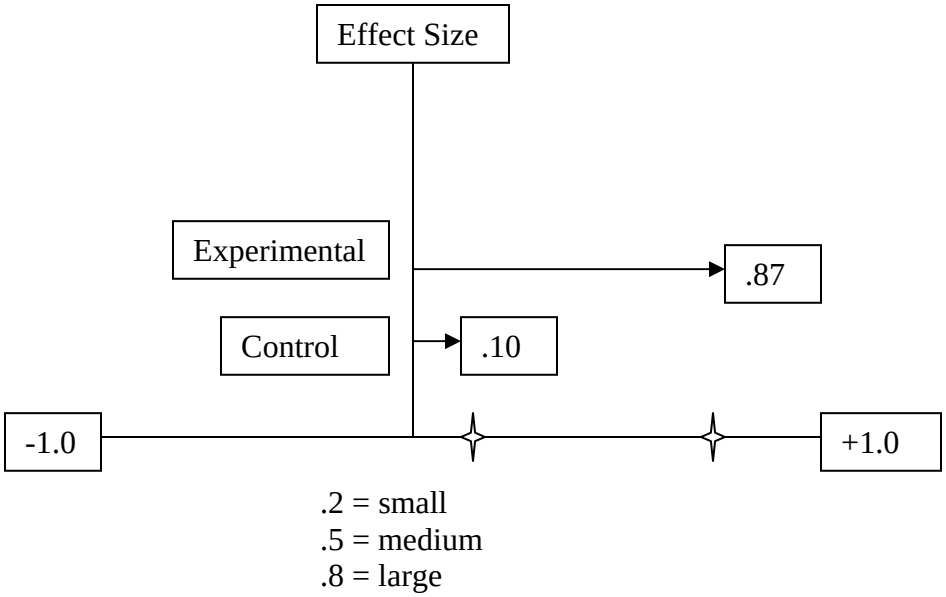
See Figure 1 for a graphic display of the pretest to posttest changes in the two groups:

Figure 1: Pre to Post Changes in Critical Thinking Mean Scores



The effect size differences are captured graphically in Figure 2:

Figure 2. Effect Size Differences in Critical Thinking



All of these results are consistent with (and supportive of) an affirmative answer to the twin research questions of the present study. For an informative exchange on comparative effect size results in critical thinking research, see Hatcher (2006) and Solon (2006). Two excellent general literature reviews can be found in Hatcher (in press) and Hitchcock (2004).

Discussion

Early empirical research on the impact of critical thinking instruction in higher education indicated that significant improvement and substantive change in general reasoning skills required at least a one year or longer intervention (McMillan, 1987; Pascarella & Terenzini, 1991), although several single academic term studies did show significant subtest score improvement with the Watson-Glaser measure (Annis & Annis, 1979; Frost, 1991). More recently, others have maintained the possibility of achieving

measurably important overall gains within a single semester, but only in the context of a special critical thinking course, and perhaps then solely by using an argument mapping approach (Twardy, 2004; van Gelder, Bissett, and Cumming, 2004). The present study, however, demonstrates that a moderate infusion of critical thinking material emphasizing active learning principles and guided practice can produce significant and substantive growth in student critical thinking ability. The effect sizes recorded here are well above average. Also, the confidence intervals around the effect sizes exclude the possibility of a zero effect for the study at the 95% level of confidence—a rare and important finding. Moreover, such improvement extends to the entire range of critical thinking skills, and is not limited to gains in a single skill or subclass of abilities, as has been the focus of research by Riniolo and Schmidt (1999) and Wesp and Montgomery, (1998). Indeed, the findings presented here are comparable to those reported previously by Allegretti (2005), Allegretti and Frederick (1995), and Solon (2001; 2003). Each of the investigations just mentioned apparently involved similar infusion methods and employed the Cornell Z as the dependent measure. In addition, there have been other critical thinking infusion studies, such as those by Reed and Kromrey (2001) and Ross and Semb (1981), employing other test instruments and perhaps somewhat different pedagogical strategies, and yet also obtaining similarly successful results.

Furthermore, the fact that in this particular study, there were no significant differences in course content learning between the groups indicates that a moderate generic critical thinking infusion of 10 hours in classroom activity coupled with 20 hours of homework exercises—although a substantial investment—need not lead to a significant cost in subject matter learning in the host course—which should be taken as a

reassuring and encouraging piece of information to answer a serious ethical consideration for those who may be contemplating a critical thinking infusion approach in their own various classes, but may have been reluctant to do so because of legitimate and understandable concerns about cost-benefit tradeoffs. Also, for additional professional ethical reasons, participants in the control group of this study were subsequently offered the opportunity to attend free critical thinking enrichment sessions during the following academic year (and 7 have actually taken advantage of this option). This procedure was enacted, of course, to assure that no one in the control group would be precluded from receiving the potential educational benefit of the special critical thinking material that the experimental group received.

Whereas the findings in this research report and those of other investigators already mentioned constitute an increasing body of evidence to support the potential effectiveness of critical thinking infusion, the current number of published studies and the combined number of participants therein are both relatively small. There is a clear continuing need for more and better quality studies of critical thinking infusion. Obvious examples of fruitful possibilities for future research would be courses such as introductory philosophy and ethics. Nevertheless, one can at this point realistically hope that someday, perhaps soon, there will be a sufficient data bank to warrant a comprehensive meta-analysis—which , as the research community is gradually coming to realize, is the *true* gold standard of empirical research, replacing the former pretender to such status—the single randomized experimental null hypothesis significance test.

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Appendix A

A Sample Class Session Topic

The instructor begins by putting the following argument on the chalkboard (or screen):

> If I believed in God, then I would feel obligated to try to lead a morally good life. But, I do not believe in God. Hence, I have absolutely no obligation to try to lead a morally good life.

He invites student responses to the argument. Typically, someone will say he or she does not accept the argument. The instructor then asks for a reason. The respondent says that the arguer is wrong not to believe in God and thus should feel obliged to attempt to live a morally good life. The instructor then asks the student about how he or she would react to the argument if he or she accepted the premise of not believing in God. The student says he or she would, in that case, accept the conclusion. The instructor at this point asks if everyone agrees with the student's response. Typically, at least one other student, sometimes more, see a problem—not simply a factual dispute about God's existence—but a logical issue—in the inference itself. Often there will be a student who will point out the underlying fallacy—the fallacy of Denying the Antecedent. Occasionally, the instructor needs to make the point and provide a mini-lecture on elementary rules of formal logic and Euler or Venn diagrams. But, to the extent possible, the instructor allows the student or students to work things through by themselves. He asks probing, leading questions, and avoids giving answers whenever possible. He tries to be a "guide on the side" rather than a "sage on the stage" as the saying goes. One of this instructor's

core beliefs is that traditional lecturing accomplishes little. Students need to become active in the learning process. And, in order to become good critical thinkers, they need lots of practice, both in and out of the classroom. The empirical literature supports this contention.

A Sample Homework Assignment

Directions: Read the following paragraph and write a 250-500-word essay in response to it. In your response, address the following questions:

1. Are there any stated or implied assumptions that would logically justify the judge's decision?
2. What evidence is there for the judge's assumptions and/or inferences?
3. What behavior seems to be rewarded or reinforced here?
4. What prejudices or biases might be involved?
5. Is this merely a "special interest" issue for single mothers, or are there possible broader social implications in this case?

Judge Raymond Cashen, a Michigan Circuit Court Judge, ruled that Jennifer Ireland could not keep custody of Maranda, her three-year-old daughter. Custody was to be awarded to the father, Steve Smith. The reason given by the judge was that the 19-year-old Jennifer, who had won a scholarship to the University of Michigan, was placing Maranda in childcare while she went to school. By giving the child to Steve, whose mother would then raise Maranda, the Judge was protecting the child from being raised by strangers. Ironically, Steve had not gone to court to get custody—Jennifer had filed to force Steve to pay the $12 a week child support he had not paid.

Add to this that a warrant had been issued against Steve Smith for assault and battery against Jennifer.

Sample Small Group Exercise

A group of four or five students reads a fictional research report. The example contains a number of methodological and statistical flaws. Students have the task of finding, individually and collectively, as many of these research flaws as they can. The group selects a member who reports the group's discoveries to the rest of the class and a recorder who keeps track of individual credit for detecting mistakes and who organizes material for the one who speaks to the class in general. During the later general discussion, the instructor becomes involved only if an error has not been noticed by the students—or to elaborate on some relevant critical thinking principle. One of the best examples of this sort of thing can be found in Julian Meltzoff's *Critical Thinking about Research*, pp. 219-225 (1998).

Additional sample course materials and information are available upon request from this author.

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