

# Assessing Change in Student Critical Thinking for Introduction to Sociology Classes

Teaching Sociology  
 41(3) 271–281  
 © American Sociological Association 2013  
 DOI: 10.1177/0092055X13479128  
 ts.sagepub.com



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## Abstract

Although there is widespread agreement among academics that critical thinking is an important component to the college classroom, there is little empirical evidence to verify that it is being taught in courses. Using four sections of introductory sociology, we developed an experimental design using pretests and posttests to assess students' critical thinking skills. Controlling for grade point average, cumulative credit hours completed, gender, race/ethnicity, socioeconomic status, instructor, and initial levels of critical thinking, being in the experimental group had a statistically significant impact on critical thinking at the end of the semester. Thus, inclusion of writing assignments and classroom discussion designed to enhance creative thought processes for the experimental group helped students improve from one-dimensional thinking toward more multistructural analysis.

## Keywords

critical pedagogy, critical thinking (skills), introduction to sociology

There appears to be widespread agreement that critical thinking is a crucial component of what should be taught in college classes (Baker 1981; Bradshaw and McPherron 1978; Browne and Keeley 1986; Browne and Litwin 1987; Hart Research Associates 2010; Pascarella and Terenzini 2005). Students also believe they are learning critical thinking (Howard and Zoeller 2007; Shepelak, Curry-Jackson, and Moore 1992), but recent evidence from Arum and Roksa (2010) indicates that almost half of all students they studied did not increase their level of critical thinking (as measured by performance on the Collegiate Learning Assessment [CLA]) in their first two years of college, with more than one-third showing no gains after four years.

Arum and Roksa's (2010) book *Academically Adrift* has sent shock waves through American

higher education, prompting a great amount of reaction, criticism, defense, and introspection. Our purpose is not to enter this debate, but to focus on one underlying, neglected aspect of it: Can critical thinking be taught?

Most teachers seem to know what critical thinking is until asked to define it, and not surprisingly, there is no conclusive set of strategies for teaching critical thinking in the college classroom. In this study, we adopt the Structure of the Observed

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Learning Outcomes (SOLO) taxonomy (Biggs and Collis 1982) for evaluating critical thinking, then test the effectiveness of specifically designed assignments, and briefly discuss how they improve critical thinking outcomes. We find that our use of focused writing assignments and discussion increased the posttest SOLO scores of students in experimental classes, as opposed to control group classes that did not do these assignments and have this discussion. Given the strong emphasis that sociologists and other social scientists place on critical thinking skills, our efforts suggest an encouraging way forward.

## WHAT IS CRITICAL THINKING?

Although there is no clear consensus, most agree that critical thinking is not mere information recall or an application of ideas. Instead, critical thinking can be conceived of as a skill or a process, rather than a body of knowledge (Browne and Litwin 1987; Facione 2011). Critical thinking also involves attitudes, habits, values, and behavior. Others refer to it as rational thinking that consists of both critical and creative reasoning and involves a two-step learning process. First, critical reasoning evaluates the logical and empirical sufficiency of a statement. Second, creative reasoning defends a logical and empirical statement that has been created. Consequently, critical thinking is rational and not based on emotion, ideology, popular beliefs, or folk wisdom (Baker and Jones 1981; Ennis 1985, 1989; Fasko 2003; Glaser 1941; Logan 1976; Paul and Elder 2006; Shepelak et al. 1992).

A central purpose of sociology is to think more critically about social phenomena (see, e.g., McPeck 1990). This directive is seen today, with one of the main concepts in sociology, the sociological imagination (Mills 1959), which is found in almost every introduction to sociology textbook. Malcom (2006:143) argues that to think critically is to use the sociological imagination to “recognize that the concepts discussed in class can be applied to real life events happening outside.” In perhaps the most comprehensive recent account, Grauerholz and Bouma-Holtrop (2003:491-93) define a specific amalgam of “critical sociological thinking,” which they argue refers to the “ability to evaluate, reason, and question ideas and information while demonstrating awareness of broader

social and cultural contexts.” This “quality of mind” (Mills 1959:4) requires the use of sociological knowledge and awareness and thus utilizes the sociological imagination to promote a way of thinking that calls for students to be able to apply knowledge to the world around them (Buechler 2008; Geersten 2003; LeMoyné and Davis 2011; Massengill 2011; Pence 2009; Shepelak et al. 1992).

## CRITICAL THINKING RESEARCH: A BRIEF SUMMARY

In the following review, we focus on the results of studies on critical thinking as well as the methodological designs used to acquire those results. As will be seen, much scholarly discussion on critical thinking—especially in sociology—lacks a quantitative evaluation component. Instead, studies have tended to describe what critical thinking is (Baker 1981), strategies for teaching critical thinking (Buechler 2008; Burdette and McLaughlin 2010; Geersten 2003; Grauerholz and Bouma-Holtrop 2003; Malcom 2006; Rusche and Jason 2011), and how critical thinking happens within the classroom (Browne and Litwin 1987; Weast 1996).

Other studies have used more rigorous, quantitative data analysis yet are still lacking in the evaluative rigor that could help scholars understand what is necessary for critical thinking to occur. For example, Smith (1977) tape-recorded classes to ascertain which practices helped critical thinking. Although certain classroom strategies and behaviors improved critical thinking (i.e., student participation, encouragement, and peer-to-peer interaction), mean critical thinking scores did not change over the semester. Smith (1977) did not test students doing specific critical thinking writing assignments, but just interpreted which approaches seemed to help. Others offer strategies for increasing critical thought in students but lack evaluative components to show the effectiveness of these methods, such as “game show” activities (Pence 2009) and new technology like “clickers” that have become more common in natural science classrooms and are making their way into the humanities (Mollborn and Hoekstra 2010).

The most widely cited recent study is Arum and Roksa’s (2010). Their truly groundbreaking work

has helped focus not only academic discourse but also public attention on critical thinking in higher education. They analyzed the social, demographic, and academic factors that were associated with greater gains in critical thinking. Because of the nature of their study, they could not include the role of particular instructional practices other than the amount of writing and reading done across courses on improving critical thinking. Because their dependent variable was changes in the CLA, they could not provide estimates of successive higher levels of thinking.

Even though relatively few sociological studies have evaluated student skills by considering different elements of course design, work, or assignments, most assume critical thinking results from normal course instruction. Green and Klug (1990) measured the effect of using classroom debates to improve critical thinking, while others relied on some evaluation of writing (Baker and Jones 1981; Grauerholz and Bouma-Holtrop 2003; Logan 1976). Debates did little to increase critical thinking skills as measured by intellectual flexibility in evaluating social opinions (Green and Klug 1990). Rusche and Jason (2011) showed how specific writing exercises can promote student learning and knowledge within courses but did not provide any real analysis of specific learning outcomes associated with critical thinking.

Research design is an important factor in scholarship on critical thinking. Many sociological studies that analyze student skills have favored an experimental design. Crucial to this design is the need to consider the initial skills of students at the beginning of some period—usually a semester—and their skills at a later point. This design has allowed scholars to measure the change in critical thinking test scores (Baker and Jones 1981; Grauerholz and Bouma-Holtrop 2003) or essay quality (Green and Klug 1990). These studies have determined that classroom experiences change student outcomes and opinions by the end of the semester. For example, Baker and Jones (1981) found that 63 percent of students showed modest or significant gains in their critical thinking scores by the end of the semester. In Green and Klug's (1990) study, students who held "neutral" opinions at the beginning of the semester were significantly likely to modify their positions as a result of class debates.

Even though most sociologists value critical thinking, most scholarship has not clearly distinguished critical thinking skill acquisition in "normal settings" or in deliberately experimental settings. Studies have compared different student populations, including sociology majors, at different time points in their college careers (Logan 1976) and different sections of the same class (Shepelak et al. 1992). Logan (1976) reported generally low critical thinking skills (defined as the ability to spot violations of logic or scientific thinking), even among graduate students and teaching assistants. But, students who had taken a course designed to develop habits of critical thinking and scientific thinking were more likely to think critically. A few deliberate efforts have been made to construct experimental and control groups for study. Both Hamlin and Janssen (1987) and Weast (1996) controlled for teaching method and found that the active learning classes reported higher levels of sociological and scientific thinking than did traditional classes. Green and Klug (1990) observed significantly higher levels of quality thinking for classes that participated in debates than those that did not. These studies suggest that deliberate efforts must be made to improve critical thinking.

The measurement of "critical thinking" is nearly as varied as studies on the subject. Some research has given subjective evaluation of critical thinking, based on standard grading scales like A, B, C, D, or F (Green and Klug 1990) or the ability of students to critique faulty arguments (Logan 1976; Weast 1996). Others have evaluated critical thinking with predesigned, scaled rubrics: "critical reasoning tests" (Baker and Jones 1981), Watson-Glaser Critical Thinking Appraisal (Smith 1977), or an 11-item measure (Grauerholz and Bouma-Holtrop 2003). Some scholars have evaluated student impressions about their acquisition of critical thinking skills, concluding that students generally *believe* they are learning to think critically as the result of their sociology classes (Howard and Zoeller 2007; Shepelak et al. 1992). Thus, despite the quality and care of this research, these studies did not consider whether student impressions were based on the real, measurable acquisition of critical thinking skills. Burdette and McLaughlin (2010) go a bit beyond these studies in their

**Table 1.** Structure of the Observed Learning Outcomes (SOLO) Taxonomy.

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1. Prestructural: No understanding is demonstrated; response either restates question or does not answer the question
  2. Unistructural: Limited understanding; response focuses on one item
  3. Multistructural: Understanding of several discrete components is demonstrated; response includes several different, unrelated items in the exercise
  4. Relational: Understanding is demonstrated of several components that are conceptually integrated into the answer; response is appropriate to the scale of the question and prioritizes information.
  5. Extended abstract: Understanding is demonstrated at a level beyond what is asked for in the question; response generalizes beyond the scope of the question.
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Note: Adapted from Gerwing et al. (2007).

experiment, which was concerned mainly with how to increase quantitative literacy. In addition to the former, they also reported finding increased critical thinking in students' papers, though they do not present any criteria for how they measure this.

Perhaps the best recent scholarship on how to improve critical thinking, and certainly the research most closely related to this article, is the interdisciplinary work done by faculty, led by geologist David McConnell, from four metropolitan higher education institutions (Central Connecticut State University, Portland State University, University of Akron, and Wagner College) who formed a consortium, (CT)<sup>2</sup>: Critical Thinking for Civic Thinking (Gerwing et al. 2007). These scholars developed a series of critical and civic thinking exercises in which they presented realistic scenarios of community situations, followed by questions that required critical or civic thinking.

During the 2007–2008 academic year, 22 instructors (including one of the coauthors of this article) from biology, chemistry, environmental science, geology, physics, and sociology at the four institutions (724 students in 34 different class sections) participated in the (CT)<sup>2</sup> study. In each course, students were given a common (CT)<sup>2</sup> exercise as a pretest during the first week of class and as a posttest during the final week of class. The instructors used a variety of interventions, ranging from just using the pre- and posttest through various combinations of homework and in-class exercises on critical and/or civic thinking. Although there was some improvement in posttest scores in 19 of 34 courses (55.8 percent), only 4 of these were statistically significant. Interestingly, 13 courses (38.2 percent) showed a *decline* in posttest

scores, with one of these being statistically significant. Greater interventions generally, but not always, resulted in larger posttest score gains. One other interesting conclusion was that posttest scores were higher only when the critical thinking exercise had at least a minor impact on the student's final grade (for these and other results, see McConnell 2011).

McConnell (2011) and his colleagues' results are intriguing but are largely descriptive, leaving many essential questions unanswered. Can critical thinking be taught? And if so, are there specific approaches that work better than others? In this study, using the same approach as McConnell,<sup>1</sup> we address the first of these questions as we test the effectiveness of specifically designed assignments in improving critical thinking outcomes. More specifically, we created an experimental design using four sections of introductory sociology, with two instructors each teaching two sections, in which the instructors administered the pre- and posttests in all four classes while also using a series of critical thinking assignments (followed by a brief discussion of them) in one of each of the instructors' classes. Our central research question, then, is whether these relatively modest instructional innovations can improve critical thinking skills.

## WHAT WE DID IN OUR STUDY: METHODS

This study uses the SOLO taxonomy (see Table 1) to assess the level of critical thinking in students' writing on a number of different elements: the amount of understanding about the problem that

the students displayed, the ability to synthesize and prioritize information in order to make a case for their argument, the ability to discern what details are appropriate to answering the question given, and the students' ability to bring in outside information (e.g., sociological concepts and ideas) in order to further analyze the problems and make an effective argument (Biggs and Collis 1982). Students who have no essential understanding of a subject or question are assigned a "prestructural" designation. Moving up the ladder in the complexity of thinking, the next least complex response students can give is "unistructural," which only demonstrates an understanding of a single relevant aspect of the question. "Multistructural" responses are better and indicate the understanding of more than one aspect. Students who can organize their response into a coherent structure are able to achieve a "relational" designation. Finally, students who transcend the previous tiers and are able to connect with other bodies of knowledge, experience, and theories have achieved an "extended abstract" level. Thus, higher scores on the SOLO taxonomy indicate that a student's writing reflects a higher quality of critical thinking. Each of these aforementioned elements needed to be present in some form or fashion to receive the highest mark for critical thinking (5 points), and if none of the factors were present, the students received the lowest mark for critical thinking (1 point).

Four separate introduction to sociology classes, taught by two different instructors (two classes for each instructor), serve as the basis for this study. One class for each instructor served as an "experimental" group in which special assignments designed to improve critical thinking were assigned, and another class for each instructor was designated a "control" group where no special assignments were used. Consequently, there were two experimental classes and two control classes in total. Each of the four classes was limited to a maximum enrollment of 50 students. The course requirements for all four classes were exactly the same and included the same point distribution: weekly quizzes (15 percent), exams (46 percent), class participation (15 percent), and written assignments (23 percent).<sup>2</sup> The written assignments in the control classes were "typical" assignments that the instructors had used in previous semesters but did not

include any conscious "critical thinking" component, while the assignments required in the experimental classes were deliberately designed to assess students' critical thinking. Instructors taught both of their own classes in the same fashion as they had in recent previous semesters, with the exception of a focus on the critical thinking assignments for their experimental classes.

The two writing assignments assigned to the experimental classes were handed out to students a week before their respective due dates (the first assignment is in Appendix A; information on the second can be obtained from the first author). The first assignment focused on perceptions of the mass media's impact on female self-esteem and was given after both experimental classes had covered socialization. The second assignment focused on perceptions of criminal behavior in neighborhoods and was given after class inequality and crime had been covered in both classes. All instructions were included on the paper and no additional oral instructions were given to students in class. Students submitted their assignments via the Internet using a course management system (CMS). The instructors downloaded all submitted papers and graded them using the SOLO taxonomy as the rubric. Comments were added to the papers and then reposted to the CMS. Three separate scores were given to students (SOLO taxonomy level [i.e., critical thinking score], the accurate use of sociological ideas, and writing quality), each ranging in general from 1 (poor) to 5 (excellent). These scores were combined together into a final grade for the paper. In the experimental classes, on the day that students were notified in class that their papers had been graded and available on the CMS, instructors reviewed how the papers were graded, using five detailed, instructor-created example answers, each based on a SOLO taxonomy level. Thus, our experimental classes were distinguished from the control classes based on these two related interventions: the writing assignments and the subsequent brief discussions of them.

To assess changes in critical thinking across the semester, pretest (during the second week of the semester) and posttest (during the last week of the semester) assignments were conducted in all four introduction to sociology classes. For the pretest, the instructors read a prepared script explaining to

their students the purpose of the research, noting that students would receive extra credit for completing the question (see Appendix B for complete script). Students were told they still receive extra credit and would not be penalized if they chose not to sign a release form to participate in the research. The posttest assignment was conducted in a similar fashion during the last week of class, again offering extra credit to complete the question.<sup>3</sup> These essay pairs are the key focus for this research, and they were also evaluated via the SOLO taxonomy. The posttest scores are our dependent variable, while pretest scores are included to control for initial differences in critical thinking among students.

After the semester ended, we determined that 101 students (66 in the control and 35 in the experimental group) completed both the pre- and post-essays, leaving us with a final sample of 202 essays to assess. These essays were then coded and given randomly generated four-digit numbers ranging from 1000 to 9999. Two researchers (who were neither of the two instructors for the four studied classes) graded every student's essay on the level of critical thinking displayed in the work using the 1 to 5 SOLO taxonomy scale. It is important to point out that graders did not know whether an essay was from the pretest or posttest.

To assure that the essays were being coded in a standardized manner, two individuals from the research team used a system of intercoder reliability. Once the essays were scored, the coders and other members of the research team met to compare each essay's assigned scores in an effort to establish the evaluative criteria for critical thinking. During the first few meetings essay grades were compared and only those papers that were scored 2 or more points apart (higher than a 2-point difference only happened once in the entire process of grading) were discussed so that some understanding of the disputed content could be reached. Once the discrepancies in grading were accounted for, the coders reassessed all of the essays from the portion that was just graded (i.e., 1000-1999), plus the next portion (i.e., 2000-2999). This process was repeated after each successive meeting and the coding became more and more convergent as the grading continued. In the final grading session, 72.7 percent of all essays were scored equally by the coders, 26.7 percent of

essay scores differed by 1 point, and only one essay was off by 2 points. In these discrepant cases, we averaged the ratings to produce the final scores. In summary, there was absolute agreement on almost three-quarters of all essays, and because we recognize that there truly are some answers that straddle critical thinking levels (think of these as analogous to plus and minus grades on a 5-point A-F scale), we are comfortable in concluding that there was a high level of intercoder reliability in this process.

## ASSESSING CRITICAL THINKING

Before addressing our central research question, it is helpful to provide some basic demographic information on our study participants. As noted previously, they all were enrolled in an introductory sociology course at a public university during the 2009 spring semester. Three-fourths of them were freshmen, with another 19 percent sophomores. Slightly more than half the sample was women (51.5 percent); 18.8 percent were non-white, and almost one-quarter (23.8 percent) were on Pell grants (a proxy measure of socioeconomic status). The mean grade point average—as recorded by the university registrar—was 2.85. The only significant difference between the experimental and control groups on these background factors were in terms of gender: Women composed 65 percent of the control group but only 26 percent of the experimental group.

Table 2 contains the average pre- and posttest critical thinking scores for the experimental and control groups. Turning first to the pretest scores, the control group (2.30) showed slightly higher—though not statistically significantly ( $t = 1.17$ ,  $ns$ )—levels of critical thinking than did the experimental group (2.14). The experimental group's score was higher than the control group for the posttest. But, there was no significant difference ( $t = 1.61$ ,  $ns$ ) on the posttest scores between the two groups: 2.02 (control group) versus 2.23 (experimental group). What had changed, however, was that the control group's average level of critical thinking declined during the semester while the experimental group's critical thinking increased.

Initially, these results may be surprising, in particular the decline in critical thinking for the

**Table 2.** Critical Thinking (Structure of the Observed Learning Outcomes [SOLO] Taxonomy) Scores on Pretests and Posttests.

	Means	
	Pretest	Posttest
Control group ( $n = 66$ )	2.30	2.02
Experimental group ( $n = 35$ )	2.14	2.23
$t$ test	1.17 (ns)	1.61 (ns)

control group. Although one may be tempted to wonder about instructional quality when students actually do worse at the end of the semester than they were doing at the beginning of it, recall that (a) a similar decline was observed in almost 40 percent of courses in Gerwing et al.'s (2007) multi-institutional study, (b) these declines are especially likely to occur when an emphasis on critical thinking is not a core part of the course, and (c) critical thinking did appear to improve in the experimental group—and they had the same instructors as in the control group.<sup>4</sup>

The question becomes whether these changes across the semester between the experimental and control groups are statistically significant, and the results that address this are reported in Table 3. Our primary explanatory variable is whether the student was in the control group or the experimental group. Recall that the primary difference between the two groups is that the students in the experimental group were given two critical thinking writing assignments that were modeled after the pre- and posttest critical thinking scenarios; as noted previously, when returning students' assignments in the experimental group, instructors also spent class time reviewing different complexities of critical thinking required for each of the five SOLO taxonomy levels.

The dependent variable in Table 3 is posttest scores, and at the bivariate level (column 1), there was no significant difference in posttest scores between the experimental and control groups. Because ours is not a true experiment, with random assignment of subjects to experimental and control groups, we need to control for extraneous sources of variation between the two groups. We do this in column 2, as we include measures of

**Table 3.** Teaching Critical Thinking: The Impact of Scaffolding Assignments on Posttest Scores (Unstandardized Regression Coefficients).

	$b$	$b$
Experimental group	0.213	0.419*
Pretest score		0.256*
Instructor		-0.223
Grade point average		0.169
Credit hours taken		-0.002
Women		0.230
Minority		-0.099
Pell grant		-0.084
Constant	2.015	0.995
Adjusted $R^2$ ( $N = 101$ )	0.016	0.137*

\* $p < .05$ .

pretest score, instructor, grade point average, cumulative credit hours completed, gender, race/ethnicity, and socioeconomic status (measured by whether they received a Pell grant).

These results are quite telling: Not only are pretest scores ( $b = 0.256$ ) positively associated with posttest scores, but also and more importantly, so is being in the experimental group ( $b = 0.419$ ). In fact, after adjusting for the other differences between the groups and taking into account their initial levels of critical thinking, having just two additional writing exercises designed to enhance critical thinking, along with modest discussion of them, raised critical thinking scores almost half a level on the SOLO taxonomy.<sup>5</sup> This is a considerable amount of change in just one semester, as students showed solid movement from thinking at a unistructural level toward more multistructural analysis. It is also noteworthy that membership in the experimental group and pretest score were significant predictors of the posttest scores, while all the usually expected sociological characteristics (e.g., race, gender, class) were not.<sup>6</sup>

## CONCLUSION AND DISCUSSION

We have several key findings that support the thrust of the current literature on critical thinking and suggest future lines of inquiry. Similar to Arum and Roksa (2010), our first finding is that initial levels of critical thinking among a sample of

college students indicate that students start college with limited skills in demonstrating complex understandings of issues. Our results duplicate almost exactly those found in Gerwing et al.'s (2007) multi-institutional study and, given the importance that employers place on critical thinking (Hart Research Associates 2010), underscore the need for college educators to focus more energies on this.

Our second key finding, however, is that our relatively modest interventions increased critical thinking significantly from just one course in one semester. Although this is encouraging, it is important to realize that part of the reason for this effect was that the critical thinking skills of our control group eroded during the semester.<sup>7</sup> Similarly, as noted earlier, in a similar instrumentation McConnell (2011) reported declines in critical thinking for almost 40 percent of students, with critical thinking increasing only when the posttest had an impact on a student's final grade.<sup>8</sup> Perhaps, then, critical thinking is unlikely to improve substantially without serious and sustained attention and a commitment on the part of instructors to have it directly impact students' grades.

On one level, our results are a useful and perhaps optimistic counterpoint to Arum and Roksa (2010). As we noted earlier, Arum and Roksa's book (2010) has caused a great deal of academic hand-wringing, as commentators from across the political spectrum have decried the performance of U.S. higher education. Yet, despite the quality of their work, Arum and Roksa's (2010) analysis essentially is descriptive; they do not test the role that specific instructive practices play in impacting critical thinking, nor do they have a clear "assessment"-based standard for what constitutes a particular level of critical thinking. In contrast, by using the SOLO taxonomy in our experimental design, we are able to point to two specific interventions—critical thinking writing exercises followed by class discussion of them—that when coupled together can, in one semester, move students toward higher levels of thinking.

Because our design had two interventions in the experimental group—the critical thinking essays and their subsequent discussion—we cannot formally disentangle the impact of these two treatments.<sup>9</sup> The best that we can do is provide some

indirect evidence. Recall that students in the experimental groups received grades on both of these assignments; interestingly enough, net of all else, these grades—either individually or together—are not significantly related to posttest scores. This suggests that either the discussion or the discussion in combination with the essays is the driving force in enhancing critical thinking. However, determining this precisely will require additional testing.

Building on this, our results may also be useful for what may properly be described as an emerging "assessment regime" in higher education. Hardly a week passes without more calls for greater accountability and, in particular, documented evidence on student learning, especially as student debt mounts and employment opportunities dwindle. Although we fully support the primary role of student learning, one fear is that in our rush for learning outcomes we will rush past the need to rely on solid education practices that actually lead to the outcomes that we desire for our students.

Finally, we would like to end on an optimistic note. Our modest intervention provides evidence that critical thinking can be taught. As suggested by Logan (1976), it is essential that sociology instructors who value teaching the sociological imagination continue this discussion of critical thinking and assess over time students' ability to retain and enhance this "quality of mind" as Mills (1959:4) called it. Future research designs should consider a longitudinal component to evaluate students' progress over multiple semesters, with a variety of exercises and interventions specifically designed for improving critical thinking coordinated throughout the curriculum. For instance, would students' thinking abilities lessen if they enrolled in lecture-style courses directly after active-learning courses (Hamlin and Janssen 1987)? One would hope that if critical thinking is *learned* that a student would then retain this skill, however, this is debatable and needs further investigation.

## APPENDIX A: WRITTEN ASSIGNMENT I

### *Socialization*

*Instructions:* The final paper should be 2-3 pages long. Use proper sentence structure and paragraph



formation (do not use bullet points or an outline form!). All papers must be typed double spaced using 12 point, Times New Roman font. Refer to the syllabus for more details.

*Scenario:* You are currently a member of a community where there has been an increased concern of young women's image of their bodies. Members of your community are very concerned about the self-esteem of these women and have gathered to discuss ways to intervene.

There are some community members who feel women's body image has a direct link back to the media. Young teens watch an average of 2 hours of television per day and the portrayal of women in movies and TV shows has been increasingly sexualized over recent years. They feel the community's efforts to increase young women's self-esteem about their bodies should be targeted solely at the media. They feel increased censorship of television and movie content would greatly help to lower the rates of eating disorders and the frequency of dressing in revealing clothing. Not everyone agrees with the stance that the media is the only socializing agent to blame for young women's decreased body image and sense of self.

*Assignment:* As a resident in the neighborhood, identify and explain the strengths and weaknesses of the argument that the media should be the only place of focus to increase women's body image.

## APPENDIX B: PRETEST SCRIPT

Research is being conducted on campus regarding critical thinking, research that my classes are participating in. The researchers are studying how students at the University of Akron critically think. I would like you to take about 20 minutes to complete this question. Read through the scenario then answer the question to the best of your ability. You will be given 5 points extra credit for completing this question—so make sure to write your name on top. At the end of the semester I will ask you to complete a form authorizing the researchers to use your response. You do not have to allow the researchers to use your data. Extra credit will be given regardless of whether you choose to participate. This is completely confidential—your name will later be removed from the form that you turn in. Your performance on this is not going to affect

your grade in this class. Please turn in these two pieces of paper to me when you finish (both the scenario and your answer), and then wait for the rest of the class to complete this assignment. Thanks for your help in this important research.

## ACKNOWLEDGMENTS

The authors would like to acknowledge David McConnell for allowing us to use his critical thinking scenarios.

## NOTES

Author names are listed alphabetically. Email the authors for any scenarios not included herein.

Reviewers for this manuscript were, in alphabetical order, Jay Howard, Nancy Malcom, and Theodore C. Wagenaar.

1. We received written permission from David McConnell, the principal investigator of the project.
2. Percentages do not total 100 percent due to rounding.
3. All students present in class completed the pretests and posttests.
4. The instructors were not responsible for assigning the pretest and posttest scores analyzed here, thus avoiding any experimenter bias.
5. As suggested by Allison (1990), we replicated these analyses using change scores (posttest minus pretest) as our dependent variable. Our results were extremely similar, except that being in the experimental group was significant in bivariate regression and had a slightly larger impact controlling for all other factors. Because some have cautioned against using change scores as they may be affected by regression to the mean, Allison (1990) suggests that using either change scores or the "regressor variable" method (posttest scores regressed on pretest scores) are both acceptable. We report the latter since they provide a somewhat smaller impact of our experiment, thus helping us not to overstate its importance.
6. It is worth speculating as to why there were no differences in critical thinking by race, gender, class, and so on. The lack of difference is not due to these variables' intercorrelations, as none have a significant bivariate relationship with either pre- or posttest scores. It appears that race, at least, has an effect by lowering GPA, and this at least in the bivariate case is related both to lower pre- and posttest scores.

7. Part of the reason for this decline may be due to regression to the mean, which as noted previously, is one reason why some have suggested not to use change scores as a dependent variable (cf. Allison [1990] for a summary of this argument).
8. Similarly, Arum and Roksa (2010) found that almost half of all students showed no improvement on the Collegiate Learning Assessment (CLA) after two years of college.
9. To do so, of course, would have required a design with three experimental groups—one that did the writing assignments, one that had in-class discussion with no assignments, and one that did both—but we were unable to field this design because we had different instructors each doing only two courses. In order not to have a confounding relationship with instructor, we would have needed a situation in which one instructor taught all four courses.

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