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## Gaining Ground: Toward the Development of Critical Thinking Skills in a Social Problems Course

Ada Haynes

Tennessee Tech University, [ahaynes@tnitech.edu](mailto:ahaynes@tnitech.edu)

Jacob Kelley

Auburn University, [jkk0019@auburn.edu](mailto:jkk0019@auburn.edu)

Andrea Arce-Trigatti

Tennessee Tech University, [aa.trigatti@gmail.com](mailto:aa.trigatti@gmail.com)

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## Abstract

The purpose of this article is to contribute to the scholarship of teaching and learning in sociology by examining a set of course redesign improvements made in a Social Problems course at the undergraduate level. These improvements center on increasing students' critical thinking skills by integrating research-based, innovation-driven learning and student-centered strategies into a four-part course assessment redesign. Using a primarily case study approach, we examine quantitative data in the form of an interdisciplinary pre- and post- Critical thinking Assessment Test (CAT) from students enrolled in one iteration of the redesign for this particular course. Results from this analysis highlight the potential of these pedagogical improvements to foster the development of critical thinking skills and as an example of how assessment data can be used to guide further iterations of a course.

## Keywords

Critical Thinking, Sociology, Inquiry-Guided Learning, Assessment, Undergraduate Education

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# Gaining Ground: Toward the Development of Critical Thinking Skills in a Social Problems Course

Ada Haynes,<sup>1</sup> Jacob Kelley,<sup>2</sup> and Andrea Arce-Trigatti<sup>1</sup>

<sup>1</sup> *Tennessee Tech University*

<sup>2</sup> *Auburn University*

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The purpose of this article is to contribute to the scholarship of teaching and learning in sociology by examining a set of course redesign improvements made in a Social Problems course at the undergraduate level. These improvements center on increasing students' critical thinking skills by integrating research-based, innovation-driven learning and student-centered strategies into a four-part course assessment redesign. Using a primarily case study approach, we examine quantitative data in the form of an interdisciplinary pre- and post- Critical thinking Assessment Test (CAT) from students enrolled in one iteration of the redesign for this particular course. Results from this analysis highlight the potential of these pedagogical improvements to foster the development of critical thinking skills and as an example of how assessment data can be used to guide further iterations of a course.

Courses on social problems are prevalent within sociology programs across the United States and form a vital part of the undergraduate general education experience (Malcom, 2006). Leon-Guerrero (2019) conceptualizes a social problem as “a social condition or pattern of behavior that has negative consequences for individuals, our social world, or our physical world” (p. 4). In other words, a social problem is a major issue that adversely affects society in a significant way. In taking these courses, undergraduate students are charged with developing their sociological imagination (Mills, 1959) to examine a variety of social problems like poverty, human trafficking, and deforestation. The critical thinking component of developing one's sociological imagination is essential for understanding that these problems are not centered on the impact of the individual but rather students' immediate and the larger global community (Kelley et al., 2021). It is important to recognize, then, that a social condition is not considered a social problem until recognized by people as such, which makes them socially constructed (Loseke, 2003). In garnering stronger critical thinking skills, students will be more readily able to navigate the idiosyncrasies associated with social problems as well as construct more innovative solutions to these challenges (Arce-Trigatti et al., 2022; Haynes et al., 2015; Malcom, 2006).

The purpose of this article is to contribute to the scholarship of teaching and learning in sociology by examining a set of course redesign improvements made in a Social Problems course at the undergraduate level that sought to develop critical thinking skills. As suggested by Noddings (1998), although the teaching of critical thinking is necessary in all disciplinary areas, faculty members are traditionally ill-equipped to engage in the sophisticated arena of the intentional development of such skills. More specifically, faculty members are rarely trained to develop learning assessments for critical thinking despite understanding the importance of critical thinking as a learning outcome (Arce-Trigatti et al., 2022; Haynes et al., 2016). Better understanding the alignment of intentional pedagogical strategies to the enhancement of critical thinking skills is thus beneficial. The improvements featured in this article center on increasing students' critical thinking skills by integrating research-based, innovation-driven, and student-centered strate-

gies into a four-part assessment redesign of the course (Arce et al., 2015; Bransford & Stein, 1993; Lee, 2004).

The research questions anchoring this study address the “what works?” question from Hutchings (2000) in such a way that can be intentionally and rigorously considered for other disciplines. Using a primarily case study approach, we examine quantitative data in the form of a pre- and post- Critical thinking Assessment Test (CAT) from students enrolled in one iteration of the redesign for this particular course (Arce-Trigatti et al., 2022; Haynes et al., 2015; Haynes & Stein, 2020). Results from this analysis highlight the potential of these pedagogical improvements to foster the development of critical thinking skills and as an example of how assessment data can be used to guide further iterations of a course.

## BACKGROUND

### The Need for Critical Sociological Thinking

The skills associated with critical thinking are essential for navigating the complexity associated with social problems (Kelley et al., 2021; Lemoyne & Davis, 2011; Malcom, 2006). For Lemoyne and Davis (2011), emphasizing critical thinking within sociological frameworks is paramount to fostering the type of critical sociological thinking that is required to debunk false claims, find verifiable evidence, and move toward a viable solution to complex social problems. To this end, sociological educators at the post-secondary levels have been intentionally integrating pedagogical strategies that are aligned with the development of these skills, including those established in intensive writing practices (Malcom, 2006), elaborate ethnographic projects (Pederson, 2010), community-based research (Pitt & Packard, 2010), civic education (Kelley, 2021), media literacy (Platts, 2018), and justice-oriented work (Kelley et al., 2023), *inter alia*.

Further, Lowry (2016) emphasizes the alignment of sociological frameworks to social justice challenges by arguing that sociology courses at the undergraduate level are often merely an academic enterprise. The result of the integration of social justice initiatives and the movement to instill critical thinking skills in sociology courses is aimed at providing students with a civic-minded platform in which to engage with complex social prob-

lems and to develop a form of “critical, multifaceted sociological thinking” (Lowry, 2016, p. 184).

## Challenges to the Development of Critical Thinking Skills in Sociology

The need to integrate the development of critical thinking skills with sociological thinking to help students become critical sociological thinkers with regards to social problems is evident in the literature (Kelley et al., 2021; Lemoyne & Davis, 2011; Malcom, 2006). Toward this end, the American Sociological Association (ASA) Task Force on Liberal Learning and the Sociology Major recommended that the Sociological Literacy Framework (Ferguson & Carbonaro, 2016), which consists of key sociological concepts and competencies (see Table 1), serve as outcomes for the sociological major (Arce-Trigatti et al., 2022; Kelley & Garner, 2023; Pike et al., 2017). With rapid changes and advancements in technology, however, the skills necessary to develop these competencies have become simultaneously more important and more challenging to teach in the classroom as the Internet and social media have drastically changed how students access information and communicate ideas (Aydarova et al., 2023; Haynes et al., 2021; Shearer & Gottfried, 2017).

environments (i.e., learner-centered, knowledge-centered, assessment-centered, and community-centered) into effective pedagogical approaches is emphasized. The basis of these environments can be traced to constructivist learning theories, which posit that knowledge can be acquired and molded by individual insight (Anderson, 2013; Platts, 2019).

Students are then actively charged with obtaining vital information to help them construct new knowledge (i.e., acquisition) while also encouraged to synthesize this new knowledge to create new solutions to ever complex problems (i.e., transfer) (Arce et al., 2015; Bransford et al., 1999; Hales et al., 2019). Within this pedagogy, these paradigms are often set within the context of inquiry-guided learning—associated with active learning environments—wherein students identify a complex challenge or issue and utilize creative and critical thinking skills to address this issue (Lee, 2004, 2012; Miller et al., 2021; Platts, 2019).

Inquiry-guided learning adopts a student-centered approach to pedagogy wherein learning lies in motivating student engagement through the identification of a problem which requires research and critical thinking skills to address or better understand (Arce-Trigatti et al., 2022; Eglitis et al., 2016; Lee, 2004, 2012). Within undergraduate education, this inquiry-based learn-

**Table 1. Sociological Literacy Framework (as cited in Ferguson & Carbonaro, 2016, p. 154)**

| The Sociological Perspective (Essential Concepts)                                | The Sociological Toolbox (Essential Competencies)                                                                    |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| The Sociological Eye: Sociology as a distinctive discipline                      | Apply Sociological Theories to Understand Social Phenomena (Theory)                                                  |
| Social Structure: The impact of social structures on human action                | Critically Evaluate Explanations of Human Behavior and Social Phenomena (Evaluation)                                 |
| Socialization: The relationship between the self and society                     | Apply Scientific Principles to Understand the Social World (Sociology as a Science)                                  |
| Stratification: The patterns and effects of social inequality                    | Evaluate the Quality of Social Scientific Methods and Data (Methodological Practice)                                 |
| Social Change and Social Reproduction: How social phenomena replicate and change | Rigorously Analyze Social Scientific Data (Quantitative and Qualitative Data Literacy)                               |
|                                                                                  | Use Sociological Knowledge to Inform Policy Debates and Promote Public Understanding (Public Skills and Citizenship) |

Students have access to such immense realms of information on any topic that it becomes difficult to decipher the validity of the perspectives represented by this form of communication (Vosoughi et al., 2018). For example, researchers have found that public search engines such as Google were the most common source of information for student research (Purcell et al., 2012; Purdy, 2012; Yevelson-Shorshe & Bronstein, 2018). Thus, the need for students to develop these same critical thinking skills on the evaluation of this readily available information via this media so as to not confound misdirected ideas with valid claims related to social problems becomes vital (Shearer & Gottfried, 2017; Vosoughi et al., 2018).

## Pedagogical Strategies to Address These Challenges

To answer these evaluation of information challenges, several pedagogical strategies have been identified. The ones that are specific to this paper center on three pedagogical frameworks: the *How People Learn* framework (Branford et al., 1999), inquiry-guided learning (Lee, 2004), and the IDEAL Problem Solver (Branford & Stein, 1993). In Branford and colleagues' (1999) foundational work, *How People Learn*, the integration of four powerful learning

ing movement has transformed the way in which students interact with the social problems central to sociology. Eglitis et al. (2016), for instance, argue that the very essence of sociology is for students to move beyond being passive recipients of information, “. . . to become thoughtful researchers, problem solvers, and effective communicators” (p. 212). In creating this type of student-centered environment, a myriad of skills is fostered within the students, including communication, critical and creative thinking, the examining of different perspectives, ideas, and attitudes as well as the synthesis of these ideas into new frameworks (Bach & Weinzimmer 2011; Desmond, 2005; Eglitis et al., 2016). At the core of these pedagogical approaches lies the active participation of the students who not only drive the learning process but engage with the content in a way that develops skills associated with an IDEAL problem solver (Bransford & Stein, 1993).

The IDEAL problem solver necessitates the embodiment of the skills that align with the framework of the same name (Bransford & Stein, 1993). This framework encompasses: the Identification of problems and opportunities; the Definition of goals; the Exploration of possible strategies; the Anticipation of outcomes and the appropriate actions in accordance with this evaluation; and a necessary reflection to Look back and Learn from this

process (Bransford & Stein, 1993, p. 20). Skills associated with the IDEAL problem solver then are related with these elements of the framework and can encompass, for example, critical and creative thinking, synthesis of ideas, experimentation, discovery, and a research mindset (Ferguson, 2016; Kelley et al., 2021; Platt, 2019). Once more, we posit that the pedagogical conceptualizations of the assessments and activities encompassed by this course redesign are aimed at fostering these skills by offering students the opportunity to interact with complex social problems via multiple perspectives, while leveraging resources to understand the problem holistically and identify viable solutions from a sociological perspective.

## CASE STUDY

### Understanding Critical Thinking in Pedagogy

This article centers on better understanding the connections between pedagogy and enhancements of critical thinking skills in students by gathering information about our classroom teaching to make iterative improvements on pedagogical strategies linked to critical thinking skills for application to complex social problems (Kelley et al., 2021; McKinney, 2017; Medley-Rath, 2019). As Siegel (1988) posited, the development of critical thinking skills runs in tandem to the development of “student autonomy, self-sufficiency, the skills of reason assessment, and the attitudes, dispositions, habit of mind, and character traits of the critical spirit” (p. 55).

This argument is further developed in the justification for the intentional fostering of critical thinking skills in students in an effort to generate perspectives of respect for students as persons, self-sufficiency in the development of individual critique and thought, as well as training in rational thinking and civic practices (Kelley & Watson, 2023; Noddings, 1998; Siegel, 1988). In terms of sociological thinking, the need for critical thinking skills is evident in the requisites of the discipline, wherein it is necessary to be able to observe, navigate, and critique the social structures that influence human movement, interaction, and behavior (Giroux, 2020; Kelley & Arce-Trigatti, 2021; McKinney, 2017). The current study, thus, offers insight into how the redesign featured for the Social Problems course at the undergraduate level links to specific critical thinking skills that were assessed using the CAT evaluation tool.

### Overview of Curriculum Redesign

In accordance, the purpose of this study was to understand the effectiveness of pedagogical strategies related to a curricular redesign in terms of students’ gains in critical thinking skills. This redesign aimed at improving the critical thinking skills of students enrolled in an undergraduate level Social Problems course through various applications of these skills used to analyze multiple points of information related to complex social problems, including classroom exercises, debates, and the development of Creative Inquiry Application Papers (CIAP). The expectations were that they would build on these analyses as they complete a larger project throughout the semester—the Creative Inquiry Media Project (CIMP).

The changes to our course’s syllabus are therefore intentionally designed to promote critical and creative thinking skills through inquiry-guided learning practices (Ferguson, 2016; Arce-Trigatti et al., 2022; Lee, 2004), which also align with several of the sociological concepts and competencies outlined earlier in

the Sociological Literacy Framework (see Table 1). The conceptualizations of the CIAP and the CIMP enhance this objective by providing students a forum in which to engage with the complexity of social problems through multiple perspectives, to utilize a myriad of resources to understand the problem holistically, and to identify viable solutions from a sociological perspective. This design draws heavily on key learning concepts derived from the three pedagogical frameworks described in the previous section.

### Institutional Support

The course redesign that we are featuring is part of a larger university-wide effort to support the promotion of critical thinking skills in undergraduate classrooms. Expressly, the major proponents of the course redesign were financially supported by a university level Quality Enhancement Grant (QEP) meant to foster active learning and student-centered learning strategies at the undergraduate level. The QEP mission affiliated with our university is currently focused on Enhancing Discovery through Guided Exploration (EDGE), which advances the integration of these innovative pedagogical strategies, centered on the fusion of research-based practices in an exploratory setting, in an effort to develop critical thinking with the undergraduate student population. The course redesign, therefore, is aligned with these efforts and based on the aforementioned pedagogical strategies.

### Course Portrait and Logistics

Adding to the contextual information for this study, the Social Problems course is a lower division elective open to all majors that examines social problems through multiple sociological perspectives. It is a three-hour, undergraduate level course offered at a mid-sized, R2, public university in the southeastern region of the United States and is intended to be scheduled as an early social science elective course for those inside or outside the major. Aligned with the QEP objectives mentioned above, the purpose of this course is to equip students to identify, define, explore solutions to—and anticipate the outcomes of—those solutions to social problems actively and critically (Kelley et al., 2021). As part of this aim, we intentionally designed the course in such a way that wove student-centered learning strategies (Malinowski, 2004; Pedersen, 2010; Scheel, 2002) throughout the learning ecology. The course had five student learning outcomes:

1. Students will identify and apply sociological theories to understand social problems from multiple perspectives.
2. Students will employ digital information search tools to research social problems.
3. Students will collect, evaluate, and synthesize information from numerous sources to effectively suggest real-world solutions to social problems without making inappropriate inferences.
4. Students will design an innovative media project that clearly and coherently communicates a solution to a real-world social problem using relevant and quality information from sociological research in order to promote public understanding.
5. Students will understand and appreciate the value that sociological knowledge and skills have for life, work, and citizenship.

Each student learning outcome draws from the language and the mindset of the Sociological Literacy Framework (Ferguson & Carbonaro, 2016; see Table 1) and captures the inquiry-driven



spirit (Lee et al., 2004) of our institution's QEP. We contend that they also align themselves with the specific characteristics associated with critical thinking skills, including respect for multiple perspectives, training in civic and democratic practices, and the development of rational thought (Seigel, 1988).

## Pedagogical Theory

As noted, this course integrates elements of inquiry-guided learning, active learning, and the IDEAL problem solver into its project and content design. For example, students are encouraged to take an active role in their learning process and be involved in the investigation of the research process for the development of their creative media project (i.e., CIMP) (Lee, 2004). Integral to this process, students are actively engaged in the collection, evaluation, and synthesis of information from various sources within the creation of the CIMP for this course (Anderson, 2013). These tasks involve the fostering of the aforementioned skills associated with the IDEAL problem solver (Bransford & Stein, 1993) and include, for example, the critical and creative thinking skills, synthesis of ideas, experimentation, discovery, and research mindset as developed as part of the requirements of this course (Arce-Trigatti et al., 2022; Ferguson, 2016; Platt, 2019).

Further, these elements are integrated into the Renaissance Foundry Model, the innovation-driven pedagogical platform leveraged to design the CIMP and integration of assessments for this course (Arce et al., 2015). This model integrates two major pillars, knowledge acquisition and knowledge transfer, that help students navigate a six-step process that commences with the identification of a student-led challenge and finalizes with the creation of a prototype of innovative technology (Arce et al., 2015; Bransford et al., 1999). Both pillars work iteratively throughout the process to allow students to acquire and transfer knowledge (i.e., the critical thinking course assessments) that is relevant to the creation of their prototype of innovative technology (i.e., the CIMP) (Arce et al., 2015; Bransford et al., 1999). These steps are embodied by the course learning objectives specified in the previous section.

## CRITICAL THINKING COURSE ASSESSMENTS

### Addressing the Technology Challenge through Information Literacy

Recognizing the need for information literacy among our students, we intentionally constructed opportunities for them to navigate the literature surrounding social problems within these assessments. The American Library Association (2000) defines information literacy as "a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (p. 2). We began early in the semester by facilitating a suite of exercises from the Stanford History Education Group. Once each student had completed the exercises, we paired them to evaluate one another's responses. We found that this was an effective strategy for scaffolding the transition from opinion-based perspectives to evidence-based perspectives, a hallmark of our course design.

Moreover, we spent ample time guiding the students through locating peer-reviewed sources. In particular, we demonstrated the effectiveness of utilizing the CRAAP test (Blakeslee, 2004) when evaluating sources. This humorous yet powerful strategy advises students to consider the Currency, Relevance, Authority,

Accuracy, and Purpose of a source before using it. Each assessment thereafter deployed these information literacy skills (Arce-Trigatti et al., 2022). This skillset became a cornerstone of all the critical thinking assessments developed for the purpose of this course redesign.

## Four Course Assessments:

### Knowledge Acquisition and Transfer

During the semester, students engaged in various assessments designed to improve their critical thinking skills. The first assessment, Engagement, was a combination of attendance and participation. Due to the integration of active and inquiry-guided learning elements into the redesign of this course, it was crucial for the students not only to attend every session but also to meaningfully engage with the content that included exercises such as those from the Stanford History Education Group as well as other exercises that built critical thinking skills related to social problems. The second assessment, the CIAP, was a writing exercise in which students selected a social problem from the required readings to explore more fully by proposing two real-world solutions to the social problem. These papers, eight in total, were all designed to help students to acquire knowledge, analyze and synthesize that knowledge, and later transfer that knowledge to coherent and relevant solutions related to the social problems they were addressing (Arce et al., 2015; Bransford et al., 1999). The iterative nature of this process not only exposed students to the necessary time and work related to understanding multiple perspectives but also to applying the CRAPP method to these sources.

The third assessment, Debates, was an oral communication exercise in which the students researched and presented points on social problems from opposing viewpoints that were self-selected. In this effort, because students were to deliver their research-based perspectives to their peers, communication skills, and the ideas and viewpoints delivered needed to be sufficiently validated and evaluated against the CRAPP process and based upon peer reviewed articles in the discipline (Blakeslee, 2004). Finally, the fourth assessment, the CIMP, asked students to design a social awareness campaign that clearly and coherently communicated a solution to a real-world social problem of their choice by using an emerging technology. As noted, this assessment embodied the Renaissance Foundry element of a prototype of innovative technology wherein the creative media campaign was envisioned to address a student-identified challenge, in this case a larger social problem (Arce et al., 2015).

Engagement with the other three assessments was meant to provide avenues in which students could acquire knowledge that was relevant and beneficial for the purpose of developing this campaign (i.e., knowledge acquisition), wherein the process of applying these elements to the actual creation of the campaign embodied engagement in knowledge transfer (Arce et al., 2015; Bransford et al., 1999). For the purposes of this assessment, we required students to use Adobe Spark to help streamline the quality of the final project and address the issue of an equitable platform for use of technology (i.e., varying technology skills influencing the quality of the product).

## METHODS

### Research Design

The research questions associated with this study are 1) After experiencing this redesign, is there a difference between students'

initial and final critical thinking skills scores as measured by the Critical thinking Assessment Test (CAT)? 2) In what types of critical thinking skills did students make gains after experiencing this redesign? Both of these questions consider the effectiveness of the pedagogical strategies implemented in this course in terms of critical thinking gains. The primary research design for this study was a quantitative pre- and post- test design, wherein students enrolled in this course during one semester were administered the CAT at the beginning and the end of a semester, as it was imperative to use a direct measure of student learning.

Research has found that students have difficulty gauging their gains in critical thinking in the classroom (Harris, 2015). For example, a recent National Academy of Science study by Deslauriers and team (2019) found that students learned more in classrooms engaged in active learning but felt that they learned less than students in a traditional lecture class. Therefore, a direct measure of students' critical thinking skills, the CAT was used as our measure of student learning.

### CAT (Critical thinking Assessment Test)

The CAT instrument is an open-ended, faculty-driven assessment, which means that it was designed with faculty input to assess the skills that faculty think are most important (Stein & Haynes, 2011) to measure critical thinking skills across disciplines. The CAT was originally developed in 2000 and was refined and nationally disseminated with funds from the National Science Foundation (NSF). The funding provided by NSF provided opportunities for additional input from a more diverse group of faculty members in a greater variety of disciplines and institutions, as well as experts in learning sciences and assessment (Stein et al., 2007). Over 350 colleges and universities around the world from various disciplines have participated in the CAT project. Miller (2012) notes that the skills assessed by the CAT instrument may provide "a de facto definition of the aims of college" (p. 6). The assessment has been found to be valid, reliable, and culturally fair (Stein et al., 2007). The range of possible scores on the CAT test are 0 to 38.

The CAT uses 15 primarily short answer essay responses to assess critical thinking that can be given in an hour class period (although it is not a timed test). The CAT instrument also incorporates a process known as "dynamic assessment" (Feuerstein, 1979; Lidz, 1987; Samuels, 2000; Sternberg & Grigorenko, 2002). In dynamic assessment, a series of increasingly deeper and more explicit question prompts are used to engage students' critical thinking skills to measure the extent to which people can understand and evaluate new information and apply that information to a novel situation. Deeper prompting frequently helps reveal critical thinking skills that might not otherwise be observed and provides a more valid measure of the students' potential to think critically. The CAT uses machine scoring in an effort to alleviate potential bias that might occur through human scoring and to protect the anonymity of students due to the small sample size.

### Sample

A total of fourteen students ( $n = 14$ ) completed both the pre- and the post- CAT assessment, the pre- on the second day of class and the post- at the end of the course. These students represent a mix of undergraduate student majors enrolled in this course during one semester which included the following representations: 35% of the students were enrolled as sociology majors and an equal percentage 35% as psychology majors, with 6% of

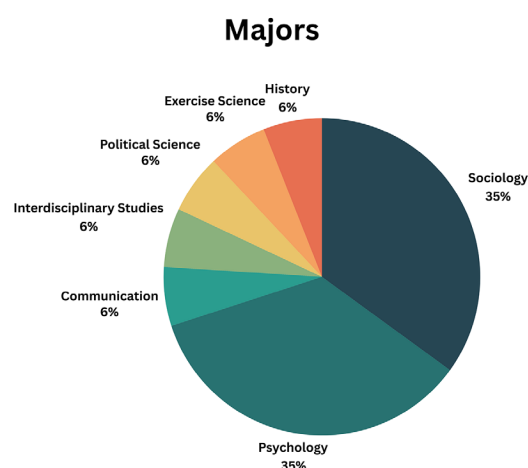


Figure 1: Distribution of Majors Enrolled in the Course

the students each being communication, history, interdisciplinary studies, legal studies, and exercise science (see Figure 1). Of the fourteen students completing both the pre- and post- assessment, 14.3% were men and 85.7% were women. All of the participants were either second-year (21.4%) or third-year (78.6%) students.

### Hypotheses

For the purpose of this paper, two hypotheses were developed. Both hypotheses leverage the extant literature on active and student-centered learning, which posits that such strategies increase student engagement, interest, and understanding of complex problems (Arce et al., 2015; Lee, 2004, 2012; Malcom, 2006). Based on these insights, this study hypothesized that there would be a difference between students' pre- and post- test results after experiencing the redesign aspects related to this course. Further, this study contended that specific critical thinking skills related to the research and innovation-driven learning strategies implemented in the course redesign would be impacted.

### Ethical Considerations

All ethical considerations regarding research involving human subjects were taken prior to collecting data for this study. These considerations involved applying for Institutional Review Board (IRB) approval prior to the commencement of this study. Informed consent was obtained from all student participants as part of the requirements for this assessment process. Furthermore, the data collected and analyzed as part of this study are aggregated at the student level to protect confidentiality and anonymity of all student participants.

## RESULTS

### Research Question One

To answer the first research question for this study, a paired t-test was conducted on the difference between the students' pre- and post- CAT results. As part of our initial hypothesis for this study, we posited that we would find a difference in students' initial and post scores on this assessment based on the redesign strategies implemented. The results from the paired samples t-test indicate that there was a significant difference between the means for the two groups. The mean for the pre-test was 16.00 ( $SD = 6.75$ ) and the mean for the post-test was 17.93 ( $SD = 6.76$ ),  $t(13) = 3.389$  ( $p < .01$ ) (see Figure 2). The effect size was 0.3, which is a moderate effect size (Cohen, 1988). This indicates that not only

was the difference between the two groups significant but also meaningful as well.

### Research Question Two

As part of our second research question, we hypothesized that we would see gains in students' specific critical thinking skills. While students overall improved their critical thinking skills on the CAT test in the course, they did not make significant gains on the individual questions on the CAT (see Table 2). This indicates that for most questions, there is still ample room for improving students' critical thinking skills. The one question which may be an exception to this is the first question on the CAT assessment which is, "Summarize the pattern of results in a graph without making inappropriate inferences." On this question, 79% of students received the full points on this question on the pre-test while 93% of exiting students received the full points on the question.

Overall, the skills that received the most time and attention in the class had the biggest improvements. A large percentage of the classroom activities and assignments focused on helping students to make appropriate inferences, to evaluate whether data supported a hypothesis, and to provide alternative explanations for data, which were all centered on the development of research and student-centered practices (Arce et al., 2015; Bransford et al., 1999; Lee, 2004, 2012). On these items, students generally had positive but non-significant gains on the individual questions. However, other important critical thinking skills such as providing additional information needed to evaluate information—which were not a pivotal part of the redesign components and therefore not provided as much or any class time—did not produce gains and, in some cases, the means for these questions actually decreased. For example, the class did not spend any time working on using basic mathematical skills to solve a real-world problem. The pre- and post- scores on this question were identical, providing a built-in control for the results of the assessment. We would therefore not expect gains on questions on which we were not spending time in class (e.g., mathematical skills).

### Pre- and Post-Test Scores

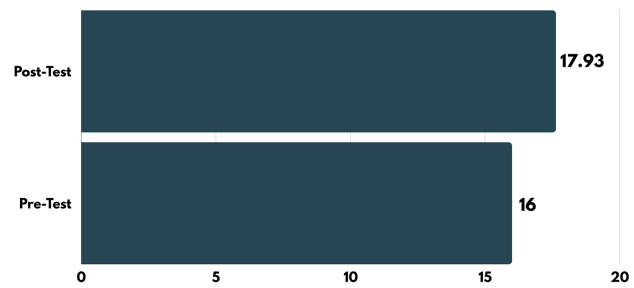


Figure 2. Means for Pre- and Post-Tests on CAT

### DISCUSSION

The results provide evidence to suggest that the redesign aspects for the course hold potential for improving students' overall critical thinking skills as based on the results of the paired samples t-test. Extrapolating from these results, we posit that the holistic design of the four assessments, based on the core pedagogical frameworks for this redesign—the Renaissance Foundry, IDEAL problem solver, and inquiry-guided learning—all facilitated students' overall exposure to the type of research and innovation-driven learning practices associated with the development of critical thinking skills (Arce et al., 2015; Bransford et al., 1999; Lee, 2004, 2012). As an introductory course, we also contend that the exposure to these types of practices is preliminary for the majority of our students and therefore also reflects the potential of these redesign elements to help continue building these skills as students progress through their programs. In other words, the course redesign centers on examining student learning with clear goals and deploying solid methodologies that connect to student learning. Further, the difference also signals the potential of these practices to help students develop critical sociological thinking skills that will help better their understanding of the complexities associated with social problems in the field of sociology.

Table 2. Overall CAT Scores by Question

| Number | Skill Assessed                                                                              | Pre-Test Mean | Post-Test Mean |
|--------|---------------------------------------------------------------------------------------------|---------------|----------------|
| Q1     | Summarize the pattern of results in a graph without making inappropriate inferences.        | 0.79          | 0.93           |
| Q2     | Evaluate how strongly correlational-type data supports a hypothesis.                        | 1.14          | 1.79           |
| Q3     | Provide alternative explanations for a pattern of results that has many possible causes.    | 0.93          | 1.36           |
| Q4     | Identify additional information needed to evaluate a hypothesis.                            | 0.86          | 0.71           |
| Q5     | Evaluate whether spurious information strongly supports a hypothesis.                       | 0.64          | 0.79           |
| Q6     | Provide alternative explanations for spurious associations.                                 | 1.79          | 1.71           |
| Q7     | Identify additional information needed to evaluate a hypothesis.                            | 0.36          | 0.29           |
| Q8     | Determine whether an invited inference is supported by specific information.                | 0.43          | 0.64           |
| Q9     | Provide relevant alternative interpretations for a specific set of results.                 | 0.71          | 0.86           |
| Q10    | Separate relevant from irrelevant information when solving a real-world problem.            | 3.29          | 3.36           |
| Q11    | Use and apply relevant information to evaluate a problem.                                   | 1.00          | 1.07           |
| Q12    | Use basic mathematical skills to help solve a real-world problem.                           | 0.64          | 0.64           |
| Q13    | Identify suitable solutions for a real-world problem using relevant information.            | 0.86          | 0.86           |
| Q14    | Identify and explain the best solution for a real-world problem using relevant information. | 2.50          | 2.79           |
| Q15    | Explain how changes in a real-world problem situation might affect the solution.            | 0.07          | 0.14           |
|        | CAT Total Score                                                                             | 16.00         | 17.93**        |

\*\* $p < .01$  (2-tailed)



With regards to the second question, in which students did not significantly improve on any individual skills, this indicates that while overall students' skill level increased, it did not increase enough on any one skill to establish a significant statistical gain. From a pedagogical perspective, this provides evidence to suggest that certain areas in the pedagogy need to be enhanced. For example, students may need more practice on each of the individual skills identified, more feedback regarding practices or projects related to those individual skills, and more of their grade dedicated to the individual skills that are prioritized for the course. In addition, we conclude that perhaps more direct and explicit instruction needs to be provided to the students on how to achieve certain skills such as identifying specific information needed to evaluate a hypothesis. Therefore, other parts of the course not integrated directly into the purposes of the redesign strategies—which may distract from these skills or are not key to the course—need to be revised or adjusted to allow for more directed instruction in these areas, wherein increasing students' holistic exposure to critical thinking practices in sociology.

## IMPLICATIONS

Teaching is an iterative process that necessitates continuous learning (McLean et al., 2008), coaching (Cruz & Rosemond, 2017), and reflecting (Kelley et al., 2020) among faculty members. One of the most important take-aways from this project is as a case study of how to effectively use assessment data to make improvements in an undergraduate level sociology course (Arce-Trigatti et al., 2022). For this course, as an example, the CAT data were used in conjunction with the results from the formative and summative classroom assessments to make course adjustments. Having made overall significant gains on the CAT from pre- and post-tests, the results of this study suggest that the course redesign is playing a particular role on the impact on student learning and the development of critical thinking skills.

Thus, we conclude that we are gaining ground on this front. When looking at scores on individual questions and student responses on individual classroom assignments, however, there is still ample room for improvement through directed impactful practices still centered on the pedagogical strategies identified in this article (Arce et al. 2022; Bransford et al., 1999; Lee, 2004, 2012). As such, several incremental changes are being proposed as part of future iterations of this course including providing additional practice in these specific areas, allocating a larger percentage of their grade dedicated to these redesign elements, offering additional feedback focused on these particular skills, and fostering more opportunities to evaluate complex hypotheses.

## LIMITATIONS

This study leveraged several methodological parameters that were aligned with the research design utilized. A limitation of this design would include the use of one semester of data that was reflective of one course. In order to strengthen the findings from the study, more data reflective of different semesters would be beneficial in understanding the replication of these strategies in this type of learning environment. Likewise, as the nature of the context of the course adapts to be reflective of socially relevant content, as well as the shifting demographics of the region, more research is still needed to better understand how these strategies, and their proposed design, interact with a student-centered environment. Additional research is also needed to study the applicability of this

approach to other classes in both sociology and beyond to other disciplines. Furthermore, it is recommended that this study be replicated with additional classes of both Social Problems courses and in other classes in other disciplines, which would address the need for larger samples. In addition, a larger sample might produce more statistical effects for the individual CAT questions, which may address the potential statistical power limitation related to the second hypothesis of this study.

## CONCLUSION

The purpose of this article was to contribute to the scholarship of teaching and learning in sociology by investigating elements of a course redesign implemented in a Social Problems course at the undergraduate level. These elements focused on developing students' critical thinking skills through a holistic integration of research-based, innovation-driven learning, and student-centered strategies. Such strategies are reflective of various pedagogical frameworks which, in turn, were integrated into a four-part assessment redesign of the course. Using a primarily case study approach, quantitative data in the form of a pre- and post- CAT from students enrolled in one iteration of the redesign for this particular course were analyzed. These lessons learned align nicely with our conviction of sharing the pedagogical insight obtained from conducting this study so that others may utilize our lessons learned for transfer into their own teaching contexts.

Overall, the results from this paper present an interesting case of how direct measures of student learning can be an integral part of an iterative course redesign process. It also demonstrates that using an evidence-based, justice-oriented approach to a Social Problems course can produce significant transfer of gains to a non-discipline specific critical thinking skills test. Similar to Bransford and colleagues (2002), the pedagogical implications of this paper also underscore that students need many opportunities to practice critical thinking skills with accompanying feedback in sociology courses as well as in other disciplines. Based on these results, there are clear implications for further improvement of the course which merit extensive investigation as students continue to gain ground.

## CONTACT

Ada Haynes <ahaynes@tntech.edu>  
Jacob Kelley <jkk0019@auburn.edu>  
Andrea Arce-Trigatti <atrigatti@tntech.edu>

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