

Measuring the Efficacy of a Critical-Thinking Skills Program

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Abstract

This study evaluates the efficacy of a critical-thinking skills program among Master of Science in Business students at a large U.S. public university. Using the Collegiate Learning Assessment (CLA+), students were assessed across three instructional conditions: no instruction, implicit instruction, and explicit instruction. Results showed statistically significant improvements in CLA+ scores with increasing levels of instruction, with the highest gains observed in the explicit instruction group. Additionally, a greater proportion of students in this group achieved “accomplished” or “advanced” mastery levels. These findings suggest that structured, explicit instruction in critical thinking significantly enhances students’ higher order skills, offering a scalable model for addressing the critical-thinking gap in higher education.

Objectives

In an era marked by rapid technological advancements, the advent and rise of generative AI (Bastani et al., 2025; Kosmyrna et al., 2025), and an ever-evolving global landscape, the ability to think critically is recognized as a fundamental skill crucial for both academic and professional success. Employers seek and highly value critical thinkers (Capital, 2016; Finley, 2023; Rios et al., 2020), and evidence suggests that higher proficiency in this skill leads to improved academic and career outcomes (Carnevale et al., 2020; Zahner, James, & Lehrfeld, 2022). Yet critical thinking, along with problem solving and effective written communication, is lacking in many college graduates (Finley, 2023; Van Damme & Zahner, 2022).

This is not a new revelation; over a decade ago, O*NET¹, an occupational database sponsored by the United States Department of Labor, found that 96% of all occupations describe critical thinking as very important or extremely important to that job (Carnevale, 2013). So, why do so many students lack these skills? Unlike academic and technical skills, also essential for future success, critical thinking and problem solving are not intentionally taught, deliberately practiced, nor thoughtfully measured in most K-12 and higher education institutions.

This study investigates the efficacy of a critical-thinking skills program for master’s students at a large public, land-grant university using the Collegiate Learning Assessment (CLA+), a performance-based assessment, to compare students’ critical-thinking skills in three conditions: no instruction, implicit instruction, and explicit instruction.

¹ <https://www.onetonline.org/>

Theoretical Framework

As higher education institutions face greater pressure to graduate students with skills beyond those reported on an academic transcript, it is increasingly important for institutions to find ways to teach, measure, and improve these skills. Findings routinely show that employers are most concerned about critical-thinking, problem-solving, and communication skills (Capital, 2016; Hart Research Associates, 2013; National Association of Colleges and Employers, 2018; Rios et al., 2020; World Economic Forum, 2016). These are higher order skills that are not captured on transcripts, which are problematic given the grade-inflation problem that academia has been experiencing over the past two decades (Carter & Lara, 2016; Eiszler, 2002; Jewell et al., 2013; Johnson, 2003; Mansfield, 2001; Nordin et al., 2019; Sabot & Wakeman-Linn, 1991) (Carter & Lara, 2016; Eiszler, 2002; Jewell et al., 2013; Johnson, 2003; Mansfield, 2001; Nordin et al., 2019; Sabot & Wakeman-Linn, 1991). Additionally, increasing evidence has revealed that students' critical-thinking skills tend not to develop substantially during higher education (e.g., Evens et al., 2013; Roohr et al., 2017).

Prior research supports these concerns. When given the CLA+, an alarming 60% of a sample of over 70,000 entering undergraduate students did not demonstrate proficiency (Zahner, Cortellini et al., 2022). Furthermore, while most students (approximately 80%) consider themselves proficient in essential, higher order skills, the percentage of employers who rated recent graduates as proficient in these skills differs greatly: 56% for critical thinking/problem solving and 42% for communication (National Association of Colleges and Employers, 2018).

This study presents the efficacy of a holistic critical-thinking skills program that was designed to increase students' skills through instruction, practice, and assessment. The goal of the program was to close the gap between assessment and instruction for critical-thinking skills and to provide further insight into the importance of developing these skills as well as the utility of an assessment of higher order skills.

Methods

The data used in this study come from 178 Master of Science in Business (MSB) students from a large public, land-grant university in the United States who completed the CLA+ (Zahner, Dawber, & Rotholz, 2022). The MSB program is a one-year master's degree designed for non-business major students coming directly from their undergraduate program with less than one year of professional work experience.

Over the course of four academic years between 2019 and 2025 (excluding the COVID-19 years of 2020 and 2021), the institution gradually increased their students' exposure to a critical-thinking framework and associated performance tasks. In 2019, the first year of the study, there was no deliberate instruction, either implicit or explicit, for the students. This allowed the institution to establish a baseline of their students' critical-thinking skills as measured by the CLA+. In subsequent years, there were varying levels of instruction, which were then compared to the baseline data.

Participants

The 178 participants from this study comprise multiple cohorts of students in a one-year Master of Science in Business (MSB) program from a large public, land-grant university between 2019 and 2025 (Table 1). The demographic reference group represents the most frequently self-reported category.

TABLE 1

Participant Demographic Descriptive Statistics

	No instruction	Implicit instruction	Explicit instruction	All participants
<i>N</i>	29	67	82	178
Academic year	2019	2024 & 2025	2022 & 2025	
% Female	48.28%	44.78%	52.44%	48.87%
% English primary home language	82.76%	85.07%	93.90%	88.76%
% White, non-Hispanic	62.07%	70.15%	73.17%	70.26%
% Parent earning at least BA/BS	68.97%	86.57%	87.80%	84.27%
Average effort score (2–10 scale)	6.52 (<i>SD</i> = 1.21)	7.12 (<i>SD</i> = 1.71)	8.07 (<i>SD</i> = 1.55)	7.46 (<i>SD</i> = 1.67)
Average CLA+ score (400–1600 scale)	1133 (<i>SD</i> = 114)	1251 (<i>SD</i> = 112)	1288 (<i>SD</i> = 80)	1249 (<i>SD</i> = 112)

The 29 students in the “no instruction” group took the CLA+ in the spring semester of 2019 and did not receive any instruction in critical thinking from their professors. The 67 students from the “implicit instruction” group received instruction from faculty who were trained in the six steps for effective critical thinking and incorporated concepts into their teaching but did not explicitly teach the six steps to their students. The implicit instruction cohort comprised 60 students who took the CLA+ in spring 2024 and 7 who took the CLA+ in 2025. The 82 students from the “explicit instruction” group received instruction from trained faculty on the six steps for effective critical thinking, which included the six steps as well as a performance task designed for deliberate practice of the skills. The explicit instruction cohort comprised 34 students who took the CLA+ in 2022 and 48 students who took the CLA+ in 2025.

Measures

CLA+. The CLA+ is a 90-minute performance-based assessment of critical-thinking and written-communication skills comprising a 60-minute performance task (PT) and a 30-minute set of 25 selected-response questions (SRQs). The PT asks students to analyze a set of documents and respond to a writing prompt that asks them to analyze the provided information from the document library and propose a solution to a real-world problem. The PT measures performance in three areas: *Analysis and Problem Solving* (making a logical decision and supporting it by analyzing, evaluating, and synthesizing the appropriate information); *Writing Effectiveness* (constructing an organized and cohesive essay with support for positions); and *Writing Mechanics* (demonstrating command of Standard Written English). The SRQ section is aligned to the same construct as the PT. Both the PT and SRQ sections are document based. The supporting documents include a range of information sources, such as letters, memos, photographs, charts, and newspaper articles. Scale scores are reported for the total test and the PT and SRQ sections. A total score is awarded to each participant.

Demographic Survey. In addition to taking the CLA+, all participants answered a series of demographic and survey questions (Table 2).

TABLE 2

Student Demographic and Survey Questions

Gender	Gender: Male [1]; Female [2]; Decline to state [3]
Primary home language	Student's primary home language: Not English [0]; English [1]
Race/ethnicity	Race/ethnicity: American Indian / Alaska Native / Indigenous [1]; Asian (including Indian subcontinent and Philippines) [2]; Native Hawaiian or other Pacific Islander [3]; African American / Black (including African and Caribbean), non-Hispanic [4]; Hispanic or Latino [5]; White (including Middle Eastern), non-Hispanic [6]; Other [7]; Decline to state [8]
Parents' educational status	Highest level of education completed by a parent: Less than high school [1]; High school [2]; Some college, less than a bachelor's degree (including associate and technical degrees) [3]; Bachelor's degree [4]; Graduate or post-graduate degree [5]; Don't know [6]
Effort on the PT	Student's response to the question <i>How much effort did you put into the written-response task?</i> : No effort at all [1]; A little effort [2]; A moderate amount of effort [3]; A lot of effort [4]; My best effort [5]
Effort on the SRQs	Student's response to the question <i>How much effort did you put into the selected-response questions?</i> : No effort at all [1]; A little effort [2]; A moderate amount of effort [3]; A lot of effort [4]; My best effort [5]

Critical-Thinking Skills Materials. The students who were part of the critical-thinking skills program were in one of two instructional conditions, implicit or explicit. In the implicit condition, the faculty in the program were trained on the instructional materials (i.e., six steps for effective critical thinking) and incorporated the concepts into their teaching but did not specifically use the instructional materials to teach. In the explicit condition, the faculty in the program were trained on the instructional materials, then explicitly taught critical thinking to their students using the instructional materials and provided a deliberate practice opportunity that included a case study.

Data Sources

The data presented in the results section are the CLA+ scores and demographic and survey information (Table 2) for the 178 participating students across the three experimental conditions.

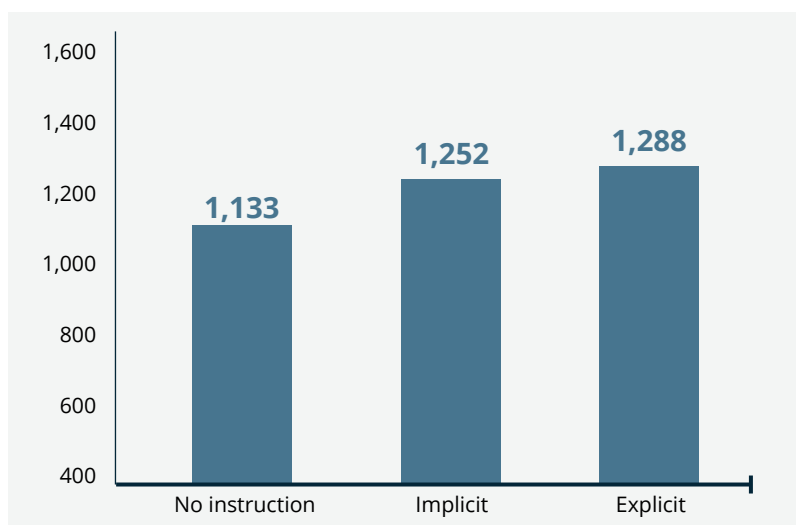
Results

Was there a difference in critical-thinking skills across the three cohorts?

Average CLA+ scores were statistically significant different across the three groups ($F = 26.18$; $p < .0001$), with the students receiving explicit instruction having the highest average CLA+ scores (Figure 1).

FIGURE 1

Average CLA+ Scores by Cohort



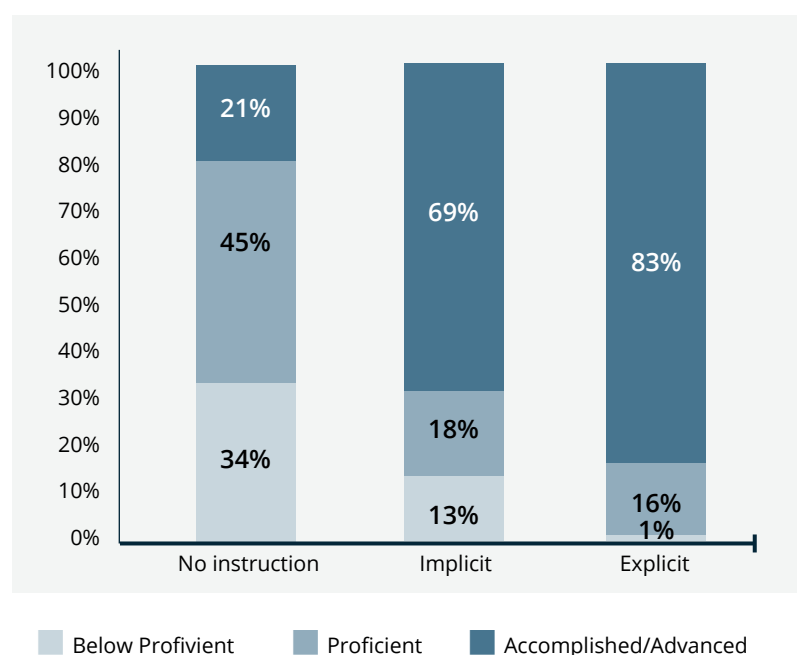
When comparing specific pairs of cohorts, the students who received implicit instruction significantly outperformed students who received no instruction ($t = 8.55$; $df = 66$; $p < .001$; Cohen's $d = 1.41$), and students who received explicit instruction significantly outperformed those who received implicit instruction ($t = 2.91$; $df = 82$; $p = .005$; Cohen's $d = .36$).

What were the students' critical-thinking mastery levels across the three cohorts?

In addition to CLA+ total scores, students also receive information on their level of mastery of critical thinking based upon a standard setting study (Zahner, 2014). Results showed that as instruction increased, proportionally more students were accomplished and advanced ($\chi^2 = 42.45$; $df = 4$; $p < .00001$), with just one student below proficiency in the explicit instruction group (Figure 2). Also of note is that there was a significant proportion of students in a master's program who were not proficient in critical thinking (34%), but that instruction can make a difference.

FIGURE 2

CLA+ Mastery Level Distribution by Cohort



Scientific Significance

This study investigated master's students' performance on an assessment of critical thinking (CLA+) across three conditions: no instruction, implicit instruction, and explicit instruction. Overall, average CLA+ scores increased as the level of instruction increased, with the highest average scores earned by the students who received explicit instruction on critical thinking (Figure 1). Additionally, proportionally more students reached the "accomplished" and "advanced" levels of mastery (Zahner, 2014) in the explicit instruction group than in the implicit and no instruction groups.

Findings from this study also corroborate previous studies that have found that higher education graduates are not skilled in critical thinking (Evens et al., 2013; Hart Research Associates, 2015; Roohr et al., 2017; Van Damme & Zahner, 2022). The results suggest, however, there is a solution to this skills gap. By receiving implicit and explicit instruction in critical thinking, students were able to significantly increase their skills, as measured by the CLA+. This model adopts the logic of the Instructional Improvement Cycle (Cherasano et al., 2015), in which instructors develop instructional strategies based on student data such as an assessment score, implement these strategies, and then assess student success to inform further teaching practices (Figure 3). By embedding both assessment and instruction, institutions can more effectively prepare students for the demands of the modern workforce. This proposed model of integrating critical-thinking assessments and curriculum as a cycle of continued improvement is one way to address the current gap between the skills that higher education graduates possess and the skills that are required by hiring managers for success in the workplace.

FIGURE 3

Assessment and Curriculum Model for Improving Students' Critical-Thinking Skills



The results of this study are encouraging but limited, because the data are from a single institution with relatively high-performing students. Future studies should include more institutions and a longitudinal study to collect additional evidence on the predictive nature of these skills on career and workplace outcomes. Nonetheless, results from this study offer a compelling case for assessment coupled with explicit instruction in critical thinking as a model for measuring and improving higher education students' essential, critical-thinking skills.

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