

# **Measuring and Improving Higher Education Students' Critical-Thinking and Written-Communication Skills**

Doris Zahner, Tess Dawber, & Olivia Cortellini  
Council for Aid to Education

*Paper presented on April 14, 2023 11:20 am CDT at the annual meeting of the American Educational Research Association*

## **Abstract**

This paper presents two studies, both of which examined higher education students' critical-thinking skills. Study 1 investigated students' attitudes toward critical-thinking skills and performance on a critical-thinking assessment. In this study, entering students from an undergraduate business school participated in a critical-thinking assessment and subsequently completed a survey on the importance of critical-thinking skills for their academic and career success. Findings revealed that students valued critical-thinking skills and demonstrated adequate mastery, but they did not find value in certain skill-development offerings. Study 2 evaluated the efficacy of targeted critical-thinking instruction for exiting students at the same university. Students who received the targeted instruction achieved higher average exam scores than their peers who did not receive instruction.

## **Objectives**

In response to employers' concerns about graduate employability (Capital, 2016; Hart Research Associates, 2013; Rios et al., 2020; World Economic Forum, 2016) and the growing interest in domain-agnostic skills, higher education institutions continue to refine their curriculum development, course design, and teaching and learning practices. Three dimensions seem to be important in the current critical-thinking-centric educational reform in higher education: the shift from the long-standing lecture format to a student-centered approach, the change in the balance from curricular and textbook focus to case-based materials, and the innovation in assessment instruments.

This research attempts to answer three questions:

1. What level of critical-thinking mastery can entering students demonstrate on a performance-based assessment?
2. How do students perceive critical-thinking skills and skill-improvement measures in the landscape of their education and future career outcomes?
3. Does the addition of critical-thinking instruction impact students' critical-thinking performance?

We explore the use of two performance-based assessments of critical thinking and written communication, the Success Skills Assessment (SSA+) and the Collegiate Learning Assessment (CLA+), and the associated curriculum at an undergraduate business school at a large public university within the United States. Student survey responses as well as SSA+ and CLA+ scores were analyzed.

The results of this research yield a model for assessment and instruction for improving domain-agnostic skills in higher education. Additionally, results showcase the utility of an assessment of higher order skills, which are skills beyond content knowledge that have been cited as essential for college and career

success (Capital, 2016; Hart Research Associates, 2013; National Association of Colleges and Employers, 2018; Rios et al., 2020; World Economic Forum, 2016).

## Perspective

Although content knowledge is a requisite part of a student's education, it alone is insufficient for a student to thrive academically and professionally (Capital, 2016; Hart Research Associates, 2013; National Association of Colleges and Employers, 2018; Rios et al., 2020; World Economic Forum, 2016). Educators, parents, administrators, and employers generally agree on the importance of skills outside of content knowledge. Yet, these skills are seldom explicitly taught in classrooms, measured on reliable assessments, or reported on student transcripts.

Prior research supports these concerns. When given CLA+, a performance-based assessment of higher order thinking skills, an alarming 60% of a sample of over 70,000 entering undergraduate students did not demonstrate proficiency (Zahner, 2021). Furthermore, while most students (approximately 80%) consider themselves proficient in the essential higher order thinking 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 seeks 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.

## Study 1: Entering Students

### Method

#### *Measures*

The SSA+ is a 60-minute performance-based assessment of critical-thinking and written-communication skills comprising a 30-minute performance task (PT) and a 30-minute set of 25 selected-response questions (SRQs). The PT includes a set of selected-response, technology-enhanced items and a writing component. 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.

SSA+ mastery levels are derived from a standard-setting study (Zahner, 2018). The mastery level categories are: Emerging, Developing, Proficient, Accomplished, and Advanced.

#### *Mode of Inquiry*

Entering students were assessed on their critical-thinking and written-communication skills using the SSA+ to identify strengths and areas for growth and to establish a baseline of their skills during their first week of classes, prior to any instruction provided by the university. These students were then given instruction on critical-thinking skills using a case-study approach as part of a week-long module. The curriculum was developed to focus students on their critical-thinking skills, using a case that required

students to make a business decision. Students completed a critical-thinking survey at the conclusion of the course.

*Participants*

The sample comprised 1074 entering students in Fall 2021 from an undergraduate business school at a large public university within the United States. All students were enrolled in a week-long critical-thinking curriculum. The sample self-identified as 47.5% female; 67.5% White, non-Hispanic; 14.1% Latinx; 10.6% Asian/Asian American; and 1% Black. Almost all students were business majors (98.6%), and 90.4% had at least one parent or guardian with at least some college courses.

**Data Sources**

The data presented in the results section are for the 1032 students who completed both sections of the SSA+ and received total scores.

At the conclusion of the course, the students were given a survey asking them to rate the importance of critical-thinking skills as well as some general questions about their experience with the critical-thinking assessment and instruction (Table 1). Slightly more than half of the students ( $n = 552$ , 53.5%) completed the post-course survey. Because the university was only interested in improving students’ critical-thinking skills, the survey questions did not address written-communication skills.

**Table 1**  
*Survey Questions on Critical-Thinking Skills*

	On a scale of 1 – 5, where 1 = not at all and 5 = extremely,
Q1	How valuable do you think critical thinking and problem-solving skills are for success at the university?
Q2	How valuable do you think critical thinking and problem-solving skills are for a career in business?
Q3	How much do you think your professor values developing your critical thinking and problem-solving skills?
Q4	How much do you think the university values developing your critical thinking and problem-solving skills?
Q5	How much do you think employers value critical thinking and problem-solving skills?
Q6	How valuable did you find the assessment?
Q7	How valuable did you find your report?
Q8	How valuable did you find the instruction you received?
Q9	How much did your critical thinking and problem-solving skills improve as a result of the instruction?
Q10	Where do you think your critical thinking skills rank compared to other students at the university?

**Results**

*SSA+ Scores*

Students’ descriptive statistics for the SSA+ scores are presented in Table 2.

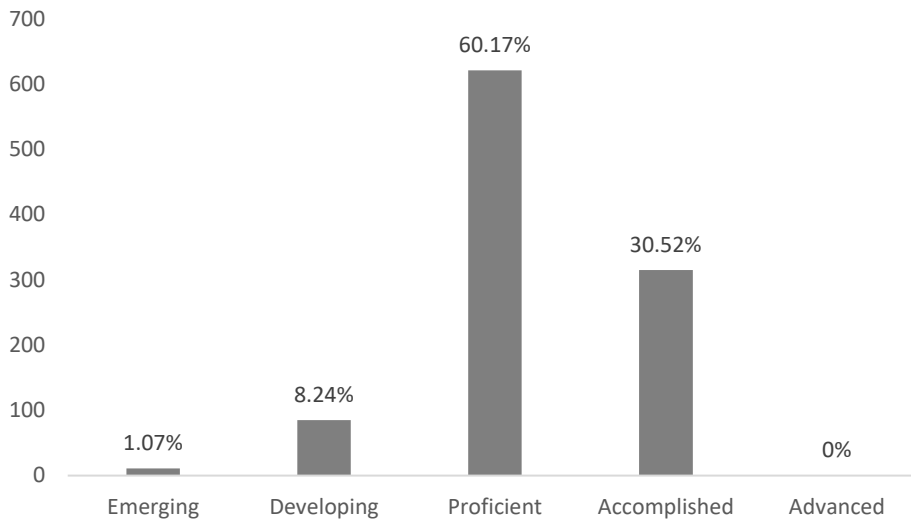
**Table 2**  
*SSA+ Descriptive Statistics*

Section	N	Minimum	Maximum	Mean (st. dev.)
Performance task	1032	135	1462	1073 (170.7)
Selected response	1032	553	1513	1212 (142.0)
Total SSA+	1032	482	1416	1143 (134.6)

Overall, the majority of entering students were proficient or beyond in critical thinking and written communication (Figure 1), but none of the students reached the advanced mastery level. This indicates that although many students are proficient in these skills, there is room for improvement to become accomplished or advanced critical thinkers.

**Figure 1**

*Frequency Distribution of SSA+ Mastery Levels for Entering Students*



**Survey Results**

Due to the specific instruction targeting critical thinking, most of the students themselves felt that the institution and their instructors greatly or extremely valued developing their generic skills (Figure 2).

**Figure 2**

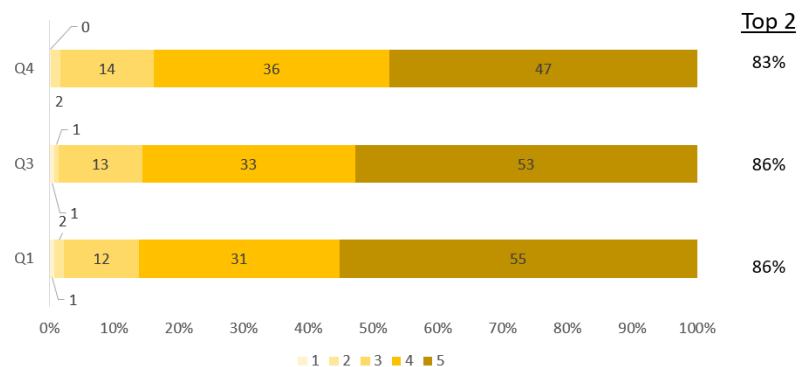
*Institution Feedback Survey Results*

On a scale of 1 – 5 where 1 = not at all and 5 = extremely

Q4: How much do you think the university values developing students' critical thinking and problem-solving skills?

Q3: How much do you think your professor values developing students' critical thinking and problem-solving skills?

Q1: How valuable do you think critical thinking and problem-solving skills are for success at the university?

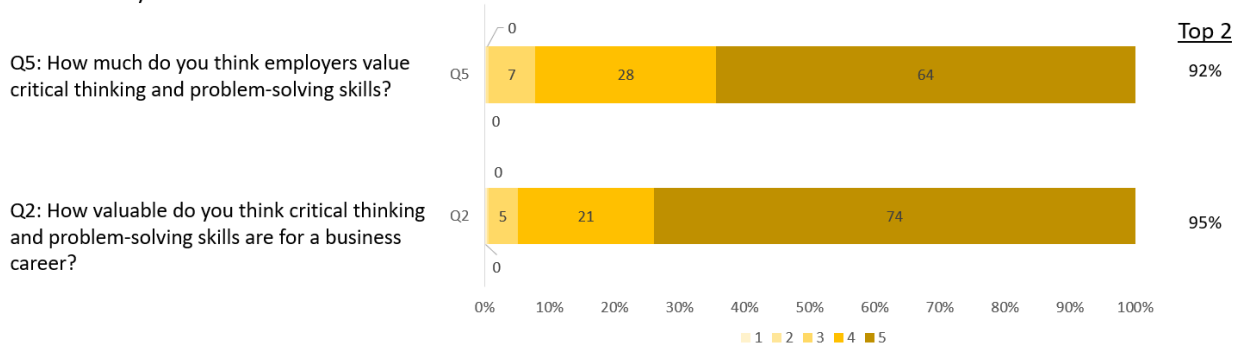


The vast majority of students felt that critical-thinking skills are greatly or extremely valued by employers and greatly or extremely valuable for success in a career in business (Figure 3).

**Figure 3**

*Career Feedback Survey Results*

On a scale of 1 – 5 where 1 = not at all and 5 = extremely

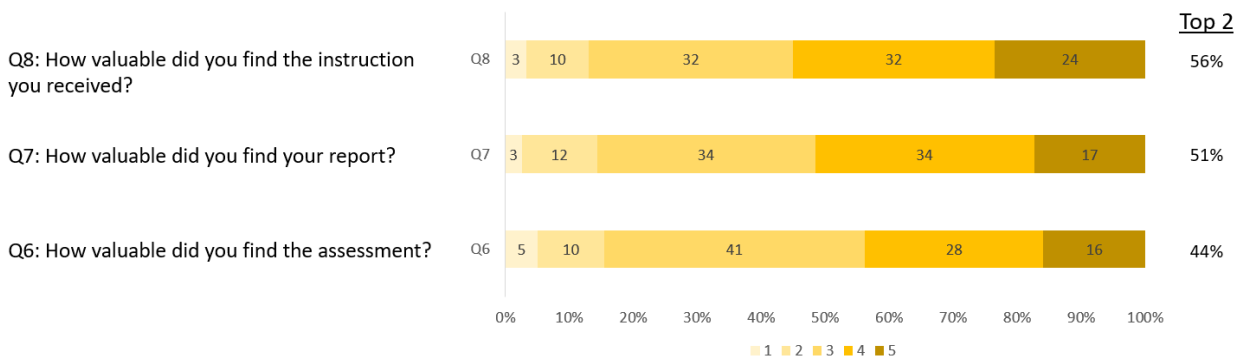


Yet, although the majority of students felt that critical-thinking skills were essential for their academic success and careers, far fewer of them thought the instruction, assessment, and reports were valuable (Figure 4), illustrating a disconnect between the skills that students value and how those skills are imparted to them.

**Figure 4**

*Assessment and Curriculum Feedback Survey Results*

On a scale of 1 – 5 where 1 = not at all and 5 = extremely



**Study 2: Exiting Students**

**Method**

*Measures*

CLA+ is a 90-minute performance-based assessment of critical-thinking and written-communication skills comprising a 60-minute PT and a 30-minute set of 25 SRQs. Refer to the Study 1 method section

for a description of the SRQs and the evaluation criteria for the PTs. The PT section for the CLA+ includes a written response only to address an issue, propose a solution, or recommend a course of action to resolve a conflict. The CLA+ cut scores were established during a standard-setting workshop (Zahner, 2014). The mastery level categories are the same as those for the SSA+.

*Participants*

In comparison to the entering cohort, where all students received the SSA+ and critical-thinking instruction, only a small group of exiting students participated in the study. These students were assessed using CLA+ during their final year at the university. Half of the students were given a specific module on critical thinking. The other half received the standard curriculum with no targeted critical-thinking skills instruction.

The sample comprised 89 exiting students from Fall 2021 from the same undergraduate business school as Study 1. Slightly fewer students received the targeted critical-thinking instruction compared to those who received the standard curriculum. Each of the four sections was taught by a different instructor, but only two of the instructors were assigned to specifically teach the critical-thinking module. The demographics of the students by group are presented in Table 3.

**Table 3**  
*Self-Identified Student Demographics by Group*

<b>Group</b>	<b>N</b>	<b>Gender</b>	<b>Race</b>	<b>Parental education</b>	<b>English as primary home language</b>
Instruction	43	58.7% Female	69.6% White 10.9% Latinx 13% Asian 2.2% Black	91.3% some college or above	87%
No instruction	46	41.9% Female	62.8% White 25.6% Latinx 7% Asian 2.3% Biracial	93.1% some college or above	88.4%

**Data Sources**

The data for this study come from CLA+ scores of the exiting students described in the participant section. Students’ CLA+ mastery levels and scores are used in the analyses. The average scores for the two cohorts (instruction vs. no instruction) were compared using an independent sample *t* test.

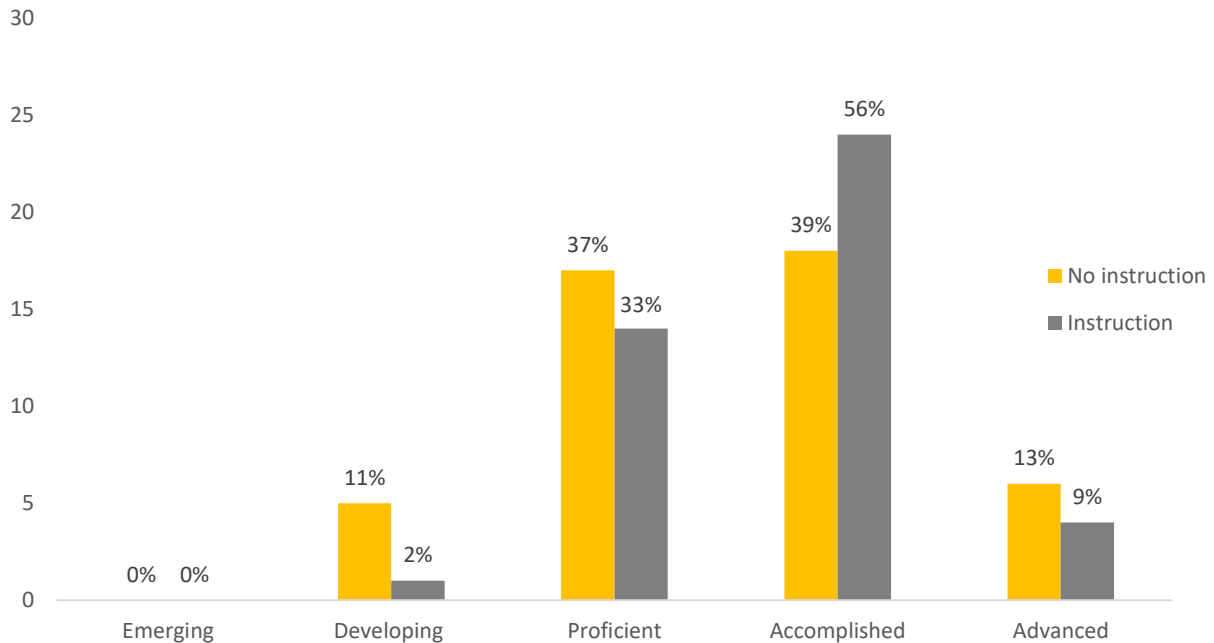
**Results**

*CLA+ Scores*

Overall, the majority of exiting students were at least proficient in critical thinking and written communication (Figure 5), and several of the students achieved the advanced mastery level.

**Figure 5**

*Frequency Distribution of CLA+ Mastery Levels for Exiting Students*



*Comparison of the Two Groups*

The mean student scores by cohort are presented in Table 4.

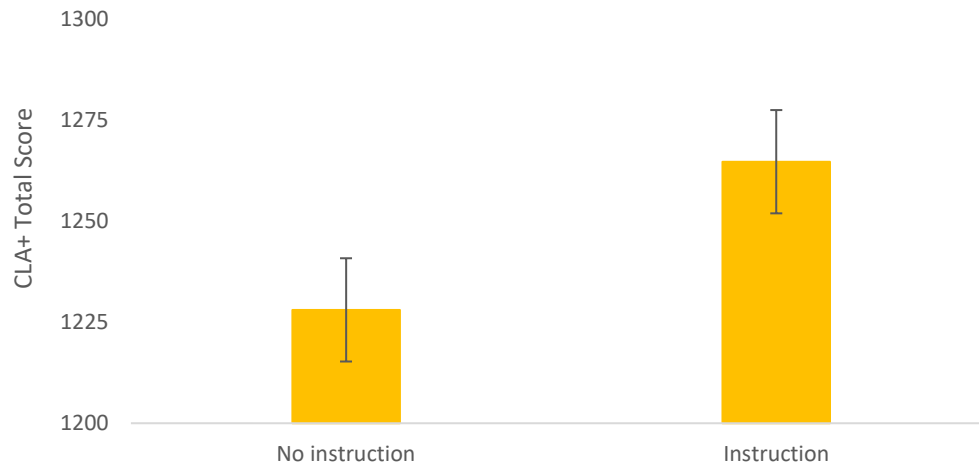
**Table 4**

*Scale Score Results by Cohort*

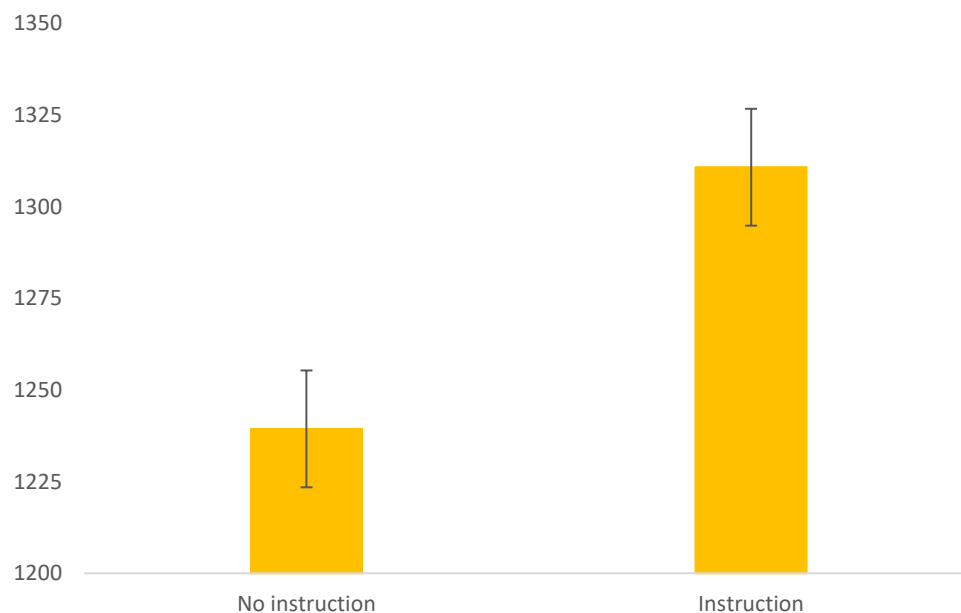
Section	Cohort	N	Mean	St. deviation	St. error mean
PT section	No instruction	46	1216.20	135.23	19.94
	Instruction	43	1218.35	110.47	16.85
SRQ section	No instruction	46	1239.39	153.15	22.58
	Instruction	43	1310.77	104.52	15.94
Total score	No instruction	46	1228.09	111.65	16.46
	Instruction	43	1264.79	83.87	12.79

Results showed that students who had classroom instruction on critical thinking performed statistically significantly higher on the CLA+ total score ( $t(df = 87) = 1.74; p = .042$ ) and SRQ section ( $t(df = 80) = 2.58; p = .006$ ) than those who did not have classroom instruction (refer to Figures 6 and 7, respectively). There was no cohort difference on the PT section ( $t(df = 87) = 0.08, not significant$ ).

**Figure 6**  
*Average CLA+ Total Scores for Students by Cohort*



**Figure 7**  
*Average CLA+ SRQ Section Scores for Students by Cohort*



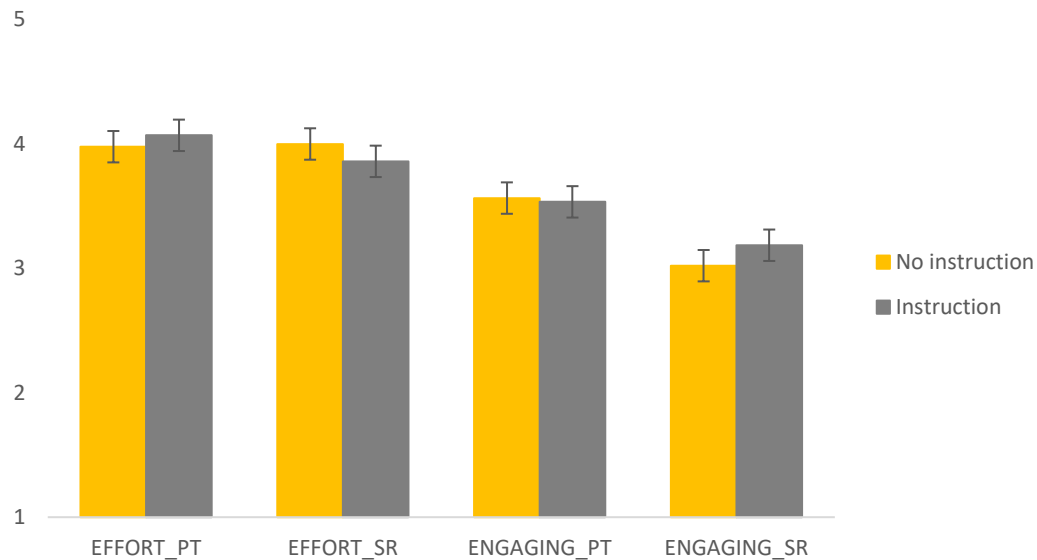
To evaluate student motivation, which has been shown to affect assessment outcomes (Liu et al., 2012; Napoli & Raymond, 2004; Wise & DeMars, 2005; Wolf & Smith, 1995), students' self-reported effort and engagement on CLA+ were compared by cohort. The Likert ratings were on a scale from 1 to 5, where 1



represented the lowest and 5 represented the highest effort/engagement. Results showed that students' self-reported effort and engagement did not differ significantly by instruction group (Figure 8), indicating that motivation can potentially be removed as a factor in the observed group differences (Figures 6 and 7).

**Figure 8**

*Average Self-Reported Effort and Engagement Scores for the Performance Task and Selected-Response Questions*

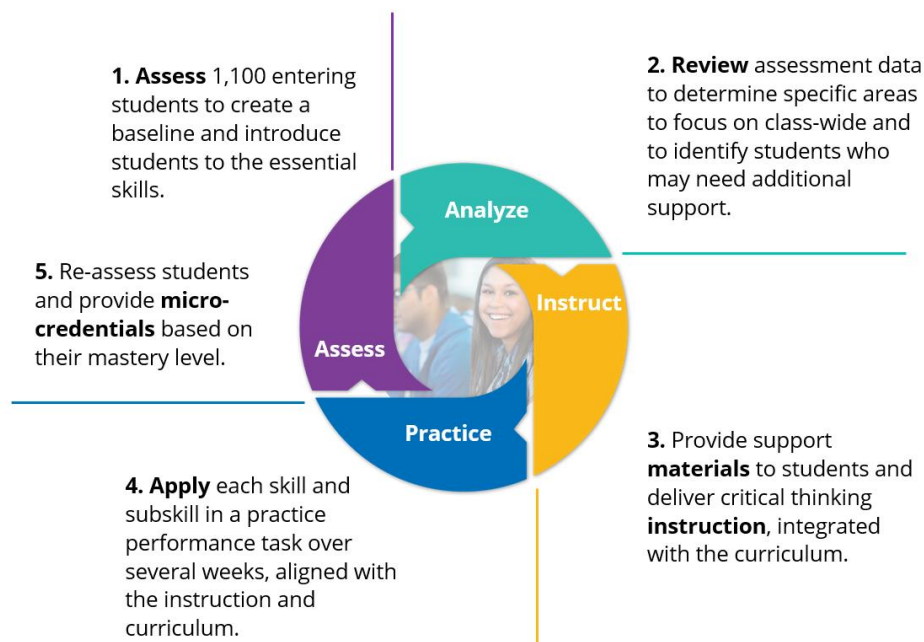


## Discussion

These two studies investigated entering and exiting students' performance on the SSA+ and CLA+. Overall, most students were at least proficient in critical thinking and written communication (Figures 1 and 5), with some exiting students reaching advanced mastery. Additionally, the majority of entering students reported that these skills are important for a career in business (Figure 3). Yet, far fewer felt that the instruction or the assessment they received were valuable in furthering their skills (Figure 4). Due to this disconnect, the university implemented a new program beginning in Fall 2022 (Figure 9) to improve their students' critical-thinking skills. Despite a large proportion of their entering students having proficient critical-thinking skills, the university leadership hope to further improve their students' skills because students who have stronger critical-thinking skills predict better post-university outcomes (Zahner & James, 2015; Zahner & Lehrfeld, 2018).

**Figure 9**

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



This model adopts the logic of the Instructional Improvement Cycle (Cherasaro et al., 2015), in which instructors develop instructional strategies based on student data, implement these strategies, and then assess student success to inform further teaching practices. 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.

The results of these two studies are encouraging but limited because the data are from a single institution with relatively high-performing students. Additionally, the second study had a small sample size and did not demographically match the comparison group. The results of the survey also do not reveal the reason behind the disconnect in students' perceived lack of value in measuring and learning critical-thinking skills in the classroom despite their perception of these skills as essential for career success. Future studies should include the efficacy of the proposed model (Figure 9) as well as follow students longitudinally to collect additional evidence on the predictive nature of these skills on college and post-college outcomes.



## References

- Capital, P. H. (2016). *Workforce skills preparedness report*. PayScale. <http://www.payscale.com/data-packages/job-skills>
- Cherasaro, T. L., Reale, M. L., Haystead, M., & Marzano, R. J. (2015). *Instructional improvement cycle: A teacher's toolkit for collecting and analyzing data on instructional strategies*. (REL 2015-080). Regional Educational Laboratory Central. <https://files.eric.ed.gov/fulltext/ED556126.pdf>
- Hart Research Associates. (2013). It takes more than a major: Employer priorities for college learning and student success. *Liberal Education*, 99(2).
- Liu, O. L., Bridgeman, B., & Adler, R. M. (2012). Measuring learning outcomes in higher education: Motivation matters. *Educational Researcher*, 41, 352–362. <https://doi.org/10.3102/0013189X12459679>
- Napoli, A. R., & Raymond, L. A. (2004). How reliable are our assessment data? A comparison of the reliability of data produced in graded and ungraded conditions. *Research in Higher Education*, 48, 921–929. <https://doi.org/10.1007/s11162-004-5954-y>
- National Association of Colleges and Employers. (2018, February 19). Are college graduates “career ready”? [Blog post]. <https://www.nacweb.org/career-readiness/competencies/are-college-graduates-career-ready/>
- Rios, J. A., Ling, G., Pugh, R., Becker, D., & Bacall, A. (2020). Identifying critical 21st century skills for workplace success: A content analysis of job advertisements. *Educational Researcher*, 49(2), 80–89. <https://doi.org/10.3102/0013189X19890600>
- Wise, S. L., & DeMars, C. E. (2005). Low examinee effort in low-stakes assessment: Problems and potential solutions. *Educational Assessment*, 10, 1–17. [https://doi.org/10.1207/s15326977ea1001\\_1](https://doi.org/10.1207/s15326977ea1001_1)
- Wolf, L. F., & Smith, J. K. (1995). The consequence of consequence: Motivation, anxiety, and test performance. *Applied Measurement in Education*, 8, 227–242. [https://doi.org/10.1207/s15324818ame0803\\_3](https://doi.org/10.1207/s15324818ame0803_3)
- World Economic Forum. (2016, January). *Global challenge insight report: The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution*. [http://www3.weforum.org/docs/WEF\\_Future\\_of\\_Jobs.pdf](http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf)
- Zahner, D. (2014). *CLA+ standard setting study final report*. Council for Aid to Education.
- Zahner, D. (2018). *SSA+ standard setting study final report*. Council for Aid to Education.
- Zahner, D. (2021). *Point of view: The case for essential higher education and career skills*. Council for Aid to Education. <https://www.inqaahe.org/sites/default/files/2021.02.19.Essential%20Higher%20Education%20and%20Career%20Skills.pdf>
- Zahner, D., & James, J. (2015). *Predictive validity of a critical-thinking assessment for post-college outcomes*. Council for Aid to Education. <https://cae.org/wp-content/uploads/2020/07/Zahner-James-2015-Predictive-Validity-of-a-Critical-Thinking-Assessment-for-Post-College-Outcomes.pdf>
- Zahner, D., & Lehrfeld, J. (2018). *Employers' and advisors' assessments of the importance of critical thinking and written communication skills post-college*. Council for Aid to Education. <https://cae.org/wp-content/uploads/2020/07/2018.04.17.Zahner.Lehrfeld-AERA-Predictive-Validity-Employers.pdf>