

CAE



Assessing Students' Differential Performance of Critical Thinking and Written Communication Skills across Fields of Study

Doris Zahner, Olivia Cortellini, & Tess Dawber
Council for Aid to Education
April 24, 2022

Objectives



Student learning encompasses more than facts and content knowledge. Student learning includes a broad range of higher order skills such as critical thinking, problem solving, and effective written communication, which cut across academic disciplines. Despite the importance of these skills, they are seldom, if ever, reported on university transcripts. This study investigates whether:

- Students graduating from different fields of study demonstrate similar levels of competency on general college outcomes, specifically critical thinking, problem solving, and written communication?
- Academic content knowledge interacts with the topic of a performance-based assessment of general learning outcomes?

Perspective



- While 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).
- Once students do graduate, their next challenge is finding a career that leverages their knowledge, skills, and abilities.
- When graduates are unable to find appropriate employment, the impact is immense for students, their parents, and their institutions.
- Prior research on differential performance across fields of study on an assessment of higher order skills shows that STEM, humanities, and social science students performed better than students studying business or education (Arum & Roksa, 2011, 2014).
- This study seeks to replicate findings from a previous study (Bradley & Steedle, 2012) to provide further understanding of the impact of field of study on students’ higher order thinking skills.

Method: Measures



The Collegiate Learning Assessment (CLA+) measures students' critical thinking, problem solving, and written communication skills in two sections:

- Performance Task (60 minutes)
 - Document based
 - Open-ended constructed response
 - Rubric scored
 - No single correct answer
- Selected Response Questions (30 minutes)
 - Document based
 - Single correct answer

Students are challenged to:

- Analyze and understand data;
- Evaluate the credibility of various documents;
- Identify questionable or critical assumptions;
- Deal with inadequate, ambiguous, and conflicting information;
- Identify additional information that would help resolve issues;
- Construct an organized and logically cohesive argument by providing elaboration on facts or ideas (e.g., explaining how evidence bears on the problem, providing examples, and emphasizing especially convincing evidence);
- Organize and synthesize information from several sources; and
- Marshal evidence from different sources in a written response.

Method: Participants



Table 2: Academic Fields of Study and Majors

Field of study	Majors	<i>N</i>
Business	Accounting; Business Administration; Management; Marketing	9,641
Helping/Services	Education; Health Care (Nursing, Pre-Med., Physical Therapy, Health Technology); Home Economics and Vocational Home Economics; Law Enforcement (Criminal Justice, Pre-Law); Parks, Recreation, Leisure Studies, Sports Management; Physical Education; Public Administration (City Management, Public Policy); Social Work	11,189
Humanities and Languages	Art History; Communications (Speech, Journalism, Television/Radio); English and Literature; Foreign Languages and Literature (French, Spanish, Chinese); Liberal/General Studies; Philosophy; Religion; Visual or Performing Arts (Studio Art, Music, Theater)	6,952
Sciences and Engineering	Agriculture; Architecture; Biological/Life Sciences (Biology, Biochemistry, Botany, Zoology); Computer and Information Sciences; Engineering and Technology; Mathematics; Physical Sciences (Physics, Chemistry, Astronomy, Earth Sciences)	9,281
Social Sciences	Anthropology; Economics; Ethics Studies, Cultural Studies, or Area Studies (Peace Studies, Women’s Studies); Geography; History; Multi/Interdisciplinary Studies; Political Science; Psychology; Sociology	7,128

Method: PT Distribution



Table 1: CLA+ Performance Task Descriptions and Primary Field of Study Related to Cover Story

Task	Description	Primary field of study	N
1 (AP)	Determine whether a traveling business should be allowed into town given a recent incident.	Helping/Services	7,247
2(CG2)	Recommend a policy for dealing with a transportation issue.	Helping/Services	821
3 (ED)	Make a decision about a local development proposal.	Helping/Services	3,683
4 (LF)	Determine a solution for an invasive species.	Sci & Eng	6,843
5 (RE)	Determine where a business should expand next.	Business	4,931
6 (SB)	Recommend a solution for a public venue.	Business	8,309
7 (SE)	Recommend how funding should be allotted for a government program.	Helping/Services	4,629
8 (TS)	Determine the root cause of a decline of species.	Sci & Eng	7,728

Note: The codes used for the PTs are initialisms for the name of the tasks and is confidential information

Results: CLA+ PT Scale Scores by PT and Students' Fields of Study



- There was a significant main effect for student field of study, which indicated significant differences in average performance across the five fields of study.
- There was also a significant interaction between field of study and PT, meaning that students in differing fields of study may have performed significantly better or worse on tasks that varied in their content.

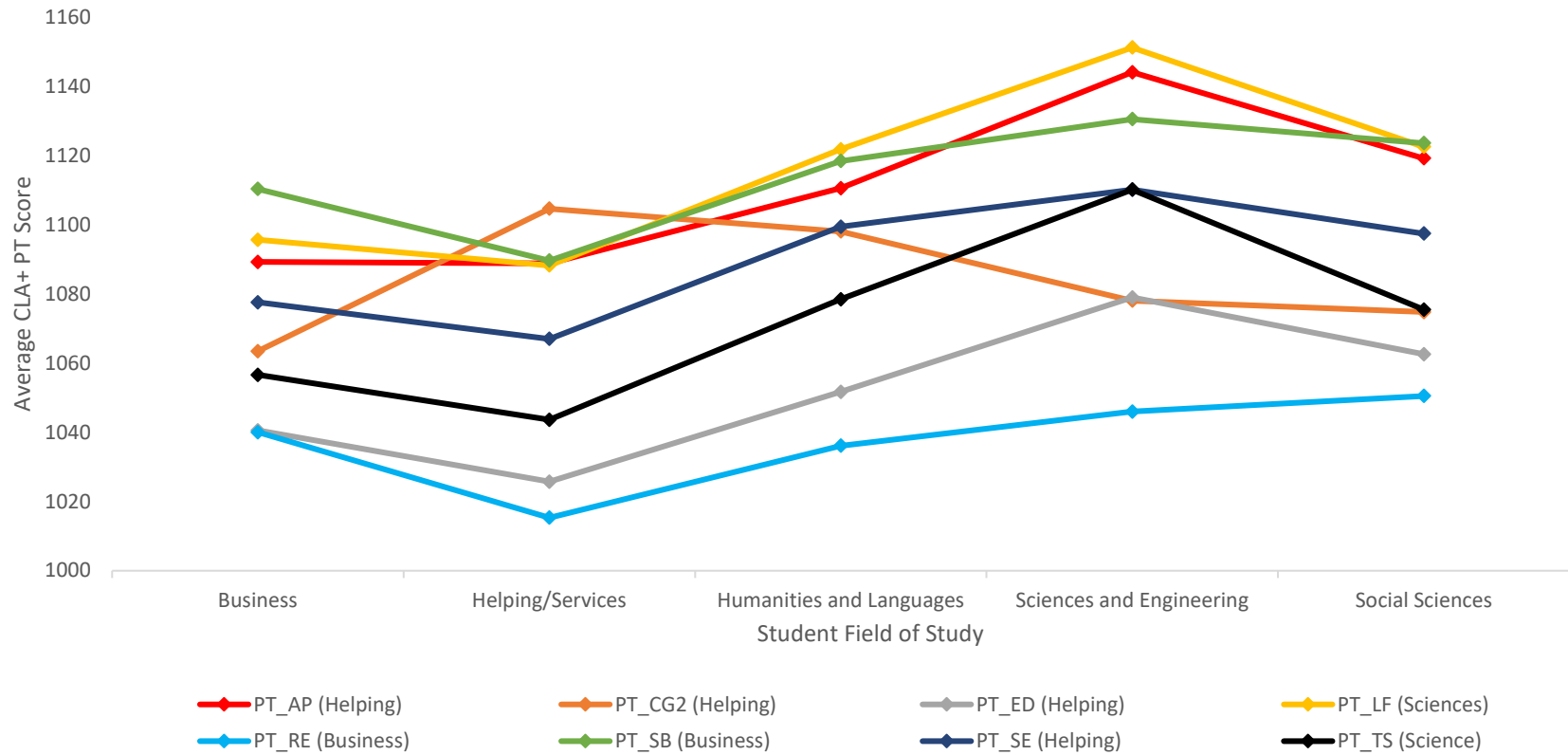


Figure 1: Average Performance on Eight CLA+ Performance Tasks (PTs) by Field of Study

Results: Adjusted CLA+ Scores (GPA) for FoS X PT



- A regression was conducted to adjust CLA+ PT scores for students' cumulative college GPAs. Results of this regression accounted for 5.7% of the total variance in CLA+ PT scores.
- A second ANOVA yielded results that were similar to the first one, with significant main effects for field of study, PT, and the interaction between the two variables.

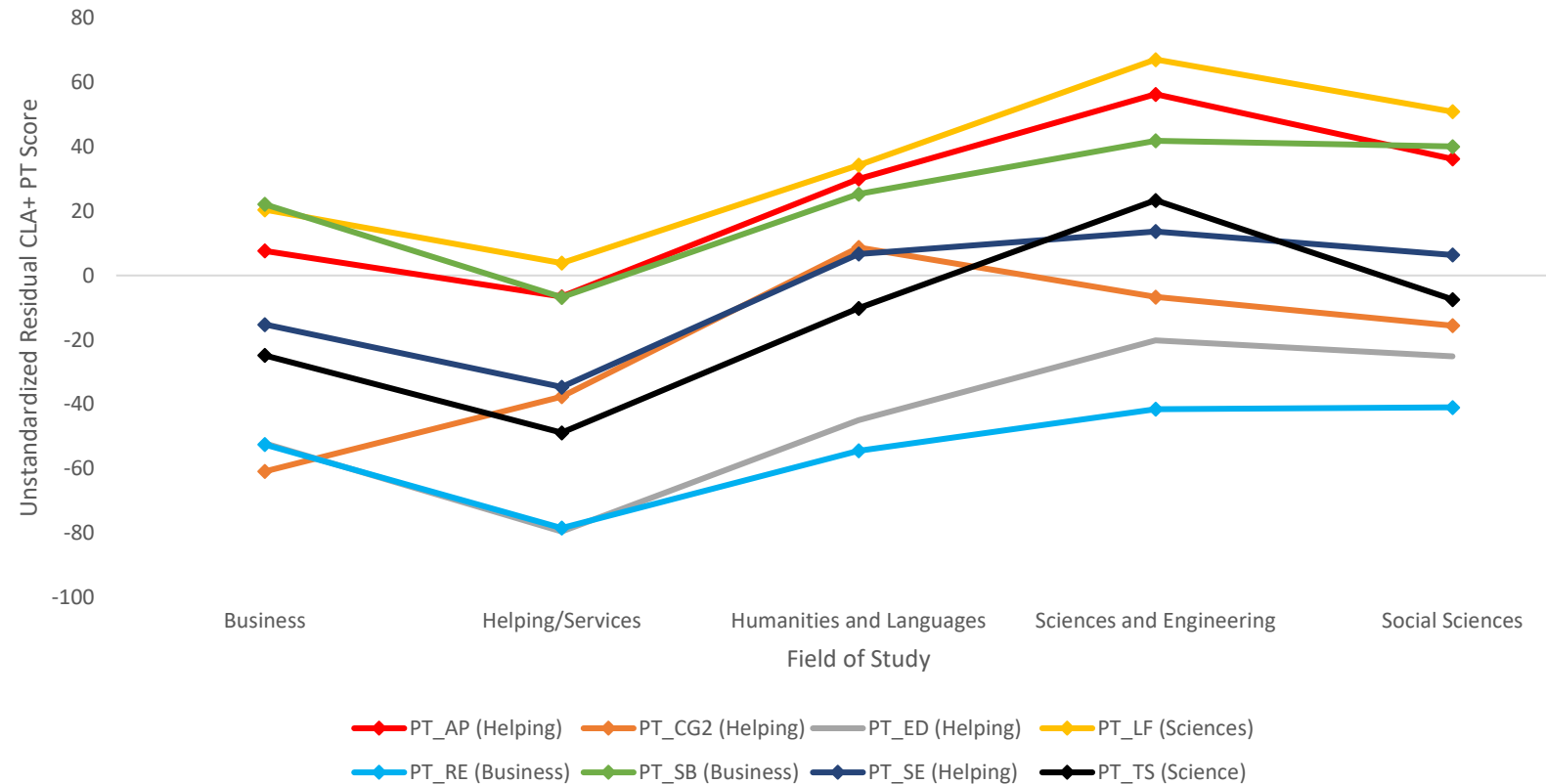


Figure 2: Average Adjusted Performance on Eight CLA+ Performance Tasks (PTs) by Field of Study

Results: Operational PTs



- Given the impracticality of administering more than three PTs in any given window, for all future administrations, three of the eight PTs were selected, based upon their psychometric properties.
- A third ANOVA was run using only the three PTs that will be administered for future testing windows, starting in fall 2021.
- The PT by field of study interaction was no longer significant, indicating that the quality of the PTs may account for the significant interaction that was observed in the first two analyses.

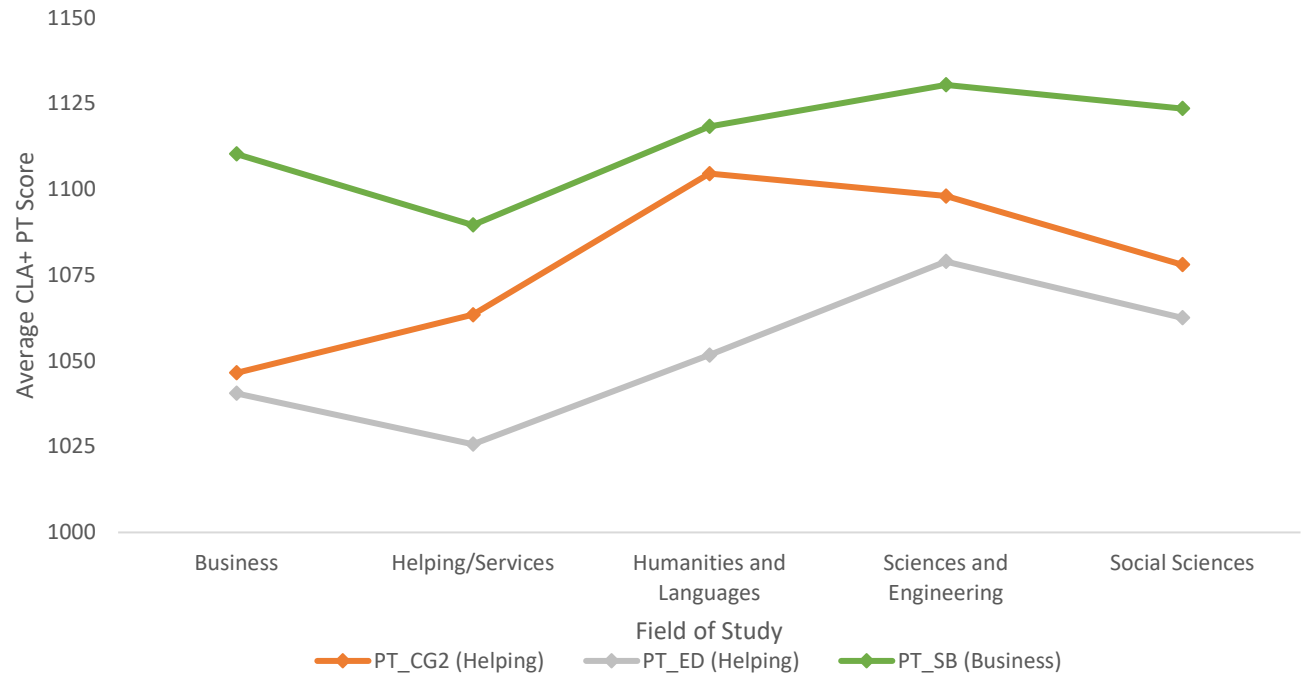


Figure 3: Average Adjusted Performance on Three CLA+ Performance Tasks (PTs) Selected for Future Administrations by Field of Study

Conclusion



- Overall, a significant difference was found across fields of study, with students in the Sciences and Engineering, Humanities, and Social Sciences performing better than those in Business and Helping/Services.
- After adjusting for cumulative GPA, the order remained consistent in terms of student performance on CLA+, indicating that students in certain fields have more command of these skills than do their peers in other fields (Arum & Roksa, 2011, 2014; Bradley & Steedle, 2012).

Conclusion



- The question of whether assessing general education skills such as critical thinking, problem solving, and written communication can be domain agnostic was partially answered.
- In some cases, when the full range of all PTs was used, there appeared to be an interaction between field of study and the primary field of study associated with the cover story of the PT.
- However, when the number of PTs was reduced to the best performing tasks, in terms of psychometrics, the interaction effect was no longer observed.
- This finding suggests that these skills may be assessed reasonably using a carefully selected set of complex, authentic performance-based assessments without great concern for the confounding effects of content knowledge and interest.

Limitations & Future Studies



- Limitation
 - The results of this study are limited because it is purely descriptive and correlational. It does not reveal the reason behind the differences in performance on CLA+ for students in differing fields of study.
 - It may be that there are differences in terms of academic demands and expectations. It may also be that students are self-selecting into specific fields of study.
- Future studies
 - Further studies would benefit from additional information about the predictive nature of these skills on college and post-college outcomes.

Contact us!



Doris Zahner, PhD
Chief Academic Officer
Council for Aid to Education, Inc

dzahner@cae.org
+1.212.204.8407

Olivia Cortellini
Senior Reporting and Data Analyst
Council for Aid to Education, Inc

ocortellini@cae.org
+1.212.217.0718

Tess Dawber, PhD
Senior Measurement Scientist
Council for Aid to Education, Inc

tdawber@cae.org
+1.212.661.5800