

# Analyzing the effect of LDT courses on students’ domain-specific critical thinking ability

## Abstract

Going to college has been shown to provide an increase in critical thinking ability. However, it is difficult to identify the specific courses and learning activities that cause this increase. This paper describes the implementation of a rubric and evaluation process assessing students’ critical thinking ability and analyzes how this ability is influenced by each of the six required courses in the MA in Learning Design and Technology program (LDT) at Georgetown University. The Critical Thinking VALUE rubric by the AAC&U was adapted to LDT to be domain-specific, and faculty were trained in the rubric in order to increase interrater reliability. In the six required courses, students’ summative assessments were graded by faculty using the VALUE rubric. Each student received a score of 0 to 4 in the 5 VALUE sub-skills, and their composite score was the mean of these 5 scores. A statistical analysis was conducted to measure the change in the mean composite critical thinking scores, which according to ANOVA was statistically significant between Semester 1 and 2, but not between 2 and 4. The degree of the change between course 1 and 6 is estimated with a Cohen’s *d* value of 1.88 standard deviations. These positive results affirm the value of the LDT degree and may be further parsed to identify which specific classes and learning activities result in higher levels of student critical thinking ability.

## Problem/Background

Critical thinking in the workforce continues to be a highly sought after skill. Employers use degrees as a proxy for critical thinking and other employable skills. Higher education has been shown to foster an improvement in critical thinking ability. [A 2015 meta analysis “Does College Teach Critical Thinking? A Meta Analysis”](#) estimates the effect of 4 years of college on critical thinking as 0.59 standard deviations, using Cohen’s *d* (Huber and Kuncel, 2016).

However, not every educational program measures or tracks critical thinking skill over time. Even among the programs that do so, it is often not easy to parse out which specific classes or interventions were responsible for an increase in critical thinking. This presents a design challenge. Although one of the purposes and benefits of higher education is to improve critical thinking, it is not often a deliberate design outcome that is measured throughout the curriculum and student experience.

## Research Questions

The goal of this research is to begin collecting data on student critical thinking ability as demonstrated on the summative assessments of six core LDT courses. This initial data will enable professors and administration to have a better understanding of the current level of student critical thinking ability, as well as how it changes over time. The initial research question, therefore is:

- 1

What is the current level of critical thinking ability that is demonstrated by LDT students? How does this critical thinking measurement vary by course and over time?

The results from this data gathering phase will inform a subsequent question:
- 2

What portions of the LDT curriculum demonstrate strength in student critical thinking ability? how could portions of the LDT curriculum better address critical thinking ability?

## Methodology

VALUE RUBRIC OF CRITICAL THINKING

| Label | Subcategory                             | Score Range |
|-------|-----------------------------------------|-------------|
| EXPL  | Explanation of Issues                   | 0.0 - 4.0   |
| EVID  | Evidence                                | 0.0 - 4.0   |
| CTXT  | Influence of Context and Assumptions    | 0.0 - 4.0   |
| PSTN  | Student’s Position                      | 0.0 - 4.0   |
| CNCL  | Conclusions and Related Outcomes        | 0.0 - 4.0   |
| COMP  | Composite score, average of 5 subscores | 0.0 - 4.0   |

### Design-based Research Process

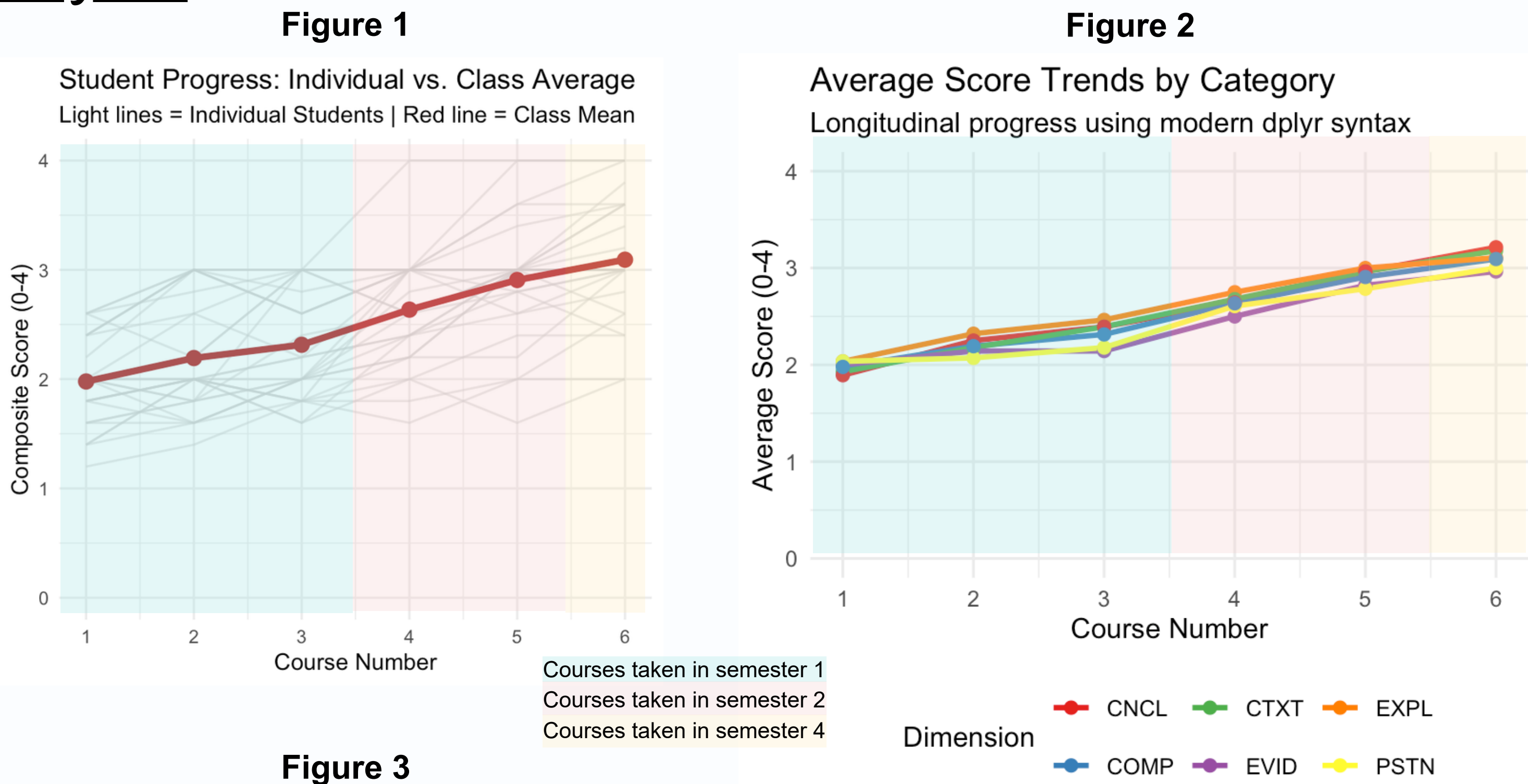
1. Adapt VALUE rubric to LDT
2. Train faculty for interrater reliability ( $\kappa=0.87$ )
3. Prime students on rubric
4. Evaluate summative assessments
5. Map scores across the curriculum
6. Identify curriculum interventions
7. Repeat and refine

n = 28 (All students in the LDT program)

Core courses that are evaluated:

1. Foundations
2. Methods
3. Technology
4. Research Methods
5. University as a Design Problem
6. Capstone: ePortfolios

## Analysis



| Semester                                                | Mean of COMP | incremental p value |
|---------------------------------------------------------|--------------|---------------------|
| 1                                                       | 2.41         | -                   |
| 2                                                       | 2.95         | p < 0.001           |
| 4                                                       | 3.09         | p = 0.347           |
| Cumulative Cohen’s <i>d</i> (from course 1 to course 6) |              | 1.88                |

Figure 1 shows that although there was significant variability among students in their performance in each course, over time the mean composite score increased. Figure 3 shows the incremental value of Cohen’s *d* after each course, showing small improvements after each course, as well as a cumulative value of 0.67, which is a greater improvement than the 4 year increase documented by an undergraduate degree. Figure 2 provides more insight into the variability of means of subscores for each course. Overall, all skills tended to increase at a steady rate over time.