2019 Assessment Document
Department of Mathematics and Computer Science

Key Assessment-Driven Accomplishments of the 2018-19 Academic Year

- We concluded that MATH 120 should be clearly targeted at preparing students for Calculus. To this end, we retitled the course as Precalculus, changed the textbook, and disentangled it from its role in the ECON/BUSI curriculum. It is no longer a prerequisite for any course in the latter department.
- We crafted a rubric for evaluating capstone projects in both of our department's disciplines. (The capstone is, for us, a depth requirement rather than a breadth requirement, so it is not a suitable venue for assessing a student's performance relative to the sum total of the program learning goals.)
- We revised the catalog copy for Calculus I and Calculus II.
- We revised the CSCI major and drafted a new set of program learning goals.

Senior Capstone

Our capstone projects take two basic forms, plus one special case. We use the same rubric for evaluating all capstone projects:

- **Year-long Undergraduate Research Project**: Each research project is undertaken in close collaboration with a faculty member from the department. Each project culminates in a public presentation, typically late in the Spring semester of the senior year. All Mathematics majors complete a year-long research project; it is optional for Computer Science majors. For Computer Science majors, completing a year-long research project is a requirement for graduating with distinction. In both cases, it is an opportunity to earn an Odyssey UR credit.
- **Semester-long Capstone Project:** Computer Science majors may satisfy the capstone requirement by completing a substantial creative computing project over the course of one semester. Projects may involve software development, writing a literature review, or creating educational materials for particular topics or technologies. These projects are completed as part of the required CSCI 410 *Senior Seminar* course, under the supervision of the course instructor.
- **Special Case: Departmental Double Majors:** Students double-majoring in Mathematics and Computer Science typically complete a single year-long undergraduate research project. The project topic should contain sufficient elements of both mathematics and computer science content that it can stand alone as a credible research project by the standards of both disciplines. Separate capstone grades are awarded for that same project for each of the two majors.

Here is the rubric we developed for our Senior Capstone:

Category	Excellent	Satisfactory	Questionable	Problematic
Integration of ideas	Devises innovative application of MATH/CSCI concepts from multiple classes or experiences for addressing a substantive problem.	Appropriately applies MATH/CSCI concepts and techniques from multiple classes or experiences to investigate a substantive problem.	Inconsistently applies MATH/CSCI concepts from multiple classes or experiences to investigate a substantive problem.	Incorrectly applies MATH/CSCI concepts to investigate a problem, or relies upon concepts and techniques from only one prior experience.
Written exposition	A clear and well-organized written document demonstrates deep technical insight and persuasively articulates topic significance.	A clear and well-organized written document demonstrates technical understanding and topic significance.	A written document that is somewhat unclear and mildly disorganized demonstrates modest technical understanding and conveys a notion of topic significance.	An unclear and/or poorly organized written document fails to convey technical understanding and/or topic significance.
Oral exposition	Provides a compelling education about project scope and achievements in a concise oral presentation.	Effectively communicates project scope and achievements in a concise oral presentation.	Conveys some idea of project scope and achievements in an oral presentation that is comprehensible with significant effort.	Fails to communicate project scope and/or achievements in an oral presentation.
Answering questions	Demonstrates profound understanding of project topic and work in answers to questions.	Demonstrates competency and mastery in answers to questions about project topic and work.	Answers questions in a manner that demonstrates modest understanding of project topic.	Unable to coherently answer questions about project topic and work.
Independence and Self-Awareness	Selects a compelling project topic, and responds in an innovative way to feedback.	Selects a pertinent and interesting project topic; as the project develops, responds appropriately to feedback.	Selects a project topic with some potential; makes modest use of feedback.	Selects an irrelevant or uninteresting project topic, or fails to respond appropriately to feedback.
Engagement	Demonstrates persistent and regular incremental progress throughout the project period.	Demonstrates consistent engagement for the duration of the project period.	Demonstrates somewhat consistent engagement during at least part of the project period.	Works inconsistently and irregularly during the project period.
Membership of MATH/CSCI Community	Shows mastery of pertinent technical terminology and concepts throughout the project.	Properly uses technical terminology and concepts throughout the project.	Mostly uses proper technical terminology and concepts, but makes several errors in doing so over the course of the project.	Consistently misuses technical terminology and concepts during the project.

The following charts present our ratings of the 2019 capstone projects. The first chart contains the overall mean, minimum, and maximum for each of the six rating categories. The second, third, and fourth charts contain the same information for our three sub-populations.

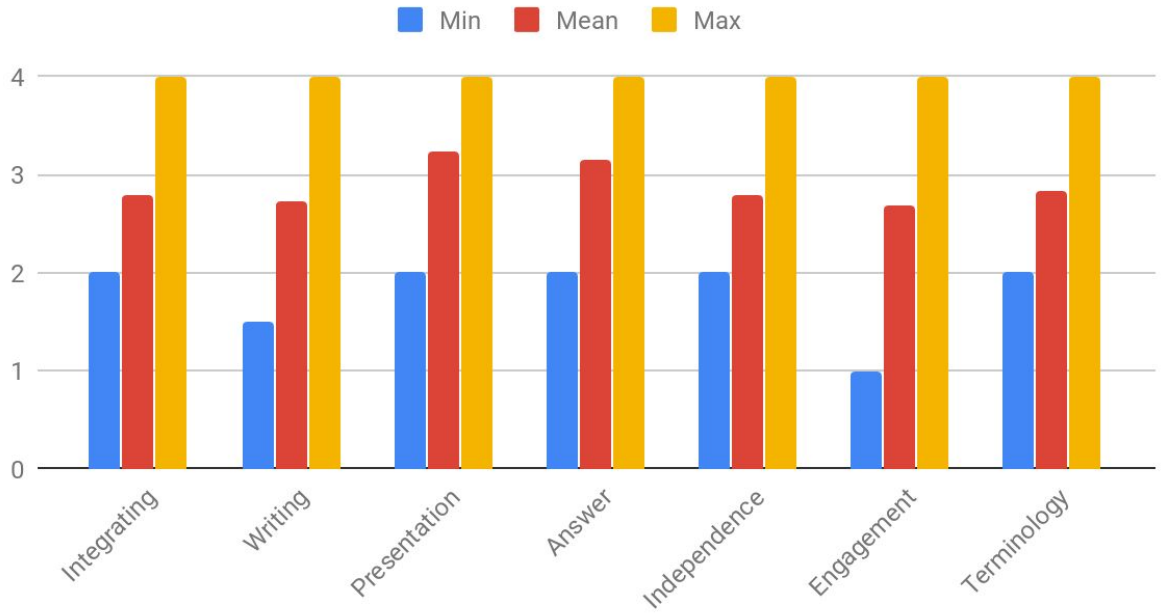
Overall, on average our students scored close to Satisfactory on each criterion. Students are on average stronger in discussing their ideas in the oral presentation than in their writing. This may partly be a result of the fact that the oral presentation is by its very nature summative of a lot of technical details, and may, in a sense, be easier to “get right”. Nevertheless, we will focus efforts on helping students improve their writing, explain their integration of ideas, and better understand and apply the technical terminology of their disciplines.

The CSCI Thesis students performed poorly in comparison to the other two subgroups. None of the three were rated as satisfactory in the categories of Independence and Engagement, suggesting that the conceptual trouble they encountered corresponded to a general failure of work ethic.

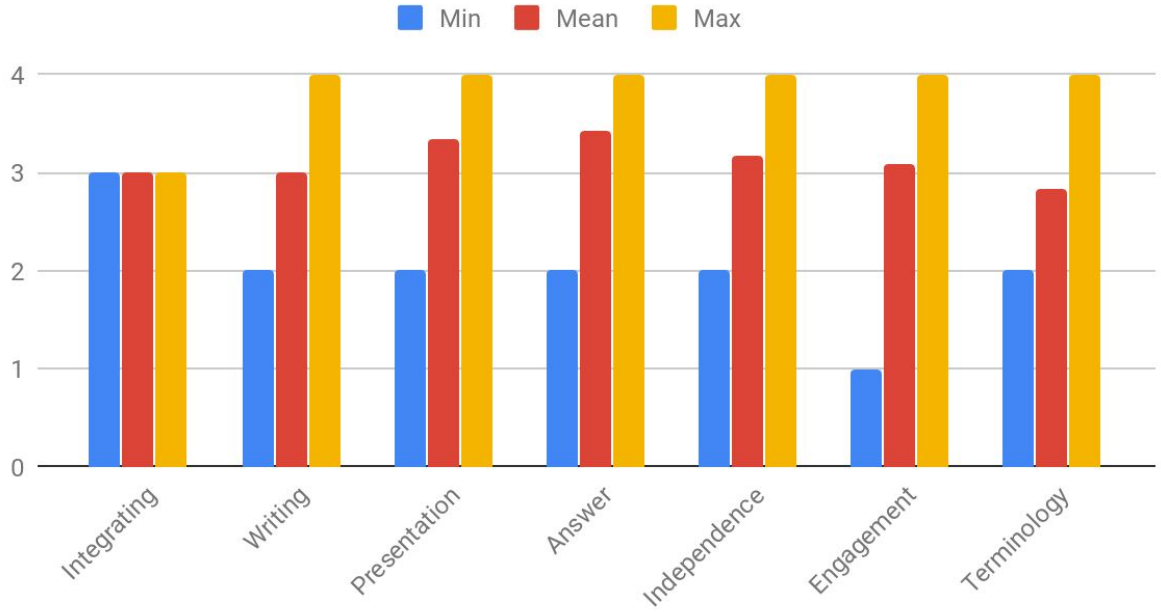
We examine this concept further in the next table, “Correspondence of Effort and Content”. The first four rows and the final row of the rubric constitute Content assessments: how well did the student understand and explain the subject matter? The other two rows are Effort assessments: how seriously did the student take the project, and how well did the student demonstrate the capacity for independent work? For each student, we calculated the average score for the Content and Effort assessments. An average of 3 or higher (“Satisfactory”) is considered High; a lower average is considered Low.

What we find is that nearly all students who exhibit High Effort also demonstrate High Content, and nearly all students who exhibit Low Effort demonstrate Low Content. This suggests that overall, students who are properly engaged with the process are demonstrating high subject mastery in their capstone projects.

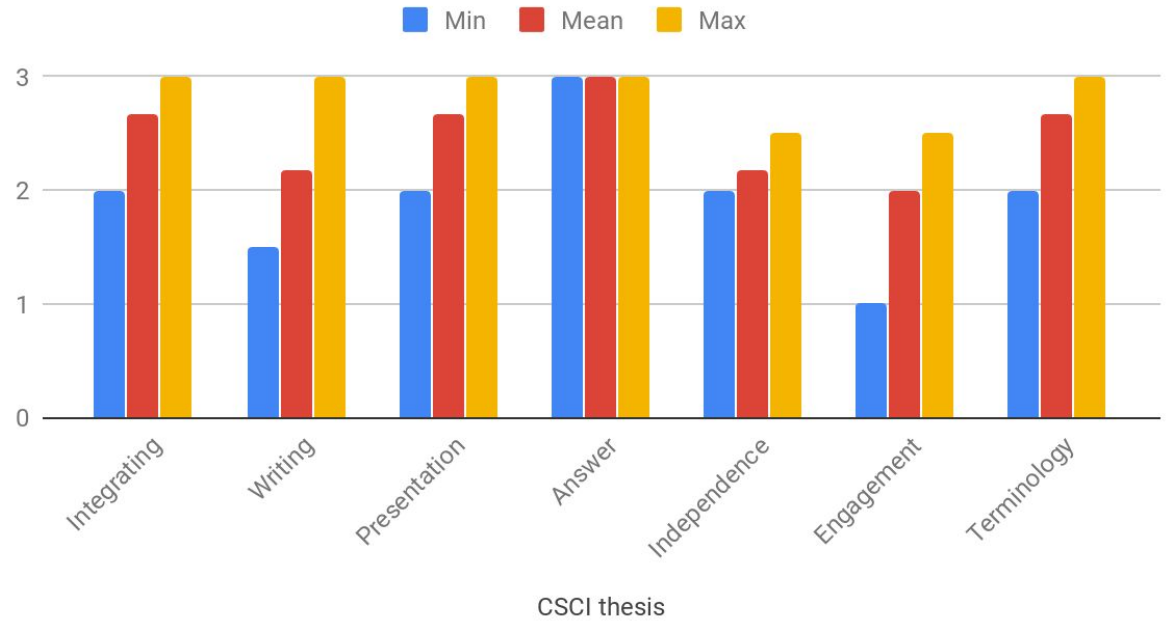
Capstone Scores (17 grades, 2 double-majors)



MATH Thesis (6 students)

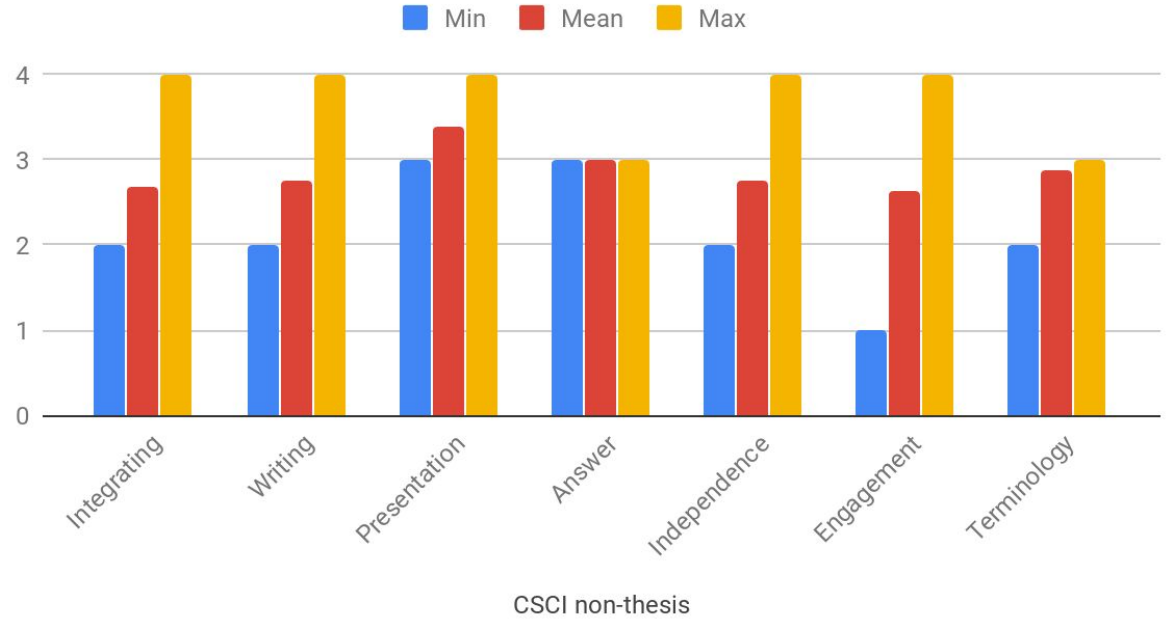


CSCI Thesis (3 students)

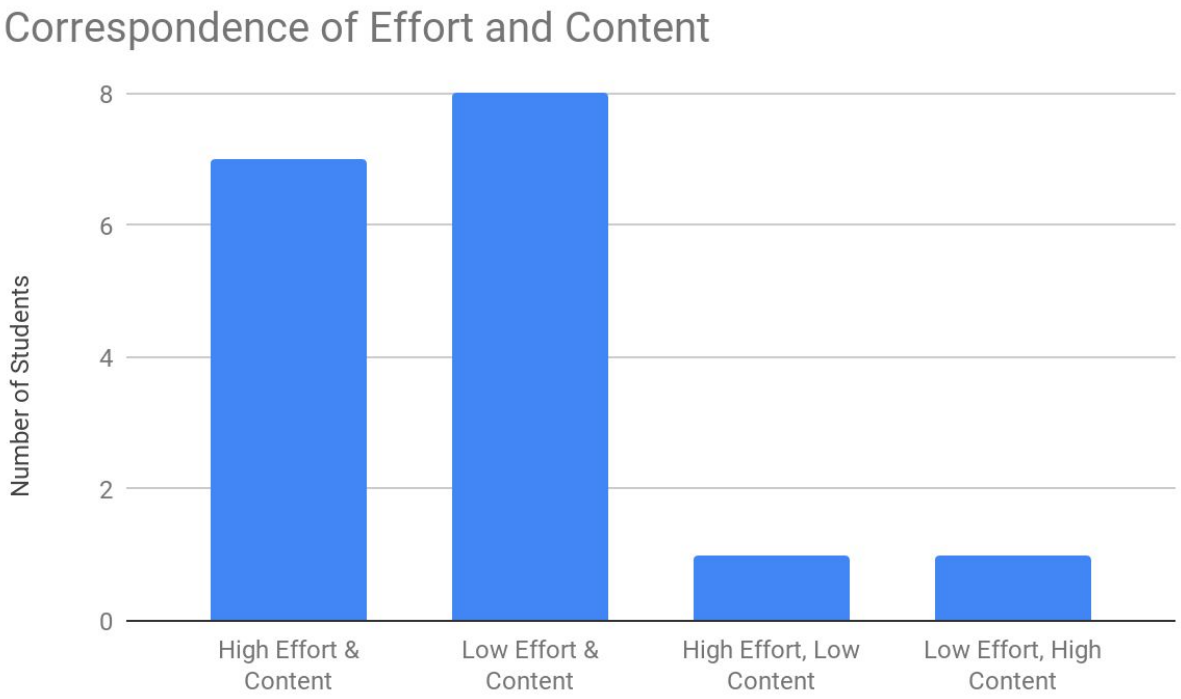


CSCI thesis

CSCI Non-Thesis (8 students)



CSCI non-thesis



Assessment Priorities for the 2019-20 Academic Year

- We need to revise our Student Assessment Plan.
    - We are aware that a revised Student Assessment Plan ought to have been included in this document. Our department's peculiar circumstances in Spring 2019 rendered the revision process impossible.
    - The only full-time faculty remaining in the department since the writing of the 2009 plan are Professors Ferrer and Seme. The rewriting of the CSCI learning goals greatly accentuates the need to rewrite at least that portion.
    - Furthermore, the use of Exit Interviews has been uneven at best as a form of indirect assessment. There is no repository of notes from those interviews, and the questions are not asked in a consistent manner. Furthermore, due to an overwhelming workload, we were unable to conduct Exit Interviews in Spring 2019. We issued a Senior Survey, but the response rate was extremely poor. We will need to discuss best practices with other departments to make progress on this.
- We are due for an external evaluation, which will drive much activity.
    - Different sections of the self-evaluation document will be written by different members of the department, to spread the work around.
    - Everyone will read and give feedback on the entire document.
- We need to carefully examine and revise the learning goals for our 100-level courses:
    - CSCI 150

    - CSCI 151
    - MATH 120
    - MATH 130
    - MATH 140
    - The focus of this activity is transparency. We need to write learning goals that are comprehensible to students upon reading the syllabus at the start of the semester. At the same time, we need to ensure that these learning goals convey the content that is covered to an informed outside observer.
    - An additional focus of this activity is to relate the goals of these courses to the program learning goals.
- CSCI 150
    - Brent Yorgey is participating in a series of workshops on inclusive teaching, focused on CSCI 150.
    - The current course is largely derived from Mark Goadrich's version of the course from Centenary College.
    - We think it is time to re-envision the course. We plan a one-day retreat to focus on it this coming summer.
- MATH 120, 130, 140, 215, 230
    - Inexpensive options for textbooks for each of these courses have been identified.
- MATH 140
    - There is some divergence in how the course is taught by different faculty members.
    - We plan to devise a list of the learning outcomes that subsequent courses depend upon:
        - MATH 270 Differential Equations
        - MATH 230 Multivariable Calculus
        - MATH 290 Introduction to Advanced Mathematics
        - MATH 310 Mathematical Probability & Statistics
        - PHYS 2?? Vibrations and Waves
        - CHEM 3?? Physical Chemistry
    - Upon examining this list, we will revisit the key learning goals for the course.