Assessment Report for the 2019-20 Academic Year

Department of Mathematics and Computer Science

Chair: Gabriel J. Ferrer, Professor of Computer Science

Our department met on Friday, May 22 for our annual assessment meeting.

Part I: Program Assessment

In our Assessment Plan, 2019-20 is the year to examine Mathematics learning goal MLG5 and Computer Science learning goals CSLG5 and CSLG6:

MLG5: Communicate mathematical ideas in written papers, oral presentations, and group discussions. Possess the ability to argue mathematical proof validity in both written and oral work.

For this goal, the direct assessment is the final grade in each MATH course, and the indirect assessment is a question on the student course feedback form. The following points were made in the discussion:

- The letter grades earned and the scores on the feedback forms tracked each other fairly closely. With A=5, B=4, etc. (to make the results comparable to the 5-point Likert scale on the indirect assessments) the direct average is 4.17, compared to an indirect average of 4.52.
- The open-ended feedback on this question on the feedback forms confirmed that the larger-scale writing projects in Calculus I and II and Multivariable Calculus were having their intended impact. One student observed that these projects "really pulled the ideas together well," and this observation was a typical example of several that we saw.
- As written, our assessment plan is too broad, as it includes all MATH courses. The intent behind the plan is to assess courses that support or are part of the Mathematics major. (This includes MATH 120, as it is important preparation for Calculus for students who need it.) MATH 115 and 215, which are purely service course offerings, need to be assessed separately. Our current intention is for them to be assessed by the QS committee (which includes a faculty member from our department). They wrote a plan this year and will assess them next year.
- The use of the final course grade as the direct assessment tool is unsatisfactory. There is too much aggregation of distinct outcomes into this metric. (We see evidence of this in how students "overestimated" their performance relative to the course grades.) To address this, we are considering assigning a separate grade for the communicative aspect of the projects in the Calculus sequence. We would then revise the assessment plan to use those grades as the direct assessment component of this learning goal. We will also contemplate similar measures for upper-level mathematics courses.

CSLG5: Create, implement, and evaluate software abstractions that model complex phenomena.

- Since we created our assessment plan, the only course for which this was a goal was Spring 2020 CSCI 335. As this learning goal is an intrinsic part of every graded assignment in the course, the overall course grade does seem to be a suitable direct assessment. Again starting with A=5, the average direct assessment value was 4.25, and the average indirect assessment was 4.6. These tracked each other reasonably well, and they show that the course was reasonably successful in working towards this goal.

CSLG6: Create, apply, and understand the software abstractions that manage interactions with hardware.

- As with the previous goal, there has only been one course for which it was a goal: Spring 2020 CSCI 322. Again starting with A=5, the average direct assessment value was 3.70, and the average indirect assessment was 4.71. This gap was uncomfortably large. Here are some plausible explanations:
    - Ten students received grades for the course, but only 7 submitted student feedback. It may be the case that the lower-performing students were those who did not submit feedback.
    - The students who earned low grades typically had completed in a satisfactory way the earlier assignments in the course. Their success in those assignments may have contributed to a higher self-assessment on this learning goal than their overall course performance indicated.

Part II: VLSG Assessment

Upon the request of the Assessment Committee, we evaluated each MATH and CSCI senior who completed a senior capstone project according to criteria I1, I2, I3, I4, I5, and I7 of the VLSG rubric. The requested data is included in the table below:

Goal	Capstone	Milestone 2	Milestone 1	Benchmark
I1	4	2	3	3
I2	4	3	4	1
I3	4	5	3	0
I4	5	3	1	3
I5	5	3	1	3
I7	3	5	3	1

Overall, both MATH and CSCI majors performed well on these metrics. We consistently rated four of the 12 students in the "Milestone 1" and "Benchmark" categories. These four students included two Interdisciplinary major students who completed MATH capstones performed less well, as well as two of the eight graduating CSCI majors.

In the cases of the interdisciplinary majors, these students were generally low performers in classwork who, we concluded, were unlikely to complete the MATH major. The interdisciplinary majors were created to create viable pathways to graduation for these two students. Although neither of them performed well on their capstone projects, they performed well enough to graduate, and in that sense were successful.

In the cases of the computer science majors, again the capstones were solid enough for them to graduate, and again we consider those cases to be successful given the capabilities and work habits of the pertinent students.

To-Do List for 2020-21

- Reexamine the role of final course grades in direct assessment. Seek out and employ more precise, less aggregated alternatives where applicable and feasible.
- Clarify that the MATH learning goals are meant to apply to courses in the MATH major and those that prepare for it. This does not include MATH 115 and 215. We need to update the plan to clarify how those courses are to be assessed by the QS Committee, and how our department will be involved with that process.
- Related to this, MATH 215 does appear in the requirements for several other majors, including Biology, Health Sciences, and Politics. We should reach out to those programs and see about how the contributions of this course to their programs should be assessed.
- We might also consider this same idea with regards to the Calculus sequence, which is required by the BCMB, Chemistry, and Physics majors.
- The lists of which courses have which program learning goals are inconsistent across the listings for CSCI. We need to reconcile and make consistent those lists. It interfered with our data gathering this semester.
- Related to both of the previous items, we have an assessment plan for MATH 130 and 240 relative to the CSCI major, but we failed to carry out the indirect assessment portion.
- The VSLG goals proved very pertinent to our senior capstone projects. We would like to more precisely characterize the relationship between those categories and the rubric we employ for our capstone projects. We might be able to show how the categories on our existing rubric correlate to the VSLG categories. We might also modify our rubric to incorporate ideas from the VLSG rubric.
- The data gathering employed this year involved about a dozen different spreadsheets. To facilitate data management, they should be consolidated into multiple tabs of a single spreadsheet. In an ideal world, all of this data would be stored in a relational database, but it is not clear that we have the resources to implement this properly. It would certainly be a waste of resources to undertake a project of that kind prior to figuring out what precise data we really ought to be collecting.