St. Lawrence University Gen Ed Quantitative and Logical Reasoning Assessment
University Assessment Committee

In Spring 2024, the Assessment Committee pursued General Education assessment with courses that faculty members have designated as fulfilling the learning goals of our **Quantitative and Logical Reasoning (QLR) graduation requirement.** This requirement was approved by the SLU faculty in 2013 as part of a larger curriculum revision. Students need to enroll in a course that fulfills either the Quantitative Reasoning or the Logical Reasoning learning goals.

Quantitative Reasoning Courses have primary learning goals in which students develop their abilities to:

(a) address questions by examining quantitative evidence using appropriate methods of analysis and evaluation (LG1); and
(b) explain their conclusions and the quantitative methods they used in developing their reasoning (LG2).

Logical Reasoning Courses have as the primary learning goals that students develop:

(a) an understanding of deductive and/or inductive logic (LG3); and
(b) an understanding of the methods of determining the reliability of these types of reasoning (LG4)

For this assessment, the Assessment Committee developed a simple, 4 point rubric with the scoring levels of “absent”, “emerging”, “proficient” and “exemplary”. All faculty who taught one or more QLR courses in the Spring 2024 semester were asked to participate. A total of 12 faculty participated with 18 courses , contributing to 378 scored assignments at the end of the Spring semester. Two-thirds of the courses (n=12) were 100-level courses and the other third (n=6) were upper-level (200 and 300-level) courses.

After receiving the completed scores, we then merged some demographic information into the file, such as students’ class year, gender, and race/ethnicity, academic division of major, and how many QLR courses (including this one) students had taken thus far. Data were analyzed by student characteristics only (and not by course characteristics), as this is not a departmental assessment project but general education assessment.

Important to note is while courses with QLR designation need to meet either both requirements for QR or both requirements for LR, we asked faculty to assign scores only learning goals that applied to the assignment they had chosen. In other words, some faculty scores assignments for LG 1 and LG3, others for LG 1 and LG2, LG3 and LG4 or only for LG4.

Table 1 Characteristics of Artifacts Assessed

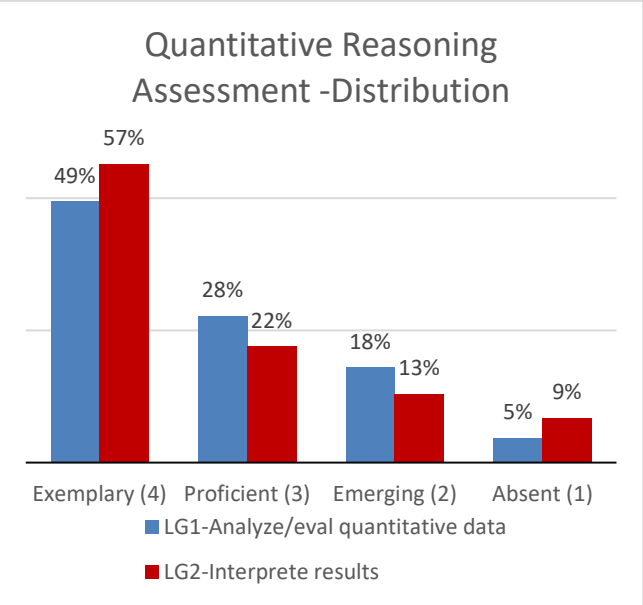
Class Level	34% FY; 34% SO; 15% JR; 18% SR
Gender	55% Male - 45% Female
Race/ethnicity	14% SOC - 13% International - 73% US White
Course level	63% 100 level – 36% 300 level – 1% 400 level

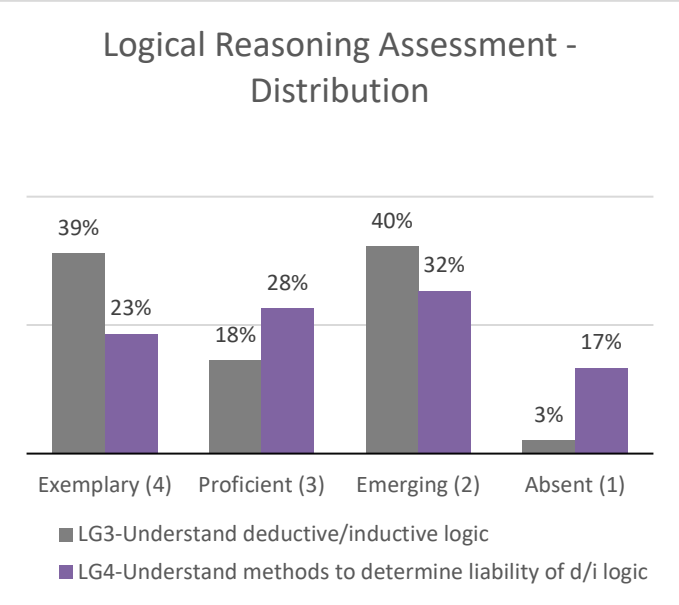
Overview of Findings

Quantitative Reasoning:
Seventy-seven percent of all assignments assessed for LG1 **are meeting the QR learning goal (a)** "*analyze and evaluate quantitative evidence using appropriate methods*" and **79%** of assignments assessed for LG2 **are meeting the QR learning goal (b)** *"explain their conclusions and the quantitative methods used in developing their reasoning"* (meaning they scored "proficient" or "exemplary".

Logical Reasoning:
Fifty-seven percent of assignments assessed for LG3 are meeting the LR learning goal (a) "*develop an understanding of deductive and/or inductive logic*" and 52% of assignments assessed for LG4 are meeting the LR learning goal (b) "*develop an understanding of the methods of determining the reliability of these types of reasoning",* with 17% of assignments being scored as "absent", meaning the student submitted the assignment but evidence of an understanding of the learning goal was absent. (See figure 1.)

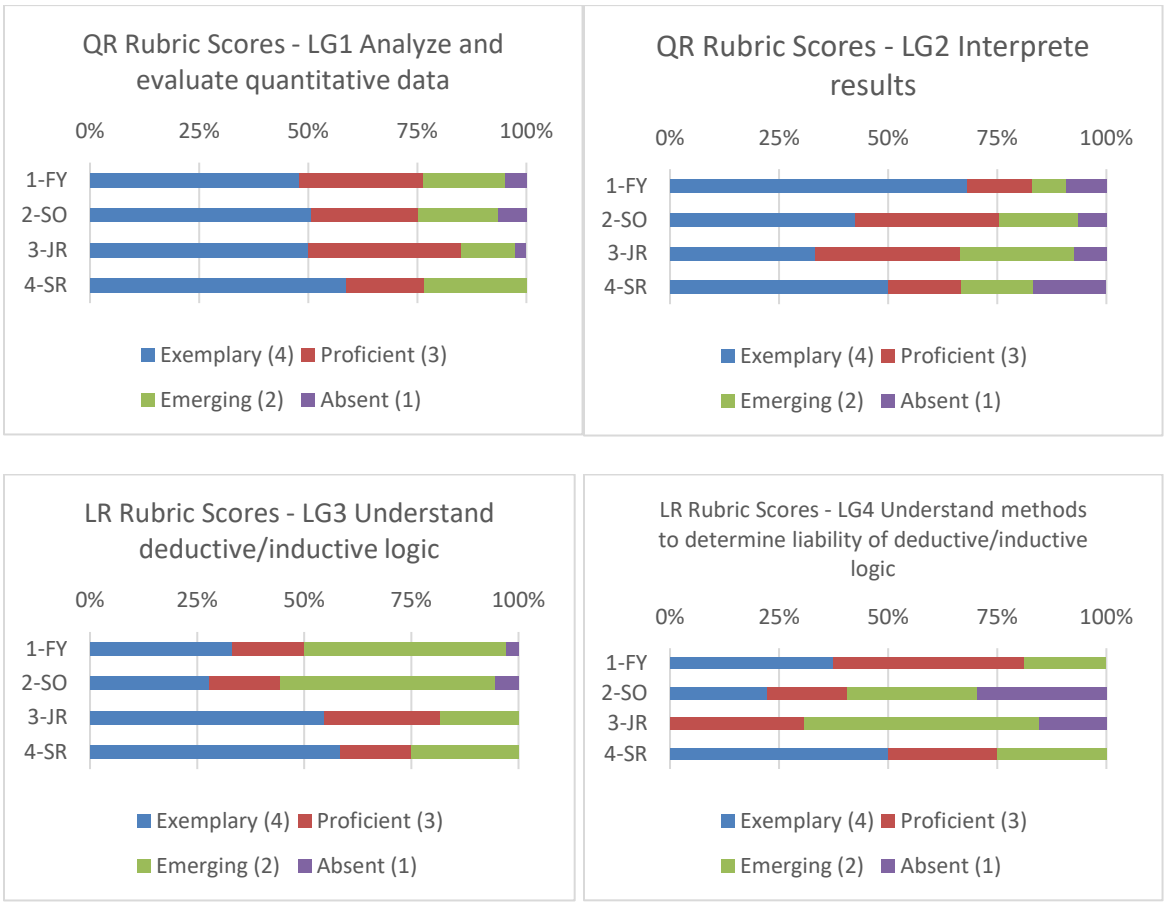
Figure 1 – Proficiency Levels for Quantitative and Logical Reasoning





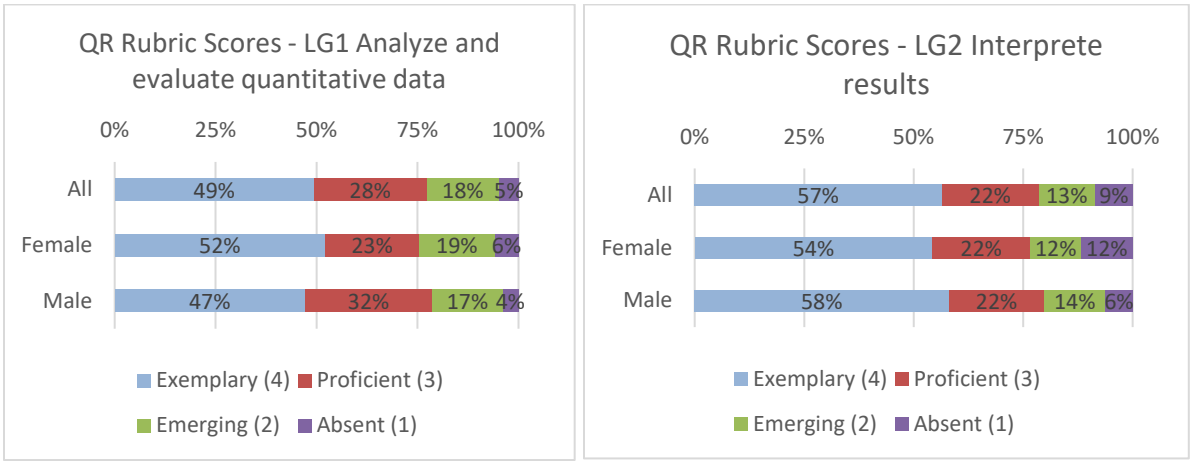
The difference in mean scores (3.2 for LG1/3.3 for LG2 versus 2.9 for LG 3/2.6 for LG4) suggests that students reach average proficiency levels for quantitative reasoning between "proficient" and "exemplary" while reaching proficiency levels for logical reason that only fall between "emerging" and "proficient", particularly LG4 "Students develop an understanding of the methods of determining the reliability of these types of reasoning".

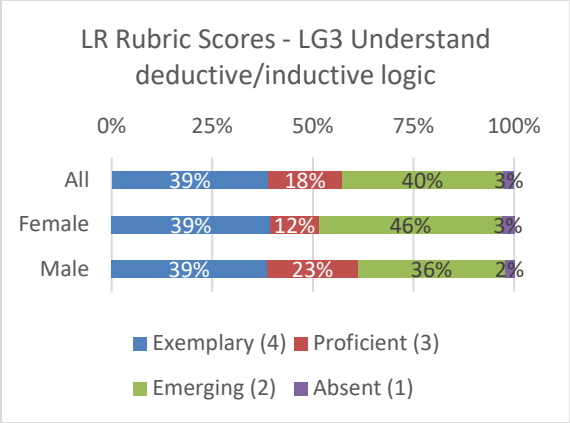
Figure 2: QLR Assessment Scores by Class Year

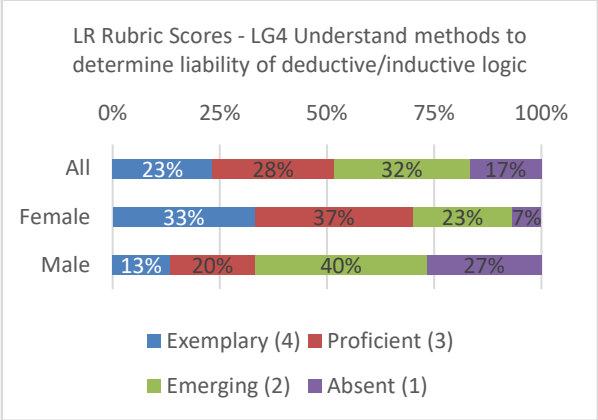


It is difficult to determine patterns by class level, although it appears that for both rubrics of QLR students upperlevel students perform higher at the first part of the QLR learning goal but are somewhat weaker than first-year students applying the second part of the QLR learning goal.

Figure 3: QLR Assessment Scores by Gender







For LG1, LG2 and LG3 there are no significant gender differences. However, LG4 shows significant differences with only one third of all assignments from male students reaching proficiency compared to 70% of all assignments from female students. While the sample is smaller for LG4, it still includes 30 students in each gender group. However, ratings are only from three upper-level courses and might benefit from further exploring if, for example, particular majors or aspects of this course might explain the gender difference.

Other takeaways:

- There are no differences based on the number of QLR courses taken (which ranged from a low of 1 to a high of 8 courses).
- Regression analysis did not indicate significant difference in proficiency by type of major (e.g. that science majors would score higher for quantitative reasoning or humanities majors higher for logical reasoning).
- While not statistically significant, international students seem to score higher on QLR scores than domestic students (except for LG4).
- The common rubric QLR assessment included 36 students who had two (and in one case three) assignments assessed. Reviewing the assignments that were scored in two different courses and by different faculty did not reveal differences of maximal one score across the learning goals, suggesting high inter-rater reliability.

Open-Ended Comments

As with the other gen ed common rubric assessments, faculty were encouraged to comment on the assessment project itself and/or the learning goals. Only very few comments beyond describing the assessment project itself were received. Below is a brief summary:

- A faculty member in the economics department found the rubric helpful and noted students feel more comfortable using methods learned in class to answer a numerical question than to interpret the findings and make a conclusion about their findings using words. This faculty member noted that generally, students who are exemplary in LG2 are exemplary in LG1, but the reverse is not necessarily true. As a result of the

assessment, the faculty member will focus on developing more questions for students to practice concluding their findings and interpreting their results.

- Suggestion made was to add “the ability to interpret findings” as a rubric for LG2.
- Didn’t learn anything new.
- One faculty member noted that all students should at a minimum reach proficiency level, but the lower scores were from students who have missed classes multiple times and have not reached out to the faculty member for additional help to catch up on course content.

Conclusions

The assessment indicated that overall, most students appear to meet our learning goal of Quantitative Reasoning as currently stated by the time they graduate. The next round of rubric assessment should follow the advice of one faculty member and include a separate rubric for the interpretation of results.

Data about Logic Reasoning suggests it is more difficult for students to achieve LR proficiency than QR proficiency; however, the assessment included only few classes and would benefit from a larger sample size. To gain more robust findings, the assessment committee should repeat the Logical Reasoning assessment in the near future. It might be also beneficial to explore further potential reasons for the gender gap for LG4 that the assessment found.

Departments participating in the assessment of Environmental Literacy included Math/Computer Science/Statistics, Digital Media Film, Performance and Communication Arts, Economics, Philosophy and Sociology.

RUBRIC FOR GENERAL EDUCATION ASSESSMENT

Quantitative Reasoning (QLR) Courses have primary learning goals in which students develop their abilities to:

(a) address questions by examining quantitative evidence using appropriate methods of analysis and evaluation; and

(b) explain their conclusions and the quantitative methods they used in developing their reasoning.

Logical Reasoning (QLR) Courses have as the primary learning goals that students develop:

(a) an understanding of deductive and/or inductive logic; and

(b) an understanding of the methods of determining the reliability of these types of reasoning.

Instructions:

1. Choose a course assignment in a QLR course from the second half of the semester in which students must demonstrate the abilities a) and b) for quantitative reasoning OR an understanding of learning goals a) and b) for logical reasoning.
2. Score each student's assignment and enter the score in the EXCEL spreadsheet that Christine will provide to you.
3. After scoring, please use the text box to provide feedback to the Assessment Committee reflecting on how the rubric and the scoring worked, what you learned from this assessment, and sharing any reflections on the Learning Goals as currently written.

Quantitative Reasoning

LGs	Exemplary	Proficient	Emerging	Absent
Addresses questions by examining quantitative evidence using appropriate methods of analysis & evaluation	Shows above average ability to address the question/s posed by using appropriate methods of analysis and evaluation of quantitative evidence	Shows average ability to address the question/s posed by using appropriate methods of analysis and evaluation of quantitative evidence	Shows a minimal ability to address the question/s posed by using appropriate methods of analysis and evaluation of quantitative evidence	Mark X if the student submitted the assignment, but evidence of the abilities in the LG was absent. Mark NA if the student did not submit the assignment.
Explains their conclusions and the quantitative methods they used in developing their reasoning	Shows above average ability to explain their conclusions and the quantitative methods that they used in developing their reasoning	Shows average ability to explain their conclusions and the quantitative methods that they used in developing their reasoning	Shows minimal ability to explain their conclusions and the quantitative methods that they used in developing their reasoning	Mark X if the student submitted the assignment, but evidence of an awareness of the LG was absent. Mark NA if the student did not submit the assignment.

Logical Reasoning

LGs	Exemplary	Proficient	Emerging	Absent
An understanding of deductive and/or inductive logic; and	Shows a sophisticated understanding of deductive and/or inductive logic; and	Shows sufficient understanding of deductive and/or inductive logic; and	Shows minimal understanding of deductive and/or inductive logic; and	Mark X if the student submitted the assignment, but evidence of the abilities in the LG was absent. Mark NA if the student did not submit the assignment.
An understanding of the methods of determining the reliability of these types of reasoning.	Shows a sophisticated understanding of the methods of determining the reliability of these types of reasoning.	Shows sufficient understanding of the methods of determining the reliability of these types of reasoning.	Shows minimal understanding of the methods of determining the reliability of these types of reasoning.	Mark X if the student submitted the assignment, but evidence of an awareness of the LG was absent. Mark NA if the student did not submit the assignment.