Efficacy of the Writing Integrated Teaching (WIT) Program in Undergraduate Physics Laboratory Courses

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Outline

- **WIT** program

- Laboratory Courses at UofT

- Survey Design and Results

- Implementation of Changes

- Lessons Learned

Writing **I**ntegrated **T**eaching (WIT) Program

- Arts & Sciences program at University of Toronto that provides TA funding and other resources to support student learning through writing

- Focus is on discipline-specific writing

- Physics joined **WIT** in 2022 to focus on lab courses

- Lead TA (Serene Shum) helped with redesigning writing guidelines, developing a writing workshop, rubric development, TA training in giving better feedback, benchmarking grading standards

Lab Sequence
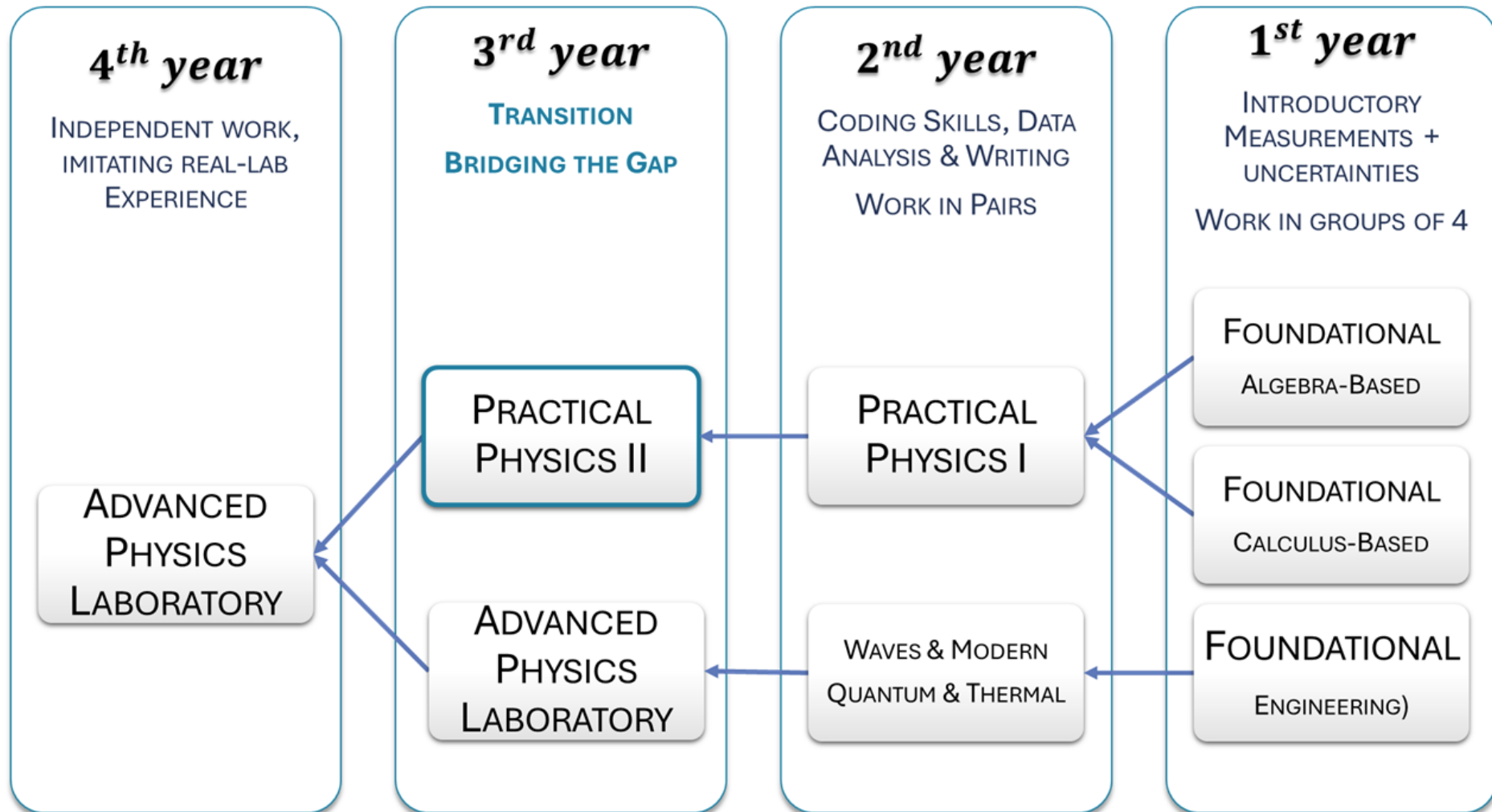
Building in space to improve.
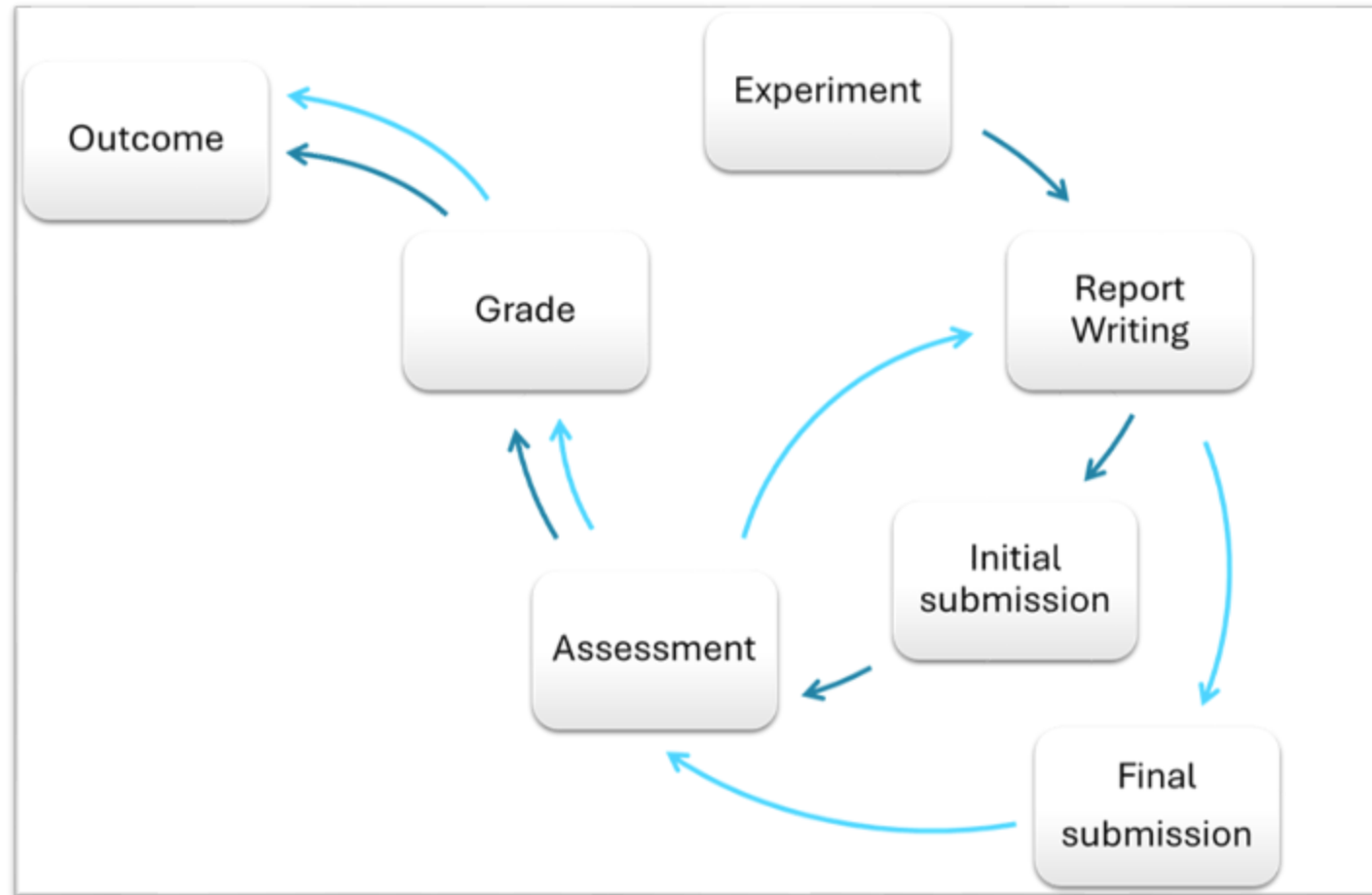
Submission procedure for any laboratory report.

Data Collection

- Two surveys – beginning and end of the semester
  - Likert scale [0-10] questions to self-assess experience and levels of confidence related to various elements of writing:

    - PLANNING
    - CLARITY
    - BREVITY
    - EDITING

    - WORD CHOICE
    - USE OF THE ACTIVE VOICE
    - USE OF TENSES

  - Likert scale questions included in the final survey to allow students reflect on the change of confidence since the beginning of the semester

    ◯   ◯   ◯   ◯   ◯

   Decreased a lot   Decreased a little   Not Changed   Increased a little   Increased a lot

  - Inquiry about resubmissions and usefulness of the feedback, resources, and WIT program

Review and resubmit

USE OF RESUBMISSIONS
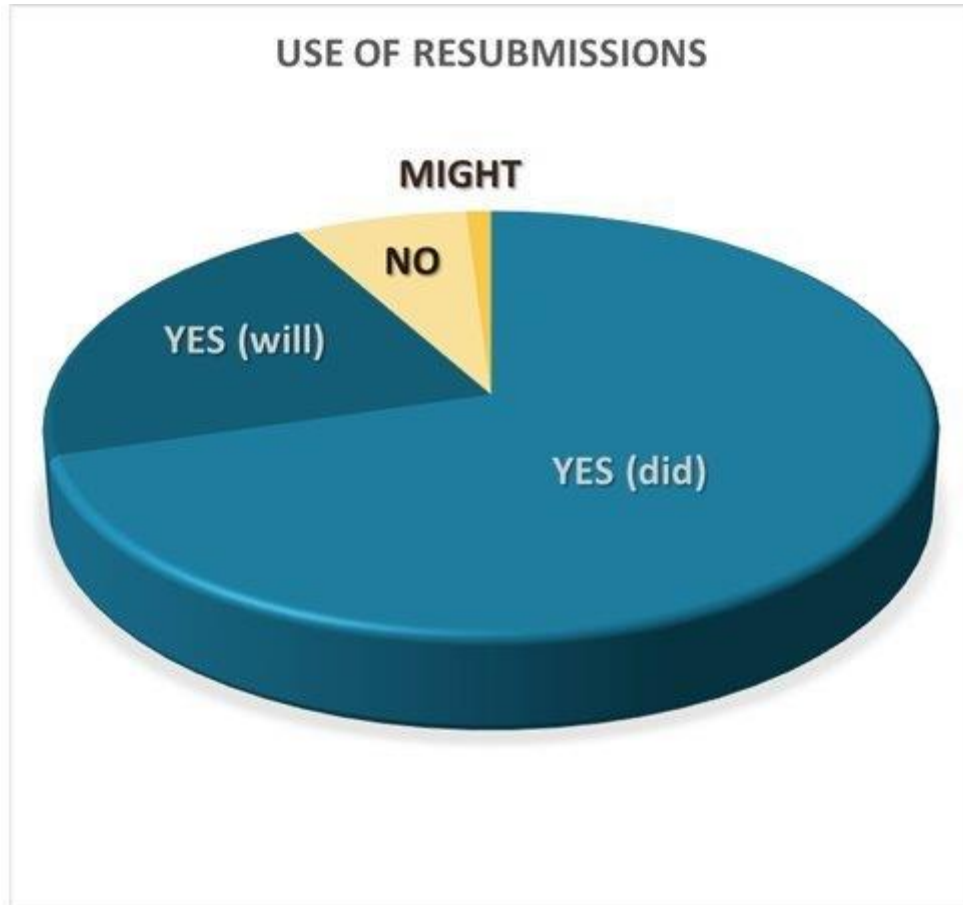
- All students who said **NO** quoted workload as a reason.

- **MIGHT** indicated satisfaction with current grade but left the possibility for the future.

- **YES** quoted *improvement of grade* as a main reason, with *improvement of work* and *easy fixes suggested* in distant seconds.
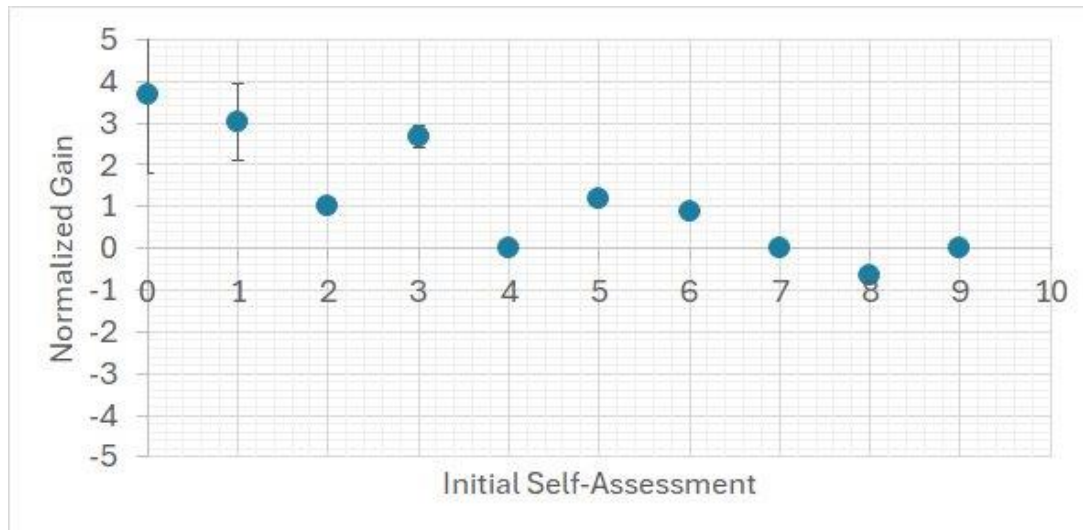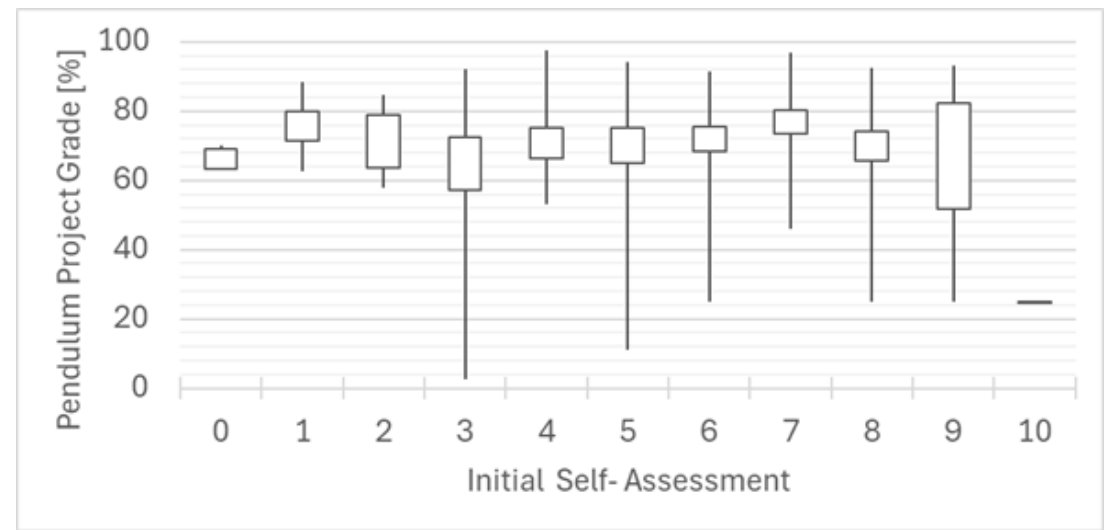
Student Self-Assessment
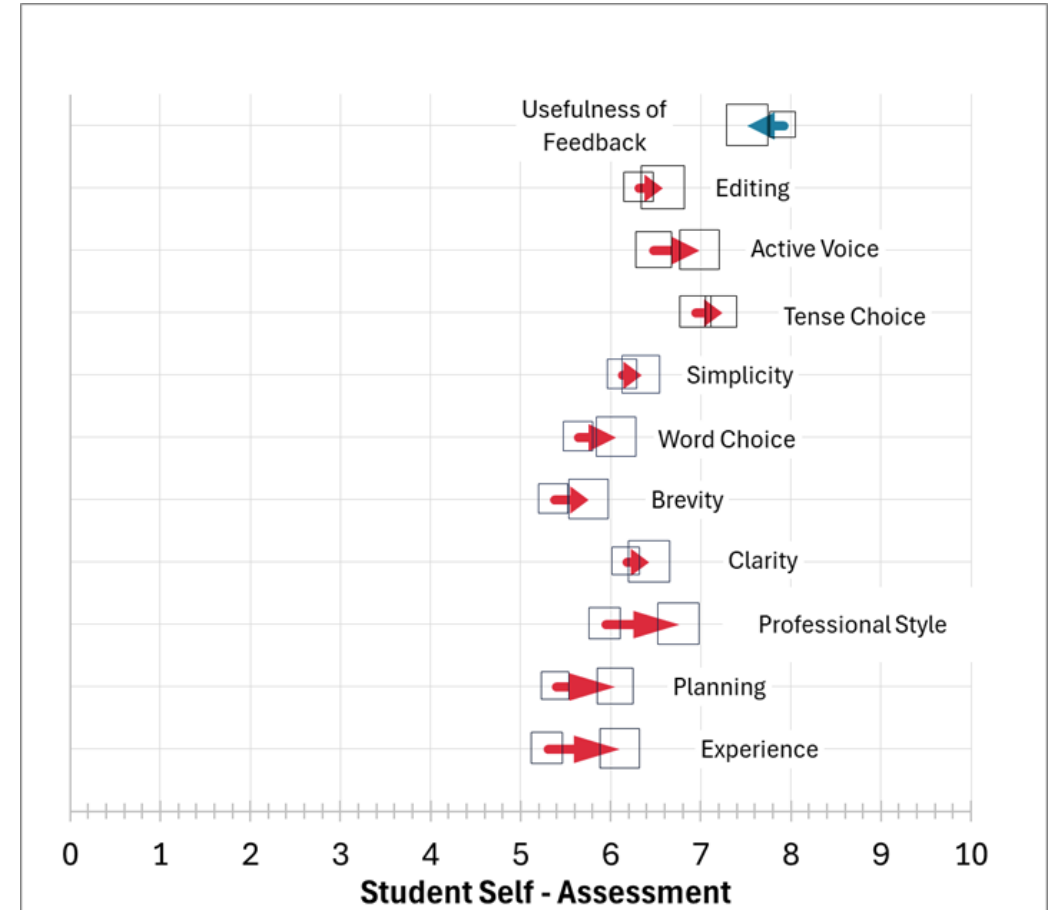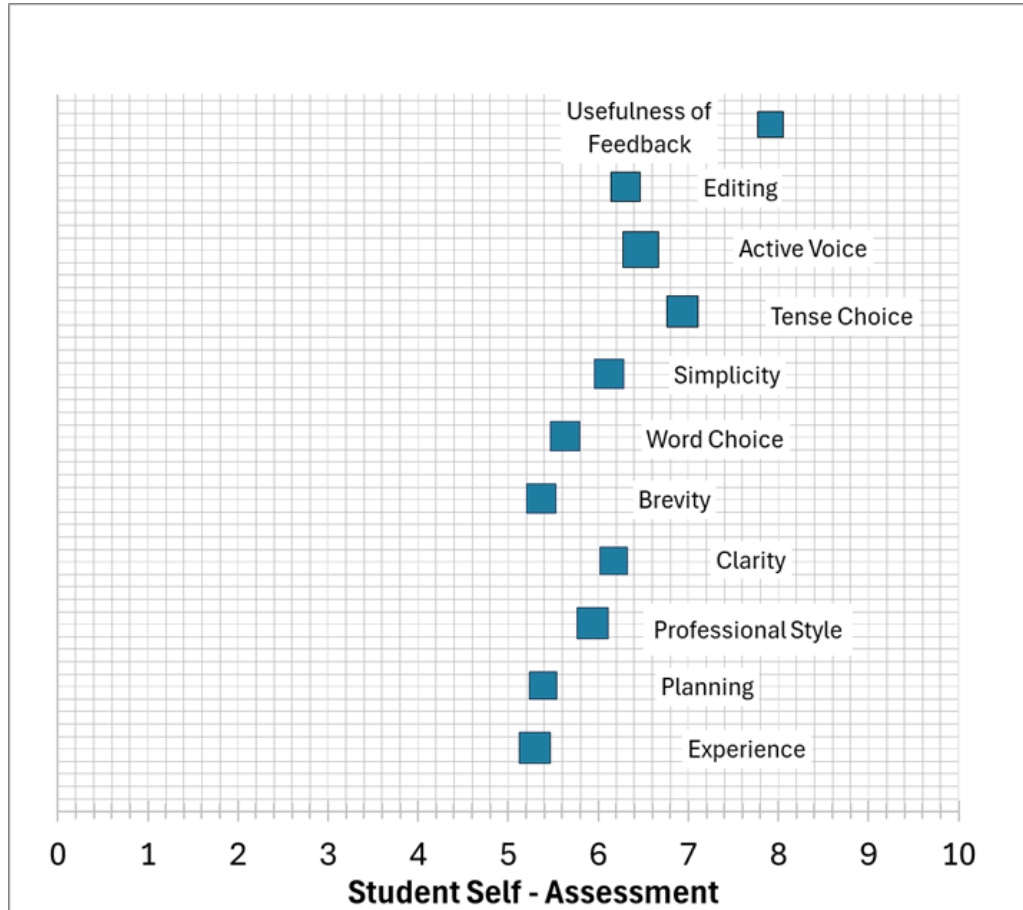
Student self-assessment of their writing-related skills and the usefulness of feedback at the beginning and at the end of the semester.

Experience

$$NG = 100 \left(\frac{X_{final} - X_{initial}}{100 - X_{initial}} \right)$$

Normalized change in the student self-assessment of their experience in writing reported at the end of the semester and at the beginning of the semester.

Percentage grade received by students on the final project (2023) as a function of students' initial self-assessment of their experience in writing, The boxes represent average grade with uncertainty, lines indicate grade distribution
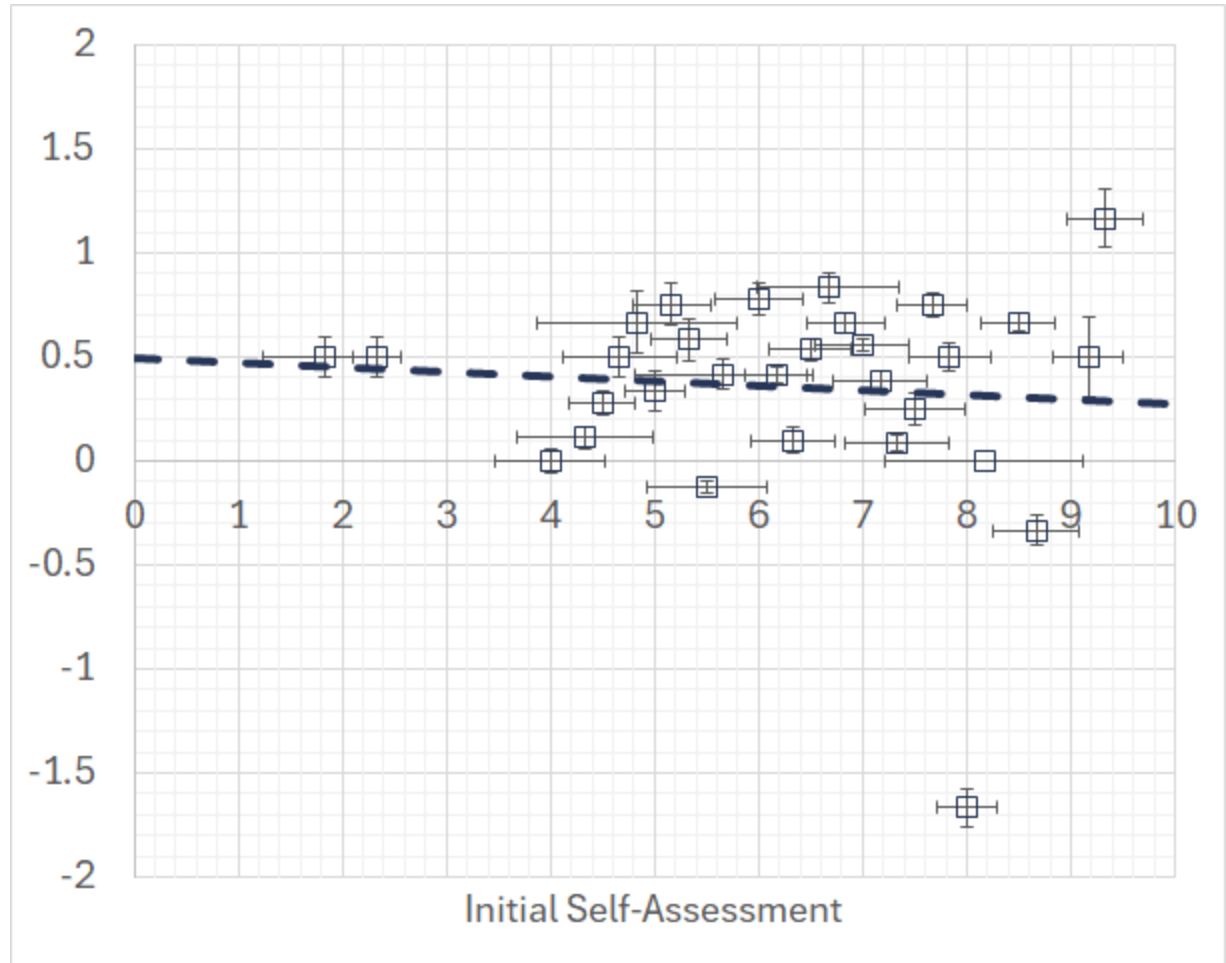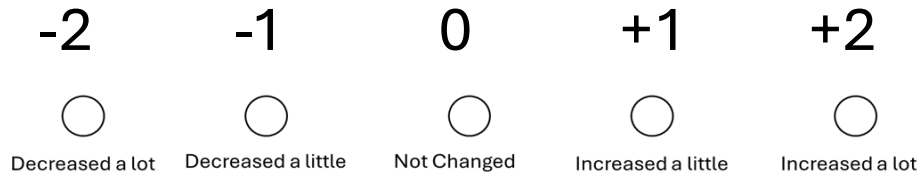
Student Self-Assessment
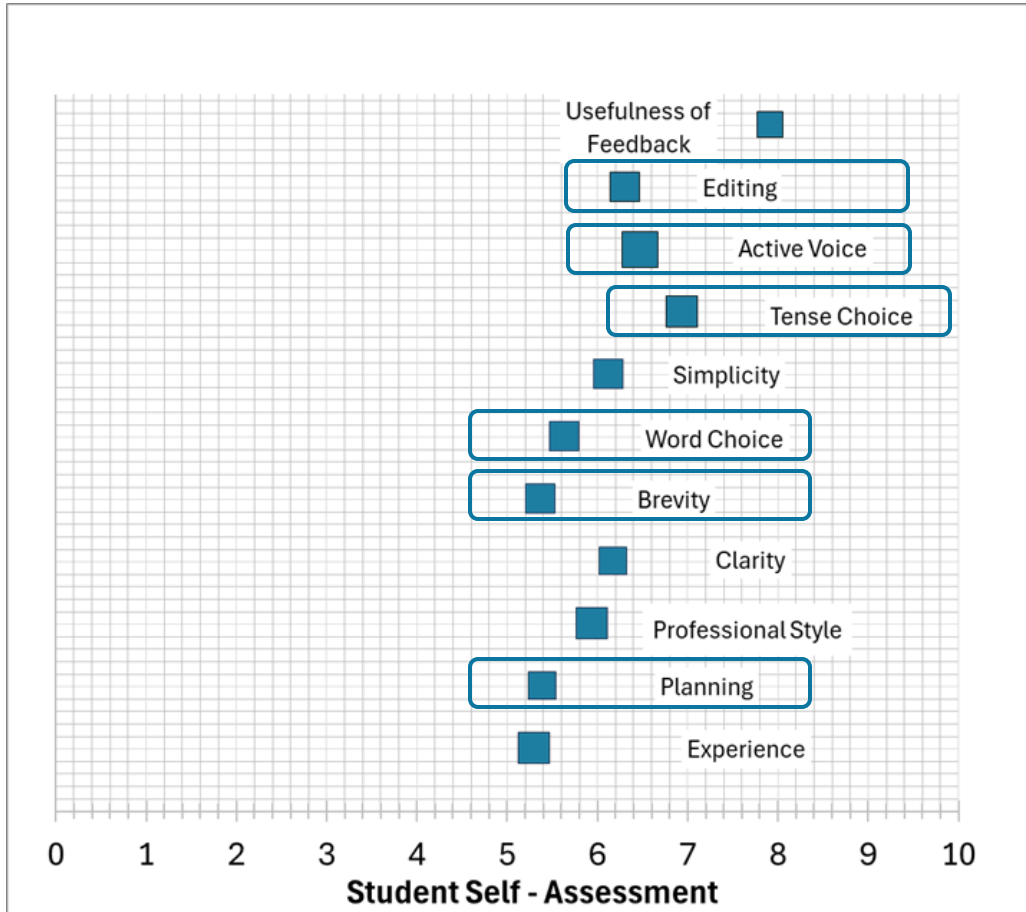
Student self-assessment of their writing-related skills and the usefulness of feedback at the beginning of the semester.

Word cloud of the Likert-scale choices assessing the change in students' confidence of planning, brevity, word and tense choices, use of active voice and editing.

Relative Change

-2   -1   0   +1   +2

◯   ◯   ◯   ◯   ◯

Decreased a lot   Decreased a little   Not Changed   Increased a little   Increased a lot

Normalized gains (dotted line) and relative gains (dashed line) for all categories. Initial self-assessment is averaged over all categories.

Feedback

Word cloud depicting the report elements identified as most difficult to write.

Most common reason, across the board was curating the content, editing and **discrepancies in TA expectations.**
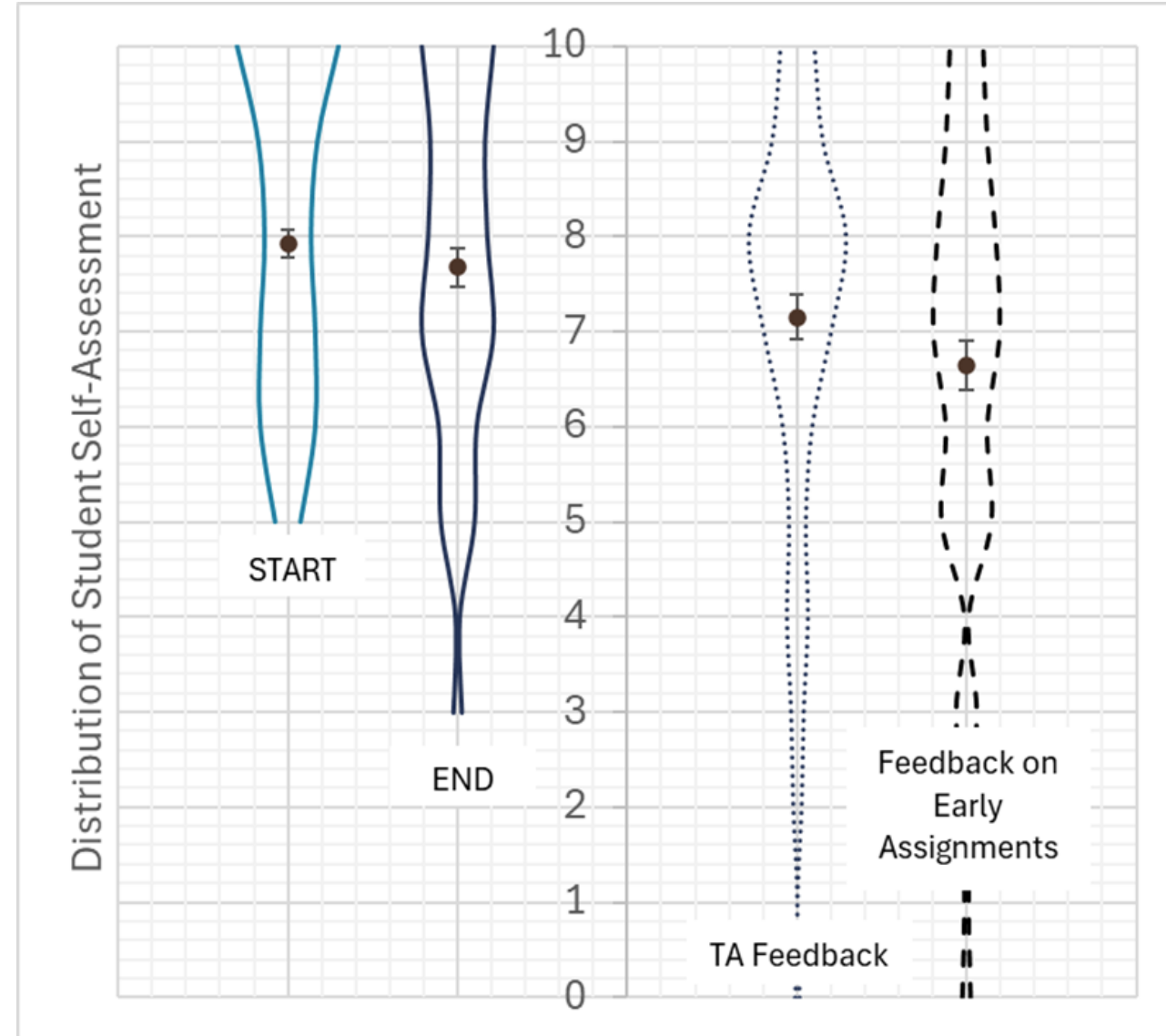
Changes for 2023-2024

- Devoted in-class time (~20 minutes per group) for individual, oral feedback from TA to students

- Provided resubmission attempts for most assignments from the start of the course (next year: all?)

- Refined TA training about marking and feedback

- Refined rubrics, increased effort to get students to read rubrics

Grades for 2023 (orange) versus 2024 (blue)
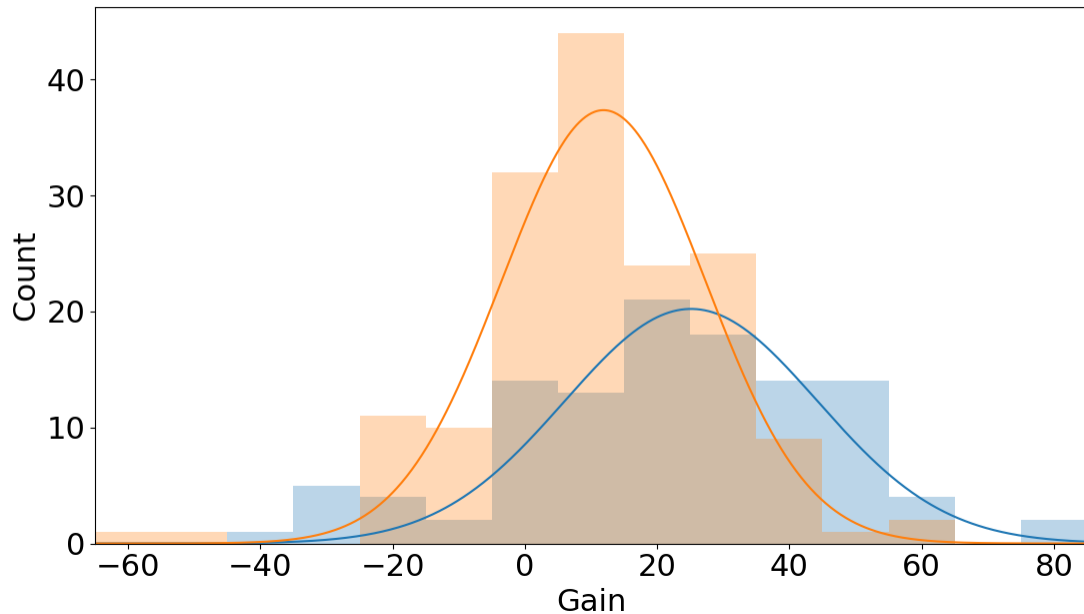
Histogram of relative gains between the first lab report and last lab report (first drafts for both). 2023 (orange) has a mean of 10. 2024 (blue) has a mean of 22. Grades are on a 100-point scale.
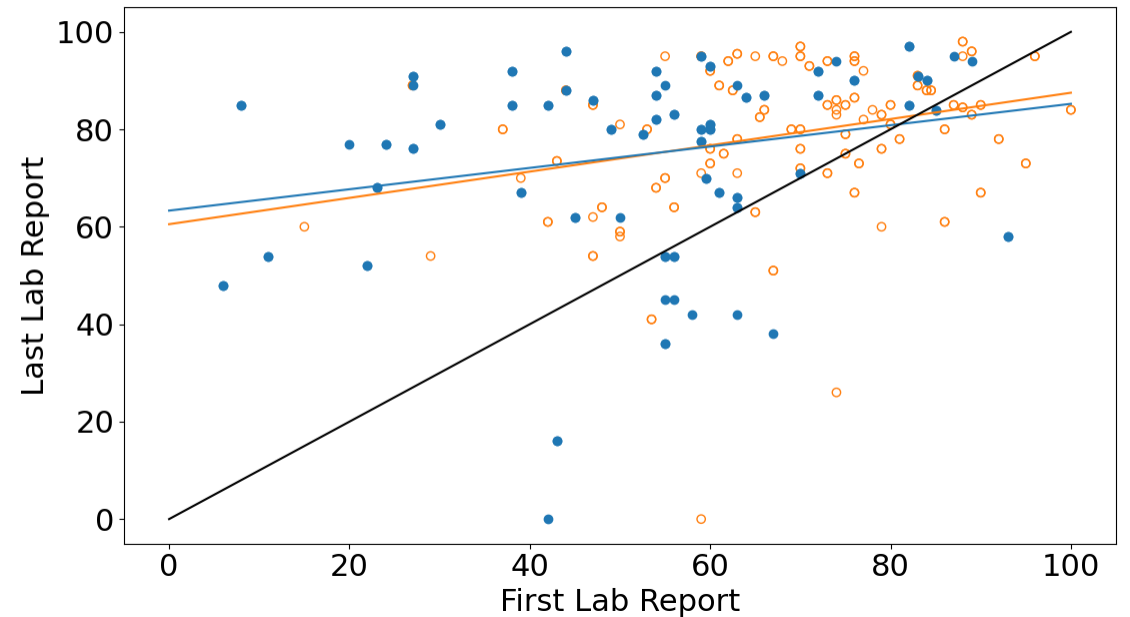
Scatterplot of the raw data used on the left plot. The black line is the line of zero gain. Linear best fit lines are nearly identical.

Lessons learned

- Technical writing is a difficult skill to acquire by osmosis
  - Workshops, lectures, how-to documents, practice are useful, but...

- Students want (and need) quality feedback, and they need to engage with the feedback

- Assistance (*e.g.* the **WIT** program) to implement this is invaluable

- Oral feedback leads to higher quality engagement