Assessing Student Learning in Chemical Engineering Laboratory Courses:
A Multi-Dimensional Approach

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1) Student Self-Assessment

Purpose: To gauge student attitudes about their own knowledge and abilities that pertain to the laboratory, as well as gauge student attitudes about the course.

Method: The Student Self-Assessment is comprised of two validated assessment instruments:
- Undergraduate Research Student Self-Assessment (URSSA) [1]
- MUSIC Model of Motivation [2]

Sample Questions: From modified URSSA

Preliminary Results: Results shown are pre- and post-Laboratory II course

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2) Laboratory Skills Test

Purpose: To gauge student understanding of laboratory concepts and skills

Method: The Laboratory Skills Test was developed by preparing multiple-choice and short-answer questions related to the following topics, which were generated by Rose-Hulman Chemical Engineering faculty:

- Laboratory Safety
- Data Acquisition
- Data Analysis
- Connecting Theory & Experiment
- Troubleshooting Equipment & Data
- Knowledge of Equipment
- Team Management
- Application of Concepts
- Communication

Test administered in-class via Moodle pre- and post-Lab II. Test participation was required, but not counted as a grade item.

Sample Questions:

Preliminary Results: Average student score for each category of the Skills Test administered before and after the Lab II course. Error bars represent standard deviation of 65 scores (pre-test) and 66 scores (post-test).

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3) Writing Assessment

Purpose: To gauge student written communication skills in the context of technical laboratory reports.

Method: The Written Communication VALUE Rubric [3] assessed the context, content development, conventions, sources, and writing mechanics of the first draft of student laboratory reports in Lab II and Lab III. Assessment was completed by four non-ChemE Rose-Hulman faculty with periodic checks for inter-rater reliability as part of RosEvaluation.

Preliminary Results:

Content Development: Deeper analysis of Student Self-Assessment and qualitative responses on written laboratory reports as compared to the Student Self-Assessment.

Control of Syntax & Mechanics: On average, moderate positive shifts in written communication skills were observed for Content Development and Control of Syntax & Mechanics.

Future Work

- Deeper analysis of Student Self-Assessment and qualitative responses on Skills Test
- Improvement and validation of Laboratory Skills Test
- Identifying future uses for instruments
- Assessment during AV 2018-2019 as laboratory changes are made

References & Acknowledgements

