1. Assessment information collected

Graduate program assessments were compiled in May of 2018 for the AYs 2016-2017 and 2017-2018 (11 total assessments). Based on a 9-point rubric, analysis addressed whether students were below, at, or above the expected level for their year in the program. The tabulated values below reflect student learning outcomes as a percent of students exceeding expectations minus the percent of students below expectations.

1. Specific knowledge of literature 9%
2. Ability to critically analyze literature 0%
3. Technical abilities 9%
4. Quantitative abilities 0%
5. General knowledge of the field 18%
6. Presentation skills -9%
7. Writing skills -18%
8. Ability to formulate hypotheses and to articulate methods for testing hypotheses 0%
9. Ability to act as an independent researcher (PhD) 9%

These data suggest that B&N PhD students met or exceeded expectations in all but two areas, Presentation skills and Writing skills. In comparison with results compiled in 2016 learning outcome improved in the area of quantitative abilities. In 2016 our analysis showed that 7% of students were below their expected skill level in quantitative abilities. We interpret improvement as benefit of a focus on quantitative skills in the B&N graduate colloquium. By contrast, presentation and writing skills are less well developed than outcomes indicated in 2016 and below expected levels in 9-18% of students.
2. Conclusions drawn from the information summarized above
Student learning met or exceeded expectations in all but two categories and is in general, very good. Skills expected of students after year 5 develop through the process of writing, revising and defending manuscripts and the thesis. Apparent deficiencies may reflect challenging research projects that have delayed experience in meeting presentations and writing. Deficiencies also suggest insufficient practice with these skills early in the program.

3. Curricular changes resulting from conclusions drawn above
The B&N, graduate colloquium (Chem 688) now includes focus on proposal writing every fall semester. Students gain hands on practice and feedback from the instructor and peers on oral and written presentation of models, hypotheses, experimental design and expected outcomes. We will change program requirements for two semesters of Chem 692 (seminar) to two semesters of Chem 688.

The B&N faculty will implement learning objectives for weekly laboratory meetings to focus on presentation skills. We will increase practice with written and oral communication skills by having students rotate through other B&N laboratory meetings twice per year to present progress reports and observe reports from peers in other labs.

B&N faculty are beta testing electronic notebooks. Electronic notebooks (SciNote) prompts students to write a purpose for each experiment. Electronic notebooks also generate reports that will guide students in design of presentations during laboratory meetings. If the electronic notebooks increase skills in writing and oral presentations, the program will consider adopting them for all graduate students.

We have modified the comprehensive exam process to include a written proposal, oral defense of the proposal and opportunity for revision. This process is expected to provide more practice and guidance in oral and written communication skills.

4. Identify the faculty members involved in reaching the conclusions drawn above and agreeing upon the curricular changes resulting
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5. Has your SLOA plan been updated to include assessment of the program's Communication Plan, as required by Faculty Senate motion? (required for baccalaureate programs only) NA for PhD program