

Student Perceptions of Scientific Writing Self-Efficacy in a Graduate Pharmacology Program

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Abstract

Effective scientific writing is important for communicating research to a broad audience. However, many biomedical graduate programs lack sufficient training in scientific writing. We assessed pharmacology students' scientific writing self-efficacy. A questionnaire was disseminated through Canvas. De-identified responses were received from 12 of 13 (92%) students who consented to participate. Students had low self-efficacy for writing discussion, significance, and literature reviews and for critique outside of their research area. They struggled with clarity, communicating relevance, and simplifying technical language. We recommend that the curriculum integrate more time for developing critical writing and reflection skills.

Background & Purpose

Academic scientific writing is an essential skill for graduate students in the biomedical sciences (1). Proficiency in scientific writing supports effective communication and critical thinking (2). Further, effective scientific communication is important for academic and non-academic careers (3). However, many biomedical graduate students express low self-efficacy related to scientific writing, requiring education interventions (1,2,4,5). We assessed needs related to scientific writing among students in a pre-doctoral pharmacology program.

Methods

Expedited IRB approval was received for this study. A survey consisting of 27 multiple-choice items and 3 open-ended items was piloted with 3 individuals (1 former student, 1 faculty member, and 1 non-academic scientist). Thirteen students were sent an e-mail, requesting participation in the study. Twelve students consented. The final survey disseminated to students through Canvas Learning Management System. Responses were de-identified automatically through Canvas. Data were managed and analyzed using descriptive statistics for quantitative items and thematic analysis for qualitative items in Excel.

Results

Response Rate: 12 of 13 students (92%) responded

Current Field of Research: Half of students have fewer than 2 years of working experience in their current field of research.

- 75% drug development or biotechnology research
- 25% molecular pharmacology research

Writing about Research: Students reported writing about their research with low frequency.

- When asked how often they write about their research, half of students reported writing only once a month, and another 5 reported writing once a week.

Previous Scientific Writing Experience: Half have contributed to more than 10 abstracts, and more than 60% have contributed to at least one manuscript.

Table 1. Descriptive statistics of individual survey

Item*	Min	Max	Mode	Median	Mean	SD
1	2	5	3	3	3.33	1.07
2	2	5	4	4	3.83	0.94
3	2	5	4	4	3.42	1.00
4	2	5	4	4	3.83	0.83
5	1	5	2	2.5	2.75	1.14
6	2	5	4	4	3.75	0.87
7	2	5	4	4	3.75	0.97

Item key (*only items with mean < 4.0 are shown)

1. It is easy for me to start writing about my research when I have a blank page.
2. It is easy for me to edit my writing.
3. I am confident about my ability to write scientific manuscripts.
4. It is easy for me to critique published articles in my research field.
5. It is easy for me to critique published articles outside my research field.
6. I have no fear of having my scientific writing evaluated by peers.
7. I have no fear of having my scientific writing evaluated by faculty.

Scale

- 1- Strongly disagree
- 2- Disagree
- 3- Neither disagree nor agree
- 4- Agree
- 5- Strongly agree

Recommendations

- Recommendations to build self-efficacy
 - Foster a daily practice of writing.
 - Use writing as a process for critical reflection.
 - Integrate critique of a broad range of science into the curriculum.
 - Provide increased time for the discussion, significance, and literature review sections.
 - Promote consistent mentorship in scientific writing outside formal courses.
- A logic model was developed to plan a curriculum responsive to these needs

Reflection

- Using the end of course evaluation results to inform survey item development was helpful.
- Survey design, such as item order, might have influenced responses.
- Piloting the survey with three individuals refined the instrument prior to disseminating to students.
- Qualitative information from open-ended questions provided deeper understanding of students' perceptions.

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Table 2. Student perceptions stratified by skill

Skill	Mean of means	SD
Writing	3.97	0.40
Critiquing	3.29	0.77
Explaining	4.15	0.06

Table 3. Student perceptions by target audience

Target audience	Mean of means	SD
Scientific	3.88	0.49
Public	4.14	0.10

Challenges: Students reported challenges with the following parts of manuscripts or grants:

- Discussion, 92% (n=11)
- Significance, 58% (n=7)
- Literature review, 50% (n=6)

Students also reported struggling with transitions (n=10) and being clear and concise (n=6) when writing about their research.

Student Narratives

- **Clarity** was a perceived challenge when speaking or writing about research.
"[challenging] to explain the research in a concise manner."
- **Communicating relevance and using plain language** were challenges when speaking about research.
- Students struggle most with **thesis development and getting started** when writing.
- **Simplifying technical phrases without compromising the information** was a challenge when using plain language.
"...difficult to define technical terms in layman's language without losing the scientific premise of the subject."
- Students recommended **knowing your target audience**
"...understanding the audience and what they know"