Math Skills in Biology Education: A Principles Focused Evaluation (PF-E) of Community College faculty needs

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What is the problem?

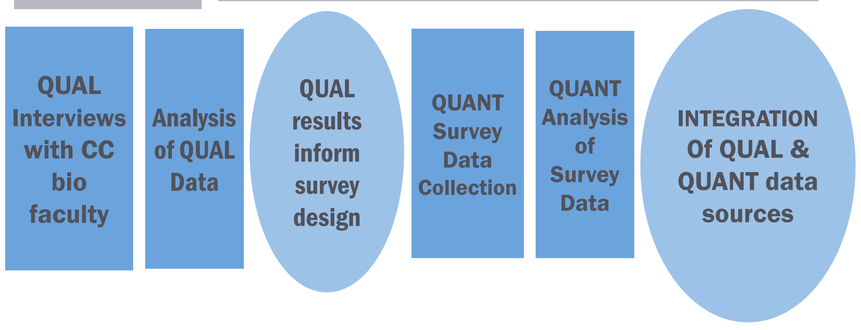
Despite the importance of community colleges (CCs) in post-secondary education, we have little understanding of the landscape of math skills in instruction at these institutions. This research demonstrates the value of examining the need for quantitative skills in undergraduate biology education and intends a mixed method approach to identifying the unique challenges community college (CC) faculty experience with employing math or quantitative skills in biology classes.

Research Questions

- What challenges and advantages/incentives do CC biology faculty experience when including quantitative skills in their courses?
- What quantitative/math skills to CC biology faculty value in their courses?
- How do CC biology faculty perceive their efficacy and skill level in teaching math skills to their student population?
- What are the needs of CC biology faculty in teaching quantitative skills in their biology courses?

Research Design & Methods

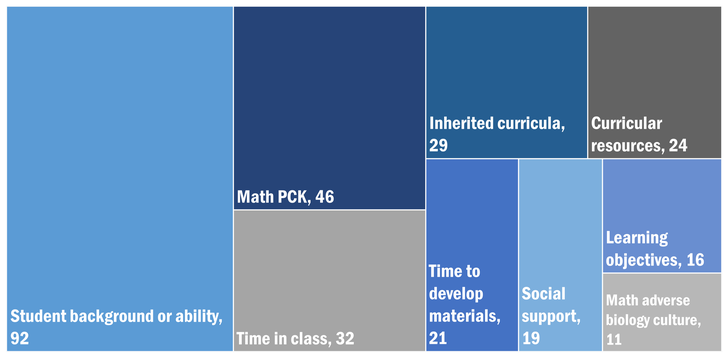
This study employs an Exploratory Sequential Mixed Methods Research (MMR) design conducted in two phases.



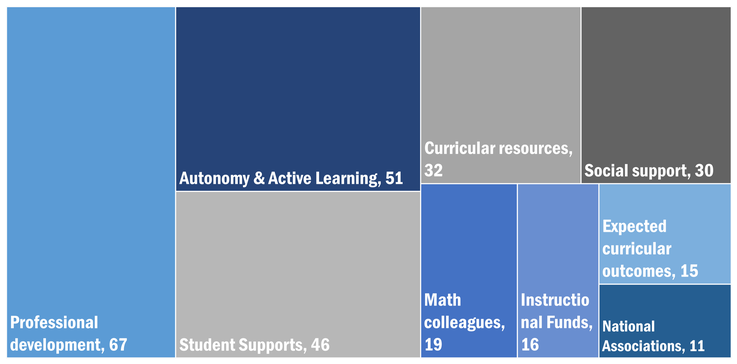
Phase 1: Interview Results

Twenty interviews were conducted with CC biology faculty recruited at three national conferences. The following graphics display the major themes with the number of instances in the interviews.

Challenges to including quantitative/math skills in CC biology courses as themed from phase 1interviews:



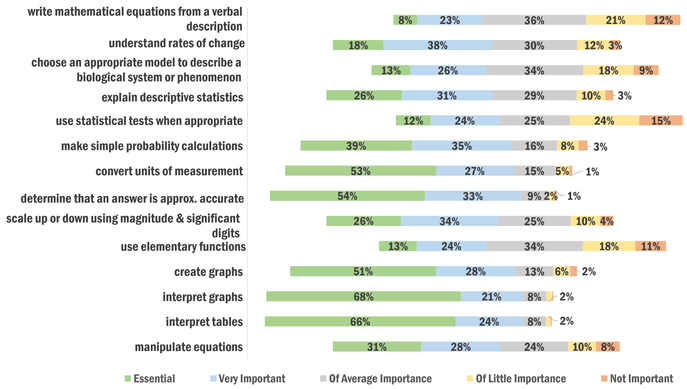
Advantages/Incentives for including quantitative/math skills in CC biology courses as themed from phase 1interviews:



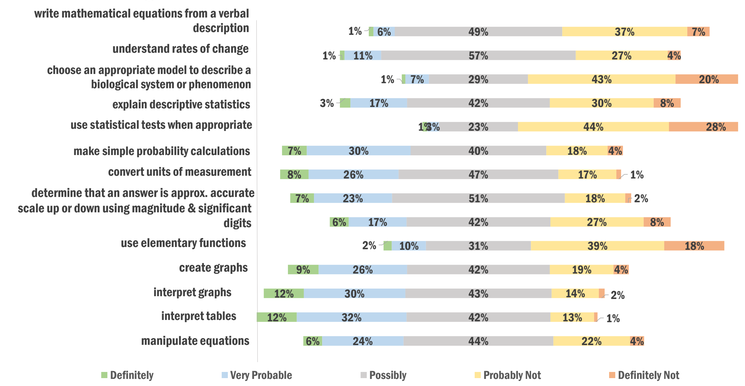
Phase 2: Survey Results

Nearly three-hundred survey responses from CC faculty representing forty-five states were analyzed to ascertain the guiding principles for including math skills in biology courses.

CC faculty respond to a survey question asking them to rank the importance of quantitative/math skills in biology:



CC faculty respond to a survey question asking them to rank the likelihood of students being able to do these same skills.



Conclusions-Next Steps

This research has several implications for professional development (PD) for faculty and administrators at CC institutions. The interviews and survey revealed that CC faculty desired PD that would help them improve or develop their quantitative skills, provide quantitative curricula that is relevant and ready to embed in their courses, and facilitate their development of the pedagogical content knowledge (PCK) necessary to teach the quantitative content. To accomplish this, PD could be comprised of workshops that focus on skill development followed by mentored teaching opportunities that focus on local adaptation of quantitative biology open-educational resources, which are freely accessible to all instructors.

References:
BIO2010: Transforming undergraduate education for future research biologists. (2003). Washington, DC: National Academies Press.
Creswell, John, W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research.* Thousand Oaks, CA: Sage Publications.
Lewandowski, C. M., Co-investigator, N., & Lewandowski, C. M. (2015). Vision and Change: A Call To Action. *The Effects of Brief Mindfulness Intervention on Acute Pain Experience: An Examination of Individual Difference*, *1*, 1689–1699. https://doi.org/10.1017/CBO9781107415324.004
Patton, M. Q. (2018). *Principles-focused evaluation.* New York, NY: The Guilford Press.