Analysis of QB@CC FMN in the implementation of OER Modules

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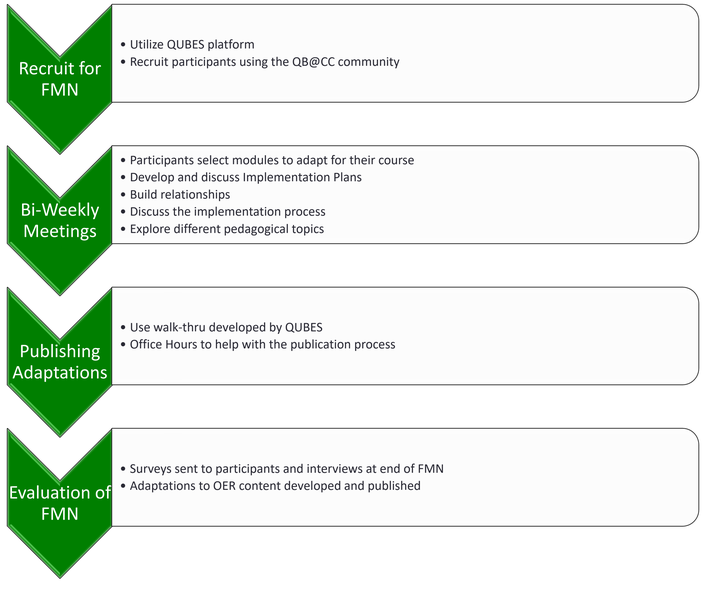
ABSTRACT

- The Quantitative Biology at Community Colleges (QB@CC) project is working to develop open educational resources (OERs) in the form of quantitative modules that can be used in mathematics and biology courses. It is important that these modules are vetted across different courses and formats. Faculty mentoring networks (FMNs) provide support for implementing new teaching content into courses, and provides a way to disseminate these modules for QB@CC. In the Spring of 2021, using the Quantitative Undergraduate Education and Synthesis platform (QUBESHub) , previously published, QB@CC modules were used in a FM that met bi-weekly over the course of the semester. As a result of the FMN, faculty participants created adaptations to the published QB@CC resource modules to make them better suited for their courses. The participating faculty indicated a greater willingness to share personally developed teaching resources and believed that having pedagogical conversations with other faculty was highly valuable in implementing these modules. These adaptations and original modules are collated at QB@CC.

BACKGROUND

- The QB@CC community brings together college faculty from biology and mathematics to help integrate quantitative concepts and skills in life science courses. The goals of QB@CC are to:
  1) Build a grassroots network of CC faculty
  2) Generate Open Educational Resources (OERs) that improve the quantitative skills of community college student
  3) Provide professional development (PD) that targets improvement in quantitative biology instruction
  4) Disseminate these materials and practices widely to CC and four-year faculty
- This QB@CC was developed in part to alleviate some of the perceived issues in teaching quantitative biology such as: the lack of curricular resources in quantitative biology, limitations in faculty time to develop materials, and the lack of familiarity with math pedagogical content knowledge (Corwin et al. 2019).
- Utilizing this community, several quantitative biology modules have been developed and published on the QUBES platform. These modules have been implemented in courses, but a broader dissemination and usage was desired. One of the limiting factors in incorporating the new QB@CC OER modules was in part due to lack of time to adapt the resources to a course, and knowledge of the available resources.
- The OER lifecycle consists of finding resources, adapting resources to the classroom, using the resources, refining, and sharing. A Faculty Mentoring Network could provide a peer mentoring opportunity to adapt, use, refine, and share resources to provide the ability to overcome some of the perceived limitations of finding and adapting quantitative biology resources. The design of the FMN process is outlined in Figure 1.

Figure 1. Outline of QB@CC FMN Bridging Mathematics and Biology



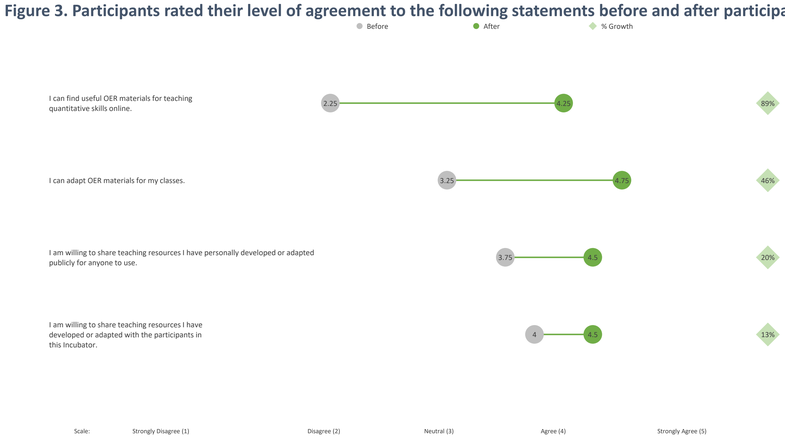
RESULTS

- Each Bi-weekly meeting focused on a different topic including implementation plans and reverse design, universal design for learning, integrating quantitative skills, assessment, presentation styles, and publication of adaptations. Each meeting began with discussions about implementation of the modules, and suggested ways for improving the modules. All participants found this discussion to be valuable in implementing the quantitative biology modules. The participating faculty taught a variety of courses, including one mathematics faculty member. This ability to collaborate with peers from various instructional settings was beneficial to the faculty in the discussions and e feedback on their adaptations. See Figure 2.

Figure 2. FMN participants rate their level of agreement to the following statements

- The ability to find OER materials and adapt OERs that are useful for teaching quantitative topics is one of the areas that was shown to be an issue before participating in the FMN, but improved significantly after faculty participation in the FMN. The confidence in sharing the OER content also improved as a result of the FMN. See Figure 3 below.

Figure 3. Participants rated their level of agreement to the following statements before and after participating in the FMN



- Barriers to Recruitment and Retention
  - One of the major obstacles in the FMN environment is in the recruitment and retention of applicants. The FMN competed in the same space as the QB@CC incubators, and several of the initial applicants choose to build new OER content in the incubators rather than make adaptions to existing modules in the FMN. Our focus was primarily on Community College faculty since that is program's primary focus, but it may benefit from more active recruitment from faculty from 4-year institutions.
  - Another hurdle in the FMN is at the publishing of adaptations phase due to time constraints.
  - The participation in the FMN from the application stage to the completion of the FMN is shown in Table 1 below.

Table 1. Participation of Faculty n the QB@CC FMN Bridging Mathematics and Biology

Applications	Bi-weekly meetings	Published Adaptations	Awaiting Publication
11	5	3	2

CONCLUSIONS

- The overall goal of the FMN was to overcome some of the limitations that faculty face when implementing and adapting quantitative biology OER content, while also increasing the quality/variety of QB@CC materials available for faculty members. The FMN was able to achieve these goals based on the following:
  - Faculty had an overall positive experience engaging in FMN.
  - The FMN was able to increase faculty confidence in adapting OER materials to their courses and publicly sharing the adaptations.
  - There was an increase in the dissemination and adaptation of QB@CC modules. The faculty also showed improvements in the awareness of the availability these resources.
- Currently, 3 adaptations to previously published QB@CC modules are available on QUBEShub, and 2 more adaptations are in progress towards completion as a result of this FMN. Published modules are linked below.
  1) Sizes, Scales and Specialization: Adapted to add scientific notation review v.1.0
  2) Students examine the diversity of human cell sizes and number using scientific notation v.1.0
  3) The Perfect Brew: An Activity Demonstrating Cell Counting and Hemocytometer Use v.1.0
- Recruitment and Retention within the FMN is an area that needs to be addressed by:
  - More widely communicating the availability of the FMN and the benefits of the experience.
  - More clearly defining the roles of a FMN versus an incubator in the QB@CC landscape.
  - Improving the communication and guidance in publishing adaptations. It may be beneficial to have participants slowly build the adaptation in the QUBES project space as they go through the FMN instead of at the conclusion of the project.
  - Initially we had asked the faculty to choose two modules to implement into their course, but it was quickly realized that this put too much of a time burden on participating faculty.

FUTURE PLANS

- The next FMN will focus on recruiting math faculty specifically to obtain more diverse adaptations to the OER modules developed by the growing community of faculty involved in QB@CC. Make sure to check the QB@CC website for further details.

ACKNOWLEDGEMENTS/ WORKS CITED

- Corwin, Lisa A et al. "Community College Instructors' Perceptions of Constraints and Affordances Related to Teaching Quantitative Biology Skills and Concepts." CBE life sciences education vol. 18,4 (2019): ar64. doi:10.1187/cbe.19-01-0003

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