**QUBES MathBench Faculty Mentoring Network**

**Final Product: Mystery of the Missing Housefly**

**Part 1: Context**

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**Course:** Introduction to Ecology

**Course description:**

The 200-level course is an introduction to the study of ecology at the population, community and ecosystem-level and is a required course for biology majors. The course includes both a lecture and laboratory. Each lecture section includes up to 24 students. The lecture was taught as a flipped hybrid course with online and face-to-face meetings. Students engaged in case studies, and quantitative exercises during the face-to-face meetings. Prerequisites for the course include two semesters of the 100-level general biology course.

**Part 2: Implementation Details**

1. What module did you implement?

The Mystery of the Missing Housefly module.

1. What learning objectives were you addressing using the selected module? Why did you decide that MathBench was a good approach for helping students achieve these learning objectives?

One of the learning objectives for the course is for students to be able to describe exponential and logistic population growth, and to identify density-dependent and density-independent factors that impact populaton growth. Students often have difficulty visualizing these different growth patterns and the influence of different factors on growth. The Mystery of the Missing Housefly module provided an opportunity for students to test and discover for themselves the impact of different factors on population growth.

1. How did you integrate the module into your other class activities? Briefly describe the pedagogical techniques you used to facilitate the module and reinforce the learning objectives you identified above.

The MathBench module was the focus of a face-to-face meeting that was conducted in a computer lab. Students were provided with a worksheet and an Excel template to complete as they worked through the MathBench Module. A secondary objective for the course is for students to gain experience using spreadsheets.

1. How did you incentivize students to engage fully with the module?

Students submitted their completed worksheets at the end of the face-to-face meeting for grading. As the lecture was taught as a flipped class, the students were accustomed to submitting worksheets after each face-to-face meeting. I also continually moved through the room to assist students or ask questions to keep the class focused on the module.

1. How did you assess whether students learned the concept or skill that you were trying to teach?

Due to the scheduling of the computer lab, students completed the MathBench module prior to the formal lecture on exponential and logistic growth. I used the worksheet and my observations during the implementation of the MathBench module to guide the population growth lecture and I probed students further for their understanding during the class. Questions that pertained to the MathBench module that were obtained from the instructor resources were included as part of the midterm and final exam.

**Part 3: Reflections**

1. Overall, how did your implementation go?

All the students engaged with the Mathbench module during class and required little nudging to stay on task. The addition of the Excel template did challenge students to actively apply what they were observing in MathBench. The students were already familiar with Excel as we had already completed three class activities in Excel. Students experienced the most difficulaty when attempting to iterate the exponential growth equation over multiple generations. I felt that this was a useful exercise for students as once they figured out how to iterate the exponential growth equation, many students were more engaged. Students had already completed the logarithm transformation MathBench module prior to completing the Housefly module. To reinforce concepts introduced during the log transform module, students were required to plot population growth on both numeric and log y-axes. This allowed students to see the differences in the proportional increase of populations experiencing exponential or logistic growth. Most students did not finish the worksheet and Excel template during the class time. We completed the Part IV and V together as a class.

Also note that several of the applets in the module were no longer available but this issue was easily worked around by using Excel and was not an issue for students.

1. What feedback (positive or negative), if any, did you get from your students about this experience?

Students enjoyed the modules but were uncertain as to what information to take from the modules. It was apparent from later assessments that most students saw the modules as an interesting exercise that was unrelated to what they were required to learn for the exams.

1. What advice do you have for faculty who wish to implement this module in their own classes?

Keep track of time as students move through the module. It may work well to have students work through the module over two class sessions. Part I-II may be completed during a class devoted to investigating exponential growth and Parts III-V may be completed during a class on logistic growth. A quizz following the implementation of the module may help students to reflect on how the MathBench module relates to what they are learning during lecture.