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REPORT of Pedagogical Inquiry Grant (Department Inquiry Project):

Collaborative design of a new introductory biology course series, PIG #1

1. Background

The faculty of Biology has been working collectively as a department to revise the current 3-course **introductory course series** (Biology 111, 112, 205) for over the past two years, with three major goals.

1) Allowing students to start taking the series without prior chemistry and even in their first year, making the biology major more accessible to students; this contrasts with the current situation, where chemistry prerequisites tend to deter many students interested in natural science away from STEM and make biology major courses nearly inaccessible to first-year students.

2) Having students start with the whole-organism emphasis, including natural history and ecology and biodiversity, which are topics that are generally both more relatable for many students and make them excited about biology. This contrasts with the current series, where Biology 111 (cell, molecules, metabolism, physiology) is expected to be taken prior to Biology 112 (biodiversity, ecology, natural history, evolution), and genetics (Biology 205) is taken after Biology 111.

3) Expecting all Biology faculty to participate in teaching the introductory courses, which will enhance faculty-student contact early in a student's biology trajectory; this contrasts with the current situation, where 9 faculty teach the tripod of three introductory courses, namely the two 100-level courses and genetics, and are the only faculty with whom students have their first and second contact in the department. This will also increase staffing flexibility for the introductory series. The instructors will follow the same syllabi and draw from shared materials; hence, the sections of the same course taught by different faculty will provide students in different lecture and lab sections with comparable foundations in biology.

Associated with this introductory course redesign, we have had to also rethink some of the structure of our major. This includes removing genetics as a requirement by incorporating a major part of the material into the two new introductory courses and making room for this material by moving large portions of the current Biology 112 course to new elective upper-level 200 courses. With this design, students will be required to complete both the two new introductory courses and at least one 200-level course (as a transition) before they can enroll in any 300-level course.

The credit total required for the Biology major is not changing. Overall, these changes will create more flexibility for students to move through the major at a wider variety of paces, making the biology related majors more accessible and moving STEM at Whitman College towards greater diversity, equity, and inclusion for our students.

What we have achieved in our current PIG (1) with same title:

In our current PIG of the same title (1), we had hoped to complete the revision of the introductory courses (**Bio 101+101L and Bio 102+102L**), but developing the lecture topics to be covered and

especially developing the labs of each course has taken much more brainstorming time than initially expected.

During this PIG #1, we (9-10 faculty and 3 lab coordinator staff) have participated regularly in the PIG meetings, which started in end August and will extend into early December. We have been very engaged in the process, which has been wonderful and furthermore a positive bonding opportunity for our department: very productive, with open and frank interchange of ideas, concepts, and philosophies within the large group and within each of the subgroups. The work and positive spirit directed to this collaborative effort has been impressive.

2. Achievements in PIG #1

We completed all of our 12 meetings (totaling 19 hours), with the faculty dividing into two groups (one for each course) for over half the meetings. We have achieved the following of our original goals set for this PIG #1:

1. Weekly topics of each course, both lecture and lab
    - Outlined topics to be covered in each course and organized them temporally across the lectures (both Biology 101 and 102); selection of textbook
    - Outlined all the labs topics and their timing alignment with lectures (both Biology 101L and 102L); this included making a list of skills that we want students to develop in each lab course (e.g., proper use and care of lab notebooks, making graphics and applying basic statistics to data, use of both compound and dissecting microscopes, amongst many others).
    - Created google sites for faculty to share resources during the teaching (e.g., lectures, power point slides, test questions)

2. Plan for incorporating DEI into each course
    - Extensive constructive brainstorming discussions over course policies (e.g., attendance, assignment formats and assessment, tests/exams, homework, office hours/group support hours).
    - In the labs of the first course (Bio 101L), we will have lab activities occupy only 2 hours in order to leave the third hour for review and mentoring of students needing more personalized teaching.
    - We have reached out to John Johnson to see if there are any STEM materials that faculty involved in the Posse training workshops might be able to share, but there is no material there.
    - We plan for a couple faculty to attend symposia on DEI in teaching at professional conferences this coming summer. These include annual meetings of the Ecological Society of America, Botanical Society of America, Society for the Study of Evolution, Entomological Society of America.

3. Plan for incorporating instruction in science communication into each course
    - Outlined science writing activities for selected labs of each course: in Bio 101L, we will have short activities focusing on specific aspects of analyzing data and writing up research projects. Biology 102L will build on these skills, culminating in a 5-week-long Course-Based Undergraduate Research experience (Banger et al. 2014) that gives students a real research experience from start to end (including presentations). We are very excited about how this feature of the courses has unfolded!

Goals still remaining for Spring and summer 2024

We realize that we very much underestimated the time and effort needed to redesign these two courses, and while we achieved a lot during our PIG #1, we have several more goals that we will work on during the coming Spring semester and summer. These consist of:

- completing the syllabi of each lecture course: detailed contents of course, readings, exam schedules, exam questions, other types of tests, assignments
- completing the labs of each course: write-ups of each lab in a lab manual format (after doing a test run of each lab), descriptions of each scientific communication exercise, and design of lab practicals and other assessments
- obtaining feedback from students on our planned DEI activities (to be done in PIG #2)