Development of a curriculum map in Integrative Physiology to provide a mechanism for assessing student achievement of departmental program goals

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Introduction

In 2016, we surveyed faculty to identify how much emphasis is and should be placed on each of three main categories (disciplinary knowledge, critical thinking & professional skills) in the Integrative Physiology (IPHY) undergraduate curriculum. We observed a mismatch between what faculty said they wanted and what they were doing, with faculty wanting more emphasis on critical thinking and professional skills than was currently occurring. Therefore, we began drafting more specific program goals in these areas identifying what a student should know (concepts and content knowledge) and be able to do (critical thinking and other professional skills) upon completion of the major.

We also realized the need to create a curriculum map that provides a visual representation of what goals are accomplished in each course and the reported level of student exposure (as indicated by faculty). The process of mapping the curriculum is the first step in ensuring that program goals are met, that courses in the curriculum combine into a cohesive whole, and that changes to the curriculum are intentionally designed to build upon and improve student learning.

Methodology & Timeline

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Over the past year, we created program goals informed by overarching principles from disciplinary professional societies. This involved adding two more categories (scientific method & metacognition). Once we had a draft, we solicited and received helpful feedback from faculty.

IPHY Undergraduate Program Goals

The term “integrative physiology” is designed to encompass the broad fields of study within our department related to the structure and function of living organisms. This includes the study of organisms as functioning systems of molecules, cells, tissues, and organs with an emphasis on whole-body function and its applications to human health and disease.

1. Scientific method in IPHY (SM)
   - Ask research questions
   - Search existing literature for relevant studies
   - Create & test hypotheses
   - Design experiments with appropriate controls
   - Acquire, analyze, interpret, & present data
   - Draw evidence-based conclusions
   - Identify strengths & limitations of the design
   - Place experimental results in the larger scientific context

2. Critical thinking in IPHY (CT)
   - Apply knowledge within and across integrative physiology courses, and to novel and real-world contexts
   - Analyze data (e.g., graphs, images, tables, etc.) to extract meaning and significance
   - Judge and critique claims in the scientific literature and popular media
   - Synthesize ideas and concepts from multiple sources to form new, integrated and meaningful patterns/designs/inventions

3. Professional Skills in IPHY (PS)
   - Communication - Students demonstrate effective oral and written communication skills, and the ability to successfully communicate an understanding of integrative physiology to a wide audience.
   - Collaboration/teamwork - Students collaborate with others towards shared goals.
   - Scientific reading comprehension - Students demonstrate the ability to search, critically evaluate, and analyze scientific literature.
   - Disciplinary experience and awareness - Students gain experience in disciplinary settings (e.g., research, teaching, leadership, outreach, internship, volunteering), and awareness of a variety of careers suitable for those with expertise in integrative physiology.
   - Basic skills - Students demonstrate practical and relevant lab and technology skills.

Future Directions

- Consult with faculty on appropriate disciplinary knowledge goals for our students.
- Compare the operational curriculum (what is intended to be taught) to the taught curriculum (what is delivered) by reviewing course artifacts and interviewing faculty.
- Once the goals and map are established, we will post them on the department website to inform prospective students, post-bac programs, and future employers of the specific knowledge and skills gained by undergraduate students through the IPHY curriculum.

Faculty Survey Results & Curriculum Mapping

We then used an online survey to ask faculty about the level of exposure students had to each of the goals in the course(s) they teach (n=31 courses; response rate of >90%). Exposures were based on a scale from 0 to 3. Survey results were used to create a map of the curriculum to more easily identify gaps in coverage and reported level of exposure to the program goals.

Next, we averaged faculty ratings of each goal for required and elective courses, respectively, and ranked the order by average rating.

Finally, we compared the 2019 faculty survey results to those from 2016. We observed consistency in faculty reporting of what they say they’re doing in their classes (especially for required courses) – despite some changes in faculty (retirements, new hires).

We then analyzed the overall ranking of the categories in required and elective courses.

*Data was averaged for courses with multiple instructors.

**Some faculty completed multiple surveys in 2019.**