What Is P-MIG?

The Physiology Majors Interest Group (P-MIG, pronounced “P”-mig) is an independent, grass-roots collective formed to discuss the issues facing undergraduate physiology degree programs. It was founded around a specific set of needs specific to the decisions facing program directors that were not otherwise being addressed in a systematic manner for physiology degree programs. The value of such a community is to improve communication across peer programs, share best practices, collectively evaluate and strengthen physiology degree program quality, and stay up to date with useful resources.

P-MIG members are dedicated faculty, advisors, program directors, and chairs within 4-yr physiology undergraduate programs who care deeply about student success. Other members who also benefit from being part of the PMIG community are partners in community colleges and those teaching stand-alone physiology courses.

Since its informal founding in 2014, P-MIG has been building the network and determining the needs of the community. P-MIG has grown to over 250 members, including numerous active international participants. Membership is worldwide, with a majority of participants from North America. Since its founding, P-MIG has hosted three stand-alone conferences, launched the first comprehensive assessment of physiology undergraduate programs and their students, developed a website to serve as a repository for numerous resources related to undergraduate physiology (9), began an online listserv, and sought to extend community and collaboration by presenting at relevant conferences. The work of P-MIG takes place at both annual stand-alone conferences and in year-round committees working toward writing community curriculum guidelines. The committees are the physiology curriculum committee, professional skills committee, and career and advising committee.

What Are the Goals of P-MIG?

As the community formed, three main goals have emerged, based on member needs: establishing a community of practice, collecting data on programs, and generating consensus national guidelines at the program level.

Community. The original vision of P-MIG was to create a space for discussion of program level issues in Bachelor of Science (BS) Physiology programs. Program directors from four schools with BS programs started having calls about shared concerns about enrollment, course sequencing, advising, transfer credit equivalencies for physiology courses, and lack of national program standards. One early concept was for program directors of undergraduate degree programs in physiology to collaborate, much like the National Directors of Graduate Studies in Physiology and Pharmacology (N-DOGS) does for graduate programs in the discipline (13). We began referring to our group as the Physiology Majors Interest Group (P-MIG), with consideration that we may one day become a formal Interest Group within the American Physiological Society (APS).

As soon as P-MIG expanded beyond the founders, it was apparent that the needs of the community were broader in scope than the original vision. P-MIG was approached by many additional programs with non-physiology degree titles who self-identified as being physiology-intensive programs. There exist many variations of the degree name, such as physiology, human physiology, physiology and medical sciences, physiology and neuroscience, and human biology that have highly similar missions and course work. It soon became clear that it was not the title of “physiology” that linked these related peer programs together, but it was the population of students served and the rigorous physiology content in the curriculum. The term “physiology” used herein is intended to be inclusive to the many degree programs that serve similar undergraduate students with core science education in physiology and anatomy. Programs by many names and affiliations have self-selected to join P-MIG, if they determine that their program is aligned with the other peer programs in the group. These programs are in a range of departments, and the members of P-MIG are from a range of professional society affiliations. Therefore, at this time, P-MIG is not directly a subset of any one society, but has partnered with numerous stakeholders and societies to fulfill its mission (14).

In addition, when community colleges joined P-MIG conferences, it became apparent that, indeed, the discussion of transfer credits for anatomy and physiology courses from community colleges into 4-yr programs was lacking and needed to go both ways. As such, the founding mission expanded to include any pre-health-care serving programs, with a heavy focus on physiology and their partner community colleges.

Data collection. We aim to understand the needs of our students, make informed and appropriate curricular decisions that best serve these needs and aspirational goals of our
students, and provide a well-rounded education necessary for the students to be successful in their professional pursuits. P-MIG has started internal data collection among members to better understand the landscape and characteristics of undergraduate degree programs. While there are more physiology programs than there are P-MIG member institutions, we can leverage the dedicated members who respond to our surveys to launch the pilot phase of data collection with the hopes to expand this to other physiology programs. The current data are shared in a special collection of *Advances in Physiology Education*.

**National curricular guidelines.** In response to the community needs, P-MIG is working on writing consensus curricular guidelines for physiology programs, including a suggested set of program-level learning objectives for a major centered around the use of the Core Concepts of Physiology (17), professional skills development, and advising. Once guidelines are established, P-MIG plans to create rubrics for departmental use in internal and external program review, set guidelines for program success metrics, and train program evaluators to provide guidance for establishment of new physiology programs and support for existing programs undergoing Academic Program Reviews.

**The Missing Link: Identifying a Need for Community Among Undergraduate Programs**

For many of us who were shepherding undergraduate physiology programs a decade ago, we worked in our own institutions to solve a myriad of problems that we assumed were ours alone, unique to our programs. Through chance meetings with peers from other institutions, often taking place at a variety of conferences centered around research, it dawned on us that we were collectively seeing and solving many of the same problems. Thus a series of informal dialogues and exchange of information were begun to address the collective concerns that BS programs in physiology were facing. Four colleagues from undergraduate physiology programs (John Halliwill, University of Oregon, BS Human Physiology; Erik Henricksen, University of Arizona, BS Physiology; Dan McCann, Gonzaga University, BS Human Physiology; Erica Wehrwein, Michigan State University, BS Physiology) started having conference calls in 2014 to share ideas on how to create the supporting infrastructure that was needed.

Much of the early discussions revolved around the identity of our degree programs on campus, our program-level teaching mission, and how to manage rapidly growing enrollments at our institutions. We were aware in 2014 that our own programs were seeing dramatic increases in enrollment (Fig. 1), with the largest being over 2,000 students in the major at the University of Arizona (4). We wondered if these trends were observed nationally, how many other programs existed, and how to best serve the students in our popular programs. At that time, there were limited data on how many other programs existed and the enrollment trends. Except for a publication about the changing landscape of physiology undergraduate programs in 2015 (3), this topic was receiving minimal to no attention, yet at the same time new programs were starting and enrollment in existing programs was dramatically increasing.

Coming at these problems from this broader shared perspective, we realized the need for a formal discussion mechanism about program-level concerns across physiology majors worldwide. Department chairs, program directors, advisors, and interested educators in such programs needed a formal channel to interact, share ideas, and receive feedback about their programs. We also considered the challenges associated with the lack of national program-level curricular standards for our field, and the opportunities for advancing our field that were present in our rapidly growing enrollments.

To explore the interest in expanding our informal partnership, we submitted a symposium proposal to APS’ Teaching Section for Experimental Biology (EB) 2015 called, “What’s Your Major? The Rise of the Undergraduate Physiology Degree.” The symposium was jointly chaired by John Halliwill and Erica Wehrwein (who claim the title of P-MIG cofounders) and was the first session, to our knowledge, to focus on programs rather than on individual courses in physiology or teaching methods. The founding members and key early participants gave four presentations in this session. A presentation about the state of undergraduate degrees in physiology was presented by Erik Henricksen (University of Arizona). Dan McCann (Gonzaga University) and Jenny McFarland (Edmonds Community College) led a talk about the content of a physiology curriculum, including what concepts, course, and skills could be included in a 4-yr degree program. Given that degree programs typically have both large and small enrollment courses, a presentation about current best practices for teaching physiology was presented by Sierra Dawson and Jon Runyoon (University of Oregon). Advising and career preparation is an important aspect to consider for program-level decisions; therefore, a presentation on career trends, career aspirations, and advising best practice for physiology majors was included. It was led by Erica Wehrwein and Lori Seischab (Michigan State University). The session ended with an audience discussion, facilitated by John Halliwill (University of Oregon), that settled on a rudimentary plan for formalizing a network focused on degree programs.

The EB symposium represented the public launch of P-MIG as an informal organization. It is fair to say that we, as a team, learned more by organizing and presenting this symposium.
than we ever expected: it was a validation of our informal observations that there was a need to be filled, the problems we were witnessing were far broader than we knew, and there was wide support for what we were attempting to create. With positive attendance and favorable feedback at the EB session, we verified the need for a formalized network focused on program-level issues.

The 2015 symposium attracted 115 attendees, largely from the APS membership. Of the attendees, 75 voluntarily signed up for a P-MIG listserv, and 46 completed a post-symposium survey. Of the 46 attendees who were interested enough to respond to the survey, we found that 44% of attendees were established faculty comprising academic researchers (n = 16) and primary teaching faculty (n = 20), with a minority of administrative staff (n = 5) and others that fell into none of these categories (n = 5). While this leaves 60% of the attendees as nonresponders, these data provided valuable feedback to the group on the interested audience for P-MIG. The attendance data were essential to us as we planned for future programming and efforts of our nascent network.

Why Was the Response So Positive?

What was going on at the time that resonated with so many? The founding members saw substantial recent growth in the number of enrolled students (Fig. 1) and wondered if this was a national trend. Later, our informal survey data of P-MIG institutions would indeed reveal that 68.5% were experiencing growth in enrollment over the past 10 yr, with the remaining having steady enrollment (unpublished data). While physiology as an undergraduate degree had existed in a few institutions for decades (Michigan State University, Southern Illinois University-Carbondale, and Oklahoma State University, for example), data from the College Blue Book indicates that, from 2005 to 2019, there was an increase in the number of programs called “Physiology” from 13 to 26.

Another audience for P-MIG was programs with roots in exercise sciences who migrated toward human and integrative physiology degree titles, to highlight the rigorous nature of the exercise sciences who migrated toward human and integrative physiology. P-MIG institutions published the first set of papers on physiology curriculum, including a comprehensive review of course requirements in physiol- ogy (ACDP).

What Has P-MIG Been Doing?

P-MIG has been collecting pilot data from member institutions to understand what draws people to P-MIG and to get a snapshot of the state of the physiology undergraduate degree programs. To share this information broadly to the benefit of all interested educators, societies, and institutions, we have published and are in the process of publishing more of our findings. Over the past several years, leading up to this special collection in Advances in Physiology Education, P-MIG members published the first set of papers on physiology curriculum, including a comprehensive review of course requirements in physiology programs in the US, three conference reports, a framing editorial on setting national standards, related editorials, and numerous reports, abstracts, and presentations. This collection of papers is our best effort to share the past 5 yr of pilot data and insights from our surveys, conferences, and research with our community.

The first standalone conference of P-MIG was hosted at Michigan State University in 2017 (Table 1). Eighteen programs identified through online searches for physiology degree programs were invited to attend, and invitations were also sent to the listservs of P-MIG, the APS teaching section, HAPS, and Association of Chairs of Departments of Physiology (ACDP).

Table 1. Physiology Majors Interest Group conferences

| Year | Location                | Attendees, n | Institutions, n | International                      | Organizers                                      |
|------|-------------------------|--------------|-----------------|------------------------------------|-----------------------------------------------|
| 2017 | Michigan State University | 45           | 34              | Canada, UK, Portugal, Australia, Nigeria | Erica Wehrwein and Valerie VanRyn               |
| 2018 | University of Arizona   | 47           | 34              | Canada, India, Australia           | Claudia Stanescu                               |
| 2019 | University of Minnesota | 51           | 30              | Canada, Portugal                   | Lisa Carney-Anderson and Vincent Barnett       |

n, No. of attendees or institutions.
The response to these invitations was beyond expectations, including international interest and many from programs that serve pre-health majors but are not formally called “physiology.” These programs have similar course requirements, include physiology as a key component of the curriculum, face common issues, and serve similar student populations. In addition, representatives from community colleges attended because of an interest in how what they are teaching fits into the 4-yr program expectations. Eighty-nine percent of participants were from an undergraduate college or university, 40% of attendees were from a biology or life science department, while 43% were from a physiology department. A key theme was that these programs focus on human and integrative physiology. At the 2017 meeting, P-MIG formed committees to work on writing international program-level curricular guidelines, started a website, posted recordings of conference talks and conference materials on the website for public sharing, started a more formal listserv, and collected extensive data from members and programs, and the real work of P-MIG began.

In 2018, we published a call-to-action editorial with a proposed framework for setting national curricular guidelines for physiology undergraduate degree programs (16). This document has been the basis on which P-MIG committee work has been grounded. In this same year, the second P-MIG conference was hosted at the University of Arizona (Table 1). The P-MIG committees formed in 2017 are active working groups who presented their work at the 2018 conference and recruited additional volunteers. As of the 2018 meeting, there were three committees: core concepts, professional skills, and advising. We also had representation from collaborating societies, including APS, HAPS, and ACDP, each of which gave an overview of their work and potential interactions between P-MIG and other societies. Of the programs represented at the meeting, 67% of participating programs had the word “physiology” in their program title. Approximately one-third of them were simply named Physiology, with the others having names such as Human Physiology, Physiological Sciences, Exercise Physiology, and Physiology and Exercise Science. This highlights that P-MIG draws from other titled programs that have a similar focus and not simply those titled “physiology” (11).

The University of Minnesota held the 2019 meeting, which had the largest attendance to date (Table 1) (1). Fifty percent were new attendees who joined a P-MIG conference for the first time. P-MIG is planning our next conference in July 2021 at the University of Oregon (skipping 2020 due to concern over the COVID-19 pandemic).

Table 2 summarizes the institutional participation in 2017–2019 P-MIG conferences. There have been 53 different academic institutions of all sizes and two companies represented at the first three conferences. Hosting P-MIG in different parts of the country is important since, as we rotate locations, there is a local subset of attendees who could not otherwise attend if more travel were involved. Therefore, P-MIG hosts in alternating regions in the US: 2017 Michigan (n = 45), 2018 Arizona (n = 47), and 2019 Minnesota (n = 51), with future commitments to host meetings for 2021 in Oregon, 2022 in Ohio, and 2023 in Washington state.

P-MIG activities are run by committee. P-MIG has three committees working toward program-level curricular guidelines and related program-level assessment tools: curriculum, professional skills, and advising committees. In addition, P-MIG has a leadership team and conference planning committee.

There is an active website and listserv (6). All talks from previous meetings have been recorded and posted freely on the website, along with a career page and other resources (https://www.physiologymajors.org/) (6j).

Evolution of Mission

As a grassroots effort, the community is defining the needs and mission rather than a small group of P-MIG founders setting the specific agenda. While that seems counterintuitive to some, we are a member-driven group and respond to the issues that are brought to bear. While P-MIG has faced criticism for its broad and flexible mission also serving physiology-related programs and community colleges, it serves us well to be an inclusive and agile group to maintain adaptability. If people find a home and community in P-MIG, regardless of their institution or program affiliation, we welcome them. Admittedly, we cannot be all things to all people, and some in programs that do not have a human physiology emphasis may not feel as if they have found a home in P-MIG. We maintain our core mission of serving program-level issues of physiology undergraduate programs, while expanding to include highly related programs with other formal titles and with recognition that community colleges serve a large number of students that end up in our majors. The expanded mission to support the generation of program-level guidelines and form stronger partnerships among stakeholders represents the next stage of evolution in physiology undergraduate education.

Summary

In the 5 yr since the first formal gathering at EB 2015, P-MIG has been surveying physiology programs, faculty, students, advisors, and P-MIG members to learn more about the status and nature of undergraduate physiology programs. Much of this data were initially for internal planning purposes, but some have evolved into research studies. Since this information that we have gathered is of interest to a broader audience, we are excited for the opportunity to share our work in this special collection of papers in Advances in Physiology Education. This work is shared in the hopes that we can continue to work jointly toward strengthening degree programs in the field and enriching physiology undergraduate education worldwide. We hope that this journal special collection of papers dedicated to P-MIG mission and data will help us reach new members so that our community will continue to grow and thrive.

P-MIG continues as an informal collaborative network with volunteers on the leadership team and committees. We are not yet formally affiliated with any other society at the time of publication; however, we see natural partnerships with those societies working on different aspects of undergraduate education in physiology and look forward to continued collaboration and partnership with stakeholders. Our key missions are to train undergraduate physiologists and future health care providers to be competitive applicants and successful in their careers, to focus on curriculum and program-level issues, to author programmatic curricular guidelines for physiology degree programs, and to create rubrics for departmental use in internal and external program review. In these ways, the
mission of P-MIG is distinct from the other stakeholders in undergraduate physiology education.

Look for us at our website, at EB, HAPS, ACDP, and the APS Institute on Teaching and Learning. We would love to have you join our listserv and join us at an upcoming P-MIG conference. Thank you for your interest, and we hope that you find the body of work from P-MIG to be informative and useful. Please consider partnering with us.

This paper is published as part of a special collection/special issue from P-MIG, a grassroots organization that has formed to help develop programmatic guidelines and serve those engaged in undergraduate physiology or physiology-related programs.

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**Table 2. Physiology Majors Interest Group conference attendance 2017–2019: institutions and companies**

| Institution/Company | Location | Year(s) Attended |
|---------------------|----------|------------------|
| AD Instruments      | Colorado Springs, Colorado | X |
| Alma College        | Alma, Michigan, US | X |
| Appalachian State University | Boone, North Carolina, US | X X X |
| Autonomous University of San Luis Potosi | Ciudad Valles, San Luis Potosí, México | X |
| Ball State University | Muncie, Indiana, US | X |
| Butler University | Indianapolis, Indiana, US | X |
| Colorado State University | Fort Collins, Colorado, US | X |
| Drake University | Des Moines, Iowa, US | X |
| Edmonds Community College | Lynnwood, Washington, US | X |
| Emory University | Atlanta, Georgia, US | X |
| Ferris State University | Big Rapids, Michigan, US | X |
| Gonzaga University | Spokane, Washington, US | X X X |
| Indiana State University | Indianapolis, Indiana, US | X X X |
| Kogi State University | Anyigba, Nigeria, Africa | X X |
| Logan University | Chesterfield, Missouri, US | X |
| Mayo Clinic | Rochester, Minnesota, US | X |
| Metropolitan State University | St. Paul, Minnesota, US | X |
| Michigan State University | East Lansing, Michigan, US | X X X |
| Middle Tennessee State University | Murfreesboro, Tennessee, US | X |
| Monash University | Melbourne, Victoria, Australia | X |
| Nova Southeastern University | Davie, Florida, US | X X X |
| Ross University School of Medicine | Knoxville, Tennessee, US | X |
| Rush Medical College | Chicago, Illinois, US | X |
| Salisbury University | Salisbury, Maryland, US | X |
| Southern Illinois University | Carbondale, Illinois, US | X |
| St. Clair County Community College | Port Huron, Michigan, US | X |
| St. Francis Xavier University | Antigonish, Nova Scotia, Canada | X |
| St. Olaf College | Northfield, Minnesota, US | X |
| Taylor University | Upland, Indiana, US | X X |
| Texas Tech University | Lubbock, Texas, US | X |
| Trail Build, LLC | East Troy, Wisconsin, US | X |
| Universidade Lusofona, Health Science and Technologies | Lisbon, Portugal | X |
| University of Arizona | Tucson, Arizona, US | X X |
| University of British Columbia | Kelowna, British Colombia, Canada | X X |
| University of California–Irvine | Irvine, California, US | X X |
| University of Colorado–Boulder | Boulder, Colorado, US | X |
| University of Colorado–Colorado Springs | Colorado Springs, Colorado, US | X X |
| University of Dayton | Dayton, Ohio, US | X X |
| University of Georgia | Athens, Georgia, US | X |
| University of Ibadan | Ibadan, Oyo, Nigeria, Africa | X |
| University of Illinois at Urbana-Champaign | Champaign-Urbana, Illinois, US | X |
| University of Iowa | Iowa City, Iowa, US | X |
| University of Kentucky | Lexington, Kentucky, US | X |
| University of Liverpool | Liverpool, UK | X |
| University of Michigan | Ann Arbor, Michigan, US | X |
| University of Michigan–Flint | Flint, Michigan, US | X |
| University of Minnesota | Minneapolis, Minnesota, US | X X X |
| University of Oregon | Eugene, Oregon, US | X X |
| University of Scranton | Scranton, Pennsylvania, US | X X |
| University of Texas at Austin | Austin, Texas, US | X |
| University of Toronto | Toronto, Ontario, Canada | X |
| University of Washington | Seattle, Washington, US | X |
| Vermont State Colleges | Morrisville, VT, US | X |
| Vermont Technical College, Community College of Vermont | Randolph, Vermont, US | X X |
| West Virginia University | Morgantown, West Virginia, US | X X |
undergraduate programs and undergraduate education. We acknowledge the inspiring members of the P-MIG community who have joined forces to strengthen physiology education worldwide through a community of support and sharing. A special thank you to Valerie VanRyn, who dedicated countless hours in support of P-MIG through design and management of surveys, design and updates to the P-MIG website, authoring numerous reports and articles on P-MIG initiatives, serving as secretary of the organization, and more. Thank you to generous sponsors of P-MIG conferences from APS, The Association of Chairs of Departments of Physiology (ACDP), Michigan State University (MSU) Department of Physiology, the University of Oregon Department of Human Physiology, the University of Arizona College of Medicine Department of Physiology, MSU College of Natural Sciences, MSU Office of the Associate Provost for Undergraduate Education, The University of Iowa Department of Health and Human Physiology, The University of Minnesota Department of Integrative Biology and Physiology, and AD Instruments.

DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the authors.

AUTHOR CONTRIBUTIONS

E.W. and J.R.H. conceived and designed research; E.W. and J.M.P. analyzed data; E.W. and J.R.H. interpreted results of experiments; E.W. and J.M.P. prepared figures; E.W. and J.R.H. drafted manuscript; E.W., J.M.P., and J.R.H. edited and revised manuscript; E.W., J.M.P., and J.R.H. approved final version of manuscript.

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