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## Characteristics of Physiology and Physiology-Related Pre-Health Degree Programs in the Physiology Majors Interest Group

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# ■ Characteristics of Physiology and Physiology-Related Pre-Health Degree Programs in the Physiology Majors Interest Group

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## Abstract:

*The Physiology Majors Interest Group (P-MIG), a grassroots organization of educators, has collected data on the history and characteristics of Physiology and highly related undergraduate programs (ex: Human Biology, Pre-Medicine, Biomedical Sciences, etc.) that serve a common population of prehealth students. Data was obtained as part of an online survey sent out to P-MIG conference attendees at the 2017-2019 annual meetings (n=30). Participating institutions indicate that 25.9% have degrees called Physiology aligned with 28% being housed in a department of physiology, 75.9% are a Bachelor of Science program, 34.9% are affiliated with a College of Arts and Sciences, and 80% have a human/integrative physiology emphasis. Further, 47.6% of programs are greater than 10 years old and 100% have seen either no change or an increase in enrollment over the past 5 years. Most programs have a dedicated advising staff (68.2%) and formalized learning objectives for the major (61.9%). 34.1% have a curriculum committee who oversees the major. Program sizes vary widely from less than 50 to over 2000 students. While there is diversity in departmental organization and management structure in the programs, a commonality is that all programs are preparing students with aspirations in careers in healthcare. We report the similarities and differences between these programs to allow for advisors to better understand the broad landscape of pre-health programs at the undergraduate level.*

## Keywords:

physiology, undergraduate, health professions, curriculum, degree programs

## Introduction

Physiology is both a biological science discipline and a stand-alone undergraduate degree program (e.g., Bachelor of Science, Bachelor of Arts). There have been undergraduate degree programs offered for over 50 years and they have recently grown in both number of programs and enrollment in these programs (Wehrwein et al., 2020). However, there is very little published about the nature and course

content of such programs, with efforts in physiology education largely focused on individual courses in the discipline or on teaching methodology. It is relevant in a time of expansion to better understand the nature of these programs, why they are so popular, and how they are operating.

The Physiology Majors Interest Group (P-MIG, pronounced, “P”-mig) is a grass-roots organization that has formed to collect data on existing

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programs, help develop programmatic curricular guidelines, and serve those engaged in undergraduate physiology or physiology-related programs. P-MIG began as an informal partnership among four degree programs called “Physiology” but quickly gained momentum and expanded to serve highly related programs with a similar focus but with a variation of degree title (Wehrwein et al., 2020). To find out more about this collective, or get involved, please visit our website (<https://www.physiologymajors.org/>).

The programs that joined P-MIG have self-identified as being “physiology” regardless of formal degree title, indicating a common purpose. The use of the one-word degree title of “physiology” does not fully encompass the many highly related programs with slight differences in degree title (e.g., Human Physiology) or those which are named by department affiliation rather than on curricular content (e.g., Biology with a track in Physiology). Yet, one commonality of these programs is that the students served as largely interested in future careers in the health professions (Steele et al., 2020). Thus, for advisors of these students, understanding the landscape of these programs is important.

Unlike other STEM fields that have defined, national program level curricular guidelines, this is not the case for physiology. One of P-MIG’s goals is to develop such guidelines. Important to this process is the gathering and analysis of characteristics of programs in the collective. Thus, this manuscript addresses key questions such as “Who is enrolled?”, “What are the learning objectives in the major?”, “When were programs founded?”, “Where are the programs?”, and “Why are students choosing a physiology major?”. The dataset reported in the manuscript serves two purposes: 1) to share information on the characteristics of undergraduate physiology programs with the broader community, specifically, advisors of prehealth students and 2) to inform the efforts by P-MIG to author program-level curricular guidelines for physiology undergraduate programs.

**METHODS**

An online survey was sent to members of P-MIG in advance of the annual P-MIG meetings in 2017 (n=45), 2018 (n=47), and 2019 (n=51). Survey respondents were asked about their program details. Data was collected in Qualtrics (Qualtrics, Provo, UT) and analyzed in R v 3.5.3 (RStudio, Boston, MA). All data is presented as N (% of total respondents). This data was collected as part of an internal evaluation to inform the conference planning of P-MIG and was not intended for publication. Names of individuals were de-identified, but institution names were necessarily included in the dataset and analysis. One designated response per university was used in order to avoid duplicate answers, and if an institution participated in multiple meetings only the most recent data was used. Attendees with both 2- and 4-year degree programs

attended meetings, but only the 4-year programs were included in this dataset. All included responses are from degree programs in physiology or related that attended P-MIG conferences.

**RESULTS****Program Titles**

Table 1 shows the programs that attended a P-MIG conference and participated in this survey. Survey respondents were asked to report their formal degree program title (Table 2). Of the respondents, 26% indicated that their degree program is called Physiology, 22% are Human Physiology, and 15% are Biology. Other degree program names were Exercise Science (7%), Biological Sciences (7%), Exercise Physiology (4%), Human Biology (4%), or Kinesiology/Integrative Physiology (4%). Respondents chose the option N/A (11%) in accordance with representing a two year or non-degree granting institution or that they were exploring developing a new program. There was a majority prevalence for Bachelor of Science (76%) while 14% were designated as a Bachelor of Arts.

**College and Departmental Alignment**

Table 2 also shows that 28% of the degree programs are housed in their university’s Physiology Department, 20% are included in the Biology Department, and 12% are in another Biological/Life Science Department. Other Departments include Integrative Biology (8%), Kinesiology (8%), Health/Exercise Science (8%), Molecular/Integrative Physiology (4%), Ecology/Evolutionary Biology (4%), and Nutrition (4%).

The names of the colleges that house these programs are Arts and Sciences (35%), College of Medicine (15%), Natural Sciences (8%), Health Sciences (8%), Liberal Arts (4%), Health and Human Services (1%), Kinesiology (1%), Basic and Applied Sciences (1%), Education (1%), Biological Sciences (1%), and Nursing (1%) as shown in Table 3.

**Program Foci**

When asked about the focus of the program, 48% of respondents answered that their focus was on human physiology, 32% answered systems/integrative physiology, 12% indicated exercise physiology, and 4% of programs each indicated cellular/molecular physiology and animal/comparative physiology (Table 4).

**Student Enrollment**

Respondents were asked to report the total enrollment in their programs as of Spring 2017 (Figure 1). Of these respondents, 21% answered that they had between 0-250 students, 21% had 250-500, 21% had 500-750 students, 4% had 750-1000

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students, 3% had 1000-1250 students, and 8% had over 1750 students enrolled. Histogram data in Figure 1 shows the number of programs in each enrollment range.

As for Spring 2017 Graduating Class Size (Figure 2), 24% of respondents reported they had 0-25 students, 19% had 26-50, 19% had 51-75, 10% had 76-100, 5% had 101-200, and 24% had 201-300.

Table 3 shows both date of program establishment and enrollment trends. 47.6% of respondents indicated that their program had been established for >10 years, 13% indicated that their program had been established for 5-10 years, and 9% indicated that the program was established <5 years ago. 4% respondents indicated that their program recently renamed to physiology, 9% are in the process of developing their program, and 4% specified that their institution is aspiring to create a physiology program.

In the past 5-10 years, enrollment was reported to be largely increased for 47% of respondents and slightly increased for 21%. The remaining 32% reported no change in enrollment trends. None of the survey respondents said that their enrollment had decreased.

**Advising**

In terms of advising, 68% of participants work at a program that has a dedicated advising team, leaving one-third of respondents in a program without formal advising (Table 4).

**Academic Year**

When asked about the format of their academic year, 92% of respondents reported that their academic year was divided into semesters, whereas 8% are split into quarters (Table 4).

**Curriculum Management**

In managing these programs, 33% of participants indicated that their department has a committee dedicated to management. Whereas, 20% have the department chair responsible for making decisions about the program, 20% have a program director that is a faculty member aside from the department chair, and another 20% have faculty/department level management. Additionally, 5% have a dedicated department head and 2% have a dean who oversees the program (Table 4).

**Learning Objectives**

Respondents were asked if there were overarching learning objectives for the entire degree program; 62% reported that they have objectives, while the rest do not (Table 4). Examples of learning objectives for the degree program

from the four founding institutions of P-MIG: Gonzaga University, Michigan State University, University of Arizona, and University of Oregon are shown in Table 5.

**DISCUSSION**

This is the first comprehensive data set about characteristics of physiology and physiology-related undergraduate programs that are involved in P-MIG. These data reveal a wide range of program sizes, graduating classes, departmental affiliations, college homes, and management approaches. It is important to understand this diversity as P-MIG moves forward to author programmatic curricular guidelines. In addition, for the prehealth advising community, understanding the diverse nature of the undergraduate programs that enroll student advisees is paramount.

**Curricula of the programs**

Aside from the fundamental issue of identifying programs and learning about their characteristics, there is also interest in determining the course requirements within these programs. A summary of course requirements for undergraduate physiology programs was reported in 2017 (VanRyn et al., 2017). In that report, an internet search was used to review colleges and universities in the country looking for a degree program with “Physiology” in the title; this was inclusive of programs like “human physiology” and “integrative physiology”. At that time, there were 18 programs identified. The course requirements of these programs were published in the first such evaluation of curriculum for physiology degree programs in 2017 (VanRyn et al., 2017).

One interesting question is what factors influence the inclusion of certain courses in the curriculum, absent national guidelines. Given the high percentage of students pursuing health professional schools, it is not unreasonable to think that prerequisites and/or content covered on standardized exams (e.g. MCAT, DAT) may be a consideration in the development of curricula in these programs. Therefore, there is a potentially important reciprocal relationship between undergraduate curricula and admission criteria of professional schools.

**Program Titles**

This current dataset obtained from surveys of P-MIG conference attendee shows that the number of programs which identify as physiology or physiology-related is much greater than previously determined. Highly related undergraduate degree programs operate under many titles but are physiology-focused by their respective departments. Examples include Human Physiology, Human Biology, Biology with a track in Physiology, Health Sciences, Kinesiology, Exercise Physiology, Pre-medicine, Biomedical Sciences, and others. Despite

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operating in different departments and under a variety of names these programs share many of the same course requirements, curricular focus, and student population (Steele et al., 2020).

**College and Departmental Alignment**

Even though many departments of physiology are housed in the College of Medicine, this data shows that very few undergraduate physiology programs are housed in medical schools. In fact, most surveyed programs are in Colleges of Arts and Sciences, and many are dispersed throughout a wide variety of colleges including Health Sciences, Liberal Arts, Nursing, and Nutrition. This diversity in college is a factor in the introductory coursework required within a major such as biology, chemistry, and math. It is also important to recognize that programs have little control over these early courses in the major. This can pose a challenge in advising, as the curriculum may span multiple departments and colleges and potentially different advising models (Crecelius & Crosswhite, 2020)

**Enrollment**

Enrollment numbers in physiology and physiology-related undergraduate degree programs are widely varying from less than 50 to over 2000 students at the time of this survey. This is largely related to overall college size with the larger enrollment programs coming from larger universities. Graduating class size relative to their enrollment (% graduation rate) can be one indicator of success in these undergraduate programs so both datasets are reported in this paper. Data was not collected on total college enrollment, but a snapshot is outlined below.

Every respondent indicated that their programs are either growing in size or maintaining enrollment trends in the last 5-10 years. For some programs there has been a steady increase in popularity over the past 10 years, leading them to be the largest programs in the college (Carroll et al., 2017; Henriksen, 2015). For example, the Human Physiology Major at the University of Oregon is currently the largest major in the College of Arts and Sciences with ~1800 students, and the Human Biology Major is currently the largest major in the College of Natural Sciences at Michigan State University with ~1600 students. Even larger is the Physiology and Health Sciences Major at the University of Arizona with over 2000 enrolled students after years of steady growth. This was previously reported at the University of Arizona (Henriksen et al., 2011) and summarized in a state of undergraduate physiology editorial (Henriksen, 2015). The Physiology major at the University of Arizona has been the second largest major selected by entering freshmen at the University. In addition, there are a number of programs that were renamed or started new in the last five years. In all, this provides evidence that physiology programs at the undergraduate level are thriving and the need for a community to share best practices and develop a set of consensus program-level curricular guidelines is urgent.

The size of the program and other factors could dramatically alter the use and implementation of curricular guidelines. In some large programs, there are space and staffing limitations that could prevent an anatomy or physiology laboratory course from being required. Department expertise could impact the number of upper division selective options offered. Staffing and teaching load considerations could be a deciding factor in offering writing intensive courses in the discipline or career exploration courses specific to the major. Future surveys by P-MIG would be useful to understand the limitations of small, medium, and large programs.

**Program Foci**

The main topic of focus among physiology programs was consistent, revolving around the human body and how systems interact with each other. Overall, physiology programs appear to be teaching similar content which is well aligned with student career interests as reported (Steele et al., 2020). It is logical that prehealth students would seek physiology as a major, as their interests are in human and systems physiology (Steury et al., 2015). This focus on human and systems level physiology differentiates physiology from cellular, molecular, and biochemical majors. Maintaining human and systems level physiology course content to align with student's preference of study, even when department research priorities are trending towards cell and molecular biology would appear to be important (Steury et al., 2015). The student aspirations and program foci are primary points of overlap that bring PMIG members together. The students in these programs are prehealth and need a rigorous science curriculum to prepare them best for their admissions exams, next round of schooling, and future careers. Joining together at P-MIG, educators are able to discuss how to best serve our students since we are working with similar sets of students at our respective institutions.

**Program-Level Organization and Management**

Physiology programs have various dates of establishment that reflect both the previous century of classical physiology (1884-1980) and a recent interest in undergraduate students to specialize in physiology as a pathway to healthcare (1997-2019). Programs that have been established for decades may have acquired robust ways of teaching physiology that can be shared with newer programs. Conversely, newer programs can serve as a hub for innovation in undergraduate physiology education that can trickle into established programs. In either case, sharing ideas is necessary and P-MIG aims to provide a forum for such discussions.

Physiology programs vary in their advising support (Crecelius & Crosswhite, 2020). Programs without dedicated advising support may rely on faculty members to advise students on university matters, such as course sequencing and registration matters, but also career exploration and post-graduation

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planning. In such programs, faculty may require additional support from colleagues and experts to improve their role as an advisor and better prepare students for a successful and fulfilling career. There is potential opportunity to collaborate with NAAHP in order to ensure best-practices advising for the vast number of future health professional students that P-MIG programs serve.

The type of program management differs from program to program. Program oversight can be the responsibility of a Dean or Department Chair for some schools, while it is assigned to a curriculum committee or program director at others. While differences among programs is to be expected, this impacts the ability of programs to undertake high capacity tasks like curricular mapping, implementing learning objectives for the major and courses in the major, and regular program review. Program assessment using existing tools such as Phys-MAPS requires a dedicated point-person to organize and collect data from every cohort of students (Semsar et al., 2019). This necessarily requires more faculty and staff time and could be challenging for a single person to oversee, especially if they have other duties.

**Program Objectives for the Major**

Programmatic learning objectives are imperative and are typically required in university accreditation processes for undergraduate education. However, despite the needs for program objectives to be reported during academic program review, nearly half of programs responded that they do not currently have or use them. Instructors are far more familiar with the idea of having course-based objectives, but still that practice is not universally implemented. Recently P-MIG has attempted to better characterize this and provide means to account for programmatic objectives (Shaltry, 2020).

**Career Trends**

Regardless of degree title, these programs overwhelmingly serve students intending to enter the healthcare field as physicians, physician assistants, and physical therapists, to name a few (Steele et al., 2020). Students enrolled in these programs state a strong interest in human and systems level physiology (Steury et al., 2015). The percentage of students in these programs who intend to pursue graduate studies in preparation for a teaching or research career is small (Steele et al., 2020). One could argue that a subset of these students, if given the opportunity to experience research, would track into graduate school or dual degree programs, and therefore feed the pipeline for physiology graduate school. However, with strong interests in integrative and applied physiology and an interest in a helping career, still many would track into health care, human and clinical research, or perhaps applied medical device industries.

**Limitations**

We recognize this report is not comprehensive of all potential programs since the survey was given to P-MIG conference attendees. While these data represent only a subset of all existing physiology programs, it provides a snapshot of the variability in program size, management, and organizational structure. Not all respondents answered all questions, which is why the total number of respondents per question may vary. It is difficult to determine why some questions were answered while others were not. Future endeavors in this line of research will strive to eliminate this common problem in survey-based research.

**Conclusion**

Physiology and physiology-related undergraduate programs have a similar focus on human and systems-level physiology which is aligned well with the prehealth career aspirations of the student in these programs. However, there is heterogeneity in how physiology programs are structured and operate. There is not currently an accurate and inclusive database for program in physiology and many highly related programs go by different degree titles. There is a lack of overarching program-level curricular guidelines for physiology degree programs. This is where P-MIG seeks to fill a gap—by creating a community dedicated to issues in undergraduate education at the level of degree programs where faculty collaborate on program-level best practices and sharing of resources to improve student outcomes. By sharing these data with the NAAHP community, we hope to broaden participation in these discussions and ensure fruitful collaborations to serve prehealth students.

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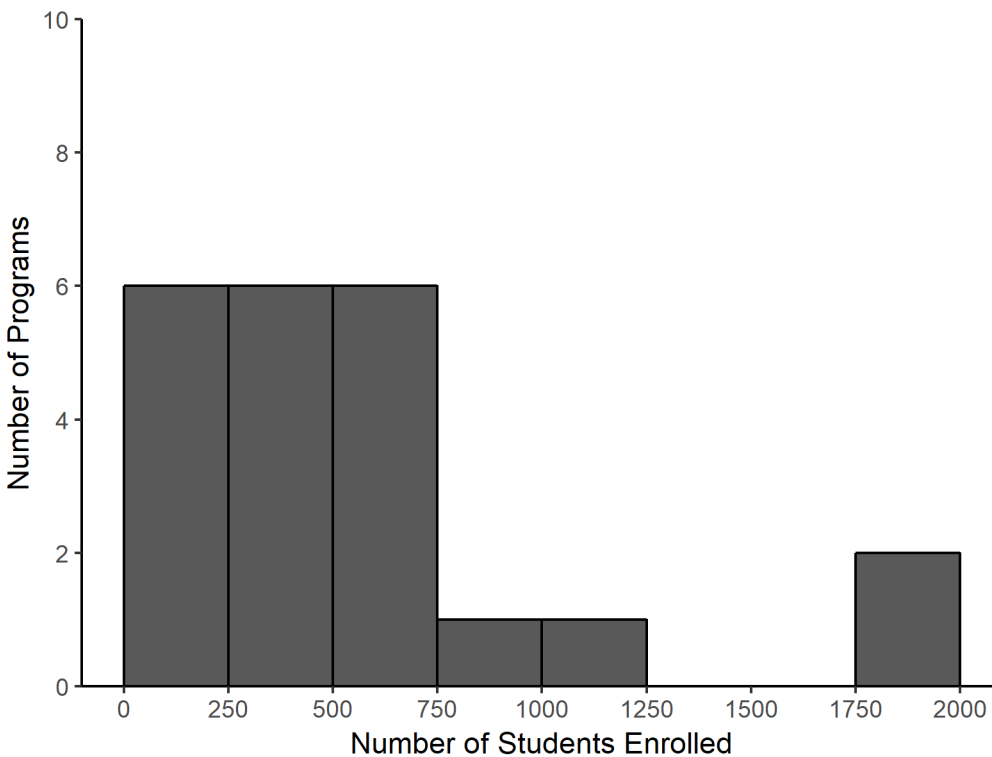


Figure 1. Student enrollment. Number of students enrolled in each program at the time of the survey. N=22



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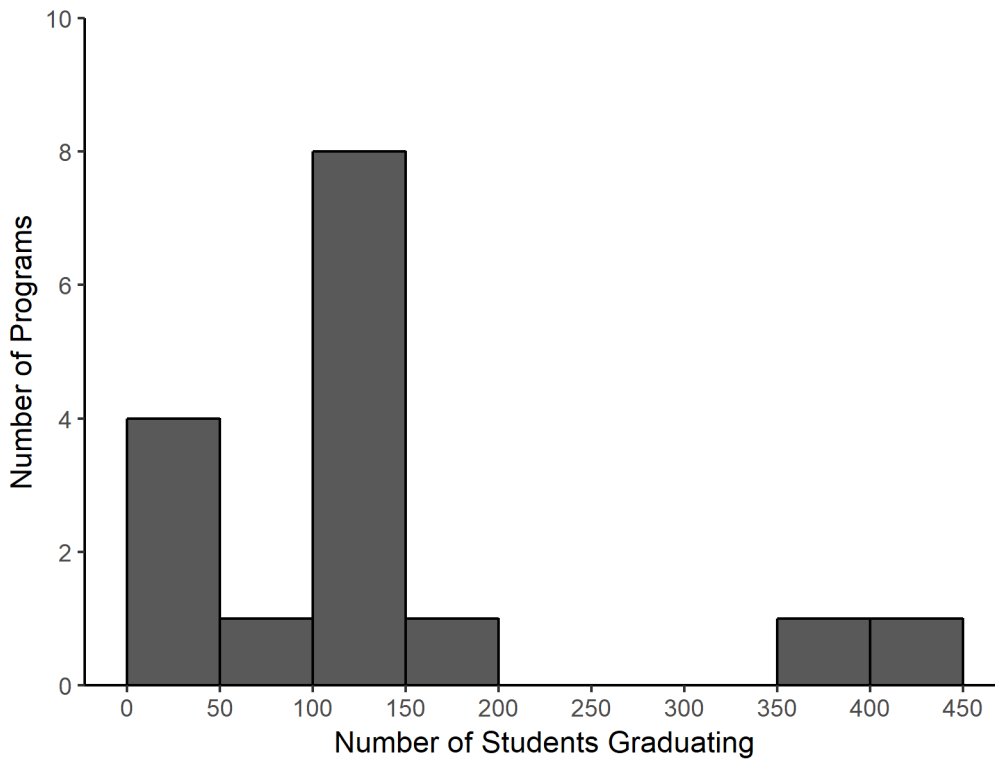


Figure 2. Graduating class size. Number of students graduating in the year in which the survey was taken. N=16

Institution	
Apollo Institute of Medical Sciences and Research	University of Colorado – Boulder
Appalachian State University	University of Colorado – Colorado Springs
Butler University	University of Dayton
Cal Poly Pomona	University of Iowa
Colorado State University	University of Kentucky
Emory University	University of Michigan – Ann Arbor
Indiana State University	University of Michigan – Flint
Metro State University	University of Minnesota
Michigan State University	University of Scranton
Middle Tennessee State University	University of Texas
Southern Illinois University	University of Toronto
St Olaf College	University of Washington
University of Arizona	Vermont Technical University
University of British Columbia	Villanova University
University of California – Irvine	West Virginia University

Table 1. List of institutions included in dataset

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	N (%)
<b>Program Titles</b>	
Physiology	7 (25.9%)
Human Physiology	6 (22.2%)
Biology	4 (14.8%)
Exercise Science	2 (7.4%)
Biological Sciences	2 (7.4%)
Exercise Physiology	1 (3.7%)
Human Biology	1 (3.7%)
Kinesiology/Integrative Physiology	1 (3.7%)
N/A	3 (11%)
<b>Degree Granted</b>	
Bachelor of Science	23 (76.7%)
Bachelor of the Arts	3 (10.0%)
Bachelor of Medicine	1 (3.3%)
N/A	3 (10.0%)
<b>Departmental Alignment</b>	
Physiology	7 (28%)
Biology	5 (20%)
Biological/Life Science	3 (12%)
Integrative Biology	2 (8%)
Kinesiology	2 (8%)
Health/Exercise Sciences	2 (8%)
Molecular/Integrative Physiology	1 (4%)
Ecology/Evolutionary Biology	1 (4%)
Nutrition	1 (4%)

Table 2. Program descriptors

<b>College Alignment</b>	
Arts and Sciences	9 (34.9%)
College of Medicine	4 (15.4%)
Natural Sciences	2 (7.7%)
Health Sciences	2 (7.7%)
Liberal Arts	1 (3.8%)
Health and Human Services	1 (3.8%)
Kinesiology	1 (3.8%)
Basic and Applied Sciences	1 (3.8%)
Education	1 (3.8%)
Biological Sciences	1 (3.8%)
Nursing	1 (3.8%)
<b>Program Focus</b>	
Human	12 (40.0%)
Systems/Integrative	8 (26.6%)
Cellular/Molecular	1 (3.3%)
Animal/Comparative	1 (3.3%)
Plant	0 (0.0%)
Exercise	3 (10.0%)
Nutrition	0 (0.0%)
Other	0 (0.0%)
N/A	5 (0.0%)

	N (%)
<b>Program Status</b>	
Established >10 Years	14 (46.7%)
Established 5-10 Years	3 (10.0%)
Established <5 Years	2 (6.7%)
Renamed	1 (3.3%)
Developing	2 (6.7%)
Aspirational	1 (3.3%)
Other	0 (0.0%)
N/A	7 (23.3%)

Table 3. Program Status and Trends

<b>Enrollment Trend in Past 5-10 Years</b>	
Largely Increased	9 (30.0%)
Slightly Increased	4 (13.3%)
No Change	6 (20.0%)
Slightly Decreased	0 (0.0%)
Largely Decreased	0 (0.0%)
N/A	11 (36.7%)

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	N (%)
<b>Presence of Dedicated Advising</b>	
Yes	15 (50.0%)
No	7 (23.3%)
N/A	8 (26.7%)
<b>Formalized Learning Objectives</b>	
Yes	13 (43.3%)
No	8 (26.7%)
N/A	9 (30.0%)

<b>Academic Year Format</b>	
Semesters	22 (91.7%)
Quarters	2 (8.3%)
<b>Curriculum Decision-Making</b>	
Committee	14 (34.1%)
Department Chair	8 (19.5%)
Programs Director	8 (19.5%)
Faculty or Department	8 (19.5%)
Department Head	2 (4.9%)
Dean	1 (2.4%)

Table 4. Curriculum management

University, Degree Name	University Level Learning Objectives	Department/Program Learning Objectives
<b>Gonzaga University, B.S. Human Physiology</b>	<ul style="list-style-type: none"> <li>Students will experience a science-based curriculum characterized by rigor and breadth and depth of course offerings.</li> <li>Students will experience high quality instruction in courses offered within the department.</li> <li>Students will be provided with effective advising related to course work and academic planning.</li> <li>Students will have access to and use of quality lab facilities and equipment in the course of their studies.</li> <li>Students will be given opportunities to participate in discipline-specific scholarship.</li> </ul>	<ul style="list-style-type: none"> <li>Students will demonstrate content knowledge in general physiological concepts, systems physiology, and integrative physiology.</li> <li>Students will be able to design, conduct, and disseminate scientific research in human physiology as demonstrated by the following outcomes: information literacy, critical thinking skills, data fluency, effectively communicate, ability to use the principles of the scientific method, and ability to design experiments.</li> </ul>
<b>Michigan State University, B.S Physiology</b>	<ul style="list-style-type: none"> <li>Analytical Thinking</li> <li>Cultural Understanding</li> <li>Effective Citizenship</li> <li>Effective Communication</li> <li>Integrated Reasoning</li> </ul>	<ul style="list-style-type: none"> <li>Apply physiological concepts to understand how normal cells and organ systems operate in the context of homeostasis and integrative physiology, and how disruptions of the normal function of cells and systems can lead to disease states.</li> <li>Analyze and interpret graphical, tabular and written information related to physiology and related disciplines.</li> <li>Generate a testable hypothesis, evaluate experimental approaches used to test a hypothesis, and recognize potential weaknesses in experimental approaches.</li> <li>Engage diverse and competing perspectives as a resource for learning, citizenship, and effective teamwork.</li> </ul>

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Characteristics of Physiology and Physiology-Related Pre-Health Degree Programs in the Physiology Majors Interest Group (continued)

		<ul style="list-style-type: none"> <li>• Demonstrate knowledge of the impact of cultural and socioeconomic factors (sex, sexual identity, race, age, and religion) on human health and disease.</li> <li>• Demonstrate knowledge of ethical and professional behavior related to academic integrity, communication with others, and during individual and cooperative work.</li> <li>• Utilize active engagement to foster lifelong learning, adaptability, curiosity, and community service.</li> <li>• Demonstrate proficiency in technical writing, oral communication, and verbal communication—such as reports, summaries, posters, and presentations—with peers within a professional setting and to the lay community.</li> <li>• Demonstrate proficiency in identifying appropriate sources of scientific information, critical analysis of the content of these sources, and demonstrate the ability to synthesize information from multiple sources into a coherent statement.</li> <li>• Integrate knowledge of molecular, genetic, cellular, microscopic, macroscopic, and organ systems physiology and apply this to integrative and clinical physiology (i.e., physiology from “bench to bedside”).</li> <li>• Apply fundamental principles across the disciplines of math, chemistry, physics, and biology as they relate to physiological function of the human system.</li> <li>• Apply contemporary knowledge of physiology to help solve large scale, interdisciplinary challenges in a constantly evolving environment of changing societal, political, and economic variables.</li> </ul>
<p><b>University of Arizona, B.S. Physiology</b></p>	<ul style="list-style-type: none"> <li>• Think Critically: Exercise synthetic, analytic and/or computational/quantitative reasoning as needed to solve problems. Raise salient questions about the evidence, inferences, and conclusions of inquiries, including one’s own inquiries. Infer and assess the ambiguities, assumptions, values, and purposes at issue in inquiries, including one’s own work.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate Knowledge of cellular function</li> <li>• Demonstrate knowledge of organ systems function</li> <li>• Demonstrate the ability to integrate physiology from the cellular and molecular level to the organ system and organismic level of organization</li> <li>• Effectively read, evaluate and communicate scientific information</li> <li>• Conduct and/or evaluate laboratory experiments in physiology</li> </ul>

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Characteristics of Physiology and Physiology-Related Pre-Health Degree Programs in the Physiology Majors Interest Group (continued)

	<ul style="list-style-type: none"> <li>• Communicate Effectively: Interpret and clearly present information in varied formats, such as graphs, charts, and multimedia projects. Compose correct and clear written material in multiple formats such as research logs, researched reports, exam answers, and reflective essays. Improve written and visual documents in response to feedback.</li> <li>• Understand and Value Differences: Assess how different modes of inquiry and expression are appropriate in varied cultural and disciplinary contexts. Exercise flexible habits of mind when exposed to diverse opinions, new ideas, and complex societal problems.</li> <li>• Demonstrate knowledge and understanding of the nature of interpersonal, intragroup, and intergroup dynamics, and skills</li> <li>• Use Information Ethically and Effectively: Access and evaluate the reliability of information from varied sources, such as internet and library resources. Use information sources ethically and responsibly.</li> </ul>	
<p><b>University of Oregon, B.S. Human Physiology</b></p>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate content knowledge and understanding of terminology, concepts, and relationships in human anatomy and physiology.</li> <li>• Utilize a broad foundation of anatomical relationships and physiological principles in analysis, application, and synthesis related to human physiology and pathophysiology.</li> <li>• Critically evaluate scientific information to help make decisions with respect to personal health, clinical applications, and research in human physiology.</li> <li>• Demonstrate life-long learning skills, which include deciding what needs to be learned, articulating a learning plan, and implementing this plan.</li> <li>• Communicate effectively, to a variety of audiences, in various modes, using up to date research skills to explain human physiology.</li> <li>• Demonstrate knowledge of ethical and professional behavior related to academic integrity, communication with others, and during individual and cooperative work.</li> </ul>

Table 5. Examples of program level learning objectives

