

Workshops 2 and 4:

***Creating National Curriculum
Guidelines for Undergraduate
Physiology Education***

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Goals:

- **OVERALL: Set national curriculum guidelines and set plan for implementation**
 - Get input from ACDP on current plan
 - Form an ACDP subcommittee
 - Plan for implementation

Stakeholders and supporters

- ACDP (2015, 2016 focus on undergrad education)
- APS education committee (2013-2016, recognition of programs)
- APS career opportunities in physiology committee (2014, 2015, employability skills for programs)
- APS Teaching Section (2014, support guidelines not accreditation)
- Phys-MAPS project (2015, end competency exams for programs)
- Physiology Majors Interest Group (2015, 2016, data collection on programs; point of interaction)
- Human anatomy and physiology society (1990, HAPS)
- Physiology, Student's Corner (Gary Sieck)
- Dept Chairs, program directors, and faculty in undergrad, grad, and professional programs

What is the consensus vision for undergraduate physiology education?

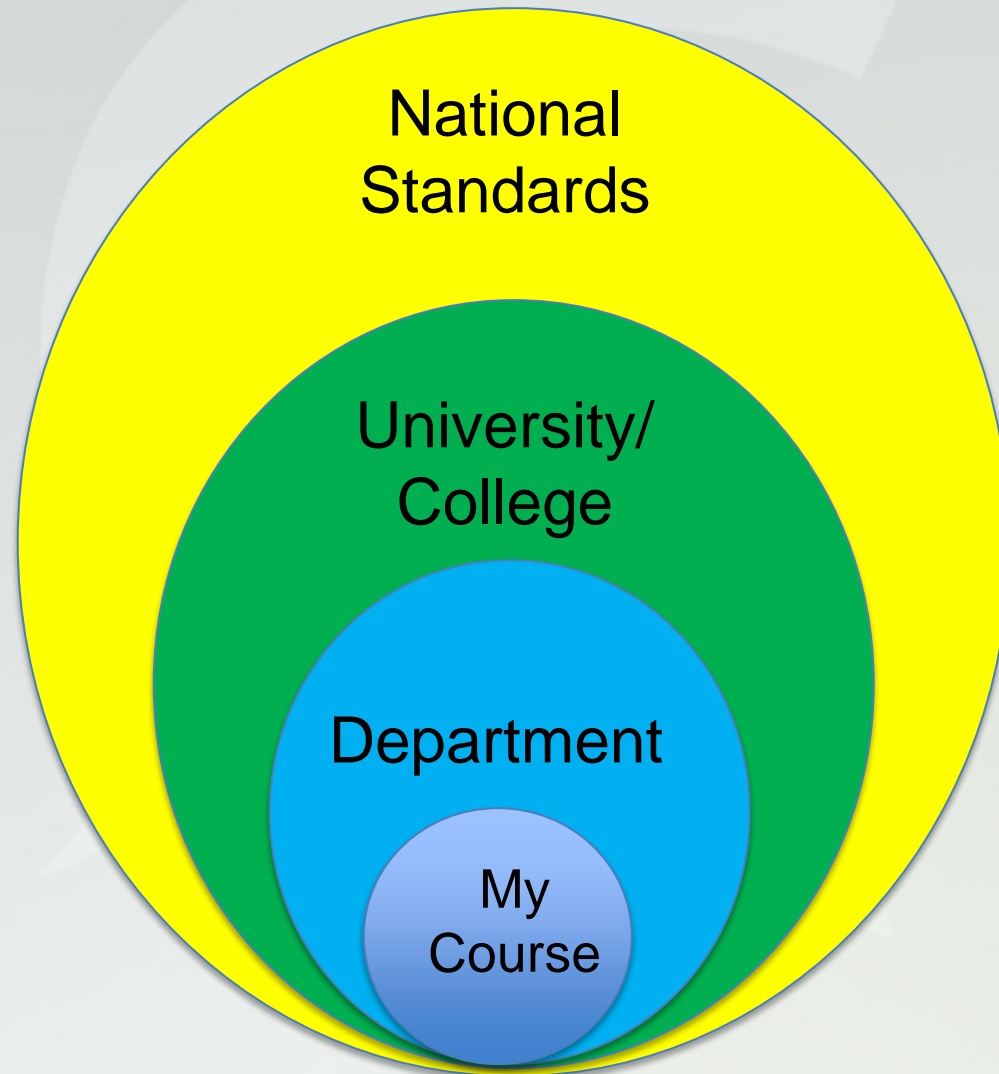
Who is accountable for physiology undergraduate programs and our students?

How can APS/ACDP play a role in setting and maintaining curricular guidelines?

Roadmap to setting curriculum guidelines

- Goal and rationale
- What are other societies doing for curricular guidelines?
- Current state of undergraduate physiology programs
- Who are our students?
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- What has been done to date for physiology guidelines by stakeholders?
- **Your input and feedback**

How does an instructor know what to teach in a physiology course?



What are others doing?

- Accreditation
- Approval/certification programs
 - External and self assessment models
- Recommended programmatic curriculum guidelines
 - Core concepts
 - Core competencies
 - Both concepts and competencies
- Recommended core concepts and learning objectives for courses

Who provides oversight and guidelines?

- Accreditation
 - National Accrediting Agency for Clinical Laboratory Sciences
 - American Society of Biochemistry and Molecular Biology
- Approval/Certification Programs
 - American Chemical Society
 - National Association for Biology Teachers
- Recommended curriculum guidelines
 - American Society for Microbiology
 - American Kinesiology Association
 - Mathematics Association of America
 - American Association of Physics Teachers
- Course level content objectives
 - Human Anatomy and Physiology Society
 - American Society for Plant Biologists
 - Independent Publications
 - **Physiology, Animal Physiology**, Exercise Physiology, Biology, Biochemistry/Molecular Biology lecture course, Biochemistry/Molecular Biology lab courses, microbiology, zoology, neuroscience, biomedical engineering

My proposal

- National programmatic curricular guidelines for Physiology undergraduate programs
 - Core concepts
 - ACDP 2016 workshop
 - Key skills and competencies
 - ACDP 2015 draft
 - Best practices for education
 - List of current resources and availability of common end competency exams
 - Self-assessment checklist for Physiology and PULSE (V&C) rubric for departmental use

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Evolution of Physiology Undergraduate Programs

From Famine to Feast...

Growth in the Number of Physiology Undergraduate Programs in the USA

(~5 in 2000, ~10 in 2006, 15 in 2014)

Transition from Kinesiology to Physiology

How many programs are there?

- 16 B.S. in Physiology
- 3 B.S in Physiology and Neuroscience
- 24 B.S. in Biology with a concentration in Physiology
- **PRELIM TOTAL: 45 programs**
- **Many others.....**

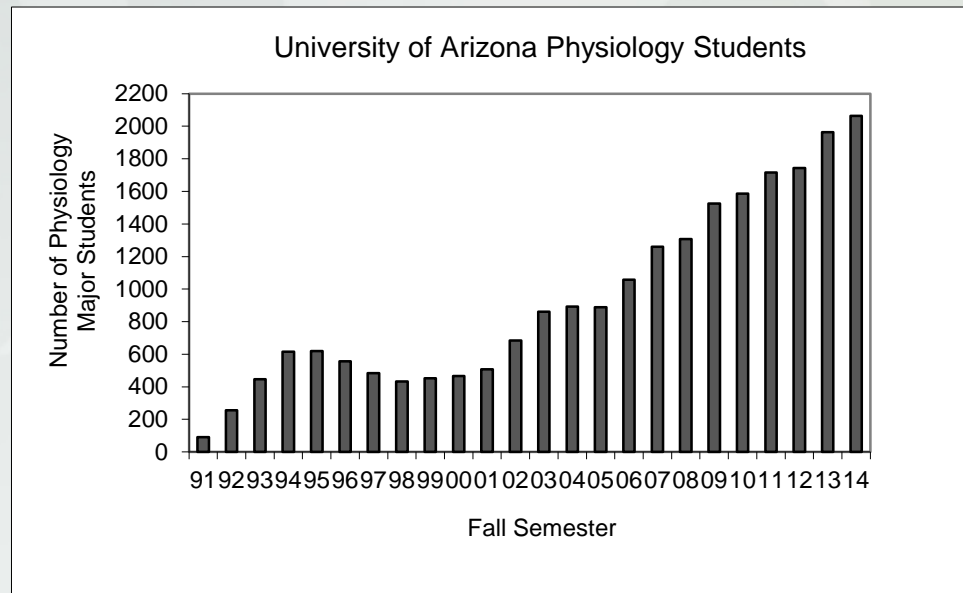
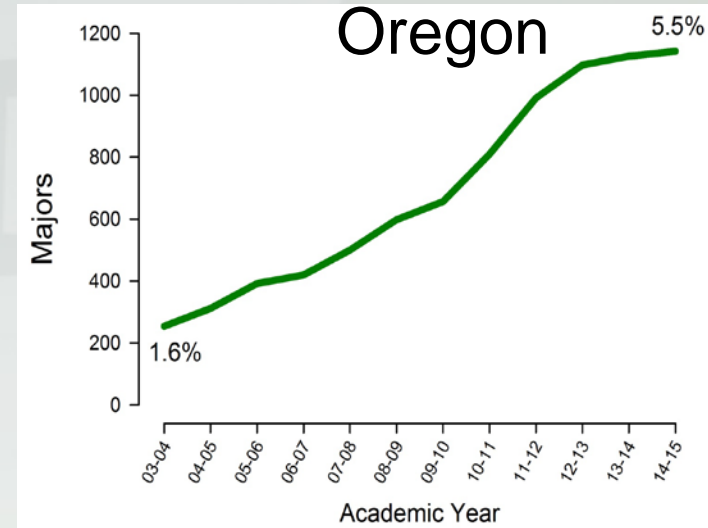
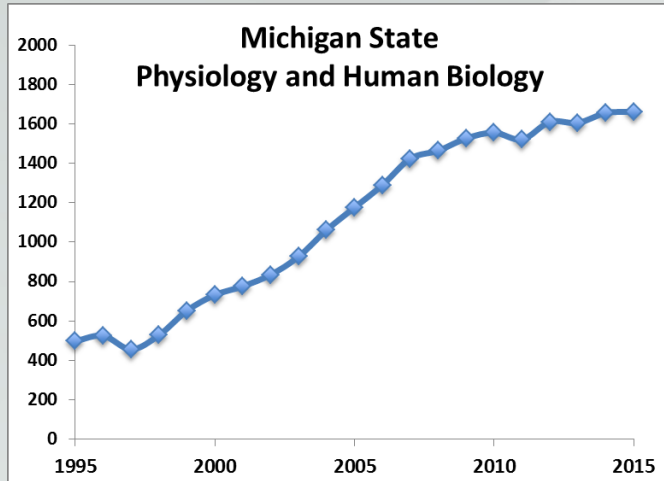
Physiology Majors Interest Group (P-MIG)

Recent additions

Institution Name	Program Title
Georgia Southern	Exercise Science
University of Wisconsin-La Crosse	Biology/Biomedical Concentration
University of South Dakota	Biology: Physiology, Cell and Molecular Biology Specialization
University of Dayton	Exercise Physiology
University of Cincinnati – College of Medicine	Medical Sciences

- 50 total programs identified to date....and counting.

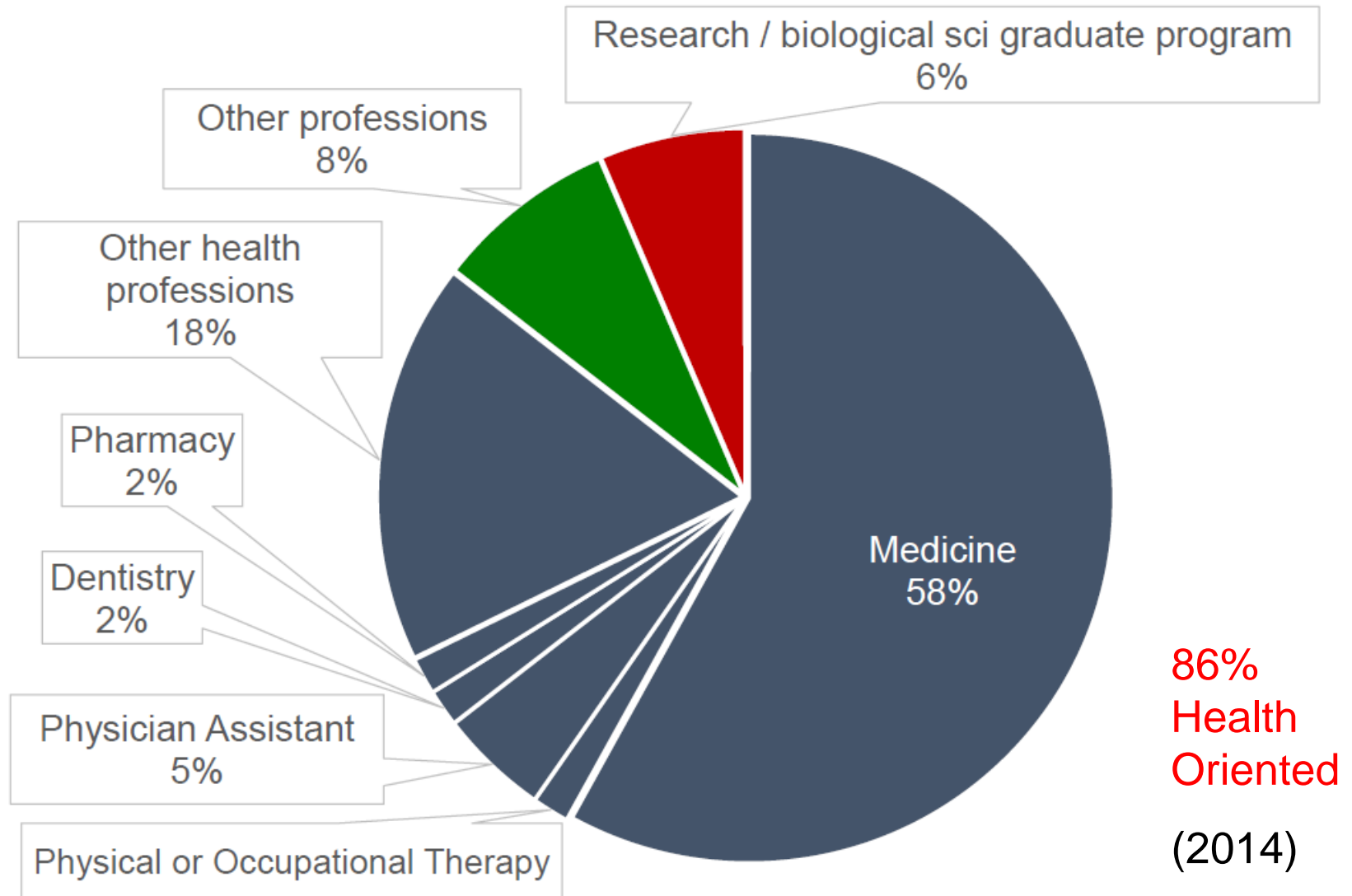
National Trends In Physiology Majors



Roadmap to setting curriculum guidelines

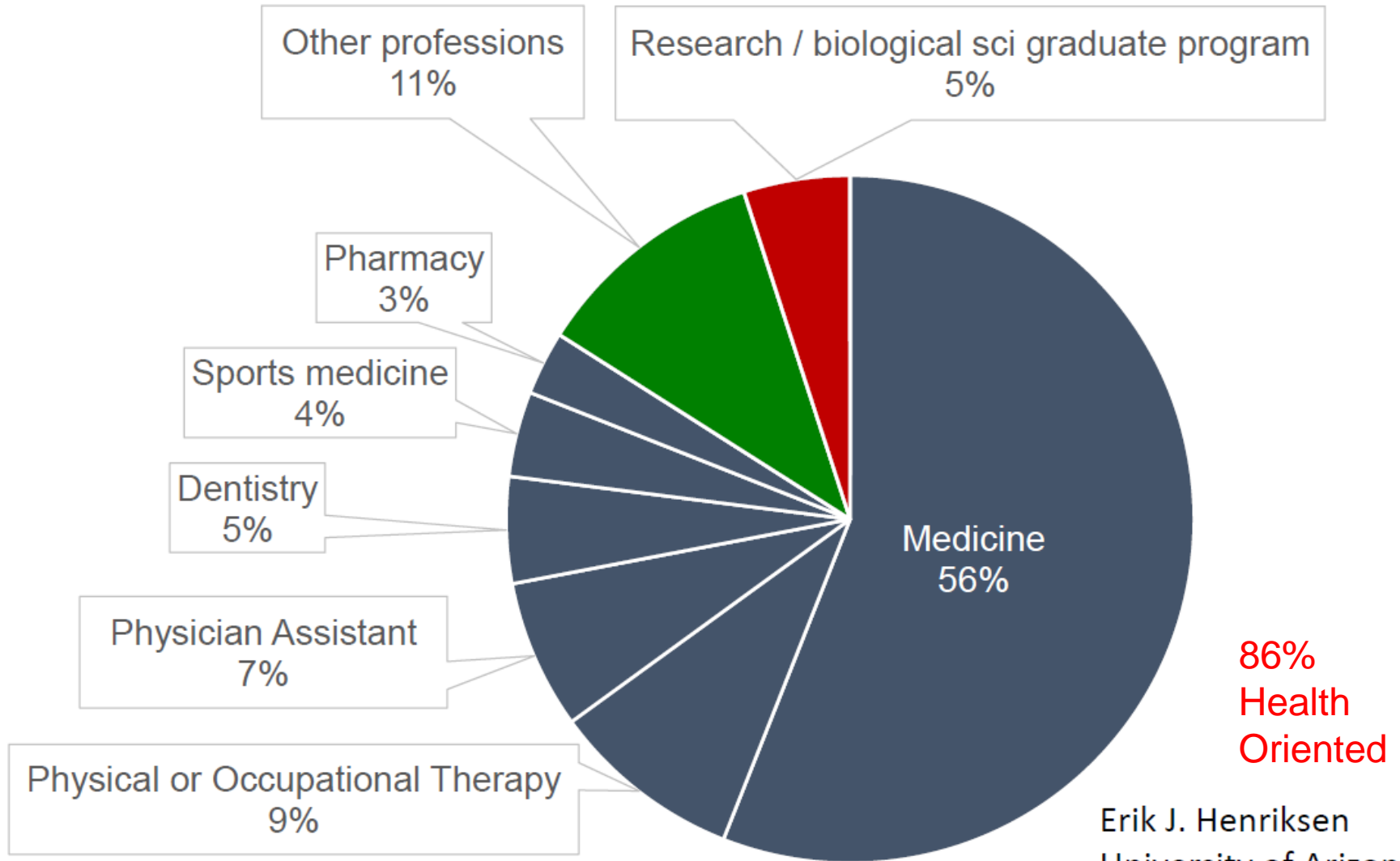
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Michigan State University: Destination/aspiration of physiology graduates



University of Arizona:

Aspiration survey of physiology majors and pre-majors



86%
Health
Oriented

Erik J. Henriksen
University of Arizona

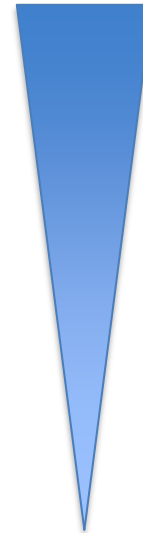
(2014)

Medical school applications and enrollments are increasing

U.S. Medical School Total Applicants, 2002-2013 U.S. Medical School First-Time Enrollment, 2002-2013

Year	Total	% change from prior year
2002	33,624	-3.5%
2003	34,791	+3.5%
2004	35,735	+2.7%
2005	37,372	+4.6%
2006	39,108	+4.6%
2007	42,315	+8.2%
2008	42,231	-0.2%
2009	42,268	+0.1%
2010	42,741	+1.1%
2011	43,919	+2.8%
2012	45,266	+3.1%
2013	48,014	+6.1%

49%



42%

(28K are not accepted)

Year	Total	% change from prior year	% change from 2002
2002	16,488	+0.8%	—
2003	16,541	+0.3%	+0.3%
2004	16,648	+0.6%	+1.0%
2005	17,003	+2.1%	+3.1%
2006	17,361	+2.1%	+5.3%
2007	17,759	+2.3%	+7.7%
2008	18,036	+1.6%	+9.4%
2009	18,390	+2.0%	+11.5%
2010	18,665	+1.5%	+13.2%
2011	19,230	+3.0%	+16.6%
2012	19,517	+1.5%	+18.4%
2013	20,055	+2.8%	+21.6%

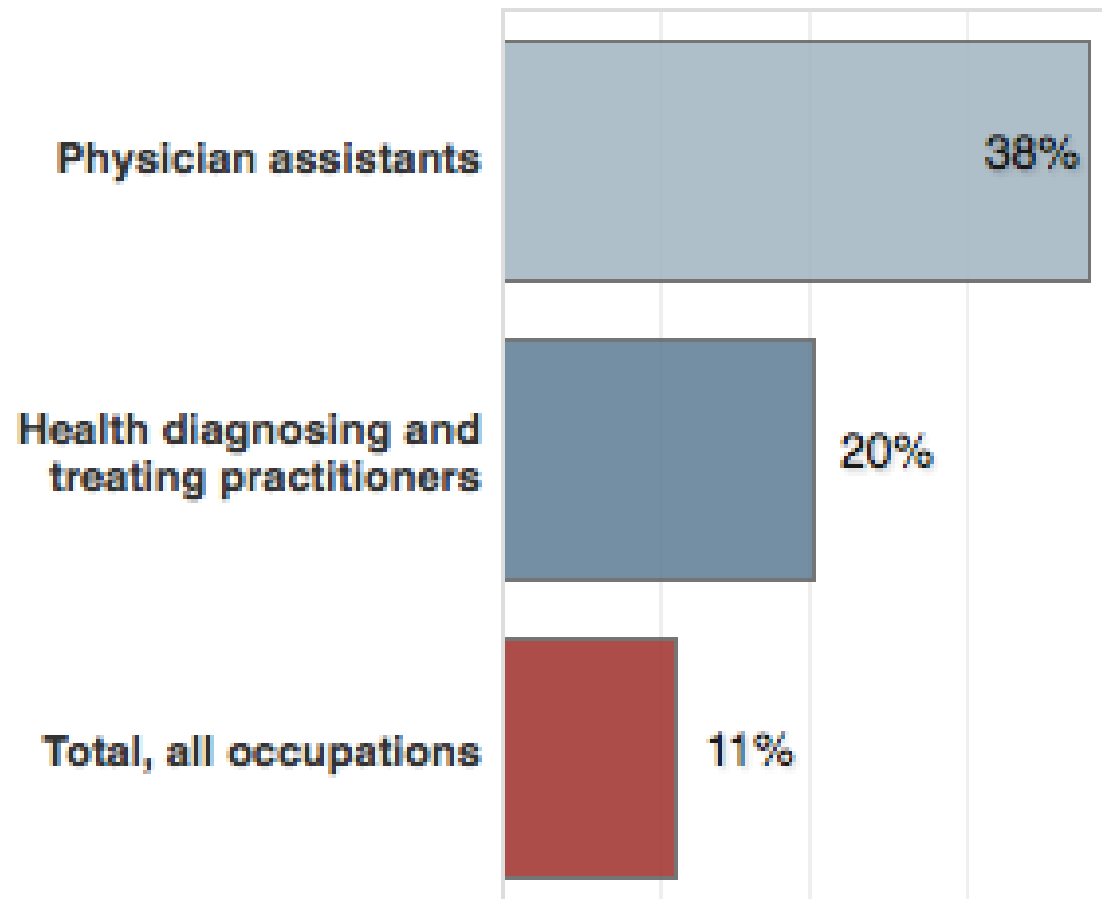
Source: AAMC DSDEV 9/24/2013

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Physician Assistants

Percent change in employment, projected 2012-22

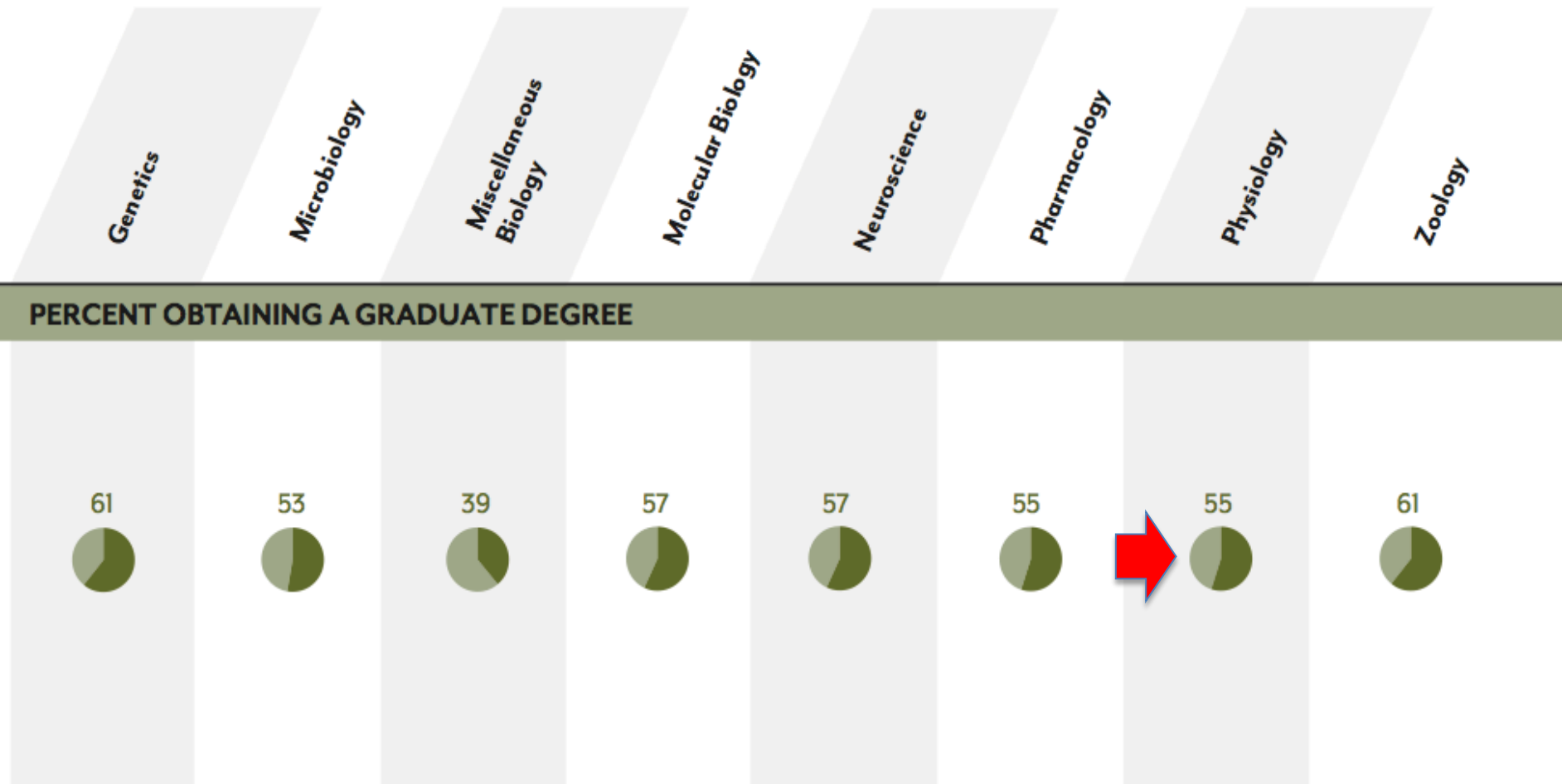


Note: All Occupations includes all occupations in the U.S. Economy.

Source: U.S. Bureau of Labor Statistics, Employment Projections program

(2014)

Many students stop formal education with a B.S. degree



"What's it worth? The economic value of college majors" Carnevale AP, Strohl J, and Melton M. Georgetown University Center on Education and the Workforce.

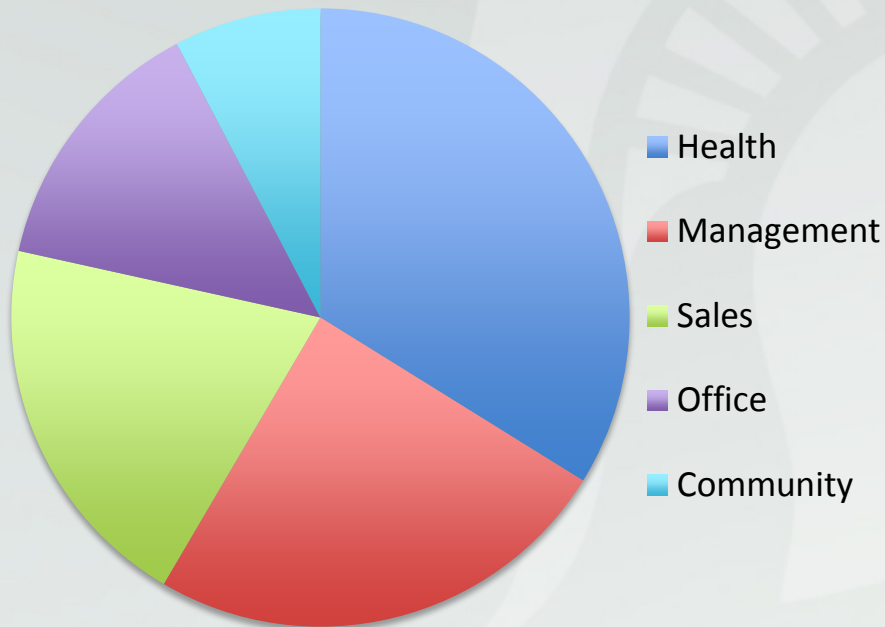
● Obtain graduate degree (%)
● Did not obtain graduate degree (%)

(2014)

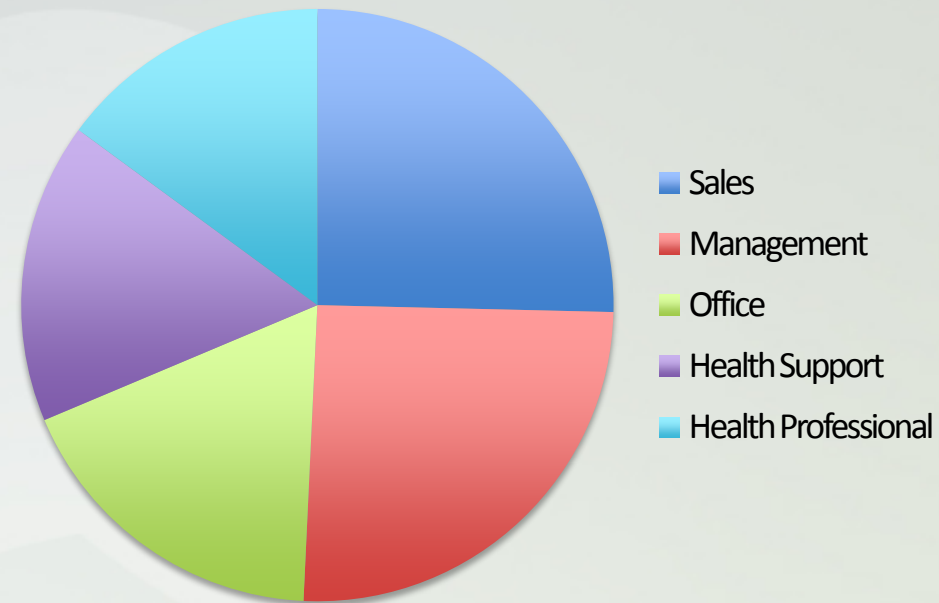
Occupations of Terminal BS

Starting
Pay \$30-
40,000

Physiology



Pre-Health Prep



How can we help?

- 58% of med school applicants are not accepted
 - Solution: early career tracking to other professional schools, improved matching to new MCAT and AAMC guidelines (**Social Science/Soft Skills**), strengthen interpersonal skills, improve communication and interview skills
- 21-30% of terminal BS in Physiology are underemployed/unemployed
 - Solution: early exposure to career options, **improved matching to employers needs**

Current state

- There are a growing number of programs and students in those programs
- Vast majority (80-90%) are aspiring pre-health professionals
- 45% end with terminal BS degree
- Many have a hard time being accepted into professional school or finding a related job
- ***No national curriculum guidelines for BS programs in Physiology***
- **Question: Who is responsible for these students and the programs?**

Roadmap to setting curriculum guidelines

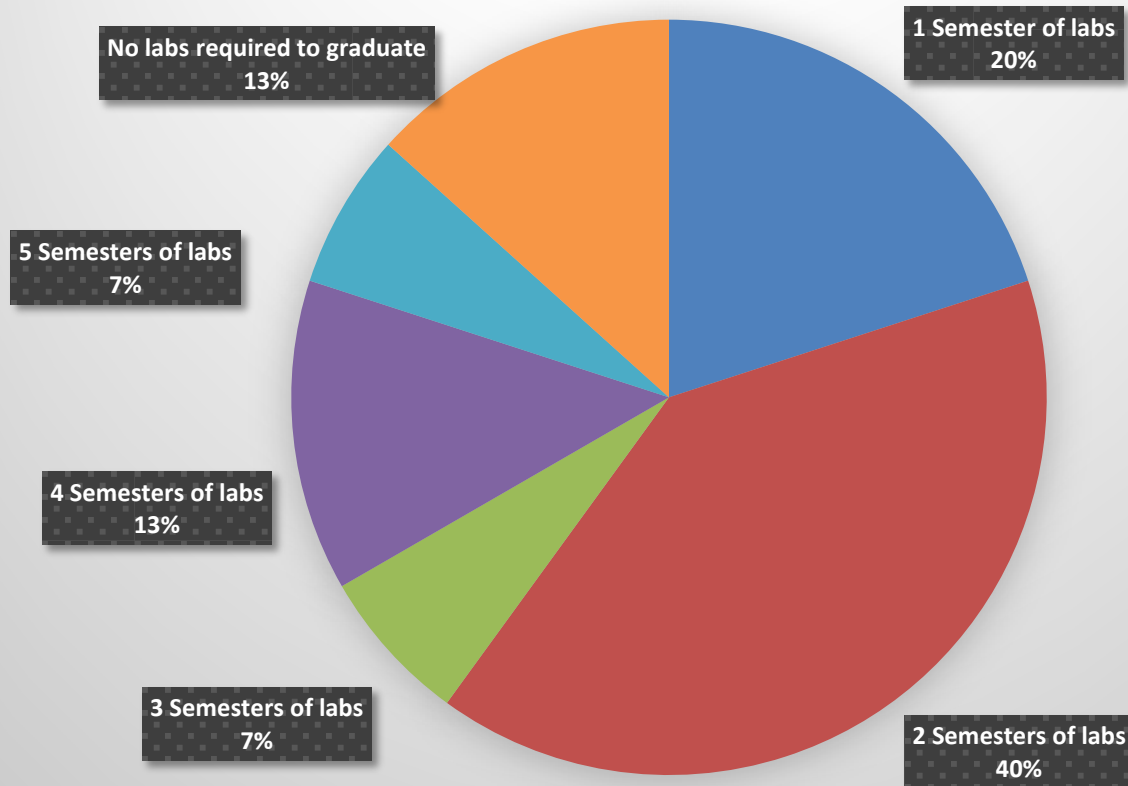
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What should we teach in our courses and programs?

- ***Physiology Core Concepts (Workshop 3)**
 - HAPS, Phys-MAPS, Publications
- HAPS guidelines for one and two semester Physiology (and A&P) courses
- End competency exam for two semester Physiology courses (HAPS)
- End competency exam for physiology major (Phys-MAPS)
- What about program requirements?
 - Lab courses
 - Career exploration
 - Writing in the discipline

Physiology Lab Courses

Required Anatomy and Physiology Lab Courses



How should we teach?

- STEM education research
 - Active learning, Problem-based learning
 - Peer instruction
 - Experiential Learning
- Vision and Change
 - Science practices and skills
- Scientific Foundations for Future Physicians
- National Research Council- STEM education

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Teaching beyond the core content

- AAMC and Professional Schools
- AACU
- President's council of advisors on STEM
- US Dept of Education's Employability Skills Framework
- STEMconnect's new STEM 2.0
- Students/Parents/Employers
- Best practices on how to incorporate and assess
- **ACDP/APS COPC Employability/professional skills document for undergrad physiology**

AAMC core competencies for entering medical students

(plus NEW MCAT with Social Science Section;
and Changes to Interview Format)

Interpersonal

- Service Orientation
- Social Skills
- Cultural Competence
- Teamwork
- Oral Communication

Intrapersonal

- Ethical Responsibility to Self and Others
- Reliability and Dependability
- Resilience and Adaptability
- Capacity for Improvement

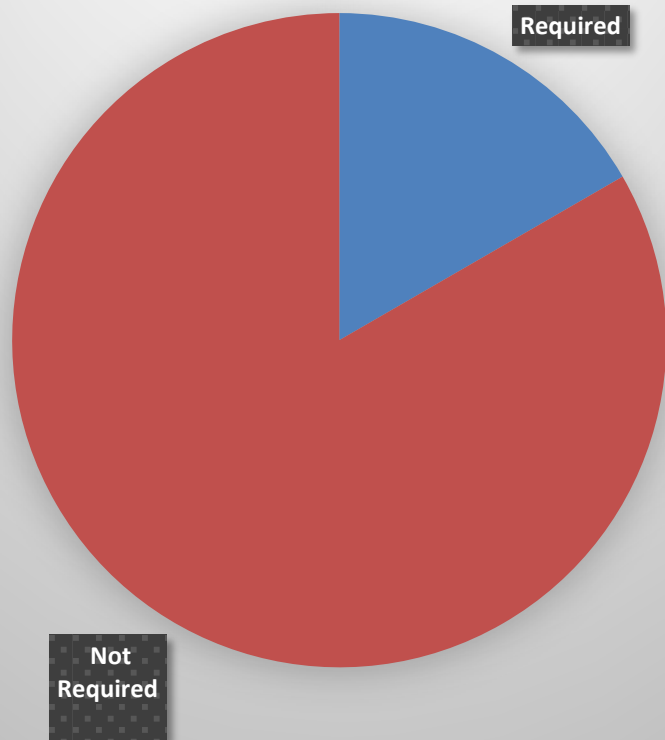
Thinking and Reasoning

- Critical Thinking
- Quantitative Reasoning
- Scientific Inquiry
- Written Communication

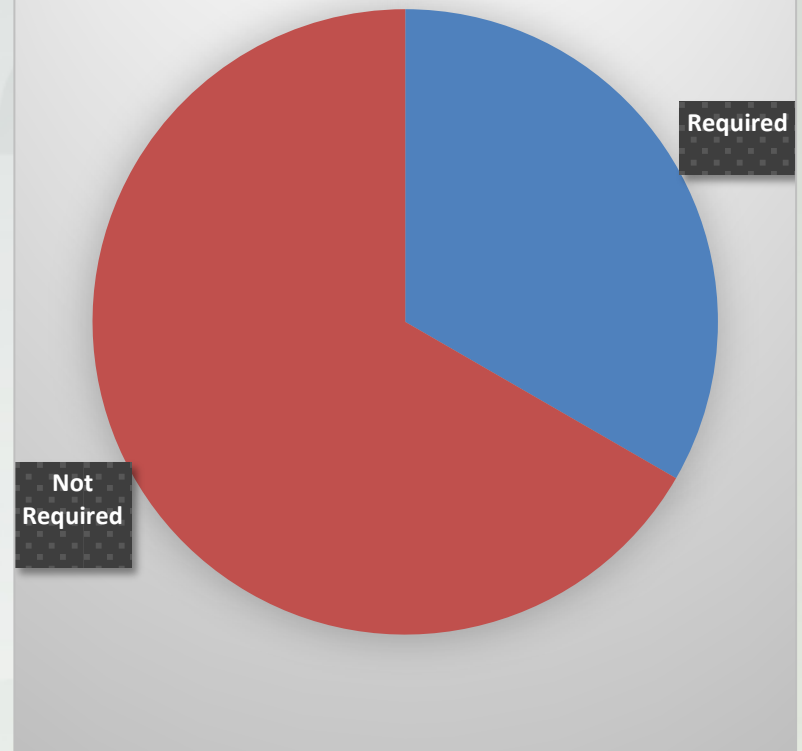
Science

- Living Systems
- Human Behavior

Career Exploration Course Requirement



Writing Course Requirement



Summary

- Programs do not have guidelines
- Minimal communication among peer programs
- Broad interpretation of Physiology curriculum
 - 1-5 semesters of Core Physiology
 - 0-5 semesters of Labs
 - Few have career and writing courses

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APS Committees: Education

- Education Undergraduate subcommittee
 - Carissa Krane (U Dayton), Drew Roberts(U Louisville Med), Mike Czubryt (U Manitoba), Patricia Halpin (U New Hampshire), Erica Wehrwein (Michigan State), Melinda Lowy (APS), and Marsha Matyas (APS)
- Focus on recognition of programs
- **Drafted an outline of a position paper and a description of a self-assessment checklist for programs**

APS Committees: Career Opportunities In Physiology

- Careers undergraduate subcommittee
 - Carrie Quinn (US Army), Josef Brandauer (Gettysburg College), Erica Wehrwein (Michigan State)
- **Employability/professional skills document for undergraduate education**
 - **Drafted at ACDP workshop in 2015**
 - **Input at EB16 from COPC and P-MIG**

Bio-MAPS Project

Multi-institution, NSF-funded collaboration

University of Colorado

Jennifer Knight

Katharine Semsar

University of Maine

Michelle Smith

Mindi Summers

University of Washington

Alison Crowe

Scott Freeman

Arizona State University

Sara Brownell

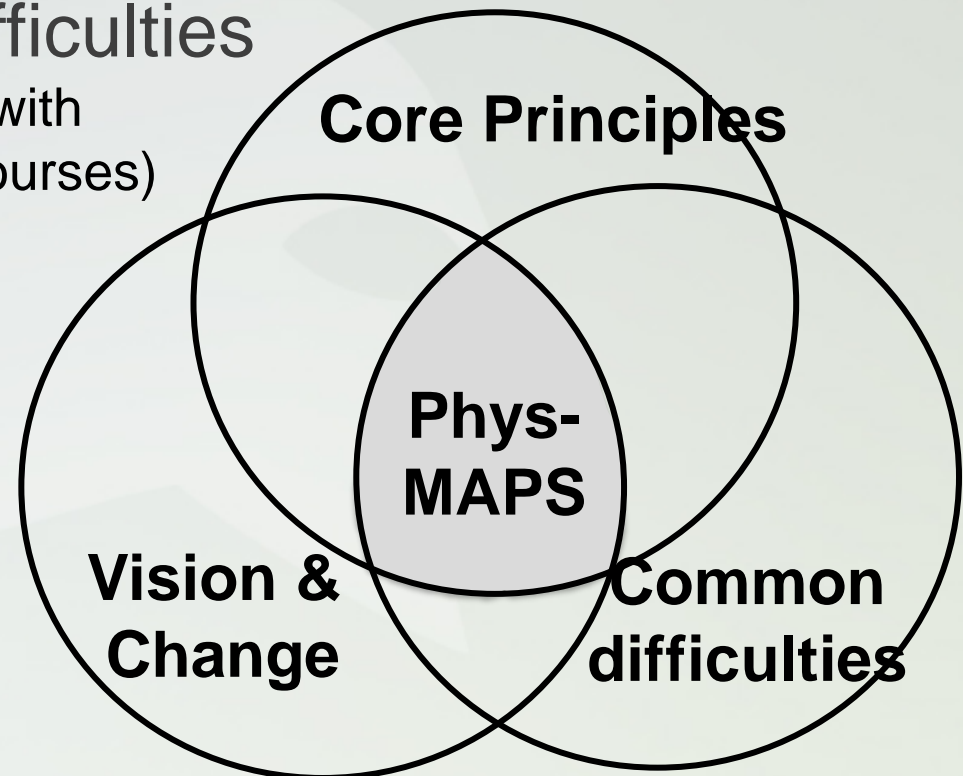
Christian Wright

University of Nebraska, Lincoln

Brian Couch

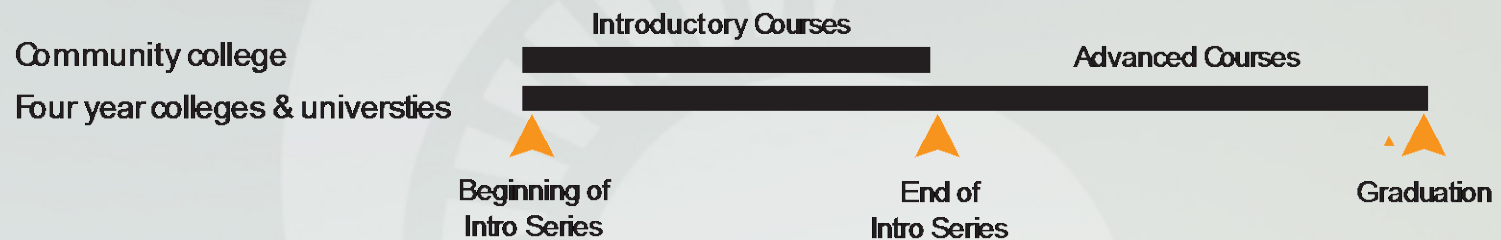
Phys-MAPS content based on the intersection among three guides:

- 1) Vision & Change Core Concepts
- 2) Core Principles of Physiology
- 3) Common student difficulties
(from literature, discussions with faculty, work in physiology courses)



Phys-MAPS Project

Goal: Develop suite of programmatic assessments to gauge students' conceptual understanding at multiple points in an undergraduate major



Assessments designed to be:

- Representative of Vision & Change Core Concepts
- Freely accessible and administered
- Take between 20-60 minutes to complete
- Use “likely / unlikely to be true”, focusing students on concepts rather than exceptions.

Physiology majors interest group (P-MIG)

- Founders:
 - John Halliwill (U Oregon), Dan McCann (Gonzaga), Erik Henriksen (U Arizona), Erica Wehrwein (Michigan State)
- Loose network of ~50 institutions and >100 people
 - Dean/Chairs, Program Directors, Faculty, Students
 - Presence at EB and APS Institute for Teaching and Learning
 - P-MIG group LifeSci TRC
 - <http://www.lifescitrc.org/forums/forum.cfm?c=16>
 - Email listserv

Other input from interested individuals

- Publications on physiology education
 - Jenny McFarland, Joel Michael, Howard Modell, Bill Cliff, Mary Pat Wenderoth
- Discussion and post-session evaluations:
 - APS: Teaching Section Symposium 2015
 - EB (APS) P-MIG networking session 2016, 2017
 - APS Institute for Teaching and Learning Workshop 2016

The proposal

- Create and maintain national programmatic curricular guidelines for Physiology Undergraduate Programs
 - Endorsed by stakeholders
- Core concepts
 - **Defining central core principles/concepts in physiology**
 - ***Key cognate courses (anatomy, genetics, biochemistry, etc)***
- Key skills and competencies
 - **A list of skills and competencies for undergraduate physiology (courses/degree programs combined)**
 - **Practical examples of skill development and assessment of competencies will be included.**
 - ***Research experiences* (course based, laboratory based)***
- Compline and maintain resources on STEM education best practices including common competency exams
 - Vision and Change, HHMI, NRC, AACU high impact practices, HAPS concept exam, Phys-MAPS
- Self-assessment checklist for Physiology and PULSE (V&C) rubric for departmental use
- *Advising guidelines and career exploration*

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Input from ACDP (please type notes at table and email to wehrwei7@msu.edu)

- What are the strengths, opportunities, weaknesses and threats (SWOT)
- What role does ACDP want to play?
- Add specific resource and faculty/staff suggestions?
- Are there other stakeholders?
- Potential conference proposal to NIH/HHMI/NSF/APS? EB workshop? Modeled after N-DOGS meetings?
 - American Kinesiology Association
- Multi-stakeholder committee? One society leads?
- How to disseminate and then maintain current guidelines?
 - Website? Publication?
 - Annual review/meeting?

Going forward.....

- Email to wehrwei7@msu.edu
- Next steps:
 - Finalize next steps for implementation
 - Solicit volunteers
 - Drafting document
 - Attending meeting
 - Logistics of implementation

- What level of guidelines are we targeting?
 - Accreditation, certification, recommendations
- Suggestions for a meeting of program directors and interested parties:
 - Aligned with EB/ACPD/other, stand alone meeting at partner institution, joint meeting with N-DOGS
 - Financial support to send faculty? Dept, grant?
- Where can the guidelines be posted as an online resource?
 - APS or ACDP website?
- Publications
 - Special issue in Advances in Physiology Education, Physiology, The Physiologist