Effective Practices for Physics Programs

AAPT Summer Meeting

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Provo, UT

Effective Practices for Physics Programs (EP3): Project Overview

APS physics

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EP3: Effective Practices for Undergraduate Physics Programs

1. **Develop a guide for self-assessment of undergraduate physics programs founded on documented best practices linked to measurable outcomes**

   The guide should provide a physics-community-based resource to assist programs in developing a culture of continuous self-improvement, in keeping with their individual mission, context, and institutional type. The guide should include considerations of curricula, pedagogy, advising, mentoring, recruitment and retention, research and internship opportunities, diversity, scientific skill development, career/workforce preparation, staffing, resources, and faculty professional development.

2. **Recommend a plan for ongoing review and improvement of this guide under the oversight of the APS Committee on Education**

Passed by the APS Council, November 2015

Task Force Members

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External Evaluator: Stephanie Chasteen

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*Leadership Team

Brief Timeline

STB*:	Requests to APS to do what ACS does: Program Certification
2012:	APS leadership asks Committee on Education (COE) to investigate
2013:	Working group formed to investigate
2014:	Survey of physics chairs, report written
2015:	COE discusses, makes recommendation to APS Council ABET announces intention to accredit all fields of natural science
2015:	APS Council charges COE to form task force (BPUPP: "Best Practices for Undergraduate Physics Programs")
2016:	APS COE begins process, drafts preliminary documents, recruits task force
2016:	Task force begins meeting
2017:	Applied for funding, beginning drafts & discussions on underlying issues, determination of content & structure of guide, development
2018:	NSF funding received, guide development commences
2019:	Guide development
2020:	Initial Rollout, training of reviewers
2021+:	Update guide, new sections, evaluate review process

*Since Time Began

Goals of the Guide

One stop shop for resources / Improve program health

- External program assessment and review
- Improve usefulness of assessment
- Bring together known literature of effective practices
- Collect practices recognized by the community as effective when there is insufficient evidence-based literature
- Encourage discussions in departments on continuous improvement of physics programs using evidence
- Collect information for departments to use in advocating for resources to improve their program
- Engage PER community on departmental needs
- **Key:** flexible, not prescriptive; mindful of local contexts

Chapter Structure of Guide

- **Introduction**: How to navigate and use the guide
- **Assessment**: Developing an efficient and effective culture of assessment
- **Effective practices** (~25 "sections")
- **How to be an effective chair**: Chair "101"
- **Departmental review**
  - Guide to reviewers
  - Preparing for a review
- **Creating change**: How to implement change
- **Appendices**: Examples of student learning goals and program learning goals, assessment instruments, mentoring "contract", additional resources

Tentative Section List: 25 "Executive Summaries" (16 developed)

Students

- *Recruiting*
- *Retention*
- *Mentoring / advising*
- *Internships*
- *Undergraduate research*
- *Career preparation*

Curriculum

- Implementing research-based instructional practices in your program (overarching)
- *Introductory courses for physical science and engineering majors*
- Introductory courses for life sciences majors
- *Upper-level physics courses*
- *Non-STEM major courses*
- Communications skills
- *Laboratory / experimental skills*
- *Computational skills*
- *Culminating integrative experiences (Capstone experiences)*
- Online education

Programs

- Individuated degree tracks: engineering / applied physics
- Institutional partnerships: dual-degree physics / engineering programs
- *High school physics teacher preparation*
- *Learning Assistant preparation*
- Community engagement / outreach

Departmental

- Physical environment: encouraging collaboration and learning
- *Departmental climate*
- *Equity, diversity, and inclusion*
- Ethics

High School Physics Teacher Preparation

Description

Physics programs are encouraged to implement, document, publicize, and support pathways to recruit and educate future high school teachers. This includes creating an environment within the program that promotes high school teaching as a valid and desirable career option for students.

Benefits to the Program

Effective Practices

1. *Implement a teacher preparation pathway*
    a. Establish a degree track for high school teacher education within the major
    a. Understand alternate pathways to teacher certification
    b. Support recent graduates during their transition into the classroom
2. *Provide students opportunities to learn physics in ways teachers are expected to teach*
    a. Incorporate evidence-based, active-engagement pedagogies into courses
    b. Provide opportunities for future (pre-service) teachers to participate in existing courses or workshops for practicing (in-service) teachers
3. *Provide early teaching experiences for students interested in teaching as a career*
    a. Provide departmental and university opportunities for students to experience and practice teaching
    b. Provide physics degree credit for students to take “introduction to teaching” courses
4. *Understand and communicate paths to and requirements for teacher licensure*

Effective Practices: Teacher Preparation Programs

Effective Practices

1. *Implement a teacher preparation pathway*
    a. Establish a degree track for high school teacher education within the major
        i. In programs with one track, modify the existing degree to allow certification requirements
        ii. In programs with multiple tracks, design a teaching track to allow students to smoothly transition among degree options (should be perceived as on par with other career options)
        iii. Collaborate with School of Education or its equivalent to accurately communicate required components for licensure (curriculum, field experiences, testing, etc.) to students
        iv. Design the program (individually or with other science departments) in collaboration with the College of Education to meet licensure requirements
        v. Learn from existing models, e.g., PhysTEC and UTeach employ practices and strategies for recruiting, preparing, and supporting teachers that begin within the physics program
        vi. Be mindful not to add extra expense or time to graduation

External Review

All departments and programs undergo periodic review

ABET now offering to accredit ***all*** natural science disciplines (ANSAC: Applied and **Natural** Science Accreditation Comm.)

ABET ACCREDITATION FOR NATURAL SCIENCE PROGRAMS

JOIN THE CONVERSATION

ABET accreditation has long been the global standard for programs in applied science, computing, engineering, and engineering technology. And recently programs that fall outside of these four main areas have shown interest in becoming ABET-accredited.

During this half-day, three-part session you will explore the value of ABET accreditation, and specifically the value that it could bring to the natural sciences. Presenters from ABET as well as industry and programs in physics, geology, biology, and chemistry will share their perspectives and describe how

Effective Practices for Physics Programs

What the Guide Is

- Collection of community knowledge and evidence-based practices
- Authored, reviewed, approved by physics community (**More than 200 involved!**)
- *Living* document (not static), with stewardship by APS COE
- Primarily online
- Ethics and diversity included throughout
- Effort to implement evidence-based pedagogy
- Transform mandatory assessment into useful exercise
- Suggestions on how to improve all aspects of a program
- Opportunity to extend reach of education research

What the Guide Isn't

The guide is **NOT**

- Accreditation
- Program certification
- Mandate to conform
- 'To-do' list departments are required to complete
- **Finished (yet)**

Effective Practices for Physics Programs

References

SPIN-UP 2002 (enrollment):

aps.org/programs/education/undergrad/faculty/spinup/

T-TEP 2012 (teacher education):

phystec.org/webdocs/TaskForce.cfm

Phys21 2016 (careers):

compadre.org/phys21/

Vision and Change 2011 (biology):

visionandchange.org

Active learning:

Scott Freeman, et al., "Active learning increases student performance in science, engineering, and mathematics," PNAS **111** (23), 8410-8415 (2014).

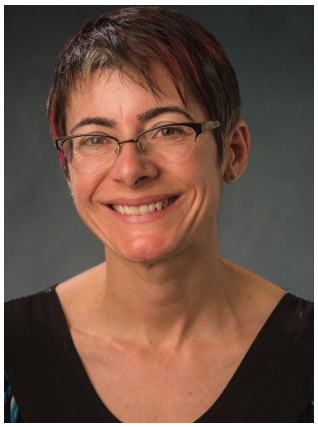
PTEPA (assessment):

Physics Teacher Education Program Analysis: phystec.org/thriving

Come give us feedback!

External Evaluator: Stephanie Chasteen

- If you are a…
  - Department chair
  - Undergraduate studies director at a university
  - New chair
- Get a sneak preview of the EP3 Guide and give your feedback about the guide structure and content.
- Meet in the front



Contact her at Stephanie@ChasteenConsulting.com if you'd like to participate at a later date

More information?

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