EP3: Effective Practices for Physics Programs: An example, and how to use it

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Session Outline

1. Task Force
2. External Program Review
   - Motivation
   - Current situation
   - EP3 expectations
3. One Section: High School Physics Teacher Preparation
   - Section outline
   - Example
4. Feedback on the Guide
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
Task Force Members

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Co-Chair: Michael Jackson, Millersville University of Pennsylvania
• Noah Finkelstein, University of Colorado Boulder
• Courtney Lannert, Smith College and UMass Amherst
• Ramon Lopez, University of Texas at Arlington
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External Program Review

Motivation

1. Had an external program review of your department?
2. Served as an external reviewer?
3. Rate your experience? (0-5)
4. Discussion: What would you like ideally to result from an external review?
External Program Review

• How many would like your program to undergo accreditation?
• How many would like to have nationally-based arguments to increase resources?
• How many would like to convince your colleagues about the effectiveness of evidence-based practices?
• How many would like physicists to evaluate your program (as opposed to people from outside the discipline)?
• What else would you find valuable?
• What do you want to avoid?
Current situation:

- The (unlucky) chair is tasked by the dean to prepare a set of materials for an external review.
- External review is put on shelf (perhaps a few ideas are moved along), but it is a document unrelated to other department activities.
- Assessments are done (e.g., Force Concept Inventory, ETS Major Field Exam), but no one is sure what to do with the results, what it means, or how it will impact teaching.
- Instructors continue to teach as they have – as there is no incentive to change.
- Difficult to decide which innovations or changes might be positive, and which negatively impact things.
- Courses taught as “independent” subjects, without coordination.
External Program Review

What EP3 guide will do for program review:

• Transform assessment into useful tools that physicists can understand and use to creatively improve programs
• Provide a structure for assessment such that external reviews can be a compendium of annual assessments already demanded for regional accreditation – no new work required
• Reduce time needed to prepare for external review and accreditation materials
• Aligns department with university vision/mission, provides strategy for broader discussions of program components and their value
• Provides the chair with evidence from published and community sources that he/she can use in advocating for resources
• Trains, and recognizes external reviewers who embrace a similar philosophy of evidence-based program improvement
Tentative Structure of Guide

Chapters:

• Introduction, how to navigate and use the guide

• Assessment: developing a useful and efficient culture of assessment

• Effective practices (~25 “sections”)

• Departmental leadership

• Departmental review:
  • Guide to reviewers
  • Preparing for a review

• Appendices: Examples of student learning goals and program learning goals, assessment instruments, additional resources
Chapters:

- Introduction, how to navigate and use the guide
- Assessment: developing a useful and efficient culture of assessment
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- Departmental leadership
- Departmental review:
  - Guide to reviewers
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- Appendices: Examples of student learning goals and program learning goals, assessment instruments, additional resources
Tentative Section List

• Capstone experiences
• Career preparation
• Communications skills
• Computational skills
• Departmental climate
• Equity, diversity, and inclusion
• Ethics
• Learning spaces and facilities
• Faculty development
• Implementing research-based instructional practices
• Individuated degree tracks: engineering / applied physics
• Institutional partnerships: dual-degree physics / engineering programs
• Internships
• Introductory STEM major courses
• Laboratory / experimental skills
• Learning assistants
• Mentoring / advising
• Non-STEM major courses
• Online education
• Community engagement / outreach
• Recruiting
• Retention
• **Teacher preparation program**
• Undergraduate research
• Upper-level physics courses
Current Situation:

- Lack of expert knowledge on how to create or improve a program
- Unfamiliarity with published literature on the subject
- Limited knowledge of assessments useful in gauging success
- Faculty “try” various things
- Chair unable to argue effectively for resources without a clear path, alignment with university strategic mission, documented benefits, or data to back ideas
- Lack of alignment with other programmatic aspects (or those of other departments)
Effective Practices: Teacher Preparation Programs

What EP3 guide will do for building/improving programs:

• Provide expert knowledge gathered from the physics community
• Provide an informed and endorsed (APS and AAPT) source of information
• Communicated in jargon-free style for individuals unfamiliar with research or community knowledge of the subject
• Provide practical suggestions for implementation of components
• Prioritized set of actions
• Provide resources for taking additional steps (this is not a compendium, but the critical first steps for building/improving a program)
• Describe assessments for evaluating strength of the program that can easily be adopted and whose value is recognizable and useful
Section walkthrough

• Description (basic boundaries of the content)

• Benefits to the program

• Effective practices
  • Themes
  • Practices
  • Implementation strategies

• Programmatic assessments

• Evidence and resources
Effective Practices: Teacher Preparation Programs

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
   b. Understand alternate pathways to teacher certification
   c. 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

Programmatic assessments
Evidence and Resources
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
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