Sustaining Programs in Physics Teacher Education

A Study of PhysTEC Supported Sites

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PhysTEC goal and methods

(Ultimate) goal:
Resolve the shortage of highly-qualified physics teachers in the US by supporting institutions in producing more physics teachers long-term.
PhysTEC goal and methods

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Resolve the shortage of highly-qualified physics teachers in the US by supporting institutions in producing more physics teachers long-term.

Funding method:
Provide “startup” funding to institutions that are predicted to increase and sustain physics teacher production

Information method:
Provide information to institutions that will enable them to increase and sustain physics teacher production
Opportunity for research

PhysTEC has funded over 30 institutions to build physics teacher education programs (2001-present).

There are 9 “legacy” (formerly funded) sites that prioritize secondary physics teacher education:

- University of Arkansas
- FIU Florida International University
- Seattle Pacific University
- University of Colorado Boulder
- The University of North Carolina at Chapel Hill
- Cornell University
- The University of Arizona
- Western Michigan University
- University of Minnesota
Research questions

- Are PhysTEC legacy sites sustaining increases in production of physics teachers?
- Did the PhysTEC award precipitate long-term support for physics teacher education at the legacy sites?
- What features should be prioritized for building sustainable physics teacher education programs?
Study methodology

- **Numerical data collection:**
  Number of PhysTEC Secondary Graduates
  Personnel contributing to physics teacher education
  Awards supporting physics teacher education

- **Extensive site visits and phone interviews:**
  To learn the history, motivations, pressures, cultures, and practices that support physics teacher education at the site
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National production of physics teachers

- To increase production by 1/year is nationally significant.
- If all 750 institutions increased by 1/year, it would substantially address the national need for qualified physics teachers.
Definitions developed in study

“Sustained increase”:
Average number of physics teachers produced in the post-award period is greater than that in the pre-award period by at least 1.0

“Further increase”:
Average number of physics teachers produced in the post-award period is greater than that in the pre-award period by at least 2.0
Is PT production sustained?

- Four sites have further increased production:

- Seven sites have sustained increases in production:

- One site has not sustained production:

   - Cornell University
Almost all PhysTEC legacy sites have sustained increases in production of physics teachers. Half have sustained large increases.

What is the relevance for non-awardees?

It suggests that the activities taking place at PhysTEC sites were effective.
Research questions

- Are PhysTEC legacy sites sustaining increases in production of physics teachers?
- Did the PhysTEC award precipitate long-term support for physics teacher education at the legacy sites?
- What features should be prioritized for building sustainable physics teacher education programs?
Long-term support for PTE?

- Four sites have further increased funding:

- Seven sites have sustained increases in funding:

- One site has not sustained funding:
All studied sites that invested in physics teacher education sustained an increase in their production of physics teachers. Sites with a greater investment saw greater increases in their long-term production of physics teachers.
Research findings

Almost all PhysTEC legacy sites have sustained increases in production of physics teachers. Half have sustained large increases.

All studied sites that invested in physics teacher education sustained an increase in their production of physics teachers.

What is the relevance for non-awardees?

Over the long term, most of the funding has not been PhysTEC funding.
Funding sources (all studied sites)

- Local institution: 40%
- PhysTEC: 14%
- NSF-DUE (mostly Noyce): 37%
- NSF – DRL: 9%
- NSF – PHY & EEC: 1%
- Other (DoEd, state, industry, etc.): 2%

Sustaining Programs in Physics Teacher Education
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Key feature: Champion

Every sustained site has one or more “champions” who:

★ Secure funding and staff for physics teacher education
★ Negotiate with institution for changes beneficial to physics teacher education
Champions

★ To be a champion is to undertake certain activities, not necessarily to assume an identity.
  Secure funding, hire personnel, and make deals with institution.

★ All champions at studied sites are faculty.

★ All sites have (or had) champion(s) in Physics. Half also have champions in Education.

★ Many champions spend only 0.1 FTE on physics teacher education.
Institutional support for champions

Every sustained site has one or more champions.

Every long-term champion is supported and rewarded for physics teacher education activities by their institution.
Institutional support for champions

• Mandate to pursue physics teacher education as part of one’s regular duties
• Funding for Learning Assistant programs
• Tenure, promotion, salary increases
• Hiring STEM education colleagues
• Infrastructure supporting physics teacher education (Centers, etc.)
• Appointments (Center Director, etc.)
Institutional motivation

✧ Fulfill institutional mission
✧ Serve regional needs
✧ Improve community reputation
✧ Support strong faculty
✧ Appear on national stage
Research findings

- Almost all PhysTEC legacy sites have sustained increases in production of physics teachers. Half have sustained large increases.

- All studied sites that invested in physics teacher education sustained an increase in their production of physics teachers.

All sustained sites studied have
- a champion of physics teacher education and corresponding
- institutional motivation and commitment.
Unique local conditions

Our findings emphasize commonalities between sites. The sites, however, are very different from one another. In each case the status of physics teacher education reflects local priorities and opportunities, including the expertise of local personnel.

- Successful institutions play to their strengths.
Physics teacher education co-creates young university’s STEM identity.

Institutional buy-in is attributed to FIU’s youth, its strength in the sciences, and its search for a community-minded and forward-looking identity. Champions are experts in Modeling Instruction, a form of introductory physics instruction that hooks first-generation college students into physics and physics teaching.
Physics teacher education improves the university’s image in the region.

Administrators working against regional perception that universities are “gloriously useless.” PTE is seen as practical, a means by which the university prepares students for jobs of recognized value. Champion secures external funding and improves university reputation. Students are motivated by interests specific to the region.
Physics teacher education is an opportunity for a small university to excel.

SPU’s physics department decided a decade ago to make physics education its focus as a means of reviving a department at risk and aligning with the university’s emphasis on teaching and service. Since that time, every person hired into the physics department has had a teaching and learning priority. PTE puts the university on the national stage.
Physics teacher education is part of overall excellence in STEM education.

Campus-wide efforts enhance the priority that departments and programs place on STEM education. Champions relish innovation and growth. Flagship site for Learning Assistant programs. Institutional commitment sometimes takes the form of commitments to STEM education improvements that benefit physics teacher education indirectly.
Physics teacher education serves the region as part of STEM teacher education.

Institutional commitment to physics teacher education is embodied in an inter-departmental STEM teacher education program created to serve regional needs. Sustainability of physics teacher education is tied to sustainability of larger program.
Physics teacher education is part of a strong tradition of teacher education.

Teacher preparation is a foundation area for the university. Physics teacher education program is being sustained even in the context of greatly decreased enrollment in the College of Education, a depressed local economy, shrinking state population, and difficult employment situation for teachers and others.
Full report

phystec.org/sustainability
Slides after this were not used
Consistent with earlier findings

Report of Task Force on Teacher Education in Physics found that successful PTE programs included recognition and support for champion.

This study:
• Extends finding to sustained sites
• Clarifies definition of “champion”
Personnel contributions to PTE

- Recruit physics teachers
- Build pathways to become a physics teacher
- Advise pre-service physics teachers
- Mentor / induct in-service physics teachers
- Teach physics teachers
- Create / maintain physics-specific pedagogy classes
- Maintain a Teacher Advisory Group of physics teachers
- Influence placement of new physics teachers for student teaching
- Lead collaborations with schools and school districts through local school administrators and teacher leaders that benefit PTE
- Promote PTE through talks, papers, and/or research

Development of operational definition allows cross-site comparisons.
Application to your own site

1. What champion activities do you (or others at your institution) engage in?

2. How does physics teacher education align with the mission of your institution and/or the goals of your administration? How could you use this to build institutional support?

3. How could the Sustainability Study help you advocate for support of physics teacher education at your institution?