ESERA Conference

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University of Cyprus

The Physics Teacher Education Coalition (PhysTEC)

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PhysTEC Project Goals

• Transform physics departments to engage in preparing physics teachers
• Demonstrate successful models for increasing the number of highly-qualified physics teachers
• Spread best-practice ideas throughout the physics teacher preparation community
• Need for physics teachers in U.S.
• Model programs
• Dissemination
• Engagement/advocacy
• Outlook
• Need for physics teachers in U.S.
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### Need for High School Teachers

#### Relative Demand by Field: Highest Demand Fields

**Considerable Shortage (5.00 - 4.21)**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>4.26</td>
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</tbody>
</table>

**Some Shortage (4.20 - 3.41)**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Demand</th>
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<tbody>
<tr>
<td>Spec. Ed. – Multi-categorical</td>
<td>4.15</td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td>4.13</td>
</tr>
<tr>
<td><strong>Chemistry</strong></td>
<td>4.12</td>
</tr>
<tr>
<td>Spec. Ed.</td>
<td>4.06</td>
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<tr>
<td>Spec. Ed. – Mild/Moderate Disabilities</td>
<td>4.04</td>
</tr>
<tr>
<td>Spec. Ed. – Learning Disability</td>
<td>4.03</td>
</tr>
<tr>
<td>Spec. Ed. – Mental Retardation</td>
<td>4.03</td>
</tr>
</tbody>
</table>

2010 AAEE (*American Association of Employment in Education*)

Educator Supply and Demand in the United States Report
Need for Physics Teachers

- 27,000 total physics teachers in the U.S.
- 3,100 new physics teachers each year
  - 1400 new teachers
  - 1700 in-service teachers

Source: AIP Statistical Research Center
• Need for physics teachers in U.S.
• Model programs
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National Models: PhysTEC Supported Sites

- 30 supported sites
- Request for Proposals
- Comprehensive (<$300k)
  - All key components
  - Teacher in Residence
- Targeted (<$75k)
  - Innovative ideas
  - Smaller sites
- Sustainability

Proposals for new sites

- Returning
- New

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Supported Sites - Outcomes

*Number of physics certifications averaged over 319 institutions in 15 states. Note that all PhysTEC teachers are more highly qualified than the minimum standard in most states.
Supported Sites - Outcomes

Future Teachers at Currently Funded Sites

- Before PhysTEC Funding
- During PhysTEC Funding

Number of Future Teachers

Virginia Tech (2011-2012)
SUNY Geneseo (2011-2013)
CSU San Marcos (2011-2013)
Boston (2011-2013)
CSU Long Beach (2011-2013)
Chicago State (2010-2013)
Middle TN State (2010-2013)
Towson (2010-2013)
PhysTEC Graduates - Outcomes

Three year retention rate (PhysTEC): 76%
Three year retention rate (All K-12): 74%
Teachers in Residence (TIR)

TIR Roles

- Recruiter
- Advisor
- Instructor
- LA/TA leader
- Mentor
- Course and curriculum developer
- Professional community leader
- Ambassador to School of Education
- Ambassador to School Districts
Key Components

- Key leadership components
  - Champion
  - Collaboration (physics, education, schools)
  - Institutional commitment
  - Assessment

- Key program components
  - Recruiting
  - Pedagogical content knowledge
  - Early teaching experiences
  - Mentoring and induction
  - Teacher in Residence (TIR)
  - Learning Assistants (LA)
  - Teacher Advisory Group (TAG)
• Need for physics teachers in U.S.
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PhysTEC annual conferences (253 institutions)

![Bar chart showing the number of new and returning institutions from 2005 to 2013.](chart.png)
Topical Workshops: Learning Assistants

LA program
• Undergraduates serve as peer instructors
• Concurrent pedagogy course
• Early teaching experience

Impact
• Teacher recruitment
• Class performance improves
• LA knowledge increases

5th workshop: October 27-29 at CU-Boulder
• Collection of scholarly articles on teacher education in physics
• All articles published in peer-reviewed journals
• Review article on research in physics teacher education
• Hardcopy sent to all U.S. physics departments

www.ptec.org/webdocs/PtecBook.cfm
Dissemination Activities

• National Conference on Physics Teacher Education:
  Feb 2012 Theme: *New Paradigms* (Ontario, CA)
  Mar 2013 Theme: *Preparing the Next Generation* (Baltimore, MD)
  19-20 May 2014 Theme: *Leadership* (Austin, TX)

• Topical workshops:
  Learning Assistants (CU-Boulder)
  Pedagogical Content Knowledge (Rutgers)
  Building Thriving Programs (College Park, MD)

• Books:
  *Teacher Education in Physics*
  *Effective Practices in Physics Teacher Education* (early 2015)

• Digital Library: [www.PTEC.org](http://www.PTEC.org)
• Need for physics teachers in U.S.
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Project Advocacy

• National coalition of PhysTEC institutions
• Task Force on Teacher Education in Physics (T-TEP)
• Partnerships:
  American Chemical Society (ACS)
  UTeach Institute
  Association of Public and Land-Grant Universities (APLU)
• Regional Workshops:
  California (CSU/UC system)
  Northwest Regional Conference
  North Carolina (UNC system)
• Publications/Talks in mainstream physics venues
• Need for physics teachers in U.S.
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Lessons Learned

• A champion is absolutely essential
• Align with institutional priorities to leverage support
• Flexibility in program implementation is key
• Not all institutions are ready, willing
• Physics teacher educators need professional community
• Professional societies can play a key role
Solving the Problem

• Estimate of the U.S. need:
  • 800 new physics teachers per year
  • 900 in-service physics teachers per year

• Stronger engagement from more institutions required
  • Minimum 100 institutions
  • Research-based in-service programs needed

• Possible actions
  • Partner with existing efforts
  • Leverage institutional resources
  • Engage institutions with high probability of success
Case Study: University of Arkansas

Gay Stewart joins faculty

PhysTEC funding starts

dramatic increase in majors

PhysTEC funding ends

Program sustained locally

Number of Graduates