New PhysTEC Sites Announced; New Outreach Efforts

The Physics Teacher Education Coalition (PhysTEC) project announced in May 2011 that it would provide funding for four universities to develop their physics teacher education programs. The new awardees, which began project activities in Fall 2011, included the University of California, San Marcos; Virginia Polytechnic Institute and State University; University of New York at Geneseo; and Virginia Polytechnic Institute and State University (Virginia Tech).

The winning institutions were selected during a two-stage review process that began with a pool of 70 applicants. Proposals were evaluated on a number of criteria, including sites’ ability to develop their programs into national models, the strength of departmental and institutional support for teacher preparation efforts, and the experience and commitment shown by the proposing teams. The review panel included representatives of APS and AAPT, which jointly lead the project, as well as external reviewers.

PhysTEC leadership expressed strong support for the project’s site selections and current directions. “As APS’s flagship education program, PhysTEC sets a high standard for the reform of physics education nationwide,” said Kate Kirby, Executive Officer of APS. “I am confident the new PhysTEC sites will continue to maintain this standard, while adding new innovations to the project.”

Beth Cunningham, Executive Officer of AAPT and serves on the PhysTEC leadership team. “I am impressed with the understanding of local context that our new sites have demonstrated,” said Cunningham. “They have clearly built connections with local school districts that will help immensely as they prepare teachers to work in these schools.”

The New Sites

Boston University is one of the largest private universities in the country, and is one of only a few PhysTEC sites located in an urban center, as well as the only site in New England. BU’s PhysTEC project will build on the physics department’s existing educational efforts, which include a transformation of the large introductory courses to include Learning Assistants and other reforms, and a newly added four-year track that allows students to earn both a physics degree and teaching license.

Project leaders plan to recruit future teachers from physics majors, engineering majors, and Learning Assistants, and to involve area teachers in a professional learning community that will provide mentorship to program graduates.

Other new sites include:

- CSU San Marcos is a regional comprehensive university in the San Diego area, and is both an Hispanic-Serving Institution (HSI) and an Asian American and Native American Pacific Islander Serving Institution (AANAPISI). Project leaders plan to create a five-year program leading to a bachelor’s degree in physics, a master’s in education, and teaching certification.
- SUNY Geneseo is a primarily undergraduate institution (PUI) in upstate New York, and is among the top PUIs in terms of number of physics majors who graduate each year. Project leaders plan to create a five-year program leading to a bachelor’s degree in physics, a master’s in education, and teaching certification. The site
- University of North Carolina and Chancelle Hoshaw of Cal Poly, San Luis Obispo. Photo by Theodore Hodapp.

Phystec Conference, UTeach Join Forces

During two warm, workshop-packed days in May 2011, 120 physicists and educators came together in Austin, Texas for the seventh annual PhysTEC Conference, the nation’s largest event focusing on physics teacher preparation. The 2011 conference was organized jointly with the annual meeting of the UTeach Institute, a project based at the University of Texas at Austin that prepares science and math teachers at “replication sites” around the country.

The theme of the conference was sustainability, and workshops developed this concept in a number of contexts. Panels explored ways to sustain various components of teacher education projects, including physics-specific pedagogy courses, the hiring of master teachers to work in physics departments, and teaching reforms in introductory physics courses. Numerous speakers presented results from data-driven teacher preparation and science education efforts; such data are crucial for building lasting support from administrators and funders.

Many conference attendees remarked on the community the PhysTEC Conference has helped build. University of Colorado physics professor Noah Finkelstein, a seven-time conference veteran and frequent presenter, said that the conference is "the right size and scale, friendly, and personable." Kathy McCloud, a program officer at the National Science Foundation added, “It’s encouraging to see people who care about teacher education exchanging ideas.”

The sessions on the afternoon of the second day of the conference were open to both PhysTEC and UTeach conference attendees. Several participants noted that PhysTEC was in a good position to provide an extra push in physics for UTeach sites, many of which have not seen the same increases in physics teachers as they have seen in other fields.

Phystec News

PhysTEC is a project to improve the education of future physics teachers. The project is led by the American Physical Society, in partnership with the American Association of Physics Teachers. Funding is provided by the National Science Foundation and APS’s 21st Century Campaign.

Cummings, Executive Officer, AAPT

“I am impressed with the understanding of local context that our new sites have demonstrated.”

—Beth Cunningham, Executive Officer, AAPT

We couldn’t do this without PhysTEC.”

—Mary Kirchhoff, Director of Education Division, American Chemical Society

PhysTEC Adds Four New Funded Sites

From left to right: a Boston University Learning Assistant works with two physics students; Virginia Tech’s TIR with two students; two students do a demo at SUNY Geneseo; two students work together at CSU San Marcos. Photos courtesy of Andrew Duffy; Beate Schmitzmann; Kurt Fletcher; Ed Price.

“Physics and chemistry are closely related subjects, and the Association of Public and Land-grant Universities.

We couldn’t do this without PhysTEC.”

—Mary Kirchhoff, Director of Education Division, American Chemical Society

The CTEC project, as envisioned at the June workshop, would be modeled after PhysTEC in a creating process proposal for funding sites, incorporating Learning Assistants, and holding meetings for the chemistry teacher education community. “PhysTEC has a number of years of experience in this area, and that has been essential in helping us identify the elements of a parallel initiative in chemistry education, said Theodore Hodapp, Director of Education and Diversity at APS and PhysTEC project director.

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Readers of this publication probably know that U.S. physics teachers are in short supply. But the problem is not limited to physics — chemistry teaching posts rank almost as difficult to fill, according the American Association of Employment in Education’s 2009 “Educator Supply and Demand” report. To address the nation’s critical need for chemistry teachers, the American Chemical Society (ACS) has taken steps toward forming a Chemistry Teacher Education Coalition (CTEC). PhysTEC project leaders have been working with ACS education staff for several years to lay the groundwork for this effort. Chemistry faculty from department that have endorsed an ACS statement supporting chemistry teacher preparation have received reduced registration fees to PhysTEC conferences for the past two years, and ACS representatives have led workshops at these meetings.

In June 2011, PhysTEC project leaders and ACS staff collaborated on a National Science Foundation (NSF) funded workshop that drew chemistry and physics faculty from universities around the country, as well as representatives from ACS, PhysTEC, NSF, and the Association of Public and Land-grant Universities. Workshop participants agreed on concrete steps for moving forward on a CTEC project with the mission “to actively engage chemistry departments in the preparation of future chemistry teachers.” The ACS’s Society Committee on Education has also endorsed the creation of CTEC, according to Mary Kirchhoff, the director of ACS’s Education Division.

“Physics and chemistry are closely related disciplines, and we see CTEC as a natural extension of PhysTEC efforts,” said Theodore Hodapp, Director of Education and Diversity at APS and PhysTEC project director.
Minority Serving Institutions Take on Teacher Preparation

Minority groups that are underrepresented in physics generally are even more severely underrepresented among U.S. physics teachers. Twenty-five percent of our nation’s black and Hispanic students now take physics in high school, and as Table 1 shows, they are very unlikely to have a minority role model teaching their physics classes.

<table>
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<th>Institution Type</th>
<th>HSI</th>
<th>HISU/PIB</th>
<th>All</th>
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<td>11</td>
<td>226 (11% MSI)</td>
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<tr>
<td>PhysTEC Supported Sites</td>
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<td>2</td>
<td>20 (1.5% MSI)</td>
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<tr>
<td>U.S. physics degree-granting institutions</td>
<td>44</td>
<td>48</td>
<td>800 (12% MSI)</td>
</tr>
</tbody>
</table>

Table 1. Sources: American Institute of Physics; U.S. Department of Education

PhysTEC has since its inception reached out to minority-serving institutions (MSIs), which educate almost 60% of underrepresented minorities who earn college degrees in the US. These include Hispanic Serving Institutions (HSIs), Historically Black Colleges and Universities (HBCUs), and Primarily Black Institutions (PBIs). Table 2 shows the engagement of minority-serving institutions in the project.

For more information about PhysTEC efforts to engage minority-serving institutions, see the article on pages 7 and 8 of the Spring 2011 edition of the APS CSWP and as well as a day-long program put on by the project in conjunction with the AAPT Summer Meeting. The project also provides funding for scholars to spend a summer doing physics education research. Christie Johnson, a University of Arkansas Noyce scholar, spent the summer working with the University of Washington’s Physics Education Group, and will present her work at the 2012 AAPT Winter Meeting. “AAPT has a lot of resources to offer these teachers as they begin their careers,” said Beth Cunningham, AAPT Executive Officer. “And the scholars’ energy really adds a unique element to our meetings as well. It’s a mutually beneficial situation.”

Hodapp also points to ways in which the engagement of chemistry departments can enhance PhysTEC efforts at universities around the country. According to the American Institute of Physics, most physics teachers are also asked to teach other subjects, of which chemistry is one of the most common. “Physics teachers who are also responsible for teaching chemistry will have a leg up in finding jobs,” Hodapp said. “Funding agencies and university administrators have also made it very clear that they want to see the science disciplines collaborating on education.”

PhysTEC Quick Tips

If you want to boost your department’s efforts to prepare physics teachers, but don’t know where to start, PhysTEC has prepared a list of steps you can take to begin having an impact right away. Go to www.PhysTEC.org/quicktips.php.
PhysTEC Membership Continues to Grow

Physics Teacher Education Coalition (PhysTEC) membership has reached 255 institutions (as of press time), ranging from major research universities to regional comprehensives, liberal arts colleges, two-year colleges, and even one national lab. The 226 US-based physics degree-granting members represent nearly 30 percent of such institutions in the country, and graduate over one-third of U.S. physics majors.

“Joining the Coalition is a great way for any physics department to start getting involved in teacher education.”
—Monica Plisch, Associate Director of Education and Diversity, APS

PhysTEC members endorse a statement supporting physics department involvement in teacher preparation, and commit to supplying the project with physics teacher graduation data annually. Nearly every member has sent a representative to a PhysTEC conference or workshop, and many have applied for PhysTEC funding or become engaged in the project in other ways. Membership is not required for attending conferences, but members receive steeply discounted registration rates; membership is required for applying for funding.

The Coalition was founded in 2003 (under the acronym PTEC), but growth picked up early in 2005, around the time of the first PhysTEC conference. “When I joined the project, we had just a handful of members, and few opportunities for them to become engaged,” said Theodore Hodapp, APS Director of Education and Diversity and PhysTEC director since 2004. “We realized we needed a much broader base to have the kind of impact we wanted to have.”

Since then, the Coalition has grown at a rate of around 40 institutions per year, and shows no sign of slowing. “It has been exciting to see the growth not just in membership, but in the enthusiasm and commitment toward physics teacher education,” said Monica Plisch, APS Associate Director of Education and Diversity, who has led the Coalition’s expansion since 2007. “Joining the Coalition is a great way for any physics department to start getting involved in teacher education.”

To become a PhysTEC member institution, go to www.ptec.org/join.

Learning Assistant Programs Expand

“See the Colorado Learning Assistant Program emulated and adapted around the country is heartwarming.”
—Valerie Otero, Professor of Science Education, University of Colorado at Boulder

In November 2011, PhysTEC and the University of Colorado at Boulder (CU-Boulder) co-sponsored the third Learning Assistant Workshop, which drew over 40 science and education faculty members from around the country. The workshop was hosted by science and education faculty at CU-Boulder, who launched its program in 2003 to improve student learning in the university’s science courses, and recruit future teachers. The program recruits talented undergraduates who work with faculty members to make large-enrollment courses more collaborative, student-centered, and interactive.

When CU-Boulder became a PhysTEC site in 2004, PhysTEC project leaders recognized that the Learning Assistant model was a method of recruiting teachers that could be replicated around the country. Nearly every funded site that has joined PhysTEC since 2004 has implemented a Learning Assistant program in some form, as have numerous unfunded member institutions. At many universities, these programs have spread from physics to other science and math departments, similar to what happened at Boulder.

“The Learning Assistant model is not just a method for recruiting teachers, it is also a catalyst for changing the culture of science departments,” said Monica Plisch, Associate Director of Education and Diversity at APS and PhysTEC project co-director.

Cody Sandifer, professor of science education and now PhysTEC project leader at Towson University, attended the first Learning Assistant workshop in 2007, and then launched a program at Towson. “The workshop was useful for me in understanding the components of a successful Learning Assistant program,” Sandifer said. “It allowed me to have access to people who were using Learning Assistants, and to ask them questions.”

Although the workshops focus on CU-Boulder’s program, this year’s schedule also included a poster session showcasing the programs of “experienced users and emulators”—universities that have adapted the model to local circumstances and needs. For instance, Learning Assistants at Florida International University use a curriculum adapted from the Modeling Instruction Program (see PhysTEC News, Fall 2010), while Seattle Pacific University Learning Assistants conduct mock “physics interviews” to develop inquiry-based teaching skills. “To see the Colorado Learning Assistant Program emulated and adapted around the country is heartwarming,” said Valerie Otero, a professor of science education at CU-Boulder, and one of the main driving forces behind the program. “Most physics and education faculty care a lot about their instruction, but at the same time they face challenges that pull at their time. The Learning Assistant program is a reasonable solution that allows faculty and institutions to make small- to large-scale change.”

At the innovations featured at this year’s workshop was the first video workshop created by a PhysTEC-funded project led by researchers from Seattle Pacific University and Florida International (see “PhysTEC Adds Four New Funded Sites,” page 1). There was also a planning session for participants to begin developing programs at their own institutions.

Learning Assistant workshops are open to all member institutions, whose representatives receive free workshop registration. For more information about the 2011 Learning Assistant workshops, see www.ptec.org/conferences/11a.
and will work to connect the project with AAPT as Associate Executive Officer, Dean of the Faculty, and Professor of to the project since January 2011. Prior to Washington University and the University from the University of California, Davis, of experience teaching high school physics of teacher professional development for Conference, and developing a new program Program, organizing the annual PhysTEC T

Bushraa Khatib, Education and Diversity Projects Coordinator, APS

For More Information
Designer: Krystal Ferguson
Editor: Gabriel Popkin

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The last few years have seen either the closure or the threat of closure of numerous physics departments in states including Texas, Louisiana, Missouri, Maine, Tennessee, North Carolina, and Idaho. These are not isolated incidents. Declining state budgets, a rising anti-intellectual stance in some corners, and real concerns about how public funds are spent all contribute to this issue. What’s more, the PhysTEC-supported National Task Force on Teacher Education in Physics has shown that regional universities and former teacher colleges are some of the largest producers of high school physics teachers. Sadly, many of these institutions are the ones being targeted for closure. In Texas, five undergraduate programs are slated to be closed this fall. Five additional programs were put on probation with the threat of closure if they cannot boost their graduation rates in the next few years. What is surprising, and a matter of deep concern, is that the state of Texas now requires all high school students to take physics in order to graduate, but is closing many of the departments that have the necessary experience of educating the teachers who serve those students. If all states were to apply the same criteria to their public institutions that Texas is using (closing all programs that graduated fewer than 5 majors per year averaged over the last 5 years), we would lose nearly half (49%) of the physics programs at public institutions in the US. (If we include private colleges, the number goes up to 60%). Included in this group are all of the undergraduate physics programs at public Historically Black Colleges and Universities. Reducing the number of programs that educate qualified teachers when there is already a shortfall is exactly the wrong way to prepare the next generation for the challenges of the 21st century. What can be done? Arguing that “we must have physics because we always have!” is not going to win the day. Instead, committing to educating more highly qualified high school physics teachers not only demonstrates community engagement, but can also be a means to increase enrollments, because these teachers are often the best recruiters to your physics program. In parallel, we can make the case to policy makers that closing departments endangers our ability to educate physics teachers—a sentiment that will likely resonate with constituents. You may not convince state bean counters that a department’s existence should continue based on precedent, but you have a much better chance to convince them that we are addressing the very real needs of educating the next generation. We must act responsibly: create sustainable, high-quality programs to educate future physics teachers; and advocate publicly about the importance of such programs.

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The Big Picture: Where Will the Teachers Come From?

By Theodore Hodapp

Sustainability is a word that gets used a lot these days, and it is important for PhysTEC, too—in fact, it is one of the project’s “key components,” which all funded sites are expected to address. So what does the concept of sustainability mean for a project like PhysTEC, which supports sites for a limited time and then expects them to maintain project elements on their own? “We expect sites to find ways to fund project components, but that is just the beginning of what we mean by sustainability,” says Hodapp. APS Director of Education and Diversity, and PhysTEC project director. “True sustainability means changing institutional attitudes so that teaching education becomes part of a physics department’s core mission.”

Since its inception in 2001, PhysTEC has funded 20 sites to improve their teacher preparation programs. The original sites received five years of funding; since 2004, funding has been for three years, with the option of splitting the last year of funding between two academic years. Though not all sites have succeeded in sustaining all project components post-funding, every site has sustained some project reforms, and many have expanded on their successes by institutionalizing programs, bringing in new funding, and involving other campus departments.

Model of Success
California Polytechnic State University, San Luis Obispo (Cal Poly), which received PhysTEC funding from 2003 to 2007, has funded one Teacher-in-Residence (TIR) since the site’s PhysTEC funding ended, and began funding a second TIR in 2010. TIRs are master teachers who work at universities in a variety of roles related to teacher preparation; they often return to the classroom after one or two years, but sometimes take permanent positions at a university. At Cal Poly, both TIRs work directly with middle and high school teaching candidates, supervising student teachers and teaching methods courses. They also team-teach physical science courses for future elementary teachers. Cal Poly provides a mixture of early teaching experiences for potential teachers, and continues to gradu ate two to three physics teachers per year, compared to less than one per year before PhysTEC funding. “My dean is very supportive of providing sabbaticals for high school teachers, and he realized that faculty may not be the best people to supervise students teachers,” says Chance Hoellwarth, physics professor, PhysTEC site leader, and co-director of the Center for Excellence in Science and Mathematics Education at Cal Poly. “Hiring TIRs frees up tenure-track faculty, gets us better student teacher supervision, and builds links within the community.”

“Having TIRs teach physical science courses for elementary teachers is an attractive funding model for department chairs and deans,” says Monica Pfisch, Associate Director of Education and Diversity at APS. “We have seen many sites create a hybrid role that allows the TIR to move into a partial faculty line in this way, while continuing to mentor and support future high school teachers.”

“It’s crucial that the project have broad support on campus, and, especially in this era of tight budgets, that all constituencies see it in their best interest to keep things going,” says Hodapp. “When faculty, admin istrators, and students are working together to improve education, that’s when lasting change happens.”

100K in 10

By Jacob Clark Blickenstaff

Inspired by President Obama’s 2011 State of the Union Address, the nonprofit groups Carnegie Corporation of New York, Opportunity Equation, and the NewSchools Venture Fund launched 100K in 10, a move ment, says Hodapp. APS Director of Education and Diversity at APS. “We have seen many sites create a hybrid role that allows the TIR to move into a partial faculty line in this way, while continuing to mentor and support future high school teachers.”

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