The PhysTEC project recently began funding five universities to develop their physics teacher education programs into national models. The new awardees are California State University, Long Beach; Chicago State University; Middle Tennessee State University; Towson University; and the University of California, Davis. Funding for the awardees began in Fall 2010 and will last for three years. The new sites will join the fourteen institutions that have already received money from the project since it began in 2001.

The winning institutions were selected during a two-stage review process that began with a pool of 52 applicants, which were evaluated based on their capacity for large increases in the number of physics teachers graduating from their programs, as well as strong departmental and institutional support for teacher preparation efforts. The review process also considered applicants’ ability to address recognized demographic and geographic shortages of qualified physics teachers. The panel that reviewed the applications included representatives of APS and AAPT as well as external reviewers.

California State University, Long Beach (CSULB) is a large comprehensive university located in the Los Angeles metropolitan area that prepares six percent of California’s secondary science teachers and is recognized as a Hispanic Serving Institution. Project leaders aim to increase the number of physics teachers the university graduates through active recruiting, early teaching experience opportunities, and continuing support structures for all levels of teachers. Participating students will be identified as “PhysTEC Scholars,” and will participate in a Learning Assistant program as well as courses designed to provide early teaching experiences and physics-specific teaching methodology.

Chicago State University (CSU) is a public minority-serving institution on the South Side of Chicago with a population of around 7,000 students. The CSU PhysTEC Program will build upon existing programs and activities that the department has in place for inservice and preservice teachers. Prospective teachers from CSU and nearby community colleges will be involved as learning assistants in physics courses that utilize innovative, research-based instructional approaches. These students will also conduct education research projects, and will participate in a “Teaching Immersion Institute.” The Institute will provide prospective teachers an opportunity to be engaged in the high school classroom early on, so that they can make an informed decision about entering the teaching field.

Middle Tennessee State University says, “PhysTEC will allow us to support Chicago Public Schools in increasing the diversity of its physics teacher workforce. Students at CSU have a strong desire to positively impact the community from which they come, and we believe pursuing a teaching career in a high-need area is one of the best ways to do so.”

Middle Tennessee State University (MTSU) serves over 25,000 students in the geographic center of Tennessee. Responding to the state’s increase in the number of science and math courses needed to graduate from high school, MTSU was recently named a replication site for UTeach, the national math and science teacher preparation program that began at the University of Texas. The Physics and Astronomy Department has already taken several steps toward becoming a leader in preparing teachers, including putting in place a requirement that all physics majors act as learning assistants, incorporating aspects of the Modeling Instruction Program into...
Five New Supported Sites

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its curriculum, and offering Robert Joyce Teacher Scholarships for future teachers. Site leaders have also initiated a marketing effort to attract more majors, and future teachers, to the department.

“Our university, with the help of PhysTEC, is well positioned to significantly increase the number of qualified physics teachers in the state of Tennessee,” says Ron Henderson, project leader at MTSU. “The Physics and Astronomy Department shares our president’s ambition of becoming the institution graduating the most science and math teachers in the state.”

Towson University is a public university in Maryland with a student population of just over 21,000. In an earlier project, Towson was funded by PhysTEC for four years (2004-2008) to reform the field of physics education. The department is in a strong position to begin its PhysTEC project, having already put in place a number of initiatives to increase student retention, including a freshman seminar, inquiry-based introductory courses, mentoring opportunities, a Learning Assistant program, and Noyce Scholarship opportunities.

The University of California, Davis (UC Davis) is a large, comprehensive public university located in the state’s Central Valley, a region where highly qualified teachers of physical science are in especially short supply.

The campus has established a Mathematics and Science Teaching (MAST) program as part of the statewide CalTeach Science and Mathematics Initiative. This program, which serves 400-500 students per year, has established a protocol for recruiting and advising prospective teachers, and uses master teachers to provide students with early teaching experiences; however, few physics teachers graduate from the program. The UC Davis Department of Physics has carried out a number of research-based reforms on its undergraduate curriculum, and is also planning to add a teaching track to its physics major to capitalize on interest among its students in teaching.

Project leaders were impressed with the quality of applications overall, and in particular were pleased to receive a number of applications from minority-serving institutions. “We are excited that two of our new sites serve large minority populations that traditionally have not had access to a high-quality physics education,” says Theodore Hodapp, Director of Education and Diversity at APS, as well as the PhysTEC project. “In addition, several of the new sites will benefit from existing large-scale efforts to prepare more science and math teachers, which will magnify the impact of their efforts.”

PhysTEC Conference Focuses on Diversity

T he sixth annual PhysTEC Conference took place in Washington, DC on February 12th and 13th. The conference is the largest gathering in the country dedicated to physics teacher preparation, and for the fourth straight year attracted over 100 participants.

The theme of this year’s conference was “Diversity in Physics Education: Preparing Teachers for the 21st Century.” Some session leaders unpacked the concept of diversity by looking at school settings. In two panel discussions on Friday that focused on issues in urban and minority-serving schools, participants got a chance to hear the perspectives of young teachers in urban classrooms as well as faculty members at urban institutions. Another workshop led by Duane Merrell of Brigham Young University tackled the very different challenges of rural physics education.

Other conference sessions focused on the persistent achievement gap between richer and poorer students, as well as between underserved minority students and the rest of the US population. A panel of faculty and teachers discussed the preparation not just of teachers but also of teacher leaders who work with such issues by becoming change agents in the educational system.

Michael Marder, a physics professor at the University of Texas in Austin co-directs the University’s UTeach Program, presented data on the achievement gap in Texas, a state that often sets national standards in education.

Apply to Be a PhysTEC Supported Site

PhysTEC anticipates funding additional sites through the 2012 academic year, with requests for proposals each fall. All applicants must be PhysTEC Member Institutions, and the best way to learn about future funding opportunities is to join. Go to www.PTEC.org/join for more information.

To view past years’ requests for proposals, go to: www.PTEC.org/request

Teacher Educators Absorb Pedagogical Content Knowledge

I n April 2010, twenty physics faculty members and educators from around the country traveled to Rutgers University in New Brunswick, New Jersey for a 1.5-day PhysTEC topical workshop on Pedagogical Content Knowledge. PCK has been described as the unique combination of content and pedagogical knowledge that is essential to the teaching profession. It includes knowledge of students’ difficulties and prior conceptions as well as content-specific instructional strategies and assessment methods.

The project held a workshop at Rutgers because of the work of Eugenia Etkina, a science education professor who has created one of the few master’s programs that focus specifically on physics and physical science teaching. Etkina’s program includes several courses specifically designed to develop teachers’ physics PCK. Workshop participants met students currently in the program and graduates who are now teaching, and attended mock classes as well as actual classes in the program.

Most workshop participants said they planned to implement aspects of what they learned in their own programs. One participant wrote afterward, “Interacting with the students and seeing them ‘in action’ during the afternoon lab activity and then hearing the testimonials that evening was very powerful. Seeing it on paper is one thing, but witnessing it in action made it come alive.”

Another said, “It is clear that Eugenia has PCK for teaching PCK!” The Spring 2008 edition of PhysTEC News included a profile of the Rutgers program as well as a description of a PhysTEC topical workshop on the University of Colorado’s Learning Assistant program.

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the science and engineering labor market, stating that “An effective precollege physics education is indispensable in preparing US students for global competition.” To address these challenges, the authors stressed the importance of “every high school student having the opportunity to learn physics with a qualified teacher.”

Stamatis Vokos, professor of physics at Seattle Pacific University and the task force’s chair, said that while the situation is grim, there is potential for improvement. “We hope that our report will serve as a wake-up call for universities, foundations, and government agencies around the country. The problem is very serious, and any significant progress will require a focused and coordinated effort from all corners.”

The task force plans to distribute its full report to every physics department
Alderman). For the spring semester, Overhiser developed the Ultimate Goal is for the UTA program to be an entry-Modeling Instruction Program, which is a very high-regarded, research-based professional development opportunity. One of the things kids do and say.” I feel like I’m genuinely making a difference, and I really like that.

Profiles in Teaching: Mary Lee McJimsey

Spend a little time in Mary Lee McJimsey’s classroom and you will realize she is not your typical physics teacher. Rarely does she stand at the board and deliver a long lecture; more likely she will ask her students to discuss a physical situation in groups and report their results on white boards, or do a hands-on lab in which the end result is not known. As a year-end project, she may ask her students to build a working musical instrument using the physics principles they have learned.

McJimsey decided to become a teacher while she was studying physics at Cal Poly in San Luis Obispo, a PhysTEC funded site. She was doing research at the time, and found that “every day I came in and did exactly the same thing.” She was inspired to pursue a teaching career by her Teacher-In-Residence, Nancy Stauch. McJimsey has also presented at a National Science Teachers Association of Mary Lee McJimsey. McJimsey has also presented at a National Science Teachers Association of New York State (STANYS), an organization of several thousand members. This post comes as the culmination of a long commitment to professional development that has included being a middle school science mentor, a STANYS board member, and a workshop leader for the Cornell Institute of Physics Teachers— a position that has taken him to Puerto Rico, Singapore, and Doha, Qatar, among other places. Between the presidency and teaching, Overhiser says he has two full-time jobs, but he still manages to get out and play tuba twice a month with his dixieland jazz band. “Luckily, I only need to know how to play two notes,” he says, “oomp and pah.”

“Now I can’t imagine teaching anything besides physics,” Overhiser says. “With physics you get the best toys in the school. Physics has fewer abstract concepts for the students than the other sciences, and you’re not doing dishes or memorizing vocabulary words all the time—you’re just laying their world in front of them and having them take notice.”

Profiles in Teaching: Belinda Hendley

A few years ago, Belinda Hendley could have been your poster child for the “non-traditional student.” Before beginning undergraduate courses at Crowder College in Missouri in 2003, Hendley had spent three years playing music at Renaissance fairs, worked 20 years in the gem industry—including eight as a jewelry appraiser—and raised a child. In fact, she decided to attend college after her daughter had gone off to the University of Texas, because she realized, “I missed my kid, and all her friends. We’d talk on the phone at night and say, ‘You know, this is hard!’”

Like many before her, Hendley was turned on to the idea of teaching physics by Gay Stewart, a physics professor at the University of Arkansas who is a nationally recognized leader in physics teacher preparation. Hendley says, “I read Gay Stewart’s website about changing the way physics is taught, and I thought wow, this really clicks with me. I had always liked science, but in high school I was told I had no math capability. Gay is committed to making physics accessible to everyone, and I found that incredibly inspiring.”

Hendley transferred to Arkansas to complete her degree, and became one of the university’s first class of Noyce Scholars, which helped her complete a Master’s in Teaching in 2009. The Noyce Scholarship commits future teachers to two years of service in a high-need school district for every year of scholarship support. Through the Noyce program, Hendley also had the opportunity to participate in a plenary panel at the Noyce Conference, which brings together several hundred project leaders and teachers every summer.

After graduating, Hendley went to teach at Malvern High School in Arkansas, where she says two-thirds of the students live in poverty. Last year she taught chemistry only; this year she is teaching physics for the first time. “Many of these students have never had the opportunity to do labs with decent equipment before,” says Hendley. “This year I’m using Vernier LabQuest with sensors and TI-84 calculators, so my physics students are learning as much about the tools as the physics. I think this will prepare them well for college ahead.

“I’m excited to give them this opportunity. I feel like I’m genuinely making a difference, and I really like that.”
Nowadays, the buzzword of choice when it comes to education, it is also an idea constantly in need of a rubric. Accountability has become paramount when we consider where our tax dollars are spent, and where the nation’s students learn. But, like many complex concepts, quality is not easy either to define or measure—perhaps you know it when you see it.

Looking at this issue from the perspective of preparing physics teachers—or any other kind of teacher—we should keep in mind that our end goal is to help students learn, and quality will ultimately be measured by the extent to which this happens. Teachers are one of the key ingredients in producing better learning, but they are not independent of their environment. It becomes easy to point a finger at teachers and claim they are not meeting “standards,” but we may want to ask whether we are providing the necessary preparation and support for these teachers. Some critical components of this include a teacher’s mastery of content and knowledge of how to teach, but equally important is the environment in which a teacher finds him- or herself, which may either support or fail to support his or her role as a professional.

PhysTEC has been concerned primarily with the first two; ensuring that all new teachers have a major or minor in physics, and providing future teachers a well-designed teacher education program of study. The third issue, however, is more elusive. Teacher education programs can help student teachers find schools that support interactive, student-centered learning environments, provide attention and appropriate interventions, and offer professional development opportunities. But once students leave these more structured environments and take their jobs, they may find themselves in schools that lack these structures, or worse, directly force teachers to teach in a way they know is ineffective. All teachers need ongoing professional development in the discipline they are teaching, and they need a supportive environment that enables their natural creativity to help them to find interest and excitement in students’ learning.

As we consider measures of quality, we need to find ways of assessing teachers’ environment and their access to professional development. National programs like PhysTEC, UTeach, and others that prepare new teachers implement this type of assessment through master teachers and direct contact with schools. We must be sure that as universities take up the task of educating physics teachers, they realize their investments are not only in preparation, but also a commitment to providing professional development for teachers as they continue in their careers. This might take the shape of offering research-validated curricula like Modeling Instruction or Tutorials in Introductory Physics for inservice teachers; or of providing linkages between universities and schools to see the challenges faced by teachers and find resources—tangible or intangible—that can make a difference in helping students learn.

Despite the fact that quality remains a difficult parameter to measure, or even define, there are clearly identifiable steps we can take to help improve the physics experience for our nation’s students.

What’s in an Acronym?

The Physics Teacher Education Coalition has long had a bit of an acronym challenge. The original acronym PhysTEC came into being in 2000, and has been praised for evoking the discipline of physics when spoken. Traditionally, PhysTEC has referred to the institutions that were funded under the project to develop their teacher education programs; as of this writing there have been 18 PhysTEC-funded institutions (one of them—Towson University—twice; see front page article), with plans to add more over the next three years.

In 2003, the project began an effort to recruit a broader coalition that would include the funded sites and also other universities, colleges, and labs that were doing work in preservice teacher education. This coalition became known as PTEC, and got its own website (PTEC.org), conferences, and digital library. To date there are nearly 200 Coalition member institutions—a number that might have seemed almost unachievable when the idea of the Coalition was first formed.

Unfortunately, but perhaps predictably, the existence of two acronyms for one set of words has led to continual confusion. Thus, the project has decided to be known by “PhysTEC” only, and to phase out the acronym “PTEC.” The blue-and-yellow logo (which has been used for PTEC) will represent the project; funded sites will be called PhysTEC Supporting Sites; and PTEC members will now be PhysTEC Member Institutions. The most significant change will be the merging of the current PhysTEC and PTEC websites, which we hope to have complete by early 2011.

The payoff will be a clearer, crisper, and more coherent presentation for the project. So for the next months we will have to ask you to, as they say, pardon our dust.

PhysTEC Noyce Second Year

The Noyce Teacher Education Program was established by the National Science Foundation (NSF) in 2002 as the nation’s first and only program designed to increase the number of highly qualified secondary school mathematics and science teachers. The Noyce Program provides scholarships, as well as support for their preparation, to student teachers who are preparing to teach in high-need school districts who serve undergraduate institutions of higher education. The Noyce program began in 2002 in 18 states; over the next 5 years, the number of states participating increased to 42. In 2007, the Noyce program was expanded to include courses in engineering and computer science, and the number of states funded was increased to 57. This year, 180 institutions received Noyce funding.

The NSF is proud to announce the 2011 Noyce scholars and their advisors. Scholarship recipients will receive up to $8000 per year for up to three years, with a requirement that they teach for three additional years in high-need school districts. Scholarships are awarded to institutions of higher education; the recipients will work closely with their advisors to ensure the highest quality of preparation. In addition, the directors of the grantees will engage in collaborative activities with their state’s Teacher Preparation Institutes, including the development of a common set of competencies for all Noyce scholars.

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