The Physics Teacher Education Coalition is a joint American Physical Society and American Association of Physics Teachers effort, with National Science Foundation and APS Campaign for the 21st Century funding.
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The Physics Teacher Education Coalition is a joint effort of the American Physical Society and the American Association of Physics Teachers, with funding from the National Science Foundation and the APS Campaign for the 21st Century.
PhysTEC Plenary Sessions

Friday, February 9

(P1) Opening Plenary with Breakfast
8:00 AM - 10:00 AM - Breakfast service begins at 7:30
Keynote Speaker: Monica Plisch, American Physical Society

Monica Plisch is Director of Education and Diversity for the American Physical Society (APS), where she leads a number of projects, including PhysTEC. Her efforts to increase diversity and inclusion in physics graduate education include the Inclusive Graduate Education Network (IGEN), a NSF INCLUDES pilot project. She led the development of the Physics Research Mentor Training curriculum and leads workshops for research mentors. Her department recently launched the National Mentoring Community and serves as the administrative home of the Conferences for Undergraduate Women in Physics (CUWIP). Dr. Plisch served as the APS staff liaison to the ad hoc Committee on LGBT issues. She completed her doctoral studies in physics at Cornell and her undergraduate degree in engineering physics at the University of Illinois in Urbana-Champaign.

(P2) Plenary with Lunch
1:00 PM - 2:30 PM
Integrated Elements of Action Plan Leading to Institutional Change
Keynote Speaker: Charles Henderson, Western Michigan University

Researchers in undergraduate STEM education have shown that many aspects of teaching can be systematically studied and improved using scientific methods. There is now a convincing body of research showing that a wide variety of innovative programs and practices can consistently improve student learning and other desired outcomes when compared to traditional programs and practices. Like most fields, though, there is a substantial gap between the research-based knowledge about effective instruction and actual practices. Change agents in higher education typically attempt to bridge this gap by developing stronger evidence supporting the efficacy of innovative practices and telling more people about this evidence. An argument will be presented that this type of change strategy, focused on convincing individuals through rational arguments, is not sufficient to bring about large scale change. This will introduce a framework of four core change stories and lead to a discussion on how institution-based change agents can align change tactics within a larger change strategy to improve their chances of success.

Charles Henderson is a Professor at Western Michigan University (WMU), with a joint appointment between the Physics Department and the WMU Mallinson Institute for Science Education. He is the co-founder and co-director of the WMU Center for Research on Instructional Change in Postsecondary Education. His research program focuses on understanding and promoting instructional change in higher education, with an emphasis on improving undergraduate STEM instruction. Dr. Henderson is the senior editor for the journal Physical Review: Physics Education Research and has served on two National Academy of Sciences Committees.

PhysTEC Plenary Sessions

Saturday, February 10

(P3) Plenary with Breakfast
8:00 AM - 9:00 AM
Get the Facts Out: Changing the Conversation Around STEM Teacher Recruitment
Keynote Speaker: Wendy Adams, Colorado School of Mines

The new PTaP (Perceptions of Teaching as a Profession) survey and the recent APS POPA (Panel on Public Affairs) report has found that there are strongly held beliefs about the teaching profession, many of which are misperceptions. These misperceptions discourage students from exploring teaching as a viable career option. The major misperceptions that preclude consideration of teaching as a career are: (1) the inaccurate belief that the salary gap between teaching, the private sector and government is very wide; and (2) inaccurate beliefs about tangible and intangible benefits of the profession. The POPA report has also found that discussing teaching as a career option correlates with the number of teaching majors in a department. To encourage discussion about teaching as a profession and change these misperceptions, we formed a partnership among APS, the American Association of Physics Teachers, the American Chemical Society, the Mathematical Association of America, 100Kin10, a behavioral change researcher, a neuroscience messaging expert, and several colleges and universities to develop a joint national campaign effort called Get the Facts Out. This campaign provides resources for faculty to use when discussing math or science teaching as a profession with STEM undergraduates.

Wendy Adams is a Research Associate Professor of Physics at the Colorado School of Mines. A physics education researcher by training, she earned her Ph.D. from the University of Colorado, Boulder. Dr. Adams’ research focuses on formative assessment and curriculum design. She has developed assessments of student perceptions of physics, of learning physics, and about teaching as a profession. Dr. Adams is the chair of the Committee for Teacher Preparation at Mines and was instrumental in the development of the Mines - University of Northern Colorado (UNC) partnership.

(P4) Closing PhysTEC Session
12:00 PM - 12:15 PM
Monica Plisch, American Physical Society
Building Thriving Undergraduate Physics Programs Plenary Sessions

Saturday, February 10

1:00 PM - 2:00 PM

Opening Plenary
Phys21: Preparing Physics Students for 21st Century Careers

Keynote Speaker: Laurie McNeil, University of North Carolina

They Won’t All Grow Up To Be You: Preparing Students for Diverse Careers

The joint Task Force on Undergraduate Physics Programs (J-TUPP) was formed in response to a growing awareness in the physics community that undergraduate physics majors pursue a wide range of careers after graduation, with very few ending up employed as physics professors. The task force was charged to identify the skills and knowledge that undergraduate physics degree holders should possess to be well prepared for a diverse set of careers, and to provide guidance on how physics could revise the undergraduate curriculum to improve the education of a diverse student population. The report (issued in October 2016) is the result of the task force's reviews of employment data, surveys of employers, and reports generated by other disciplines, as well as meetings with physicists in selected industries and interviews with recent physics graduates employed in the private sector. As part of the study, exemplary programs that provide models of how physics departments can ensure that all of their students are well prepared to pursue a wide range of career paths were identified. A summary and illustration of the findings and recommendations contained in the task force's report will be presented.

Laurie McNeil is the Bernard Gray Distinguished Professor of Physics at the University of North Carolina at Chapel Hill, where she has worked since 1984. She received her Ph.D. in physics (experimental condensed matter) at the University of Illinois at Urbana-Champaign. With the support of a PhysTEC grant, she founded a program at UNC for physics majors to become licensed as high school physics teachers. She led the transformation of all of her department’s introductory physics courses to a lecture/studio model incorporating research-validated active engagement techniques. She served as co-Chair of the APS/AAPT joint Task Force on Undergraduate Physics Programs, and is currently Chair-Elect of the APS Forum on Education.

Sunday, February 11

8:15 AM - 9:00 AM

Plenary with Breakfast
Learning Assistant Programs: Supporting Learning, Creating Community, Building Physics Identity

Keynote Speaker: Eleanor Close, Texas State University - San Marcos

The Learning Assistant Model transforms courses and departments by supporting implementation of research-based, interactive instructional strategies. Over the past decade, many studies have found that LAs positively impact student learning. The LAs themselves also benefit: we have found that in addition to becoming more confident and competent in physics, LAs perceive themselves to have increased competence in communication and a stronger sense of belonging to a supportive and collaborative community of peers, near-peers, and faculty. LAs at Texas State have described changing their ways of learning and of being students, both within and beyond physics, as a result of their LA experience. The majority of our majors now serves as LAs for at least one semester. This presentation will describe the LA model, implementation of the model at Texas State, including a brief discussion of funding and logistical considerations; and themes of identity transformation emerging from our research on the impact of program participation.

Eleanor Close is an Assistant Professor of Physics and a physics education researcher. She directs the TSTX Physics Learning Assistant Program and co-organizes regional and national workshops through the National Learning Assistant Alliance. Her research interests include physics teacher preparation and professional development, physics teacher identity, situated learning and identity development through communities of practice, and embodied cognition. She received her Physics M.S. from the University of Washington and her Ed.D. from Seattle Pacific University. Between receiving her B.A. in Physics from Bryn Mawr College and starting graduate school, she taught high school physics and physical science for three years in rural North Carolina, where she became science department chair by seniority after teaching for five months.

PhysTEC Workshops & Panels

Friday, February 9

10:00 AM - 11:15 AM
WORKSHOP 1A (S, F)
SPS Careers Toolbox: Career Preparation for Undergraduates and Advisers
Brad Conrad, American Institute of Physics

Physics students have an exceptionally broad range of career options, the most common of which is the private sector. Preparing students for these options, including teaching careers, at the undergraduate level is vital to student recruitment, retention, and department health. This interactive workshop will outline the resources available, including the updated Careers Toolbox, discuss department best practices, and provide tools for incorporation into the curriculum. Implementation examples and course material will be included, and the implications of department health will be discussed.

WORKSHOP 1B (CLOSED - F)
Fellows Working Group
Monica Pilsch, American Physical Society

This workshop is open to PhysTEC Fellows only. This workshop will provide professional development and networking opportunities for the new cohort of PhysTEC Fellows. Participants will gain project knowledge and further develop their plans for their teacher preparation programs. The PhysTEC Fellows program provides access to national physics teacher preparation leaders, helps Fellows to become more visible leaders in the community, and increases competitiveness for future funding opportunities.

WORKSHOP 1C (T)
Next Generation Physical Science and Everyday Thinking (Next Gen PET)
Paul Miller, West Virginia University
Ed Price, California State University - San Marcos
Stephen Robinson, Tennessee Tech University

This workshop provides an overview of the Next Generation Physical Science and Everyday Thinking (Next Gen PET) curriculum materials, developed specifically for use in physical science courses for prospective elementary teachers. The Next Gen PET materials consist of both in-class activities and online homework extensions that align with the physical science core ideas, science and engineering practices and crosscutting concepts of the Next Generation Science Standards. In addition, supplementary sets of activities are available to help students make explicit connections between their own learning and the teaching and learning of elementary children, and to address the important skill of designing and carrying out investigations. In this workshop we will discuss three different implementation modes for Next Gen PET (studio, large-class, and hybrid) and look at some classroom video clips that illustrate the structure of a Next Gen PET class. A brief overview will also be given of an adaptation of the pedagogical structure for an algebra-based physics course sequence.

Codes for session tracks:
S = Recommended for supported sites and experienced attendees
F = Recommended for PhysTEC Fellows and new attendees
T = Recommended for TRs and other teachers
PhysTEC Workshops & Panels

11:45 AM - 1:00 PM
WORKSHOP 2A (CLOSED - S, T)
Supported Sites Meeting
Monica Plisch, American Physical Society
This workshop is open to PhysTEC supported sites only. This workshop will provide professional development and networking opportunities for faculty and teachers-in-residence from PhysTEC supported sites. Content will address the PhysTEC key components for developing and promoting excellence in physics and physical science teacher preparation.

WORKSHOP 2B (F)
How to Build an LA Program
Chandra Turpen, University of Maryland, College Park
This workshop will introduce the Learning Assistant (LA) Model. The LA Model uses the transformation of STEM courses as a mechanism for improving the quality of STEM education for all undergraduates. The transformation of courses can be accomplished in many different ways, but often involves creating environments in which students can interact with one another, engage in collaborative problem solving, and articulate and defend their ideas. To accomplish this, LAs are hired to facilitate small-group interaction in these courses. This model offers unique affordances for recruiting and preparing physics teachers. This workshop will focus on what is involved in building an LA program.

WORKSHOP 2C (101, S, T)
Chair's Guide to Establishing a Teacher Preparation Program
Ted Hodapp, American Physical Society
What are the critical steps needed to establish, or strengthen a high school physics teacher education program? Over the past five years, the American Physical Society has been developing a guide for department chairs to help them establish and build components of excellent undergraduate physics programs. The document will be partially released in 2018, with completion of all initial components by 2019 including a guide to program assessment. In this workshop we will briefly review the section on teacher preparation, and consider how to use it to improve components of such programs, as well as to use the guide more broadly to build excellent undergraduate physics programs. The workshop will allow time to build departmental action and assessment plans that can be used more broadly in either regional accreditation or external program review – an exercise required of nearly all departments on the 5-10 year timeframe. While the guide is written for chairs, anyone can learn from the action-oriented recommendations.

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2:45 PM - 4:00 PM
WORKSHOP 3A (S, F)
Leadership Development
Jim Gentile, Hope College
Jim Gentile is the former Dean for the Natural & Applied Sciences at Hope College and has long been a leader on the integration of science research and higher education. As a founding member of the Project Kaleidoscope (PKAL) science education initiative and in other roles, he has developed and identified a number of strategies for developing leadership in the sciences. In this session, Jim will lead an interactive discussion of leadership development as it relates to physics teacher preparation.

WORKSHOP 3B (F)
Streamlined Certification Pathways
Gay and John Stewart, West Virginia University
Each state has different pathways to licensure, with state and national requirements that can be quite complicated. Some of the understanding of how these systems work can allow physics departments to engage with their colleagues in the licensure-granting unit on campus to provide the most efficient path to licensure possible for their students who choose to become teachers. The presenters have engaged in this process reasonably successfully in two states. Participants should come prepared with what they can find on the requirements in their state and at their institution (not always the same thing) or bring an internet connected device if they would like to leave with a start on their campus conversations.

WORKSHOP 3C (T)
Share-a-thon
Trevor Smith, Rowan University
Do you want to get a new idea for preparing physics teachers that you could implement right away? Do you have something that worked really well for you and could be used elsewhere? Come to PhysTEC’s first Share-a-Thon session! In this workshop, participants will share successful tips and ideas for preparing physics teachers that could be generalized to be used anywhere. Participants will learn about multiple things they could do to make a big impact in physics teacher preparation at their own institutions. Come to share ideas or get some new ones. If you’re interested in presenting your idea, please contact Trevor Smith: smithtr@rowan.edu.

4:00 PM - 6:00 PM
Poster Session with refreshments
See poster titles on page 15
PhysTEC Workshops & Panels

Saturday, February 10

9:15 AM - 10:30 AM
WORKSHOP 4A (T)
Supporting Teachers to Encourage the Pursuit of Undergraduate Physics for Women (STEP UP 4 Women)
Katharine Woodle, American Physical Society
While one-half of the students taking physics in high school are women, only one-fifth of the students interested in physics majors in college are women. How can you help high school teachers change this pattern? Physics education researchers have developed two high school physics class lessons that have been shown to increase the interest in high school women in physics careers, join us to provide critical feedback on recruiting strategies and how you can help motivate teachers to join this campaign. Learn more at stepup4women.org.

WORKSHOP 4B (F)
PhysTEC Comprehensive RFP
Monica Plisch, American Physical Society
This workshop will provide information on the request for proposals to fund up to four new comprehensive sites for a maximum of $300K over three years to address all PhysTEC key components. This funding opportunity and workshop is targeted at institutions that show strong promise to build and sustain thriving teacher education programs with the objective of preparing five or more highly qualified physics teachers per year.

WORKSHOP 4C (T)
Building a Teacher Community
Alma Robinson, Virginia Tech
Panelists from programs that have strong local physics teacher communities will share their experiences on how to build, sustain, and leverage those communities. Each panelist will describe the origins of their teacher network, the activities that keep the network thriving, and the solutions they have developed to overcome any challenges they've encountered. The floor will then be open to questions from the audience.

10:45 AM - 12:00 PM
WORKSHOP 5A (S, F)
Self-assessment with the PTEPA
Stephanie Chasteen, Chasteen Educational Consulting
This workshop will give a hands-on introduction to a new instrument developed through PhysTEC: the Physics Teacher Education Program Assessment (PTEPA). The PTEPA is a detailed rubric, which enables characterization of what different teacher programs do - such as funding, leadership, collaboration, student recruitment, physics pedagogy, mentoring, and assessment - and uses those results to generate ideas. Be among the first to explore the instrument, which is being released in its beta version at this meeting. We will introduce the instrument, help you learn how to use it, and discuss how you might use the results to improve your program.

WORKSHOP 5B (F)
An Overview of the NSF Robert Noyce Teacher Scholarship Program Plus Additional Funding Opportunities
Kathleen Bergin, National Science Foundation
The Division of Undergraduate Education at the National Science Foundation promotes excellence in undergraduate science, technology, engineering and mathematics (STEM) education for all students and provides opportunities for faculty to obtain funding for projects that address current challenges and opportunities in undergraduate STEM education. The Robert Noyce Teacher Scholarship Program responds to the critical need for K-12 science and mathematics teachers with disciplinary content depth by recruiting and preparing talented STEM majors and professionals to become teachers. Noyce investments support the development of new models for preparing teachers and the expansion of the nation’s capacity to recruit, prepare and retain STEM teachers in high-need districts. The Noyce program also supports educational research related to pre-service STEM teacher education. This presentation will offer an overview of the Noyce Program, including identifying common strengths and weaknesses for Noyce proposals. In addition, information related to the Improving Undergraduate STEM Education (IUSE) and the EHR Core Research program (ECR) related to improving teacher education will also be briefly explored.

WORKSHOP 5C (S, T)
TIR Working Group
Jon Anderson, Centennial High School, Circle Pines, Minnesota
PhysTEC has identified a Teacher-in-Residence (TIR) as one of the key components that is shared by successful teacher preparation programs across the country. Originally, PhysTEC envisioned the TIR position to be a one-year, full-time appointment of an accomplished, in-service, physics teacher. The TIR would fill multiple roles including recruiter, advisor, instructor, course and curriculum developer, LATEA leader, mentor, professional community leader, program coordinator, professional development facilitator, ambassador to school of Education, and ambassador to school districts. As PhysTEC has grown and evolved, so has the role of the TIR. In this session, TIRs from several different PhysTEC sites will discuss their own experiences and how these experiences have helped shape their unique role as TIR at their institution. This discussion will include TIR successes and challenges at each site, the integration of a TIR into an existing physics teacher preparation program, TIR job responsibilities, and possible strategies for sustaining the TIR position at an institution.

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T = Recommended for TIRs and other teachers
Building Thriving Undergraduate Physics Programs Sessions

**Saturday, February 10**

1:00 PM - 2:00 PM
**Opening Plenary**  
**Phys21: Preparing Physics Students for 21st Century Careers**  
Laurie McNeil  
See page 6

2:00 PM - 2:30 PM
**Break and set up posters**

2:30 PM - 3:30 PM
**Planning Session 1: Current Status and Problem Identification**  
In these breakout sessions that will happen throughout the workshop, department teams will meet to assess needs and develop concrete plans.

3:30 PM - 4:00 PM
**Case Study: Developing a Thriving Physics Program at Howard University**  
Quinton L. Williams, Howard University  
Quinton L. Williams is Chair and Professor of Physics at Howard University, and former professor at Jackson State University. For this case study, he will discuss his experience with rebuilding and developing thriving physics programs.

4:00 PM - 4:30 PM
**Case Study: PhysTEC@FIU: A Decade Later #AChangedCampus**  
Laird Kramer, Florida International University  
FIU’s PhysTEC project launched in 2007. The movement sparked by PhysTEC has grown to 320 LAs impacting the learning of 14,000 student enrollments each semester, a dozen active rooms with over 1,000 seats, 10 DBER faculty across 6 departments, the FIUteach program and the STEM Transformation Institute dedicated to promoting research and instructional change across the institution. This case study will focus on essential elements of FIU’s pathway over the past decade.

4:30 PM - 6:00 PM
**Poster Session with refreshments**

6:30 PM
**Dinner and Planning Session 2: Building Enrollments**  
(individually organized)

Building Thriving Undergraduate Physics Programs Sessions

**Sunday, February 11**

8:15 AM - 9:00 AM—Breakfast service begins at 7:30
**Plenary with Breakfast**  
Keynote Speaker: Eleanor Close  
Learning Assistant Programs: Supporting Learning, Creating Community, Building Physics Identity  
See page 6

9:00 AM - 9:30 AM
**Case Study: Assessment in a Thriving Physics Program**  
Kathryn Svinarich, Kettering University  
There are four simple assessment questions: What are you trying to do? How do you define success? How do you know what is working? Are you making and documenting your changes? The best assessment practices are student-centered. Building or maintaining a thriving physics program necessitates robust assessment at several levels: course, program, and university levels. During this workshop session, we will discuss how an assessment mindset helps build a thriving physics program. Robust assessment processes helped both the Applied Physics and Engineering Physics programs at Kettering University become ABET accredited in 2012. The Applied Physics program is the first and only ABET accredited Applied Physics program in the world.

9:30 AM - 10:00 AM
**Infomercials: Resources to Help Build Thriving Programs**

10:30 AM - 11:30 AM
**Planning Session 3: Developing Departmental Plans**

11:30 AM - 12:15 PM
**Lunch**

12:15 PM - 12:45 PM
**Case Study: Undergraduate Research - A Critical Tool in Building a Thriving Undergraduate Physics Program**  
John Mateja, Barry Goldwater Foundation  
A thriving undergraduate physics program depends on many things, not the least of which are building a sense of community within your department and ensuring high visibility for your program outside your department. Engaging undergraduates in research can help your department achieve these and other important objectives, attracting greater number of highly-motivated students to your program. Among others, the discussion will cover topics such as: the right time to engage undergraduate in research, how to build a nationally visible research program that can help faculty attract external research funding, and the role nationally competitive scholarships in building a successful program.
Building Thriving Undergraduate Physics Programs Schedule

**PhysTEC Poster Session and Reception**

*Friday 4:00 – 6:00 PM Rooms A & B*

1. **Careers Inclusion in Undergraduate Courses** - Brad Conrad (AIP/SPS)
2. **Impact of Learning Assistant Model on Undergraduate Physics Learning Assistant and Faculty Dispositions** - Issam Abi El Mona & Trevor Smith (Rowan University)
3. **RAPT: Rowan Area Physics Teachers** - Bryan Callow (Rowan University / Lindenwald High School) & Reiner Schmidt (Rowan University / Glassboro High School)
4. **College Physics Students’ Mathematical Difficulties and their Implications for High School Physics Teachers** - David E. Meltzer & Dakota H. King (Arizona State University)
5. **Impacts of LA Programs on the Success of Nontraditional Students: A Case Study** - Patrick Chestnut (Rowan University)
6. **Adapting the Next Generation Physical Science and Everyday Thinking Curriculum for a Lecture-Laboratory Format** - Paul Miller & John Stewart (West Virginia University)
7. **District Partnerships, LAs, and coding** - Addressing the STEM Teacher Shortage in Florida - Adam Lamee (University of Central Florida)
8. **Training Physics Teachers at Randolph-Macon College** - Rachele Dominguez & Dianna Yesbeck (Randolph-Macon College)

**Building Thriving Undergraduate Physics Programs Poster Session and Reception**

*Saturday 4:30 – 6:00 PM Rooms A & B*

1. **Sustaining Thriving Undergraduate Physics Program** - Peter Sheldon, Sarah Sojka, Tisha Colvin, Peggy Schimmoeller, Katrin Schenk (Randolph College)
2. **Success of the Mines Physics Department: Over a Decade of Effort** - H. Vincent Kuo (Colorado School of Mines)
3. **A Future for the Physics Program at Marshall University** - Maria Hamilton, Que Huong Nguyen, Sean McBride (Marshall University)
4. **Physics Department at Manhattan College** - Lubna Tumeh (Manhattan College)
5. **Physics Innovation and Entrepreneurship (PIE) Education in the First Year Physics Courses** - Douglas Petkie & Jason Deibel (Wright State University)
6. **Preparing our Students for Downstream Courses: How does Modifying the Curriculum Impact Student Learning?** - Sara Legresley Rush, Michael Murray, Chris Bruner, Chris Fischer (University of Kansas)
7. **Building Career Preparation into Undergraduate Programs** - Brad Conrad (AIP/SPS)
8. **The GCC Physics Department** - James Clem (Grove City College)
9. **Fix the Roof While the Sun is Shining** - Earl Blodgett (University of Wisconsin - River Falls)
10. **AIP Task Force to Eliminate African American Underrepresentation in Undergraduate Physics and Astronomy** - Arlene Modeste Knowles & Bo Hammer (AIP)
11. **The Physics Program at the University of Tennessee-Chattanooga** - Joshua Hamblen (University of Tennessee-Chattanooga)
12. **The Physics Program at Randolph-Macon College** - Rachel Dominguez, James Mcleskey, George Spagna & Deonna Woolard (Randolph-Macon College)
13. **Using ALPaCA Grading for Course Assessment** - Chris Fisher, Sarah Legresley Rush & Jennifer Delgado (University of Kansas)