

# How to help physics teachers who don't know physics

June 25 2019, by Laura Arenschild



Credit: CC0 Public Domain

A shortage of high school physics teachers has led to teachers with little-to-no physics training taking over physics classrooms, causing additional stress and job dissatisfaction for those teachers—and a difficult learning

experience for their students.

But new research indicates that focused physics [professional development](#) for teachers—even those who have no prior physics [training](#)—can lead to better experiences for both students and teachers, and can improve students' understanding of physics concepts.

The study, published last month in the *Journal of Science Teacher Education*, followed two groups of advanced-placement science teachers as they went through three years of training. The program was designed to improve their understanding of physics concepts and to assist them in developing [teaching strategies](#) to help their students better retain what they learn about physics.

Justina Ogodo, the study's author and postdoctoral researcher at The Ohio State University's Department of Teaching and Learning, said that when she launched this project, she remembered being a physics [student](#) in high school, and being uninspired by the education she received.

"I truly hated physics, because my teacher would speak to the board—he would teach to the board," she said. "I imagined students were having the same experience I had, because the teachers don't have the content knowledge or pedagogical skills to teach physics."

Ogodo wanted to understand how a teacher's subject-matter knowledge could affect a student's ability to learn and understand. She followed a group of advanced-placement physics teachers through intensive physics professional development funded by the National Science Foundation, then compared their teaching practices and student outcomes with AP teachers who did not attend the courses.

To evaluate the teachers, Ogodo used the Reformed Teaching and Observation Protocol (RTOP) instrument, which has been in use as a

teacher-evaluation tool since 2000. Ogodó used the instrument to measure each teacher's effectiveness in five categories: lesson design and implementation, content, classroom culture, communicative interactions and student/teacher relationships. She found that teachers who completed the training earned scores about 40 percent higher than teachers who did not participate in the professional development.

Prior to the training, Ogodó found, most teachers used "traditional, teacher-centered methods" to teach. Those methods include lectures, note-taking and problem-solving activities—methods designed to complete the AP curriculum and focused on the AP exam.

Ogodó observed that teachers who completed the course were more likely to use conceptual learning techniques and the Socratic method to teach their students—a method driven by inquiry-based teaching and learning, along with hands-on labs to help students see the real-world applications of the theories they learned.

The teachers who did not complete the training, Ogodó found, continued to fall back on lectures and standardized labs.

The shortage of physics teachers is severe. Across the United States, just 47 percent of physics teachers have physics degrees or physics education, according to the National Science Foundation.

And in Alabama, where this study was conducted, the problem is worse: Just 9 percent of physics teachers there have physics degrees or certification in physics education.

"They are just thrown into the physics classrooms to teach," Ogodó said. "That means they are not equipped to teach physics, and that can be frustrating for both teachers and students."

The results can be harmful, Ogodo found. Some teachers in Ogodo's study reported feeling a lack of confidence in their abilities, especially when teaching physics concepts they did not understand, and suggested that these feelings could lead to teacher burn-out. Ogodo also found that teachers' lack of knowledge can diminish students' interest in physics.

But in classrooms led by teachers who participated in the intensive physics education training, teachers reported feeling greater satisfaction in teaching physics and greater trust in their abilities.

Previous studies about science and education have shown that students' ability to achieve in any subject is directly connected to the quality and effectiveness of their teachers.

Ogodo said this study shows that increasing training for teachers will likely lead to better outcomes for students and to greater numbers of students seeking futures in the sciences.

"One student told me she likes to write, and that she wanted to be a creative writer, but that after taking this physics class with her teacher who had learned these better techniques, she wants to be a [physics teacher](#)," Ogodo said. "That just made my day."

**More information:** Justina A. Ogodo, Comparing Advanced Placement Physics Teachers Experiencing Physics-Focused Professional Development, *Journal of Science Teacher Education* (2019). [DOI: 10.1080/1046560X.2019.1596720](https://doi.org/10.1080/1046560X.2019.1596720)

Provided by The Ohio State University

Citation: How to help physics teachers who don't know physics (2019, June 25) retrieved 12 May

2024 from <https://phys.org/news/2019-06-physics-teachers-dont.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.