



For the New Teacher

Patricia Blanton, Column Editor
Department of Physics and Astronomy, Appalachian State
University, Boone, NC 28608; blantonp@appstate.edu

Physics Teacher by Choice or Chance?

Dan MacIsaac, David Henry, and Joe Zawicki, Buffalo State College

If you're not a physics teacher by preparation, but you've just been assigned to teach physics, you're not alone.

Nationally, fewer than one-half of physics teachers have a major, minor, or graduate degree in physics or in physics education.¹ In our experience, physics teachers usually come from other sciences as crossover teachers from chemistry or biology, and some of the very best physics teachers (including National Award winners) do not have degrees in physics. This is especially the case in rural school districts where there may be only one or two science teachers in the high school.

The first step in succeeding and excelling as a crossover physics teacher is to realize that your plight is not unusual and that you are not alone. The national professional organization supporting you is the American Association of Physics Teachers, with considerable online, regional, and local resources,² meetings, workshops, and journals, including *The Physics Teacher*. Physics departments at colleges and universities nationwide are accustomed to hearing from local teachers and may be able to field email and telephone queries about coursework leading to certification. Other valuable resources are electronic listserv communities of physics educators,³

particularly PHYS-L, PHYSHARE, and MODELING-L.

Our Advice:

► Obtain your state physics standards and expectations for your course. Your principal or department chair should have these. State guidelines from across the United States can be searched from http://wdcrobcolp01.ed.gov/Programs/EROD/org_list.cfm?category_ID=SEA.

► If you're concerned about your physics content knowledge, then consider physics to be something that you and your students are trying to make sense of together. When you meet an unknown, don't bluff—tell your students you don't know but will work to find the answer. Telephone or email a colleague or a member of the physics education community described above. Teaching physics as vocabulary and a set of equations without meaning doesn't work—you and your students really need to understand the concepts. The authors of this column learn physics every semester by listening to and reflecting upon student questions. *The Mechanical Universe* video series is a good source for answers to many questions. You can view them at your convenience as web-streamed videos found at <http://www.learner.org/resources/series42.html>. Free

online registration is required.

► Get physical and do activities, experiments, and demonstrations together with your students (available widely from AAPT and online). Leave the text periodically, even if only for end-of-semester projects. Research has shown that students of high school physics teachers who don't use any texts do better in college physics than those who do use a text.⁴ The compelling and fun parts of physics are the hands-on activities that, when combined with student discussions of ideas, help you and your students make more sense of the everyday world. These will enhance your students' problem-solving skills and everyone's morale—if your students see you having fun, they will have fun, too.

► Beyond textbooks, there are many organized and effective high school/introductory college physics curricula. Modeling Physics, an entire research-based introductory physics curriculum, is available as freely downloadable worksheets, activity masters, and teacher's guides from <http://modeling.asu.edu/Curriculum.html>. The Arizona State University Modeling Physics leaders offer summer workshops for graduate credit, listserv support, and more. The Capacitor-Aided System for Teaching and Learning Electricity (CASTLE) is a

great introductory curriculum for electricity.

► Get ready for next semester by attending a summer workshop. The Physics Teaching Resource Agents (PTRA) program has trained hundreds of workshop facilitators who also offer school-year and summer workshops for physics teachers. See <http://www.aapt.org/PTRA/index.cfm> for details. Federal No Child Left Behind (Title II) funds are available to school districts to help pay for part of these professional development costs. Many colleges and universities nationwide offer formal coursework and institutes, as do U.S. national laboratories. Learn about these from the online communities, alliance meetings, and *The Physics Teacher*.

Our summer workshops at Buffalo State College have helped more than 200 new and veteran physics teachers over the past few years. We have found that many crossover teachers find physics teaching to be fun and exciting, physically intuitive, and intellectually challenging. Most come to feel they would rather teach physics than any other science, despite their original training. Just this past summer we heard from a teacher who has been teaching physics for 11 years since attending our Workshop for New Physics Teachers: "Physics used to be on the bottom of my list of courses I would teach. Now it is on the top." Once you start teaching physics, you may never turn back! We hope that you will have such an experience, and we welcome you to our community of physics educators.

References

1. M. Neuschatz and M. McFarling, "Background and professional qualifications of high-school physics

- teachers," *Phys. Teach.* **38**, 98–104 (Feb. 2000). Available at <http://www.aip.org/statistics/trends/hstrends.htm>.
2. See <http://www.aapt.org>. Also Peter Lindenfield's online list of regional physics alliances: <http://www2.umassd.edu/Physics/Alliances/>. E.g., the Western NY Physics Teachers' Alliance homepage is <http://PhysicsEd.BuffaloState.edu/PHYS-L/WNYP-TA-L/>.
3. D.L. MacIsaac, "Communities of on-line physics educators," *Phys. Teach.* **38**, 210–213 (April 2000); see <http://PhysicsEd.BuffaloState.edu/PHYS-L/> for a copy.
4. Philip M. Sadler and Robert H. Tai, "Success in introductory college physics: The role of high school preparation," *Sci. Educ.* **85**(2), 111–136

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5. Melvin S. Steinberg, <http://www.ed.gov/pubs/EPTW/eptw7/eptw7a.html>.

If you have a colleague who is struggling as a new physics teacher, please hand him or her a copy of this column.

Assistant Professors Dan MacIsaac (danmac@att.net), David Henry (henryd@buffalostate.edu), and Joe Zawicki (zawickj@buffalostate.edu) are all previous high school physics teachers, now preparing and cross-certifying physics teachers at the NSF-sponsored Summer Physics Teachers' Academies (# 0302097) at SUNY-Buffalo State College in New York State; <http://PhysicsEd.BuffaloState.Edu/>.