

Research on the education of physics teachers

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The focus of this review is on physics teacher education in the United States. Research on “pedagogical content knowledge” in physics addresses the understanding held by prospective and practicing teachers regarding students’ ideas in physics, effective teaching strategies for specific physics concepts, and methods of assessing students’ physics knowledge. Courses designed for physics teachers focus on probing and strengthening knowledge of research results regarding students’ physics ideas, and of ways to apply that knowledge to effective instruction. Programs for practicing (“in-service”) physics teachers have been prevalent since the 1940s; the few relevant research reports suggest that some of these programs may improve teachers’ physics knowledge and teaching enthusiasm. More recent research indicates that some current in-service programs lead to significant improvements in learning by students taught by participants in these programs. Research on programs for prospective (“preservice”) physics teachers is a more recent phenomenon; it indicates that those few programs that incorporate multiple courses specifically designed for physics teachers can strengthen participants’ potential or actual teaching effectiveness. The broader implications of worldwide research on programs for physics teacher education are that several program characteristics are key to improving teaching effectiveness, including (1) a prolonged and intensive focus on active-learning, guided inquiry instruction; (2) use of research-based, physics-specific pedagogy, coupled with thorough study and practice of that pedagogy by prospective teachers; and (3), extensive early teaching experiences guided by physics education specialists.