Washington State
Institute for
Public Policy

110 Fifth Avenue Southeast, Suite 214 • PO Box 40999 • Olympia, WA 98504-0999 • (360) 586-2677 • FAX (360) 586-2793 • www.wsipp.wa.gov

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What is Known About How Teacher Pedagogy Training Affects Student Test Scores?

At the August 6, 2008, meeting of the Basic Education Finance Joint Task Force, Chair Dan Grimm directed Institute staff to summarize the research evidence on the impact of college coursework in teacher pedagogy on student test scores. Teacher pedagogy training focuses on *how* teachers teach subject matter to students.[1]

Review of Research

We examined several research reviews by others and located two studies that employ rigorous research methods to measure empirically whether teacher preparation in pedagogy affects student test score outcomes. In the research we reviewed, the results are mixed; teachers' pedagogical knowledge and training appear to have inconsistent impacts on student outcomes. **The overall finding from our review of the research is that the credible evidence on this topic is too thin to draw firm conclusions about the effectiveness of teacher pedagogy training.**

This handout cites findings from prior reviews of research and summarizes the empirical evidence from the two rigorous studies we located.

Prior Reviews. Published reviews of the research literature on teacher pedagogy training have found that not enough is known about the topic to inform the development of teacher preparation programs and policies. Conclusions from three such reviews are excerpted below.

> *"There is no research that directly assesses what teachers learn in their pedagogical preparation and then evaluates the relationship of that pedagogical knowledge to student learning."*[2]

> *"Of the few studies that examine the relationship between pedagogy coursework and student achievement, none finds causal evidence and only a few provide even general correlational evidence."*[3]

> *"The most recent research in this area is almost exclusively qualitative … and seldom compare[s] the effectiveness of different pedagogical approaches."*[4]

As researcher Dan Goldhaber noted in his August 6, 2008, presentation to the Task Force, recent empirical research suggests that teachers' knowledge and skills as measured by certification status and performance on licensure exams are associated with student achievement. However, regarding specific pedagogical approaches, Boyd and Goldhaber et al. (2007) wrote that "no study identifies either which of these skills are important or the best way for aspiring teachers to develop them."[5]

Two Empirical Studies. Recent research based in New York City and Pennsylvania found mixed results regarding pedagogical training and impacts on student outcomes as measured by test scores.

Boyd et al. (2008) evaluated the effectiveness of pedagogical training for teachers in New York City.[6] This study is a comprehensive and rigorous review of pedagogical components within teacher education programs. Using data for approximately 435,000 New York City students in years 2001 through 2006, the study examines the effectiveness of three kinds of teacher pedagogical training:

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[1] For a more detailed definition of pedagogy and a description of different pedagogical approaches in teacher education, see P. Grossman. (2005). Research on Pedagogical Approaches in Teacher Education. In M. Cochran-Smith & K. Zeichner (Eds.). *Studying Teacher Education: The Report of the AERA Panel on Research and Teacher Education.* Washington, D.C.: American Educational Research Association, 425-476.

[2] S. Wilson, R. Floden, & J. Ferrini-Mundy. (2001). *Teacher Preparation Research: Current Knowledge, Gaps, and Recommendations.* Research Report prepared for the U.S. Department of Education by the Center for the Study of Teaching and Policy, University of Washington, Seattle. Document R-01-3.

[3] D. Boyd, D. Goldhaber, H. Lankford, & J. Wyckoff. (2007) The Effect of Certification and Preparation on Teacher Quality. *The Future of Children, 17*(1), 58.

[4] Cochran-Smith & Zeichner, (2005), 19.

[5] Boyd et al., (2007), 58.

[6] D. Boyd, P. Grossman, H. Lankford, S. Loeb, & J. Wyckoff. (2008). *Teacher Preparation and Student Achievement.* NBER Working Paper 14314. <http://www.nber.org/papers/w14314>.

a) Training in specific teaching practices (e.g., listen to a child read aloud to assess reading achievement, plan a guided reading lesson, study or analyze student math work);

b) Coursework in subject-specific pedagogy (how to teach math, English language arts); and

c) Capstone projects (e.g., portfolios, research papers, or applied research).

New York City teachers' participation each of these components of pedagogical training was measured by self-reports from a survey of teachers, reviews of program descriptions and course syllabi, and interviews with directors of teacher preparation programs.

Table 1 summarizes the results for training in math pedagogy. In the table, results for "all programs" cover traditional and alternative routes to certification and "traditional programs" include results for four- and five-year college-based programs only. Impacts on student test score results are displayed for teachers in the first and second years following completion of preparation programs. In most (11 out of 16) cells in Table 1, the results are not statistically significant; in these cases, aspects of pedagogy training could not be empirically linked with student outcomes. There are five statistically significant positive impacts—four in the first year following training—and two negative impacts. For English language arts (not shown in the table), few components were found to have statistically significant impacts in the first or second years.

The authors concluded that the "results do not support the hypothesis that greater opportunities to learn how students learn influences student achievement among first-year or second-year teachers."[7] The authors caution, however, that the study "represent(s) only the first stage of research exploring the relationships between preparation programs and the subsequent impact of graduates on pupil achievement" and they suggest there is a need for further research examining the effectiveness of different features of teacher preparation programs.[8]

Table 1
Effect of Teacher Pedagogy Training in Math as Measured by Elementary Student Test Scores

Type and Amount of Pedagogy Training	All Programs		Traditional Programs	
	First Year	Second Year	First Year	Second Year
Practicing instruction	+	n.s.	+	n.s.
Limited subject-specific pedagogy	n.s.	n.s.	n.s.	n.s.
Some subject-specific pedagogy	+	–	n.s.	n.s.
Extensive subject-specific pedagogy	–	+	n.s.	n.s.
Capstone project	+	n.s.	No data	No data

A "+" indicates a statistically significant, positive effect on test scores, a "–" indicates a negative effect, and "n.s." indicates a non-statistically significant effect. "All programs" include alternative routes to certification programs, "Traditional programs" indicate four- or five-year college-based programs. Source: Boyd et al. (2008)

Strauss and Vogt (2006)[9] is the second study we located on this topic. This study analyzes the relationship between Pennsylvania teachers' scores on a national, standardized test of pedagogical knowledge[10] and student test scores at the district level. In this analysis, the test of pedagogical knowledge is a proxy measure of pedagogy training.

In their statistical model, the authors found that teachers' pedagogical knowledge had a negative, statistically significant association with student test scores. These results should be interpreted with caution, particularly because results are measured at the district, rather than individual student and teacher, level. Like Boyd et al., the authors call for further research on this topic, stating that, while the results distinguish between content and pedagogical knowledge, they do not address whether "educational school course work in pedagogy will directly improve student learning outcomes."[11]

For more information contact Annie Pennucci at (360) 586-3952 or pennuccia@wsipp.wa.gov

[7] Boyd et al., (2008), 27.
[8] Ibid, 27-28.
[9] R. Strauss and W. Vogt. (2006). *Should Teachers Know, or Know How to Teach?* Revised version of paper presented at the March 2001 American Educational Finance Association Annual Research Conference.
[10] The Educational Testing Service's National Teacher's Exam, Professional Knowledge component, was used as the measure.
[11] Strauss & Vogt, (2006), 24.