REL Midwest Reference Desk
Professional Development Effects

March 2016

Question

What does the research say about the effects of teacher professional development on teacher performance and student outcomes in K–12 education?

Background

REL Midwest received a request for information on the effects of teacher professional development on teacher performance and student outcomes.

Following an established REL Midwest research protocol, we conducted a search for research reports as well as descriptive and policy-oriented briefs and articles on teacher professional development. We focused on identifying resources that specifically addressed the effects of professional development on teacher performance and student outcomes in K–12 education. The sources included federally funded organizations, research institutions, several educational research databases, and a general Internet search using Google and other search engines.

We also searched for appropriate organizations that may act as resources on this issue. We have not done an evaluation of these organizations or the resources themselves but offer this list for reference only.

What does the research say about the effects of teacher professional development on teacher performance and student outcomes in K–12 education?

Blank, R. A., & de las Alas, N. (2009, June). *Effects of teacher professional development on gains in student achievement: How meta analysis provides scientific evidence useful to education leaders*. Paper presented at the Conference for the Society of Research on Education Effectiveness. Retrieved from http://www.ccsso.org/Documents/2009/Effects_of_Teacher_Professional_2009.pdf

From the abstract: "The Council of Chief State School Officers (CCSSO) was awarded a grant from the National Science Foundation to conduct a meta analysis study with the goal of providing state and local education leaders with scientifically-based evidence regarding the effects of teacher professional development on improving student learning. The analysis focused on completed studies of effects of professional development for

K–12 teachers of science and mathematics. The meta analysis results show important cross-study evidence that teacher professional development in mathematics does have significant positive effects on student achievement. The analysis results also confirm the positive relationship to student outcomes of key characteristics of design of professional development programs. The following are appended: (1) Meta Analysis Coding Form Excerpt: Scaffolded Guide for Determining Inclusion of a Document; (2) Effects of Professional Development on Student Achievement, by Study ($N = 104$); (3) Computation of Effect Sizes, Homogeneity Tests and Q Statistic Analysis; and (4) Correlation Table of Math Post-Only Professional Development Design Elements." Note: REL Midwest is unable to confirm whether this resource has been peer-reviewed. However, we have included it as it may be of interest to you.

Campos, A., & Peach, R. (2007). *The impact of the New York City Writing Project: Teacher and student outcomes of a professional development model for improving the teaching of writing*. Berkeley, CA: National Writing Project. Retrieved from http://www.nwp.org/cs/public/download/nwp_file/10562/New_York_City_Writing_Project.pdf?x-r=pcfile_d

From the executive summary: "This study investigates the impact of a partnership between the New York City Writing Project (NYCWP) and six high schools in a large urban district where challenges include poverty, low student achievement, inexperienced teachers, and increasing demands for high-stakes testing. NYCWP had worked from one to five years in each of these schools, offering support through teacher-consultants and graduate seminars, both onsite. This report presents findings from Phase One of a two-year study, conducted in 2004–2005. The research examined how the NYCWP professional development model supports teachers' growth and, consequently, how it affects student writing outcomes, particularly for students who face challenges when writing in English. The study compares data from two sets of teachers and their students in grades 9–12. Eight program group teachers participated in the NYCWP professional development program at their school sites; three comparison group teachers—from a school with similar demographics—did not have access to NYCWP professional development. The students of teachers from both groups were more than 90% African American or Hispanic; ELL students made up 38% of the program group and 46% of the comparison group. The analysis of teachers' growth relied primarily on interviews and surveys about instructional practices and attitudes. Program and comparison group students' growth in writing was measured by pre and post assessments of student writing samples, written to a prompt drawn from an archive of established writing prompts. The samples were independently assessed at a national scoring conference. . . . Program group teachers reported adopting views and practices drawn from NYCWP professional development. . . . Comparison group teachers, on the other hand, felt that their professional development was less useful in their classroom practice, and employed writing strategies less consistently. . . . Program group students' writing scores increased more than comparison group students' scores on the holistic and all six analytic measures."

Cotabish, A., Dailey, D., Hughes, G. D., & Robinson, A. (2011). The effects of a STEM professional development intervention on elementary teachers' science process skills. *Research in the Schools, 18*(2), 16–25.

From the abstract: "In order to increase the quality and quantity of science instruction, elementary teachers must receive professional development in science learning processes. The current study was part of a larger randomized field study of teacher and student learning in science. In two districts in a southern state, researchers randomly assigned teacher participants to the experimental and control conditions. The current study reported the effects of 2 years of sustained, embedded professional development on Grade 2 through Grade 5 elementary teachers' science-process skills, as defined by their ability to design experiments, and teacher perceptions of their capacity to lead students in scientific explorations. The results revealed a statistically significant difference between the adjusted post-test scores for the two groups, with the experimental group scoring higher than did the control group, indicating a significant gain in teachers' science process skills. The results for teacher perceptions about their own science process skills revealed a statistically significant increase between pre- and post-test scores, with a large effect size reflecting a gain in teacher views of more than 2 points on a 4-point scale. The results for teacher perceptions about students' science process skills also revealed a statistically significant increase between pre- and post-test scores with a large effect size. The results of this study document the effects of sustained and targeted teacher professional development focused on improving content-specific science instruction for students in the elementary classroom."

Note: REL Midwest tries to provide publicly available resources whenever possible. Although we were unable to locate a link to the full-text version of this article, we determined that it might be of interest to you. The resource may be available through university or public library systems.

de Kramer, R. M., Masters, J., O'Dwyer, L. M., Dash, S., & Russell, M. (2012). Relationship of online teacher professional development to seventh-grade teachers' and students' knowledge and practices in English language arts. *Teacher Educator, 47*(3), 236–259.

From the abstract: "Online professional development (OPD) has potential to improve teacher quality by improving teachers' knowledge and instructional practices. These changes, in turn, have potential to improve student achievement. Unfortunately, there is a dearth of scientific research on the effects of OPD on teachers and, more importantly, on students. This article presents the results of a randomized controlled trial exploring the effects of a series of three learning-community model OPD workshops on teachers' content knowledge, teachers' instructional practices, students' content knowledge, and students' practices in the context of seventh-grade English language arts. There were statistically significant effects on teachers' vocabulary and overall English language arts content knowledge and on vocabulary and writing practices. The effect sizes of these changes ranged from small to medium. There were statistically significant effects on students' reading comprehension practices."

De La Paz, S., Malkus, N., Monte-Sano, C., & Montanaro, E. (2011). Evaluating American history teachers' professional development: Effects on student learning. *Theory and Research in Social Education, 39*(4), 494–540.

From the abstract: "The United States government has invested nearly one billion dollars in funding to professional historians and history educators across the country since 2000 to strengthen the teaching of American history in elementary and secondary schools, yet we know little about how these programs impact student learning. Using data from one such Teaching American History (TAH) grant, the authors employ multilevel models to investigate the effects of professional development on students' written responses to document-based questions at the fifth, eighth, and eleventh grades, and qualitative analyses of teachers' activities to learn about connections between classroom lessons and student outcomes. Findings indicate that fifth and eleventh grade students whose teachers were involved in ongoing networking activities for at least 30 hours in one year resulted in improved student performance. In addition, during the year, teachers of successful students engaged in activities that allowed them to increase their content knowledge and broaden their approach to teaching with primary documents."

Desimone, L., Smith, T. M., & Phillips, K. J. R. (2013). Linking student achievement growth to professional development participation and changes in instruction: A longitudinal study of elementary students and teachers in Title I schools. *Teachers College Record, 115*(5).

From the abstract: "This study increases our understanding of which types of professional development effectively change teaching practice in ways that boost student achievement. . . . Our three-year longitudinal analysis answers two main research questions: (1) To what extent do teachers' topic coverage, emphasis on memorization and solving novel problems, and time spent on mathematics instruction, predict student mathematics achievement growth? (2) To what extent does teacher participation in content-focused professional development predict the aspects of instruction found in our first analysis to be related to increases in student mathematics achievement growth? . . . We found that (1) when teachers in third, fourth, and fifth grade focused more on advanced mathematics topics (defined as operations with fractions, distance problems, solving equations with one unknown, solving two equations with two unknowns, and statistics) and emphasized solving novel problems, student achievement grew more quickly; (2) when teachers focused more on basic topics (defined as measurement, rounding, multi-digit multiplication, and problem solving) and emphasized memorizing facts, student achievement grew more slowly; and

(3) when teachers participated in professional development that focused on math content or instructional strategies in mathematics (in Year 1), they were more likely to teach in ways associated with student achievement growth. Specifically, they were more likely to teach advanced topics and emphasize solving novel problems. Effect sizes ranged from 1% to 15% of a standard deviation."

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Garet, M., Cronen, S., Eaton, M., Kurki, A., Ludwig, M., Jones, W., et al. (2008). *The impact of two professional development interventions on early reading instruction and achievement* (NCEE 2008-4030). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://files.eric.ed.gov/fulltext/ED502700.pdf

From the abstract: "To help states and districts make informed decisions about the professional development (PD) they implement to improve reading instruction, the U.S. Department of Education commissioned the Early Reading PD Interventions Study to examine the impact of two research-based PD interventions for reading instruction: (1) a content-focused teacher institute series that began in the summer and continued through much of the school year (treatment A) and (2) the same institute series plus in-school coaching (treatment B). The Early Reading PD Interventions Study used an experimental design to test the effectiveness of the two PD interventions in improving the knowledge and practice of teachers and the reading achievement of their students in high-poverty schools. It focused specifically on second grade reading because (1) this is the earliest grade in which enough districts collect the standardized reading assessment data needed for the study; and (2) later grades involve supplementary instruction, which was outside the scope of the study. The study was implemented in 90 schools in six districts (a total of 270 teachers), with equal numbers of schools randomly assigned in each district to treatment A, treatment B, or the control group, which participated only in the usual PD offered by the district. . . . This report describes the implementation of the PD interventions tested, examines their impacts at the end of the year the PD was delivered, and investigates the possible lagged effect of the interventions, based on outcomes data collected the year after the PD interventions concluded. The study produced the following results: (1) Although there were positive impacts on teachers' knowledge of scientifically based reading instruction and on one of the three instructional practices promoted by the study PD, neither PD intervention resulted in significantly higher student test scores at the end of the one-year treatment; (2) Added effect of the coaching intervention on teacher practices in the implementation year was not statistically significant; and (3) There were no statistically significant impacts on measured teacher or student outcomes in the year following the treatment."

Garet, M., Wayne, A., Stancavage, F., Taylor, J., Eaton, M., Walters, K., et al. (2011). *Middle School Mathematics Professional Development Impact Study: Findings after the second year of implementation* (NCEE 2011-4024). Washington, DC: National Center for

Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://www.mdrc.org/sites/default/files/full_442.pdf

From the abstract: "This is the second and final report of the Middle School Mathematics Professional Development Impact Study, which examines the impact of providing a professional development (PD) program in rational number topics to seventh-grade mathematics teachers. An interim report (Garet et al. 2010) described the findings after one year of PD. The current report documents the impact after providing a second year of PD in a subset of the original participating districts and includes supplemental analyses that use data from both years of the study. The study produced the following core second-year results: (1) The study's PD program was implemented as intended, but teacher turnover limited the average dosage received; (2) At the end of the second year of implementation, the PD program did not have a statistically significant impact on teacher knowledge; and (3) At the end of the second year of implementation, the PD program did not have a statistically significant impact on average student achievement in rational numbers."

Gersten, R., Dimino, J., Jayanthi, M., Kim, J. S., & Santoro, L. E. (2010). Teacher study group: Impact of the professional development model on reading instruction and student outcomes in first grade classrooms. *American Educational Research Journal, 47*(3), 694–739. Retrieved from http://scholar.harvard.edu/files/jameskim/files/2010-gersten-aerj-teacher_study_group_rct_website.pdf?m=1368105696

From the abstract: "Randomized field trials were used to examine the impact of the Teacher Study Group (TSG), a professional development model, on first grade teachers' reading comprehension and vocabulary instruction, their knowledge of these areas, and the comprehension and vocabulary achievement of their students. The multisite study was conducted in three large urban school districts from three states. A total of 81 first grade teachers and their 468 students from 19 Reading First schools formed the analytic sample in the study. Classroom observations of teaching practice showed significant improvements in TSG schools. TSG teachers also significantly outperformed control teachers on the teacher knowledge measure of vocabulary instruction. Confirmatory analysis of student outcomes indicated marginally significant effects in oral vocabulary."

Greenleaf, C., Hanson, T., Herman, J., Litman, C., Rosen, R., Schneider, S., et al. (2011). *A study of the efficacy of Reading Apprenticeship professional development for high school history and science teaching and learning.* Final report to Institute for Education Sciences, National Center for Education Research, Teacher Quality/Reading and Writing. Oakland, CA: WestEd. Retrieved from http://readingapprenticeship.org/wp-content/uploads/2013/12/IES-history-biology-final-report1.pdf

From the abstract: "This project investigates the efficacy of the Reading Apprenticeship professional development on (a) teachers' integration of reading instruction into high school science and history instruction and (b) students' reading proficiency and achievement. Schools serving high numbers of African American and Latino students, English learners, and students from low socioeconomic groups are targeted to investigate

differential impacts on various subgroups. A pretest/posttest control group design—based on 2 cohorts of teachers—is used to assess program impacts on teacher outcomes and student achievement. Student achievement growth is tracked for 2 years among 9th grade Biology students and for 1 year among 11th grade U.S. History students. Schools are randomly assigned to one of two different groups—with a minimum of 25 schools per group and 2 U.S. History teachers and 2 Biology teachers (and their students) per school. Schools assigned to the U.S. History experimental group serve as controls in the Biology impact study, while those assigned to the Biology experimental group serve as controls in the U.S. History study. The study relies on measures of students' engagement in reading in biology/history, instructional practice based on teacher assignments, and standardized achievement tests. A qualitative study of a sub-sample of teachers, using classroom observations and interviews, is used to explain quantitative findings. . . . The multiple measures of teacher implementation provided a robust corroboration of statistically significant, teacher level outcomes with large effect sizes between intervention and control groups. We conclude that intervention teachers were more able to integrate science and history literacy learning in classroom instruction."

Hafen, C. A., Allen, J. P., Gregory, A., Mikami, A. Y., Hamre, B., & Pianta, R. C. (2012, November). *Improving teaching quality in secondary schools through professional development: Evidence from two RCT's of the My Teaching Partner program* [Study 1]. Paper presented at the Association for Public Policy Analysis and Management Conference, Baltimore, MD. Retrieved from https://appam.confex.com/appam/2012/webprogram/ExtendedAbstract/Paper4012/APPAM%202012%20Paper_CHafen.pdf

Note: REL Midwest is unable to confirm whether this resource has been peer-reviewed. However, we have included it as it may be of interest to you.

From the abstract: "In the context of education reform, there is an extreme lack of rigorously evaluated teacher-development programs that can produce reliable gains in student achievement. This paper discusses findings from two randomized control trials of the My Teaching Partner-Secondary (MTP-S) program, which is a web-mediated approach focused on improving the quality of teacher-student interactions in the classroom. MTP-S is based upon a validated observational approach to assessing the quality of classroom interactions, the Classroom Assessment Scoring System-Secondary (CLASS-S). The most unique feature of the intervention is that it employs a year-long personalized, video-based, iterative coaching process that allows the teacher and a consultant to focus intensively on review and analysis of observed teacher-student interactions. Both study 1 and study 2 are randomized controlled trials of the My Teaching Partner-Secondary professional development program. In Study 1 (see Allen, Pianta, Gregory, Mikami, & Lun, 2011), there were 78 secondary school teachers and 2,237 students across two years. Teachers participated in the intervention in year 1 only. The program produced significant gains in both student engagement and positive peer interactions in year 1. More interestingly, the program produced substantial gains in measured student achievement in year 2, which were mediated by observationally-coded changes to teacher behavior and student engagement (CLASS-S) in the classroom. In Study 2, there were 97 secondary school teachers and 1,360 students. For this study, only

one year of data is available. The program produced significant gains in CLASS-S dimensions, in some cases with larger effect sizes than in the first study."

Harris, D. N., & Sass, T. R. (2007). *Teacher training, teacher quality, and student achievement* (Working Paper 3). Washington, DC: National Center for Analysis of Longitudinal Data in Education Research. Retrieved from http://files.eric.ed.gov/fulltext/ED509656.pdf

From the abstract: "We study the effects of various types of education and training on the ability of teachers to promote student achievement. Previous studies on the subject have been hampered by inadequate measures of teacher training and difficulties addressing the non-random selection of teachers to students and of teachers to training. We address these issues by estimating models that include detailed measures of pre-service and in-service training, a rich set of time-varying covariates, and student, teacher, and school fixed effects. Our results suggest that only two of the forms of teacher training we study influence productivity. First, content-focused teacher professional development is positively associated with productivity in middle and high school math. Second, more experienced teachers appear more effective in teaching elementary math and reading and middle school math. There is no evidence that either pre-service (undergraduate) training or the scholastic aptitude of teachers influences their ability to increase student achievement."

Jacobs, V. J., Franke, M. L., Carpenter, T. P., Levi, L., & Battey, D. (2007). Professional development focused on children's algebraic reasoning in elementary school. *Journal for Research in Mathematics Education, 38*(3), 258–288. Retrieved from http://homepages.math.uic.edu/~martinez/PD-EarlyAlgebra.pdf

From the abstract: "Through a year-long experimental study, we found positive effects of a professional development project that involved 19 urban elementary schools, 180 teachers, and 3,735 students from one of the lowest performing districts in California. Algebraic reasoning as generalized arithmetic and the study of relations was used as the centerpiece for work with teachers in Grades 1–5. Participating teachers generated a wider variety of student strategies, including more strategies that reflected the use of relational thinking, than did nonparticipating teachers. Students in participating classes showed significantly better understanding of the equal sign and used significantly more strategies reflecting relational thinking during interviews than did students in classes of nonparticipating teachers."

Killion, J. (2015). Professional learning for math teachers is a plus for students: Lessons from research. *Journal of Staff Development, 36*(3), 58–60.

From the abstract: "Using 4th- and 8th-grade mathematics data from 2003, 2007, and 2011 Third International Mathematics and Science Study (TIMSS) assessments, researchers conducted a cross-national empirical study to examine teacher participation in professional development and its impact on student achievement. Findings from the research show that, although 4th- and 8th-grade students in the United States had more access to teachers who participated in professional learning than similar students in other countries, one-third to one-half of 4th graders were taught by teachers who had no

professional development in mathematics. Teachers' participation in professional development was positively associated with student achievement. Empirical research on the impact of professional learning on student achievement continues to be limited despite an increased emphasis on the importance of professional learning and federal guidelines defining levels of investment in professional learning for various federally funded initiatives. This study focuses specifically on six areas of professional learning in mathematics: math content, math pedagogy, math curriculum, integrating information technology into math, math assessment, and improving students' critical thinking or problem-solving skills."

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Meyers, M., Molefe, A., Dhillon, S., & Zhu, B. (2015). *The impact of eMINTS professional development on middle school teacher instruction and student achievement: Year 3 report*. Washington, DC: American Institutes for Research. Retrieved from http://emints.org/wp-content/uploads/2014/05/15-1527_eMINTS_Year3_report_FINAL_10292015ZH.pdf

From the executive summary: "In 2010, the eMINTS (enhancing Missouri's Instructional Networked Teaching Strategies) National Center received an Investing in Innovation (i3) validation grant to implement the eMINTS Comprehensive Program in rural middle schools and test the efficacy of the program in a randomized controlled trial. The program is based on four underlying research-based components: inquiry-based learning, high-quality lesson design, a community of learners, and technology integration. The program provides teachers with approximately 240 hours of professional development spanning two years and support that includes monthly classroom visits for coaching. The eMINTS National Center also developed a third year of professional development with the Intel® Teach Program to build on what teachers learned during the first two years of the eMINTS Comprehensive Program. The third year combines additional professional development and Intel's suite of Web-based teaching tools to expand teachers' use of inquiry-based learning. The key evaluation objectives are as follows:

- Employ experimental methods to rigorously examine the program's impact on middle school teacher practices and student achievement, particularly for middle schools in rural settings.

- Examine the impacts of a third year of professional development, using Intel Teach Program courses and tools, on middle school means of teacher and student outcomes.

This Year 3 report provides results . . . on the basis of different analytic samples. The mathematics and communication arts analytic samples (RQ1) each consisted of about 3,000 students, and the analytic samples for 21st century skills and student engagement (RQ2 and RQ3) each had about 2,300 students. These analytic samples also were used to

assess variations in impact across student subgroups. Between 98 and 117 teachers were used for the analysis of teacher outcomes."

Newman, D., Finney, P. B., Bell, S., Turner, H., Jaciw, A. P., Zacamy, J. L., et al. (2012). *Evaluation of the effectiveness of the Alabama Math, Science, and Technology Initiative (AMSTI)* (NCEE 2012-4008). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/edlabs/regions/southeast/pdf/REL_20124008.pdf

From the summary: "The Alabama Math, Science, and Technology Initiative (AMSTI) is a two-year intervention intended to better align classroom practices with national and statewide teaching standards—and ultimately to improve student achievement—by providing professional development, access to materials and technology, and in-school support for teachers . . . [S]chools were randomly assigned either to the AMSTI condition, in which teachers received AMSTI training and program materials, or to the control condition, in which teachers used their existing mathematics and science programs. . . . The effect of AMSTI on student achievement in mathematics after one year, as measured by end-of-the-year scores on the Stanford Achievement Test Tenth Edition (SAT 10) mathematics problem solving assessment of students in grades 4–8, was 2.06 scale score units. . . . The effect of AMSTI on student achievement in science as measured by end-of-the-year scores on the SAT 10 science assessment, required only in grades 5 and 7, was not statistically significant after one year. . . . AMSTI also had a positive and statistically significant effect on classroom practices in mathematics and science after one year. . . . The effect of AMSTI on student achievement in reading after one year, as measured by end-of-the-year scores on the SAT 10 reading assessment of students in grades 4–8, was 2.34 scale score units. . . . An exploration of the differential effects of AMSTI on student achievement for subgroups of students found no statistically significant differential effects on student achievement in mathematics or science based on racial/ethnic minority status, eligibility for free or reduced-price lunch, gender, or pretest level. In reading, however, AMSTI had a statistically significant differential effect for minority and White students of 3.04 scale score points ($p < .001$)."

Sample McMeeking, L. B., Orsi, R., & Cobb, R. B. (2012). Effects of a teacher professional development program on the mathematics achievement of middle school students. *Journal for Research in Mathematics Education, 43*(2), 159–181.

From the abstract: "The effect of a 15- to 24-month in-service professional development (PD) program on state accountability mathematics test scores for middle school students was examined using a quasi-experimental design. Middle level mathematics teachers ($n = 128$) from 7 school districts and 64 middle schools volunteered for a PD sequence of content-oriented summer courses and pedagogy-oriented structured follow-up experiences during the subsequent academic year. Student effects of the PD program were measured using Colorado's state mathematics test results for 2 cohorts of students: 1 that received mathematics instruction from participant teachers in the year prior to the PD and another cohort that received mathematics instruction in the year following the PD. The odds of a student achieving a Proficient or Advanced score on the state test were

then compared between cohorts. Results showed that students' odds of achieving a score of Proficient or better increased with teacher participation in the PD program."

Note: REL Midwest tries to provide publicly available resources whenever possible. Although we were unable to locate a link to the full-text version of this article, we determined that it might be of interest to you. The resource may be available through university or public library systems.

Sandholtz, J. H., & Ringstaff, C. (2013). Assessing the impact of teacher professional development on science instruction in the early elementary grades in rural U.S. schools. *Professional Development in Education, 39*(5), 678–697.

From the abstract: "This study examined the extent to which significant changes after one year of a longitudinal, state-funded teacher professional development program were sustained during the second year. Participants taught in elementary schools located in small, rural school districts in the state of California in the United States. The research examined changes in early elementary teachers' science content knowledge; self-efficacy in teaching science; instructional practices in science; and contextual factors. Data sources included a teacher survey, self-efficacy assessment, content knowledge tests, interviews and classroom observations. Teachers experienced a significant increase in their knowledge of earth science in the second year. Their overall self-efficacy scores also increased significantly in the second year. Changes in instructional practices in science were largely sustained during the second year but were influenced by contextual factors such as resources, curricular demands, administrators' support and support from other teachers."

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Taylor, J., Kowalski, S., Getty, S., Wilson, C., & Carlson, J. (2011). *The impact of curriculum-based professional development on science instruction: Results from a cluster-randomized trial*. Paper presented at the fall conference of the Society for Research on Educational Effectiveness, Washington, DC. Retrieved from http://files.eric.ed.gov/fulltext/ED528838.pdf

Note: REL Midwest is unable to confirm whether this resource has been peer-reviewed. However, we have included it as it may be of interest to you.

From the abstract: "This research is part of a larger, IES-funded study titled: 'Measuring the Efficacy and Student Achievement of Research-based Instructional Materials in High School Multidisciplinary Science' (Award #R305K060142). The larger study seeks to use a cluster-randomized trial design, with schools as the unit of assignment, to make causal inferences about the effect of treatment on both students and teachers. The research described in this report addresses the following research question associated with path 'a' in Figure 1: (1) What is the mean difference in teacher outcome (i.e.,

instruction) across the treatment groups? (a) What is the effect size (practical significance)? (b) Is the difference statistically significant at the alpha = 0.05 level?; and (2) If practically or statistically significant differences in instruction exist across treatment groups, to what extent can the differences be attributed to the treatment (instructional materials and PD)? The research takes place in both suburban and rural high schools in the state of Washington. In particular, the suburban schools are clustered near Seattle/Tacoma and the rural schools are clustered near Yakima. The data from this analysis suggest that the PD treatment was more effective in fostering reform-oriented science instruction, on average, than was the extant PD experienced by the business-as-usual comparison group. This difference was both statistically and practically significant. Applying this result to the authors' hypothesis of mediation, they now have confidence that one of the causal paths (path a) that [is] necessary to argue mediation is trustworthy. Further study of path b is necessary to understand whether instruction is serving as a mediator of the treatment effect. That said, there is evidence in the literature suggesting that the possibility of a significant b path is quite real. . . . In the context of an efficacy trial, external validity (i.e., generalizability) of findings is not paramount. However, it should be noted again that the authors' sampling approach was not random. Therefore, they are cautious not to suggest that their treatment effect estimates would generalize far beyond their sample of rural and suburban schools in Washington state."

Telese, J. A. (2012). Middle school mathematics teachers' professional development and student achievement. *Journal of Educational Research, 105*(2), 102–111.

From the abstract: "Middle school mathematics teacher quality is questionable because the number of certified mathematics teachers considered highly qualified is low (Birman et al., 2009). The author examined Grade 8 data from the 2005 National Association of Educational Progress mathematics assessment. The purposes of the study were to (a) determine the impact of middle school mathematics teachers' content knowledge and teachers' mathematics pedagogical knowledge on student achievement and (b) compare the effect of the degree to which teachers received reform-oriented professional development activities on student achievement. The results indicated that mathematics content knowledge has a larger role in predicting student achievement than mathematics pedagogical knowledge. Also, teachers who reported participating in fewer professional development activities had students with higher scores than those students whose teachers reported participating in more professional development. Results for various professional development activities are also presented."

Note: REL Midwest tries to provide publicly available resources whenever possible. Although we were unable to locate a link to the full-text version of this article, we determined that it might be of interest to you. The resource may be available through university or public library systems.

Walker, A., Recker, M., Ye, L., Robertshaw, M. B., Sellers, L., & Leary, H. (2012). Comparing technology-related teacher professional development designs: A multilevel study of teacher and student impacts. *Educational Technology Research and Development, 60*(3), 421–444.

From the abstract: "This article presents a quasi-experimental study comparing the impact of two technology-related teacher professional development (TTPD) designs, aimed at helping junior high school science and mathematics teachers design online activities using the rapidly growing set of online learning resources available on the Internet. The first TTPD design ('tech-only') focused exclusively on enhancing technology knowledge and skills for finding, selecting, and designing classroom activities with online resources, while the second ('tech + pbl') coupled technology knowledge with learning to design problem-based learning (PBL) activities for students. Both designs showed large pre-post gains for teacher participants ($N = 36$) in terms of self-reported knowledge, skills, and technology integration. Significant interaction effects show that teachers in the 'tech + pbl' group had larger gains for self-reported knowledge and externally rated use of PBL. Three generalized estimating equation (GEE) models were fit to study the impact on students' ($N = 1,247$) self reported gains in behavior, knowledge, and attitudes. In the resulting models, students of 'tech + pbl' teachers showed significant increases in gain scores for all three outcomes. By contrast, students of 'tech-only' teachers showed improved gains only in attitudes."

Note: REL Midwest tries to provide publicly available resources whenever possible. Although we were unable to locate a link to the full-text version of this article, we determined that it might be of interest to you. The resource may be available through university or public library systems.

Yoon, K. S., Duncan, T., Lee, S. W.-Y., Scarloss, B., & Shapley, K. (2007). *Reviewing the evidence on how teacher professional development affects student achievement* (Issues & Answers Report, REL 2007-No. 033). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest. Retrieved from http://files.eric.ed.gov/fulltext/ED498548.pdf

From the abstract: "The Regional Educational Laboratory - Southwest (REL Southwest) conducted a systematic and comprehensive review of the research-based evidence on the effects of professional development (PD) on growth in student achievement in three core academic subjects (reading/ELA, mathematics, and science). The primary goal of this study was to address the question, What is the impact of teacher participation in professional development on student achievement? Nine studies emerged as meeting What Works Clearinghouse (WWC) evidence standards, from more than 1,300 manuscripts identified as potentially relevant. Although the number of studies that met evidence standards was small, the average overall effect size of 0.54 was observed when examined within the three content areas included in the review. The consistency of this effect size indicates that across all forms and content of PD, providing training to elementary school teachers does have a moderate effect on their students' achievement. However, because the average number of contact hours averaged almost 49 hours across

the nine studies, the total contact hours must be substantial to get such an effect size. Because of the limited number of studies and the variability in the PD that was represented among the nine studies we examined, we were unable to make any conclusions about the effectiveness of specific PD programs or about the effectiveness of PD by form, content, or intensity."

Note: REL Midwest is unable to confirm whether this resource has been peer-reviewed. However, we have included it as it may be of interest to you.

Additional Resources

Blank, R. K. (2013). What research tells us: Common characteristics of professional learning that leads to student achievement. *Journal of Staff Development, 34*(1), 50–53.

From the abstract: "Today's education policy places a high priority on improving teacher quality and teaching effectiveness in U.S. schools. Standards-based professional learning requires teachers to have deep subject knowledge and the most effective pedagogy for teaching the subject. States and school districts are charged with establishing teacher professional development programs, some with federal funding support, designed to address the significant needs for improved teacher preparation. The results of a national study of teacher professional development over a two-year period show that, while teachers are experiencing more professional learning than in the past, the country does not have strong data regarding its effectiveness to improve teaching and learning. What follows is a summary of recent research that measures effects of professional learning on student achievement and identifies characteristics of professional learning that produces positive results for teachers and students."

Note: REL Midwest tries to provide publicly available resources whenever possible. Although we were unable to locate a link to the full-text version of this article, we determined that it might be of interest to you. The resource may be available through university or public library systems.

Bureau of Legislative Research. (2012). *Overview of research on teacher professional development and effectiveness evaluation* (Project No. 12-087). Little Rock, AR: Author. Retrieved from http://www.arkleg.state.ar.us/assembly/2011/Meeting%20Attachments/410/I10425/Overview%20of%20Research%20on%20Teacher%20Professional%20Development%20Effectiveness%20Evaluation.pdf

From "Purpose of This Report": "The primary purpose of this report is to summarize empirically-based, effective professional learning strategies and programs from the literature, with a secondary aim of providing a succinct review of evaluating effective teaching (Glazerman et al., 2011; MET Project, 2010; The New Teacher Project, 2010; Weisberg et al. 2009). A prevailing observation in the literature is that PD can enhance teachers' knowledge and teaching skills, which in turn leads to effective instruction that promotes student learning gains (Darling-Hammond et al., 2008, 2009). Effective instruction requires a comprehensive, in-depth knowledge of content taught, a thorough

understanding of different learning styles, and an array of teaching skills to present complex ideas to a diverse group of learners (Darling-Hammond et al., 2008; Fulton & Britton, 2011; Marzano, 1998; Thompson & Goe, 2009; U. S. Department of Education, 2008). Complete mastery in teaching presupposes the flexibility to match instruction to learning styles and abilities of students (Darling-Hammond et al., 2008)."

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad*. Oxford, OH: National Staff Development Council. Retrieved from http://learningforward.org/docs/pdf/nsdcstudy2009.pdf

From the abstract: "Improving professional learning for educators is a crucial step in transforming schools and improving academic achievement. To meet federal requirements and public expectations for school and student performance, the nation needs to bolster teacher skills and knowledge to ensure that every teacher is able to teach increasingly diverse learners, knowledgeable about student learning, competent in complex core academic content, and skillful at the craft of teaching. This report reveals that much of the professional development available today focuses on educators' academic content knowledge, and pays growing attention to mentoring support, particularly for new teachers. But, overall, the kind of high-intensity, job-embedded collaborative learning that is most effective is not a common feature of professional development across most states, districts, and schools in the United States. The purpose of this report is to provide policymakers, researchers, and school leaders with a teacher-development research base that can lead to powerful professional learning, instructional improvement, and student learning. It examines what research has revealed about professional learning that improves teachers' practice and student learning. It describes the relative availability of such opportunities in the United States as well as in high-achieving nations around the world, which have been making substantial and sustained investments in professional learning for teachers over the last two decades."

DeMonte, J. (2013). *High-quality professional development for teachers: Supporting teacher training to improve student learning*. Washington, DC: Center for American Progress. Retrieved from http://www.sheeo.org/sites/default/files/PD%20Research%20-%20High%20Quality%20PD%20for%20Teachers%2007-2013.pdf

From the abstract: "Professional development in education has gotten a bad reputation, and for good reason. Everyone on all sides of the education reform and improvement debate agrees that what most teachers receive as professional opportunities to learn are thin, sporadic, and of little use when it comes to improving teaching. This paper is the first of a periodic series of reports and briefs by the Center for American Progress looking at professional learning—what states and districts are doing that is working, and what policies are in place to support effective teacher-training activities. The work of improving instruction to help students achieve deserves attention, particularly now when it is an important part of powerful reforms. This report is an attempt to map the landscape of professional learning to prompt ideas that can grow from the foundation—albeit small—that is already in place around professional learning."

Gersten, R., Taylor, M. J., Keys, T. D., Rolfhus, E., & Newman-Gonchar, R. (2014). *Summary of research on the effectiveness of math professional development approaches* (REL 2014-010). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southeast. Retrieved from http://files.eric.ed.gov/fulltext/ED544681.pdf

> *From the abstract:* "This study used a systematic process modeled after the What Works Clearinghouse (WWC) study review process to answer the question: What does the causal research say are effective math professional development interventions for K–12 teachers aimed at improving student achievement? The study identified and screened 910 research studies in a comprehensive literature search for effectiveness studies of math professional development approaches. (See appendix A for details of the search, screening, and review process.) Of these 910 studies, 643 examined professional development approaches related to math in grades K–12 and were conducted in the United States. Of the 643 studies, 32 focused primarily on math professional development provided to teachers and used a research design for examining effectiveness (see appendix B for a list of the 32 studies). Five of those were determined to have met WWC evidence standards (version 2.1) either with or without reservations (appendix C). And of those five, only two found positive effects on students' math proficiency. Thus, there is very limited causal evidence to guide districts and schools in selecting a math professional development approach or to support developers' claims about their approaches. The limited research on effectiveness means that schools and districts cannot use evidence of effectiveness alone to narrow their choice. Instead, they must use their best judgment until more causal evidence becomes available."

Gulamhussien, A. (2013). *Teaching the teachers: Effective professional development in an era of high stakes accountability*. Washington, DC: Center for Public Education. Retrieved from http://www.centerforpubliceducation.org/Main-Menu/Staffingstudents/Teaching-the-Teachers-Effective-Professional-Development-in-an-Era-of-High-Stakes-Accountability/Teaching-the-Teachers-Full-Report.pdf

> *From the introduction:* "This paper aims to provide a research-based answer to how districts can structure professional development so that teachers change their teaching practices, leading to students learning more. This paper will address the many facets of developing an effective professional development program, starting with an assessment of the strengths and weaknesses of current practice in light of new reform demands. Next, the paper will examine what research says about the structure of professional development that truly changes teachers' work and the learning of students. Lastly, the paper will explore what funding effective professional development might look like in a district, while providing some surprising details about the amount districts spend today on professional development."

Jaquith, A., Mindich, D., Wei, R. C., & Darling-Hammond, L. (2010). *Teacher professional learning in the United States: Case studies of state policies and strategies*. Oxford, OH: Learning Forward. Retrieved from http://learningforward.org/docs/pdf/2010phase3technicalreport.pdf?sfvrsn=0

From the abstract: "This report is the third of a three-phase research study of teacher professional learning opportunities in the United States. In this third phase of the research, the authors conducted case studies of four professionally active states to get a deeper look at the policy frameworks that support professional development in those states. These states—Colorado, Missouri, New Jersey, and Vermont—have made significant gains in student performance on the National Assessment of Educational Progress, scoring above the national average, and showed evidence of high levels of teacher participation in professional development in the 2008 National Schools and Staffing Survey (NCES) or on other indicators of access to professional learning. The states represent pockets of promising practice, having created environments in which innovative approaches to school and instructional improvement have gradually gained a foothold. Across the four states, the authors found varied approaches to professional development policy and implementation, including differing levels of support and control at the state level and divergent strategies for monitoring and promoting professional development activity at the local level. But these states shared some common strategies for leveraging professional development access and quality, including: (1) Developing standards to guide accountability; (2) Monitoring quality; (3) Requiring induction and mentoring programs; (4) Leveraging collegial strategies for professional learning; (5) Partnering with professional organizations; (6) Creating networks of intermediary organizations; (7) Addressing federal mandates and accountability requirements in constructive ways; and (8) Skillfully marshalling resources."

Lauer, P., Christopher, D. E., Firpo-Triplett, R., & Buchting, F. (2014). The impact of short-term professional development on participant outcomes: A review of the literature. *Professional Development in Education, 40*(2), 207–227.

From the abstract: "A narrative literature review was conducted to identify the design features of effective short-term face-to-face professional development (PD) events. The 23 reviewed studies described PD with durations of 30 hours or less and involved participants in education or human service–related professions. Design features associated with positive impacts of short-term PD include sufficient time based on topic complexity, the use of learning objectives, alignment with participants' training needs, demonstrations of desired behaviors, opportunities for participant practice, group discussions, pre-work and homework, active learning tasks that require cognitive processing, a participant-centered setting and follow-up support to promote transfer of learning."

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Pianta, R. C. (2011). *Teaching children well: New evidence-based approaches to teacher professional development and training*. Washington, DC: Center for American Progress. Retrieved from http://files.eric.ed.gov/fulltext/ED535637.pdf

From the abstract: "There is widespread acknowledgement that the production of effective teaching and teachers is perhaps the critical component of education reform and innovation for improvement of student learning. This aim requires a serious investment of time, rigor, and evaluation to produce professional-development programs that actually work. This report illustrates features of new evidence-supported approaches to professional development that have promise for closing not only the evidence gap, but the achievement gap as well. The focus is on one web-based, scalable approach to professional development—MyTeachingPartner, or MTP—that illustrates how evidence-driven professional development can be designed and used to improve teacher effectiveness and student learning. MTP uses a standardized method of online, individualized coaching and a library of highly focused video clips showing effective teachers in action that are tightly coupled with a standardized metric for observing teacher practice in the classroom, called the Classroom Assessment Scoring System, or CLASS. This report provides background information on the broader challenges of building effective professional development for teachers, the theory of action that undergirds the CLASS-MTP system, and a description of the CLASS-MTP tools and evidence base. The report closes with a discussion of the policy and practice challenges of implementing effective systems of teacher professional development on a district or statewide level based on the evidence gleaned and lessons learned from this work."

Ruchti, W. P., Jenkins, S. J., & Agamba, J. (2013). Critical supports for secondary educators in Common Core State Standard implementation. *Clearing House: A Journal of Educational Strategies, Issues and Ideas, 86*(6), 246–254.

From the abstract: "Teacher professional development (PD) is a complex, ongoing challenge as educational systems attempt to deliver excellent programming in pursuit of increased student achievement (Opfer and Pedder 2011). This article examines Idaho Total Instructional Alignment (TIA), a model for teacher PD that is currently being utilized in secondary schools throughout the state of Idaho. The implications of this model for effective guidance and support with implementation of the Common Core State Standards (CCSS), as well as the factors that indicate readiness of secondary teachers for implementation of the CCSS, are explored."

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Additional Organizations to Consult

- Association for Supervision and Curriculum Development
  (www.ascd.org)

  From the website: "Founded in 1943, ASCD (doing business as the Association for Supervision and Curriculum Development) is the global leader in developing and delivering innovative programs, products, and services that empower educators to support the success of each learner. Comprising 125,000 members—superintendents, principals, teachers, professors, and advocates from more than 138 countries—the ASCD community also includes 56 affiliate organizations. The nonprofit's diverse, nonpartisan membership is its greatest strength, projecting a powerful, unified voice to decision makers around the world. The association provides expert and innovative solutions in professional development, capacity building, and educational leadership essential to the way educators learn, teach, and lead."

- Center on Great Teachers & Leaders at American Institutes for Research
  (www.gtlcenter.org)

  From the website: "The Center on Great Teachers and Leaders (GTL Center) is dedicated to supporting state education leaders in their efforts to grow, respect, and retain great teachers and leaders for all students. The GTL Center continues the work of the National Comprehensive Center for Teacher Quality (TQ Center) and expands its focus to provide technical assistance and online resources designed to build systems that:

  - Support the implementation of college and career standards.

  - Ensure the equitable access of effective teachers and leaders.

  - Recruit, retain, reward, and support effective educators.

  - Develop coherent human capital management systems.

  - Create safe academic environments that increase student learning through positive behavior management and appropriate discipline.

  - Use data to guide professional development and improve instruction."

- Learning Forward
  (http://learningforward.org)

  From the website: Learning Forward is an "association devoted exclusively to advancing professional learning for student success." Their vision "is ensuring that every educator engages in effective professional learning every day, so every student achieves."

- National Council on Teacher Quality
  (http://www.nctq.org)

  From the website: "The National Council on Teacher Quality is led by the vision that every child deserves effective teachers. As a nonpartisan research and policy

organization, we recognize that it is not teachers who bear responsibility for their profession's many challenges, but the institutions with the greatest authority and influence over teachers. To that end we work to achieve fundamental changes in the policy and practices of teacher preparation programs, school districts, state governments, and teachers unions. We advocate for reforms at the federal, state and local levels."

Keywords and Search Strings Used in the Search

- "faculty development" AND effect OR impact
- "professional development"
- "professional development" AND affect
- "professional development" AND effect OR impact
- "professional development" AND "student achievement"
- "professional development" AND "teacher performance"
- "staff development" AND effect OR impact

Search of Databases and Websites

Institute of Education Sciences sources: Institute of Education Sciences (IES), Regional Educational Laboratory (REL) Program, National Center for Education Statistics (NCES), National Center for Education Research (NCER)

Additional data resources: ERIC, EBSCO databases, JSTOR database, ProQuest, Google Scholar, Google, general Internet search

Criteria for Inclusion

When Reference Desk researchers review resources, they consider—among other things—four factors:

- *Date of the publication:* We include the most current information, except in the case of nationally known seminal resources.

- *Source and funder of the report/study/brief/article:* We give priority to IES, nationally funded, and certain other vetted sources known for strict attention to research protocols.

- *Methodology:* Randomized controlled trial studies, surveys, self-assessments, literature reviews, policy briefs. We generally give priority for inclusion to randomized controlled trial study findings, but the reader should note at least the following factors when basing decisions on these resources: numbers of participants (just a few? thousands?); selection (Did the participants volunteer for the study, or were they chosen?); representation (Were findings generalized from a homogeneous or a diverse pool of participants? Was the study sample representative of the population as a whole?).

- *Existing knowledge base:* Although we strive to include vetted resources, there are times when the research base is slim or nonexistent. In these cases, we presented the best resources we could find, which may include, for example, newspaper articles, interviews with content specialists, and organization websites.